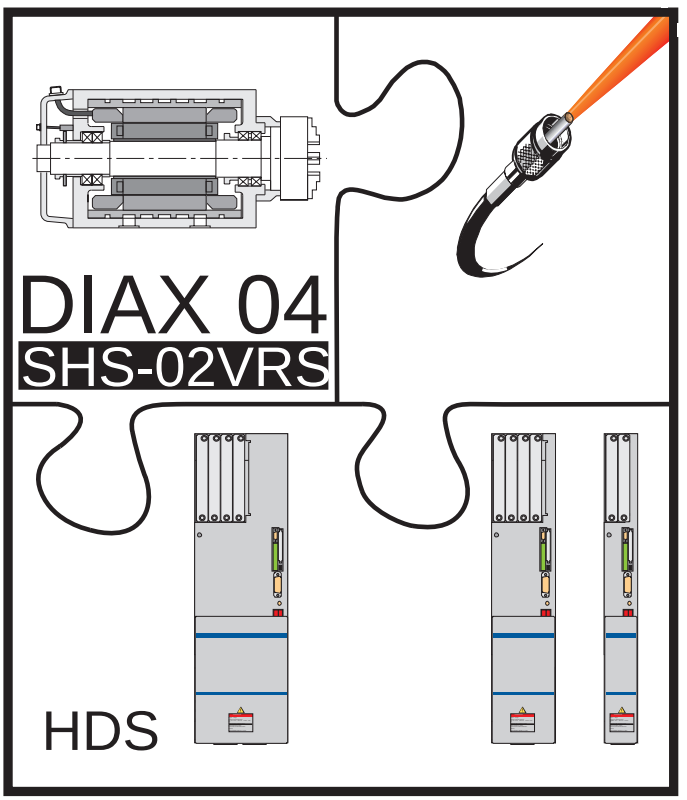
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DIAX04
Main Spindle Drives

Function Descriptions

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

278056

Indramat

Title

DIAX04 Main Spindle Drives

Type of documentation

Function Description

Document code

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

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The purpose of this document

This document is the Function Description of firmware FWA-DIAX04-SHS-02VRS.

It serve to instruct maintenance personnel:

- in the form of working instructions when commissioning the digital AC main spindle drive via SERCOS compatible controls
- for parametrizing the drive controller
- to secure drive parameters
- with error diagnostics and fault clearance in digital main spindle drives.

Editing sequence

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1 System Overview

1.1 Applications

The DIAX04 is a family of digital intelligent drives. It represents the solution for all drive tasks in the area of:

- machine tools
- printing machines
- looms
- overall automization technologies

The salient points of a DIAX04 are:

- standardized digital drive SERCOS interface
- operations with complete INDRAMAT motor programs
- a complete power spectrum from 1kW to 100kW
- extensive application-oriented software functions
- the plug-in modules make it adaptable to a wide variety of drive tasks

1.2 Drive Controllers

The DIAX04 drive family is made up of three drive controller types:

Modular drive controllers:

- HDD02.1
- HDS02.1
- HDS03.1
- HDS04.1

The type of controller used is stored in parameter **S-0-0140, Controller type**.

1.3 Motors

Rotary and linear motors can be used with the DIAX04.

Rotary motors:

- MHD
- MKD
- 2AD
- ADF
- 1MB
- MBW

Linear motors:

- LAR
- LAF
- LSF

The motor type is stored in parameter **S-0-0141, Motor type**.

1.4 Firmware Overview

There are three application-related firmware variants:

- drive with servo functions
- drive with main spindle functions
- drive with electronic gearbox functions

The firmware variants for AC main spindle drives are described in this documentation.

The drive software version used is stored in parameter **S-0-0030, Manufacturer version.**

1.5 Basic Operation Modes and Functions

Basic Operating Modes

- torque control
- velocity control
- position control with cyclically positioned command values
- drive-internal interpolation

Basic Functions

- drive halt
- drive-controlled homing
- evaluation of absolute measuring system by setting an absolute dimension
- analog output
- oscilloscope functions
- digital input and output
- analog inputs
- base load function
- modulo function
- emergency stop functions
- language switching
- overload protection for controller and motor

1.6 Drive with Main Spindle Functions

Operating Modes

- position-controlled operation (C-axis mode)
- velocity-controlled mode (spindle mode)
- torque control mode (master-slave mode)

Functions

- parameter block switching
- drive-controlled oscillating
- spindle positioning
- drive-internal velocity command value ramps
- velocity command value smoothing
- gear switching
- star/delta transitions
- main spindle messages

2 Safety Guidelines for Electrical Drives

2.1 Some Basic Information on Safety

- The safety guidelines specified here must always be complied with.
- Any incorrect handling of these units and non-compliance with the warnings can cause damage, injury and in extreme cases even death.
- Indramat assumes no responsibility for damage resulting from non-compliance with the warnings.
- Prior to commissioning ensure that documentation is available in the correct language to ensure compliance and comprehension.
- The problem-free and safe operation of this unit assumes that it has been properly transported, stored, mounted and installed as well as carefully used and maintained.
- Only qualified personnel should work on or near this machine.
- Qualified personnel is defined in terms of those familiar with mounting, installation, operation and all warnings and precautionary measures needed for this machine.
- Qualified personnel is also trained and can switch power circuits on and off and is familiar with the specified safety techniques, can ground and label and is trained in first aid.
- Use only replacement parts permitted by the manufcturer.
- Safety instructions for each application must be complied with.
- The units are intended for mounting into machines that will be used in a commercial environment.
- Commissioning may not begin until it is certain that the machine in which the product is to be mounted meets the EU guidelines 89/ 392/ EWG (machine guidelines).
- The operation is only permitted if national EU EMC guidelines for the application are met. Within the EU, EMC guideline 89/ 336/ EWG applies.
- The technical data, the connections and installation conditions are outlined in the production documentation and must be complied with.

2.2 Protection Against Contact with Electrical Parts

Explanation:

If parts conducting voltages exceeding 50 volts are touched, then these could be dangerous and harmful. When operating electrical units, some parts always conduct dangerous voltages.



DANGER

High electrical voltages!

⇒ Danger to life and limb and serious bodily injury.

⇒ The general setup and safety guidelines when working on high-voltage facilities must be complied with.

⇒ After installation, ensure that the connection of the protective fuse in all electrical units corresponds to the terminal diagram.

⇒ Operation, even just for short-term measuring and test purposes, is only permitted with protective fuses at the points on each component as designated.

⇒ Prior to accessing electrical parts with 50 volts are more, remove unit from mains or voltage source. Secure against being switched back on.

⇒ After switching off, wait through the five minute capacitor discharge time before accessing the machine.

⇒ Electrical connection points of each component may not be touched when power is on.

⇒ Prior to switching on the unit, parts conducting voltage must be secured and contact prevented.

⇒ An FI circuit breaker (earth leakage circuit breaker) cannot be inserted with AC input. Protection against indirect contact must be established in other ways, for example, an overload circuit breaker (per EN 501787/ 1994, section 5.3.2.3).

⇒ For mounting units, protection against direct contact with electrical parts can be secured by housing such as a control cabinet (per EN 501787/ 1994).



DANGER

High load current!

Possible results

Danger to life and limb or serious bodily injury!

⇒ Prior to powering up, connect or ground each piece of equipment, each unit and the motor with the protective circuit breaker.

⇒ Leakage current exceeds 3.5 mA. This means the units need a permanent connection to the power supply network (EN 50178/ 1994, section 5.12.11.1).

⇒ Prior to commissioning, even just for test purposes, always connect the insulated wire with ground otherwise high voltage levels could occur on housing.

2.3 Protection from Safe and Separated Low Voltages

Explanation:

The voltages on the power components which are found on the connections and the interface for signal voltages are in the voltage range of five to 30 volts and are within securely separated circuits.



WARNING

High voltage through false connection!

Possible results

Danger to life and limb or serious bodily injury!

⇒ The signal voltage connection and interface of this device may only be connected to equipment, electrical component or wires which exhibit a sufficient safe operation from the active circuit according to standards IEC 364-4-41, 413.5 or per DIN EN 50178, 12.94, section 5.2.18.

2.4 Protection from Dangerous Movements

Explanation:

Dangerous movements can result from mistakes between the control and connected servo system.

The causes can be:

- errors in the software
- faults in the components
- wiring or cabling errors
- error in the measured value and signal feedback
- error when servicing a components

These errors can appear directly after the device is turned on or off or after at any point in time.



WARNING

DANGEROUS MOVEMENTS!

Possible results:

Life threatening, bodily harm or device damage!

⇒ Controls in power components exclude a fail safe in the outer most connected power supply. In regards to personnel safety, this fact may not be exclusively relied upon. Until the efficiency of the included control is certain, there will be a faulty power surge whose mass is dependent on the disturbance and the power.

⇒ Personnel safety is ensured with the above mentioned fundamentals of control or preventive measures which is most important. Such is planned in terms of the structural conditions after a danger and error analysis is conducted by the manufacturer. Those which pass safety requirements, will be included.

In particular note:

⇒ Personnel may not remain within the motional area of the machine. Possible ways to keep personnel out are fencing, screens, covers and light barriers.

⇒ Fencing and covers must have sufficient resistance to motional momentum.

⇒ Emergency stop switches must be easily and quickly accessed. Check to make sure they are working properly before starting up the machine.

⇒ Secure against unintentional starts through a free switch of the power connection across the E-stop circuit or use a safety start lockout.

⇒ Before handling or moving into the dangerous voltage area, bring control device to a safe standstill. Electrical equipment above the main switch must be voltage free. Ensure that power cannot be turned on for:

- maintenance work and repair
- cleaning work
- prior to long operational breaks

⇒ Avoid operating high-frequency, remote controls and audio equipment in the area of the device or its wiring. In such cass, if use of such is unavoidable, check the system and installation for possible malfunctions prior to comissioning. If necessary, run a special EMC check of the installation.

2.5 Protection When Handling and Mounting

Explanation:

Handling and mounting certain drive components in an inappropriate way can cause injuries under some conditions, viz.,



CAUTION

Danger of injury can result from improper handling!
Injury through pinching, sheeting, cutting and trimming.

- ⇒ General installation and safety instructions must be followed when handling and assembling.
- ⇒ Use suitable assembly and transportation devices.
- ⇒ Prevent pinching and squeezing through proper precautions.
- ⇒ Use only proper tools and special tools, if necessary.
- ⇒ Lifting devices and tools must be correctly used.
- ⇒ If necessary, wear safety eyewear, shoes, gloves, etc.
- ⇒ Do not stand under hanging loads.
- ⇒ Wipe up all spilled liquids immediately.

3 General Installation Instructions

3.1 Definition of Terms

It is helpful to explain the terms used in this document so that they will be better understood.

Parameters

The communication process between the control and the drive uses parameters, with a few exceptions. These can be used for

- setting configurations
- parametrizing the control and/or drive settings
- accessing control and/or drive functions and commands and
- configuring the cyclic telegrams to transmit command and actual values.

ID numbers are used to identify a parameter

All operating data is identified with ID numbers.

All the parameter ID numbers available in the drive are listed in paramter **S-0-0017, IDN list of all operating data**.

Data Status

Each parameter is available through a data status which can also be read. It serves the following purpose:

- identifying the validity or invalidity of the parameter
- it contains the command acknowledgement if the parameter acts as a command (see Commands on page 3-7).

Data Block Structure

Each parameter has seven different data block elements. These can be read or written via a user data interface by the higher-ranking control or parameter surface.

Data block-structure: element no.	Designation:	Comments:
1	ID number	parameter identification
2	Name	can be changed by language switch
3	Attribute	contains data length, type and decimal places
4	Unit	can be changed by language switch
5	Minimum input value	contains minimum input value of operating data
6	Maximum input value	contains maximum input value of operating data
7	Operating data	actual parameter value

Tab. 3-1: Data block structure

Changing the operating data depends on the communications phase

Operating data has write access while all other elements have read access. Operating data can be either continuously or intermittently write accessed.

Possible error messages when reading/writing operating data

Error:	Cause:
0x7004, data cannot be changed	The operating data is basically write protected
0x7005, data presently write protected	The operating data cannot be write accessed in this communications phase (see Attachment A: parameter description)
0x7006, data smaller than minimum value	The operating data was written smaller than relevant minimum input value.
0x7007, data greater than maximum value	The operating data was written larger than relevant maximum input value.
0x7008, data not correct	The written value could not be accepted as internal checks concluded with negative results.

Tab. 3-2: Error messages when reading/writing operating data

Non-volatile parameter storage registers

All configurations and controller settings are backed up

There are various non-volatile parameter storage registers in the drive. They are used to back up operating data which affect

- configuration settings or
- parameter or mode settings

Each time operating data is written to, it is buffered. Memory contains the following structural component groups:

- drive controllers
- motor feedback (optional)
- programming modules

Parameter storage in drive controller

All operating data which applies only to the digital drive and which cannot be changed by the user are stored in the digital drive. This consists of the following parameters:

- **S-0-0110, Peak amplifier current**
- **S-0-0112, Nominal amplifier current**
- **S-0-0140, Controller type**
- **P-0-0518, Nominal amplifier current**
- **P-0-0519, Peak amplifier current 2**
- **P-0-4002, Amperage amplifier equalization phase U**
- **P-0-4003, Amperage amplifier equalization phase V**
- **P-0-4015, DC bus voltage**
- **P-0-4035, Equalization current**

Parameters stored in motor feedback

All motor-dependent parameters are stored in the motor feedback of MHD and MKD motors.
Additionally, parameters for the "basic load" function and the motor feedback type are stored here.

Parameters stored in programming module

By switching the programming module when devices are exchanged, the characteristics of the device which has been exchanged can be easily transferred to the next device

Depending on the setting of parameter **S-0-0269, Storage mode** all application parameters are either stored in the DSM 2.3 programming module (EEPROM) or only temporarily held in the RAM. These parameters are listed in **S-0-0192, IDN list of backup operation data.** Lists of ID numbers include those which are stored in the motor feedback of MDD or MHD motors.
If programming modules are exchanged, these parameters must be read from the older module so that they can be written onto the new module after the exchange.

Storage mode

The drive controller is capable of storing data which is transmitted via the service channel either temporarily (in RAM) or permanently (in EEPROM).

Parameter **S-0-0269, Storage mode** determines what will be done with the parameters.

Operating Modes

Operating modes define which command values will be processed in which format, ultimately leading to the desired drive motion. They do not define how these command values will be transmitted from a control system to the drive.

One of the four selectable operating modes is active when the control and power supply is ready for operting and the control enable signal is positive.

"AF" appears in the H1 display of the drive.

Errors

Many areas are monitored in connection with operating modes and parameter settings. An error message is generated if a condition is encountered which no longer allows proper operation.

Error classes

The error class is evident from the diagnosis

Errors are broken down into five different classes. They are determined with the drive's error response.

Error class:	Diagnosis:	Drive reaction:
Fatal	F8xx	torque-free switching
Travel range	F6xx	velocity command to zero
Interface	F4xx	as per parameter **(P-0-0119) Best possible braking**
Power supply unit	F3xx	as per parameter **(P-0-0119) Best possible braking**
Non-fatal	F2xx	as per parameter **(P-0-0119) Best possible braking**

Tab. 3-3: Breakdown of error classes

Drive error reactions

If an error state is detected in the drive, the drive's error response will automatically be executed as long as the drive is in control. The H1 display flashes Fx / xx. The drive's reaction to SERCOS interface and non-fatal errors can be parameterized with **P-0-0119, Best possible braking**. The drive goes torque free at the end of each error reaction.

Clearing errors

Errors must be cleared externally

Errors are not automatically cleared. They are cleared by:

initiating command **S-0-0099, Reset class 1 diagnostics**

or

externally by pressing the **"S1"** key.

If the error state is still present, then the error will be immediately detected again. A positive edge bit on the control enable signal is necessary in order to turn the drive on.

Clearing errors when control enable is set

If an error is detected while operating with set control enable, the drive will execute an error response. The drive automatically deactivates itself at the end of each error response. In other words, the power stage is switched off and the drive switches from an energized to a de-energized state.

To reactive the drive:

- clear the error
- enter a 0-1 edge bit into the control enable again.

Note:
To reactivate the drive after an error has been detected, not only must the error be cleared but a 0-1 edge bit of the control enable sgianl must also follow.
This function differs from the DIAX-02 series!

Warnings

Warnings do not cause automatic shutdowns

Many areas are monitored in connection with operating modes and parameter settings. A warning will be generated if a state is detected which allows proper operation for the time being but which will eventually generate an error and thereby lead to a shutdown of the drive if this state continues.

Warning classes

The warning class is evident from the diagnostic message

Warnings are broken down into two classes. In the first, the drive carries out an automatic response when a warning appears; in the second, it does not.

Warning class:	Diagnosis:	Drive reaction:
with drive reaction	E8xx	drive halt
without drive reaction	E2xx, E3xx, E4xx	--

Tab. 3-4: Breakdown of warning classes

Warnings cannot be cleared externally.

Commands

Commands are used to control complex functions in the drive. For example, the functions "Drive-controlled homing" or "Prepare transition check to phase 4" are defined as commands.

A primary control can start, interrupt or erase a command.

Each command started must also be cleared.

Each command has a parameter with which the command can be controlled.

While a command is being executed the diagnostic messages "Cx" or "dx" appears whereby x equals the number of the command.

Command types

There are three types of commands.

- **Drive-controlled commands**
  - can eventually lead to an automatic drive operation or motion
  - can be started only when control enable is set
  - deactivates the active operating mode durings its operation
- **Monitoring commands**
  - activates or deactivates monitors or functions in the drive
- **Management commands**
  - execute management tasks but cannot be interrupted

Procedure commands and acknowledgements

Control and monitoring of command execution occurs via the procedure command and command acknowledgement. The procedure command value tells the drive if the command should have started, interrupted or ended. The command value is the operating data of the applicable parameter. The procedure command value can be

- not set and enabled (0)
- interrupted (1)
- set and enabled (3)

The drive gives the current condition of command execution in the acknowledgement. It is contained in the data status of the command parameter.

The condition can be:

- not set and enabled (0)
- in process (7)
- errors, command execution not possible (0xF)
- command execution interrupted (5)
- command properly executed (3)

For the control to detect a change in command acknowledgement by the drive, there is a **change bit command in the drive status word.** The bit is set by the drive if command acknowledgement is not possible from processing (7) error, command acknowledgement (0xF) or if command properly (3) changed. The bit is cleared if the master clears the setting (0).

If the drive sets the change bit then the control will detect this. It can then read the relevant data status of the command which was set at some point but not yet cleared. The control then detects there whether the command in the drive was completed with or without an error. The control must then reset the command upon completion of the action.

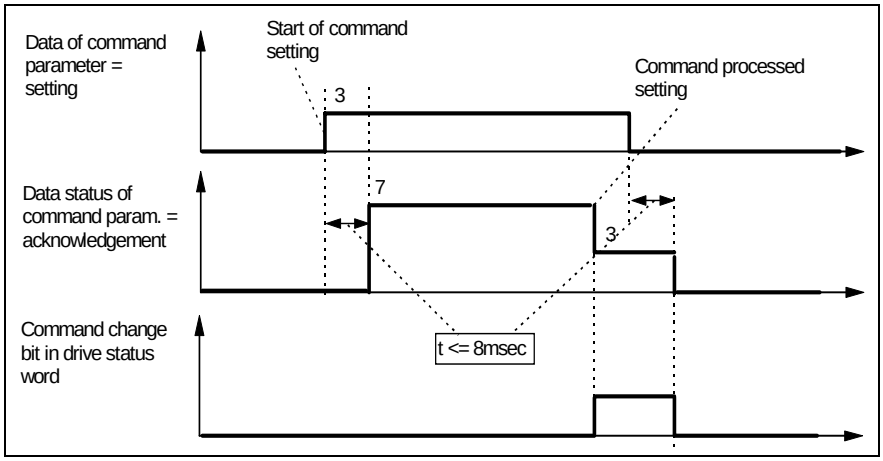


Fig. 3.1: Setting, acknowledgement and change bits with correct execution

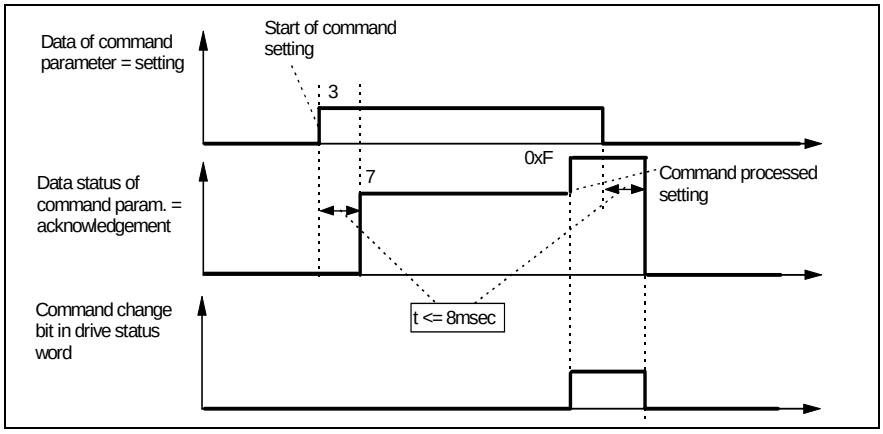


Fig. 3.2: Setting, acknowledgement and change bits with incorrect execution

Between the time of receipt of command setting and the setting of command acknowledgement there can be a delay in the drive of up to 8 mseconds.

3.2 Diagnostic Configurations

Summary

Diagnostic configurations can be broken down into two groups:

- detecting current operating states of the priority-dependent, drive-internal diagnosis generation
- group signals for various status messages

Additionally, parameters exist for all important modes which control communication can transmit.

Drive-internal diagnostics generation

The drive determines the current operating condition based on errors, warnings, commands, drive halt signals and starting lockouts. It is also displayed whether the drive is ready or in parametrization mode.

It is determined using

- the 2-place 7-segment display (H1 display)
- the diagnosis parameter **S-0-0095, Diagnose**
- parameter **S-0-0390, Diagnosis message number**
- parameter **P-0-0009, Error number**

The current diagnostic message with the highest priority is always shown in the H1 display, in the diagnostic parameter **S-0-0390, Diagnosis message number.** Parameter **P-0-0009, Error number** will contain a value unequal to 0 if an error is present. An overview of all diagnostic messages can be found in the diagnostic message description in Attachment B.

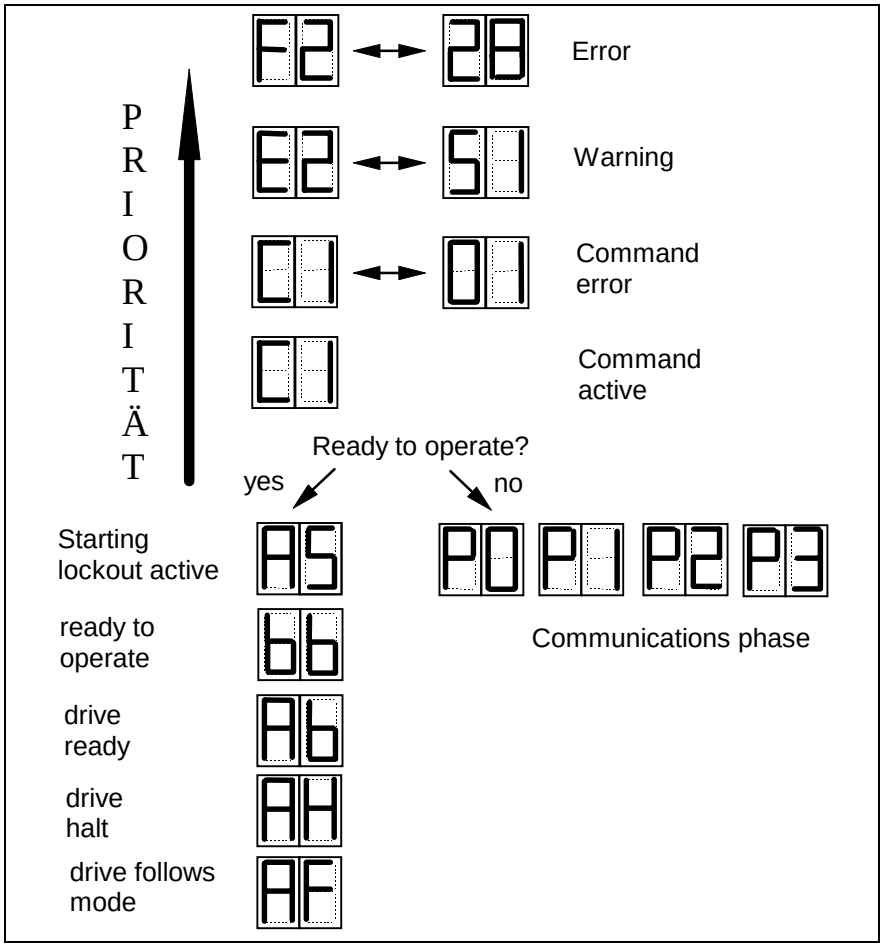


Fig. 3.3: Priority-dependent diagnostics generation of the H1 display

Diagnostic Message Composition

Each operating condition has a diagnostic message made up of

- a diagnostic message number and
- diagnostic text

For example, the diagnosis of non-fatal errors such as "Excessive control deviation" is displayed as follows:

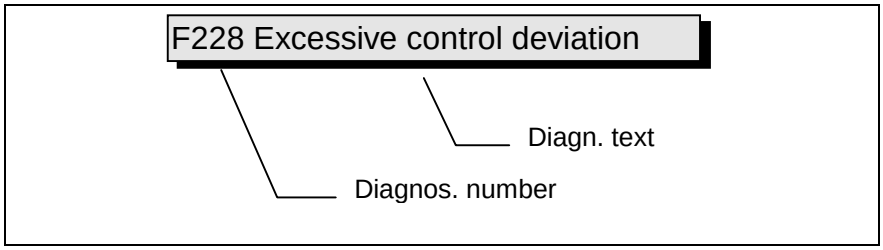


Fig. 3.4: Diagnosis structure: diagnosis message number and text

The H1 display alternates between **"F2"** and **"28".** The diagnostic message number appears in hexadecimal format in parameter **S-0-0390, Diagnosis message number.** In this example, this would be (0x)F228. The diagnostic message number and text are contained as a string "F228", excessive control deviation in parameter **S-0-0095, Diagnosis.**

H1 Display

The diagnostic message number appears on the 2-place 7-segment display. With the help of this display, it is possible to quickly determine the current operating state without using a communication interface.

The operating mode is not evident from the H1 display. If the drive is complying with the mode and no command was activated, then **"AF"** will appear on the display.

Clear text diagnostic message

This contains the diagnostic message number followed by the diagnostic message text as shown in "Excessive control deviation". It can be read via parameter **S-0-0095, Diagnostic message** and supports the direct display of the drive state on a user interface.

This can be switched to a specific language using the language selection option.

Diagnosis message number

The diagnosis message number only contains the number without any text. It can be read via parameter **S-0-0390, Diagnosis message number.** It is thus a language-independent user interface option with which the drive state can be determined and displayed.

Error number

The error number contains only the error number without text. It can be read from parameter **P-0-0009, Error number** and can serve a user interface as a language-dependent way to determine and display an error condition. This parameter contains a value not equal to "0" if an error is in the drive.

An error is formed from the bottom three digits of the diagnostic number. For example, the error **"F228, Excessive control deviation"** with the message number **"(0x)F228"** would produce error number **"228".**

Class Diagnostics

The class diagnostic parameters provide a collection of status and diagnostic information for displaying operating conditions. These parameters are:

- **S-0-0011, Class 1 diagnostics**
- **S-0-0012, Class 2 diagnostics**
- **S-0-0013, Class 3 diagnostics**
- **S-0-0182, Manufacturer's class 3 diagnostics**
- **S-0-0144, Signal status word**

S-0-0011, Class 1 diagnostics

In parameter **S-0-0011, Class 1 diagnostics** there are bits for various errors. A bit is set in this parameter in the case of a drive error. The bit "drive interlock, error in class 1 diagnostics" is set simultaneously in the **drive status word.**

All bits in class 1 diagnostics can be cleared by executing the command **S-0-0099, Reset class 1 diagnostics**.

(See Clearing error on page 3-5)

Class 1 diagnostics supports the following bits.

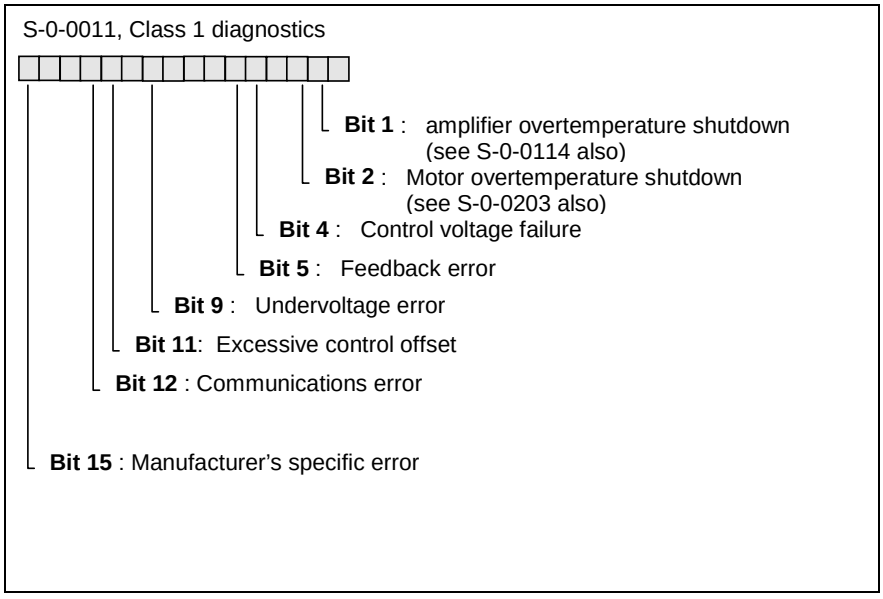


Fig. 3.5: S-0-0011, Class 1 diagnostics

S-0-0012, Class 2 diagnostics

Toggling a bit is signaled by a change bit in the drive status word

Bits for various warnings are contained in this parameter. A bit is set in this parameter when a warning occurs. The bit "change bit class 2 diagnostics" is simultaneously set in the **drive status word**. This change bit is cleared by reading **S-0-0012, Class 2 diagnostics.** Warnings may be masked in regards to their effect on the change bit with parameter **S-0-0097, mask class 2 diagnostics.**

The following bits are supported in class 2 diagnostics.

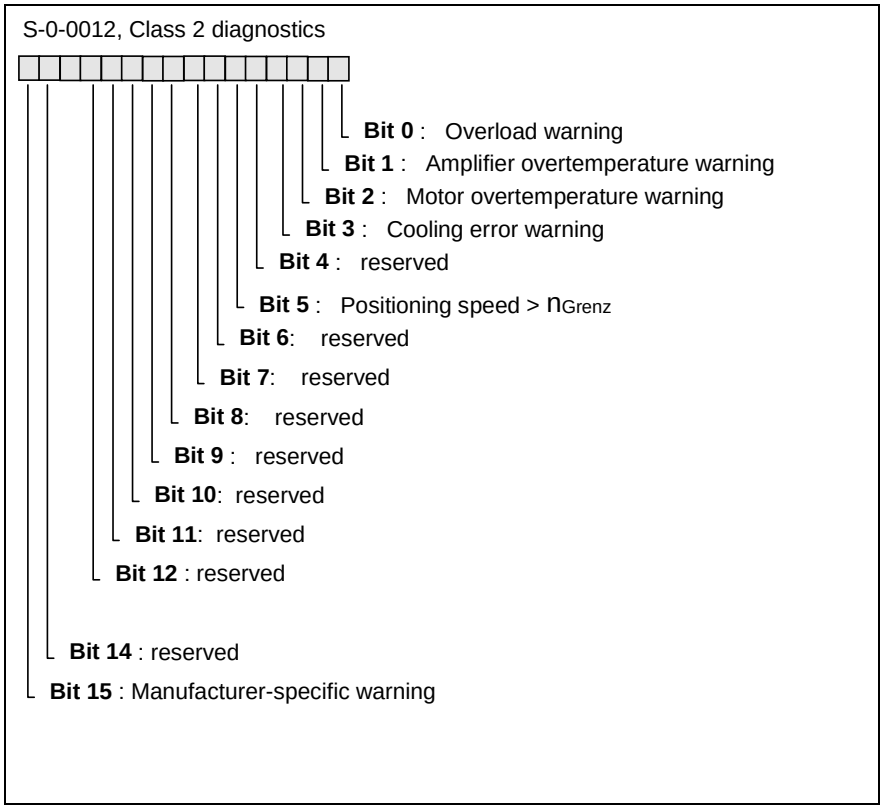


Fig. 3.6: Structure of parameter S-0-0012, Class 2 diagnostics

S-0-0013, Class 3 diagnostics

Various operating condition messages are stored here. If the condition of a message changes, a bit will also be set in the **Drive status word** („change bit class 3 diagnostics“). This change is cleared by reading **S-0-0013, Class 3 diagnostics.** Warnings may be masked in regards to their effect on the change bit with parameter **S-0-0098, Mask class 3 diagnostics**.

The following bits are supported in class 3 diagnostics:

Bit 0	**=1,** if $n_{ist} = n_{soll}$, the actual velocity value **(S-0-0040)** is within ± of the velocity window **(S-•-0157)** around the velocity command value **(S-0-0036).** *(Only applies to velocity control mode.)*
Bit 1	*With velocity control mode:* **=1,** if $\|n_{ist}\| = 0$, the actual velocity value **(S-0-0040)** and the command value **(S-0-0036)** are smaller than the standstill window **(S-•-0124)** *With torque and position control modes:*

	=1, if $\|n_{ist}\| = 0$, the actual velocity value **(S-0-0040)** is smaller than the standstill window **(S-•-0124)**
Bit 2	(not assigned)
Bit 3	**=1,** if $\|M_d\| > M_{dx}$, the actual torque value M_d **(S-0-0084)** is bigger than the torque threshold M_{dx} **(S-•-0126)**
Bit 4	(not assigned)
Bit 5	**=1,** if $\|n_{soll}\| > n_{grenz}$, the velocity command value **(S-0-0036)** is then outside of the velocity limit range $\pm n_{grenz}$ **(S-•-0091)**
Bit 6	**=1,** if „Spindle in position“, the actual position value 1/-2 **(S-0-0051/-0053)** is within ± of the positioning window **(S-•-0057)** around the command position. *(Only applies to spindle positioning.)*
Bit 7	**=1,** if $\|P\| > P_x$, output power P **(S-0-0382)** is exceeds power threshold P_x **(S-•-0158)**
Bit 8	(not assigned)
Bit 9	(not assigned)
Bit 10	(not assigned)
Bit 11	(not assigned)
Bit 12	(does not apply to spindle drives)
Bit 13	(does not apply to spindle drives)
Bit 14	(does not apply to spindle drives)
Bit 15	**=1,** if at least **one** message is pending in the Manufacturer's class 3 diagnostics **(S-0-0182)**

Fig. 3.7: Class 3 diagnostics messages

Class 2 and 3 diagnotic changes bits in the drive status word

If the condition of a bit **S-0-0012, Class 2 diagnostics** or **S-0-0013, Class 3 diagnostics** changes, the change bit class 2 or 3 diagnostics is set in the drive status word. This change bit is cleared by reading both parameters. Setting the change bit because of bit toggling in **S-0-0012** or **S-0-0013** can be masked with the help of parameters **S-0-0097, Mask class 2 diagnostics** or **S-0-0098, Mask class 3 diagnostics**.

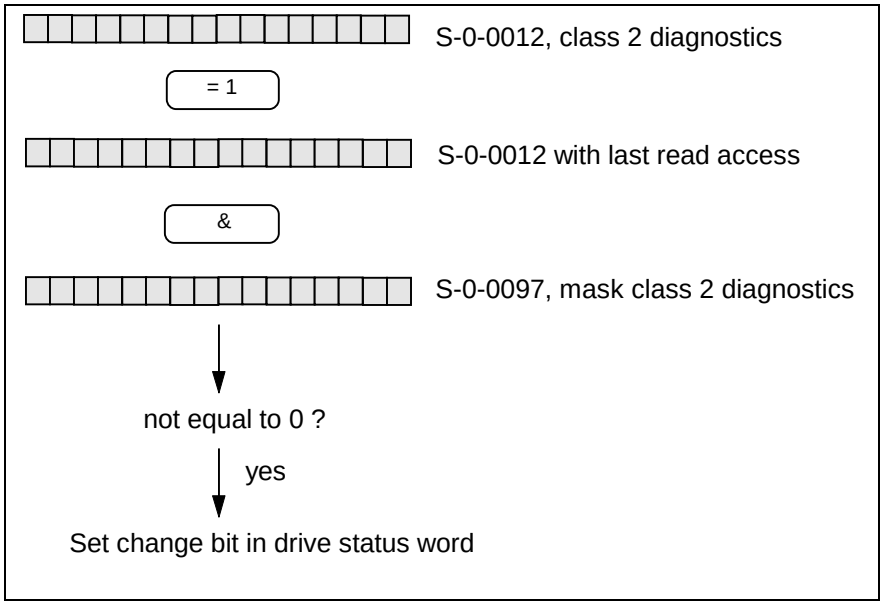


Fig. 3.8: Generating change bit of class 2 diagnostics

S-0-0182, Manufacturer's class 3 diagnostics

In parameter **S-0-0182, Manufacturer's class 3 diagnostics** there are also various messages about operating states. If the status changes, this does not signal a bit change.

The following bits are supported in manufacturer class 3 diagnostics.

Bit 0	**=1,** if start lockout is active (24V/0V at terminals AS+(X3/8) and AS-(X3/9))
Bit 1	(does not apply to spindle drives)
Bit 2...6	(does not apply to spindle drives)
Bit 7	**=1**, if drive load exceeds 90% of maximum load, i.e., there are less than 10% reserves
Bit 8...10	(does not apply to spindle drives)
Bit 11	**=1**, if „drive halt" is acknowledged, i.e., motor speed lies within the standstill window **(S-•-0124)**
Bit 12..15	(does not apply to spindle drives)

Tab. 3.5: Messages of manufacturer's class 3 diagnostics

3.3 Parameter Mode - Operating Mode

The SERCOS control sets the comunications phases including parameter mode

After the drive is turned on, it does not automatically switch to operating mode. The drive is put through a series of checks before the SERCOS control can switch the drive into operation mode.

Switching the drive to operation mode is related to making the SERCOS interface system ready to operate.

This must occur in different steps and is controlled by the master control by entering communications phases 0 to 4 and when starting/ending command **S-0-0127, C1 Communication phase 3 transition check** and **S-0-0128, C2 Communication phase 4 transition check**.

If the drive reaches phase 4 without errors, **"bb"** will appear on the H1 display. The diagnostic message is **A013 ready for power ON.**

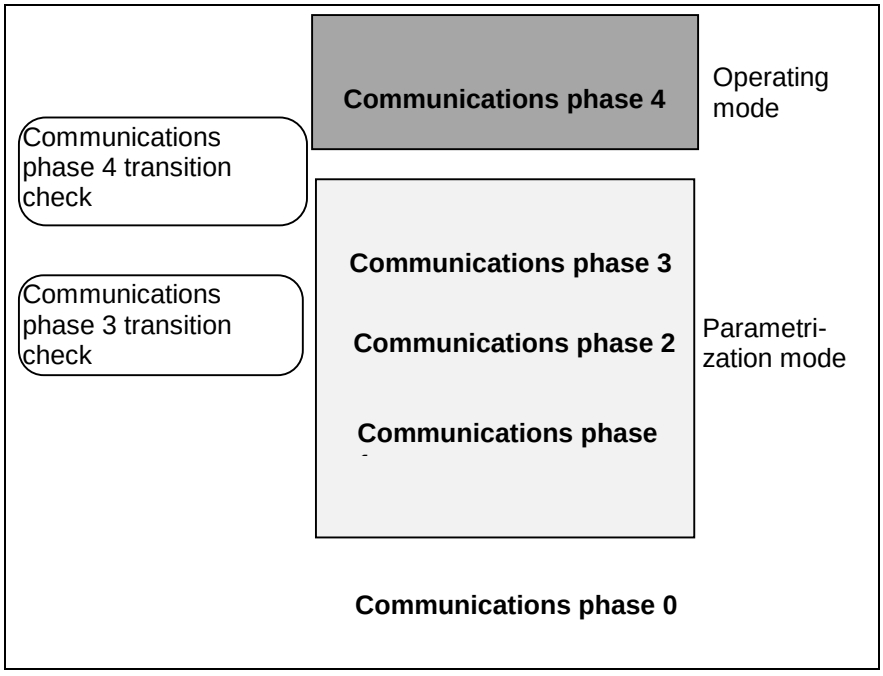


Fig. 3.9: Communications phases

Communication between the SERCOS control and the drive is not possible during phase 0. Parametrization mode is given during communications phases 1 to 3.

Monitoring the Transition Check Command

Transition check commands must be activated in the drive in order to switch from communication phase 2 to 3 and from 3 to 4. This starts a series of checks and parameter calculations.

The causes and solutions for transition check errors are listed in Attachment B, diagnostic message descriptions

S-0-0127, C1 Communications phase 3 transition check

The following checks are run while this command is activated.

Checking telegram configuration, configured telegrams are especially checked. It is checked whether the parameters selected for the configurable data block in the MDT or AT may be configured and whether the allowable length of configurable data blocks is maintained or not.

The following command errors can occur:
C104 Configurable ID number for MDT not configurable
C105 Maximum length of MDT exceeded
C106 Configurable ID numbers for AT not configurable
C107 Maximum length of AT exceeded

Parameters needed for transition to phase 3 are checked for validity. If one has not yet been written into or the back-up has failed, then command error **C101 Communications parameter incomplete (S-0-0021)** is generated. The ID numbers of the faulty parameters are listed in **S-0-0021, List of invalid operating data for communications phase 2** and must be made valid by writing.

Check timing parameters for SERCOS communications in phase 3 and 4 for plausibility and whether marginal conditions are maintained or not.

The following command errors can occur:
C108 Time slot parameter > Sercos cycle time
C109 Position of data record in MDT (S-0-0009) even
C110 MDT length (S-0-0010) odd
C111 ID9 + data block length - 1 > MDT length (S-0-0010)
C112 TNcyc (S-0-0001) or TScyc (S-0-0002) faulty
C113 Relationship TNcyc (S-0-0001) to TScyc (S-0-0002) faulty
C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
C115 T2 too small

S-0-0128, C2 communications phase 4 transition check

The following checks are run when this command is activated.

- Parameter **P-0-4014, Motor type** is checked for plausibility. If a 1 (MHD) or 5 (MKD) has been selected, but the correct motor type cannot be located in the feedback memory, then command error **C204 Motor type (P-0-4014) faulty** is generated.
- Parameters needed for transition to phase 4 are checked for validity. If one of these has not yet been written into or the back-up is faulty, then command error **C201 Parameter block incomplete (-> S-0-0022)** is generated. The ID numbers of the faulty parameters are listed in **S-0-0022, ID number list of invalid operating data phase 3** and must be made valid by writing into them.

- Check validity of parameters **P-0-0513, Feedback type** and **S-0-0116, Rotary encoder resolution.** If these are not valid in a measuring system with data storage, or if they cannot be read, then either command error **C217 Error reading motor encoder data**
  C218 Error reading external encoder data
  C219 Error reading master axis encoder data is generated.
- Check whether operating mode parameters *S-0-0032..35* or homing parameter *S-0-0147* require an external encoder, but such is lacking because 0 is set in parameter **P-0-0075, External encoder interface.** The invalid operating mode and homing parameters are listed in **S-0-0022, ID number list of invalid operating data phase 3.** Command error **C210 External encoder needed (-> S-0-0022)** is generated.
- The parameters stored in memory are read from motors with feedback data storage. If an error is found, the command error **C211 Invalid feedback data** is generated.
- The drive controller reads the EEPROM operating data. If an error occurs during this process, then command error **C212 Invalid amplifier data** is generated.
- The scaling format is checked for position, acceleration, velocity and torque for proper configuration. If an error is found, then one of the following errors is issued:
  C213 position data scaling error
  C214 velocity data scaling error
  C215 acceleration data scaling error
  C216 torque/force data scaling error
- The minimum and maximum values of each of these parameters is checked and parameters with bit format are checked for proper configuration. If an error is found, the command error **C202 Parameter limit value error (->S-0-0022)** is generated. The ID numbers of the faulty parameters are stored in **S-0-0022, ID number list of invalid operating data phase 3** and must be corrected.
- Check if parameter **S-0-0103 Modulo scaling** can be processed when modulo scaling is activated. If it cannot, the command error **C227 Modulo range error** is generated.
- Determine if the coprocessor is ready for initialization. If it is not, the error message **C225 Coprocessor not ready for initialization** appears.
- Special checks for specific parameters. For example, the encoder interface parameters P-0-0074/75/76 are checked to see if the selected encoder interface is actually available. If discrepancies are found, the command error **C203 Parameter Calculation error (->S-0-0022)** is generated. The ID number of the faulty parameters are listed in **S-0-0022, ID number list of invalid operating data phase 3** and must be corrected.

- Feedbacks are checked during initialization. Depending on the type of encoder, specific errors may occur during initialization, e.g., invalid position with DSF feedback. The command errors generated are:
  C220 Motor feedback initializing error
  C221 External feedback initializating error
  C222 Master axis feedback initializing error

- Absolute encoder monitoring. If the actual position exceeds actual position +/- **P-0-0097, Absolute encoder monitoring window** before the machine was last switched off, then error **F276 Absolute encoder outside monitoring window** is generated. The transition command will not be acknowledged as an error, but the error may be cleared by executing command **S-0-0099, C5 Reset class 1 diagnostics**. (See "Clearing error" on page 3-1).
- Determining whether the coprocessor has processed and accepted its initialization values. If it has not, then command error **C226 Coprocessor acknowledge failed** is generated.
- Various internal settings are made depending on the controller type. If the parameter **S-0-0140, controller type** cannot be read, command error **C228 Controller type (S0-0140) incorrect** is generated.

3.4 Parameter Checklist for Commissioning

Checklist for Drive Parameters

The following offers an overview of parameters which must be properly preset for the initial start of the main spindle drive in speed control to function properly. Some parameters must be additionally set.

	Parameter ID no. (Id.no.)	Parameter name	Base value, Comment
Motor feedback	**S-0-0277** **S-0-0116** **P-0-0074**	**Pos. enc. type para. 1** **Motor enc. resolution** **Motor enc. interface**	0 *(Parameters must be* 256 *motor enc. specifically* 1 *matched! see sect. 5.3)*
Spindle feedback (optional)	**S-0-0115** **S-0-0117** **P-0-0075**	**Pos. enc. type para. 2** **Ext. enc. resolution** **Ext. Geberinterface**	0 *(Parameters must be* 0 *spindle feedback specifically* 0 *matched! see sec.7.2)*
Operating modes	**S-0-0032**	**Main modes**	2 *(speed control, see sect. 6.3)*
Values	**S-0-0076** **S-0-0044** **S-0-0160** **S-0-0086** **S-0-0103**	**Scaling types** **position data** **-speed data** **-acceleration data** **-torque/force data** **Modulo value**	*(rot.arty scalin, prefer.* 1100 0010 *scaling, dim. unit* 100 0010 *<-deg. , min, ref. load,* 100 0010 m*odulo, see sec. 7.1)* 0 *(percent scaling)* 360 *(in terms of 1 spindle rev.)*
Polarities	**S-0-0055** **S-0-0043** **S-0-0085**	**Polarities parameter** **for - position** **- speed** **- torque/force**	0 0000 *(positive polarities,* 000 *see sec. 7.1)* 000
Limit values	**S-•-0091** **S-0-0092** **P-0-0109**	**bipolar speed limit** **bipolar torque limit** **peak torque limit**	6000 *(min^{-1})* 150 *(%) (see sec. 7.4)* 150 *(%)*
Monitoring window	**S-•-0157** **S-•-0124** **S-•-0057** **S-•-0159**	**speed window** **standstill window** **positioning window** **monitoring window**	50 *(min^{-1}, lt. pre-set scale.)* 20 *(min^{-1}, lt. pre-set scale.)* 20 *(<-deg., lt. pre-set scale.)* 3000 *(<-deg., lt. pre-set scale.)*
Active parameter set	**S-0-0217**	**preselect param. set**	0 *(Param.set •-0-•••• presel.)*
Mechanical transmission elements	**S-•-0121** **S-•-0122**	**load gear input revs.** **load gear output revs.**	1 *(match parameters in terms of gears*) 1
Behavior with fault	**P-0-0117** **P-0-0118** **P-0-0119** **P-0-0008** **P-0-0126**	**Activate NC reaction** **Power off with failure** **Best poss. standstill** **Activate E-stop** **Maximum brake time**	0 *(Parameters* 0 0 *application-specifically* 1 5000 *matched!)*
Drive halt	**S-0-0138** **S-0-0349**	**bipolar acceleration** **bipolar jerk limit**	49087 *(match parameters* 400 000 000 *to application!)*

Note: The intention of the above parameter values is to achieve problem-free starts. The machine-specific motor feedback requirements must be taken into account for the initial startup!

Checklist for Motor Parameters

The motor parameters are read out of the motor feedback in MDD and MKD motors using the "load base values" command. 2AD, ADF and 1MB motors have no motor feedback data memory. This means that the values for the following motor parameters must be entered manually using a motor-specific parameter list or they can be read in via the data carrier (disk).

	Parameter ID number (Id.no.)	Parameter name	Unit
	P-0-4014	**Motor type**	(ID no.)
	P-0-0018	**pole pair no.**	(number)
	P-0-0051	**torque/force constant**	Nm/A(threshold value)
	P-0-0537	**S1 kink speed**	min-1
	P-0-0538	**Motor function parameter 1**	Hz/100A(threshold val)
	P-0-4012	**Slip factor**	100K-1
	P-0-0530	**Slip increase**	A/(V*min)
	P-0-0531	**breakover curr. limit**	min-1
	S-0-0113	**maximum motor speed**	
Current, voltage	**S-0-0109**	**motor peak current**	$A_{(threshold\ val.)}$
	S-0-0111	**motor standstill current**	$A_{(threshold\ val.)}$
	P-0-4004	**magnetization current**	$A_{(threshold\ val.)}$
	P-•-0532	**pre-magnetization factor**	%
	P-0-0535	**idle voltage of motor**	%
	P-0-0536	**maximum motor voltage**	%
Control parameters	**S-0-0106**	**prop. gain of current regulator 1**	$V/A_{(threshold\ val.)}$
	S-0-0107	**current control action time 1**	msec
	P-0-0533	**flux loop prop. gain**	A/V
	P-0-0534	**flux loop integ. action time**	msec
	S-•-0100	**speed control P-gain**	Asec/rad (pos. opt.)
	S-•-0101	**speed control integ. action time**	msec (pos. opt.)
	P-0-0004	**smoothing time constant**	msec (pos. opt.)
	S-0-0392	**actual speed vaue filter time constant**	msec (pos. opt.)
Motor temperature monitor	**S-0-0201**	**Motor warning temperature**	°C
	S-0-0204	**Motor shutdown temperature**	°C

Note: Indramat determines the values for the above parameters making them available as document or on disk. The values for
- **S-•-0100, velocity loop proportional gain**
- **S-•-0101, velocity loop integral action time**
- **P-0-0004, smoothing time constant** and
- **S-0-0392, velocity actual filter time constant**

are start values that must be optimized in terms of a specific application!

List of all Parameters with Base Values

Default values are set to the parameters. These ensure a problem-free start in speed control and the fastest possible braking given an error. The base values of the motor parameters must be edited with INDRAMAT values (see above Checklist for Motor Parameters).

Parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
S-0-0001	NC cycle time (TNcyc)	2000	0	us
S-0-0002	SERCOS cycle time (TScyc)	2000	0	us
S-0-0003	Minimum AT transmit starting time (T1 min)	-	0	us
S-0-0004	Transmit/receive transition time (TATMT)	-	0	us
S-0-0005	Minimum feedback acquisition time (T4min)	-	0	us
S-0-0006	AT transmission starting time (T1)	80	0	us
S-0-0007	Feedback acquisition starting time (T4)	750	0	us
S-0-0008	Command vaid time (T3)	420	0	us
S-0-0009	Beginning address in MDT	1	0	--
S-0-0010	Length of MDT	4	0	--
S-0-0011	Class 1 diagnostics	-	0	--
S-0-0012	Class 2 diagnostics	-	0	--
S-0-0013	Class 3 diagnostics	-	0	--
S-0-0014	Interface status	-	0	--
S-0-0015	Telegram type parameter	0	0	--
S-0-0016	Custom amplifier telegram configuration list	" "	0	--
S-0-0017	IDN list of all operation data	-	0	--
S-0-0021	IDN list of nivalid operating data phase 2	-	0	--
S-0-0022	IDN list of nivalid operating data phase 3	-	0	--
S-0-0024	Configuration list of MDT	" "	0	--
S-0-0028	Error count MST	-	1	
S-0-0029	Error count MDT	-	1	
S-0-0030	Manufacturer's Version	-	0	--
S-0-0032	Primary mode of operation	2	0	--
S-0-0033	Secondary operation mode 1	0	0	--
S-0-0034	Secondary operation mode 2	0	0	--
S-0-0035	Secondary operation mode 3	0	0	--
S-0-0036	Velocity command value	-	S-0-0044	S-0-0044
S-0-0040	Velocity feedback value	-	S-0-0044	S-0-0044
S-0-0043	Velocity polarity parameter	0	0	--
S-0-0044	Velocity data scaling type	1000010	0	--
S-0-0045	Velocity data scaling factor	1	0	--
S-0-0046	Velocity data scaling exponent	-4	0	--
S-0-0047	Position command value	-	S-0-0076	S-0-0076
S-0-0051	Position feedback value 1 (motor feedback)	-	S-0-0076	S-0-0076
S-0-0052	Reference distance 1	0	S-0-0076	S-0-0076
S-0-0053	Position feedback value 2 (ext. encoder)	-	S-0-0076	S-0-0076
S-0-0054	Reference distance 2	0	S-0-0076	S-0-0076
S-0-0055	Position polarity parameter	0	0	--

Parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
S-0-0057	Positioning window	20	S-0-0076	S-0-0076
S-0-0076	Position data scaling type	11000010	0	--
S-0-0077	Linear position data scaling factor	1	0	--
S-0-0078	Linear position data scaling exponent	-7	0	--
S-0-0079	Rotational position resolution	36000	0	--
S-0-0080	Torque/force command value	-	S-0-0086	S-0-0086
S-0-0084	Torque/force actual value	-	S-0-0086	S-0-0086
S-0-0085	Torque/force polarity parameter	0	--	--
S-0-0086	Torque/force data scaling type	0	0	--
S-0-0088	Receive to receive recovery time (TMTSY)	-	0	us
S-0-0089	MDT transmit starting time (T2)	363	0	us
S-0-0090	Command value transmit time (TMTSG)	-	0	us
S-0-0091	Bipolar velocity limit value	6000	S-0-0044	S-0-0044
S-0-0092	Torque/force bipolar limit value	150	S-0-0086	S-0-0086
S-0-0093	Torque/force data scaling factor	1	0	--
S-0-0094	Torque/force data scaling exponent	-1	0	--
S-0-0095	Diagnostic message	-	0	--
S-0-0096	Slave arrangement (SLKN)	-	0	--
S-0-0097	Mask Class 2 diagnostics	FFFF hex.	0	--
S-0-0098	Mask Class 3 diagnostics	FFFF hex.	0	--
S-0-0099	Reset class 1 diagnostics	-	0	--
S-0-0100	Speed control P-gain	20	1	As/rad
S-0-0101	Speed control integral action time	15	1	ms
S-0-0103	Modulo value	360	S-0-0076	S-0-0076
S-0-0104	Position loop KV factor	1	2	1000/min
S-0-0106	P-gain 1 current regulator	3	2	V/A
S-0-0107	Current regulator 1 integral action time	1,5	1	ms
S-0-0108	Feedrate override	-	2	%
S-0-0109	Motor peak current	500	3	A
S-0-0110	Amplifier peak current	-	3	A
S-0-0111	Motor standstill current	100	3	A
S-0-0113	Maximmum speed of the motor	6001	S-0-0044	S-0-0044
S-0-0115	Position feedback 2 type parameter	0	0	--
S-0-0116	Motor encoder resolution	256	0	Cycle/rev.
S-0-0117	External encoder resolution	0	0	Cycle/rev.
S-0-0121	Input revolutions of load gear	1	0	--
S-0-0122	Output revolutions of load gear	1	0	--
S-0-0124	Standstill window	20	S-0-0044	S-0-0044
S-0-0126	Torque threshold Mdx	0	S-0-0086	S-0-0086
S-0-0127	C1 communications phase 3 transition check	-	0	--
S-0-0128	C2 communications phase 4 transition check	-	0	--
S-0-0130	Probe value 1 positive edge	-	S-0-0076	S-0-0076
S-0-0131	Probe value 1 negative edge	-	S-0-0076	S-0-0076
S-0-0132	Probe value 2 positive edge	-	S-0-0076	S-0-0076

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
S-0-0133	Probe value 2 negative edge	-	S-0-0076	S-0-0076
S-0-0134	Master control word	-	0	--
S-0-0135	Drive status	-	0	--
S-0-0138	Bipolar acceleration	49087	S-0-0160	S-0-0160
S-0-0140	Controller type	-	0	--
S-0-0141	Motor type	" "	0	--
S-0-0142	Application type	"Default"	0	--
S-0-0143	Sercos Interface version	-	0	--
S-0-0144	Signal status word	-	0	--
S-0-0148	C6 Command drive-controlled referencing	-	0	--
S-0-0150	Reference offset 1	0	S-0-0076	S-0-0076
S-0-0151	Reference offset 2	0	S-0-0076	--
S-0-0152	C900 Command spindle positioning	-	0	--
S-0-0153	Spindle angle position	0	S-0-0076	S-0-0076
S-0-0154	Spindle positioning parameter	0	0	--
S-0-0157	Velocity window	50	S-0-0044	S-0-0044
S-0-0158	Power threshold Px	500	1	
S-0-0159	Monitoring window	3000	S-0-0076	S-0-0076
S-0-0160	Acceleration data scaling type	1000010	0	--
S-0-0161	Acceleration data scaling factor	1	0	--
S-0-0162	Acceleration data scaling exponent	-3	0	--
S-0-0169	Probe control parameter	0	0	--
S-0-0170	Probing cycle procedure command	-	0	--
S-0-0177	Absolute distance 1	0	S-0-0076	S-0-0076
S-0-0178	Absolute distance 2	0	S-0-0076	S-0-0076
S-0-0180	Spindle relative offset	0	S-0-0076	S-0-0076
S-0-0182	Manufacturer’s class 3 diagnostics	-	0	--
S-0-0185	Length of configured data record in AT	-	0	--
S-0-0186	Length of configured data record in MDT	-	0	--
S-0-0187	List of configurable data in AT	-	0	--
S-0-0188	List of configurable data in MDT	-	0	--
S-0-0189	Following error	-	S-0-0076	S-0-0076
S-0-0190	d2 Drive-controlled oscillation command	-	0	--
S-0-0192	IDN list of back-up operation data	-	0	--
S-0-0193	Positioning jerk	0	S-0-0160	S-0-0160
S-0-0201	Motor warning temperature	145	1	°C
S-0-0204	Motor switch off temperature	155	1	°C
S-0-0213	Oscillation speed	8	S-0-0044	S-0-0044
S-0-0214	Oscillation offset speed	1	S-0-0044	S-0-0044
S-0-0215	Oscillation cycle time	400	1	msec
S-0-0216	d100 Switch parameter set command	-	0	--
S-0-0217	Preselect parameter set command	0	0	--
S-0-0218	Preselect gear ratio command	0	1	--
S-0-0219	IDN list for parameter set	-	0	--

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
S-0-0222	Spindle positioning speed	1000	S-0-0044	S-0-0044
S-0-0254	Actual parameter set	-	1	--
S-0-0255	Actual gear ratio	-	1	--
S-0-0258	Target position	-	S-0-0076	S-0-0076
S-0-0259	Positioning speed	1000	S-0-0044	S-0-0044
S-0-0260	Positioning acceleration	49087	S-0-0160	S-0-0160
S-0-0262	Command basic load	-	0	--
S-0-0265	Language selection	0	0	--
S-0-0267	Password	-	1	
S-0-0269	Storage mode	0	0	--
S-0-0277	Position feedback 1 type parameter	0	0	--
S-0-0301	Allocation of real-time control bit 1	0	0	--
S-0-0303	Allocation of real-time control bit 2	0	0	--
S-0-0305	Allocation of real-time status bit 1	0	0	--
S-0-0307	Allocation of real-time status bit 2	0	0	--
S-0-0330	Message nist = nsoll	-	0	-
S-0-0331	Message nist = 0	-	0	-
S-0-0333	Message M_d >= M_{dx}	-	0	-
S-0-0335	Message n_{soll} > n_{grenz}	-	0	-
S-0-0336	Message in position	-	0	-
S-0-0337	Message P > P_x	-	0	-
S-0-0347	Velocity loop deviation	-	1	
S-0-0348	Proportional gain acceleratoin feed forward	0	1	
S-0-0349	Jerk bipolar	400000000	1	
S-0-0382	DC bus power	-	2	kW
S-0-0383	Motor temperature	-	1	
S-0-0390	Diagnosis number	-	0	--
S-0-0391	External encoder monitoring window	360	1	
S-0-0392	Velocity feedback value filtertimebase	250	1	
S-0-0393	Command value mode for modulo format	0	0	--
S-0-0400	Home switch	-	0	--
S-0-0401	Probe 1	-	0	--
S-0-0402	Probe 2	-	0	--
S-0-0403	Position feedback value status	-	0	--
S-0-0405	Probe 1 Enable	-	0	--
S-0-0406	Probe 2 Enable	-	0	--
S-0-0409	Probe 1 positiv latched	-	0	--
S-0-0410	Probe 1 negativ latched	-	0	--
S-0-0411	Probe 2 positive latched	-	0	--
S-0-0412	Probe 2 negativ latched	-	0	--
S-1-0057	Positioning window	20	S-0-0076	S-0-0076
S-1-0091	Bipolar velocity limit value	6000	S-0-0044	S-0-0044
S-1-0100	Velocity loop P-gain	20	1	As/rad
S-1-0101	Velocity loop integral action time	15	1	ms
S-1-0104	Position loop KV factor	1	2	1000/min

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
S-1-0121	Load gear input revolutions	1	0	--
S-1-0122	Load gear output revolutions	1	0	--
S-1-0124	Standstill window	20	S-0-0044	S-0-0044
S-1-0126	Maximum torque threshold	0	S-0-0044	S-0-0044
S-1-0157	Velocity window	50	1	
S-1-0158	Power threshold Px	500	1	
S-1-0159	Monitoring window	3000	S-0-0076	S-0-0076
S-1-0218	Gearstage preselect	0	1	
S-1-0219	IDN list of parameter sets	-	1	
S-1-0222	Spindle positioning speed	1000	S-0-0044	S-0-0044
S-2-0057	Positioning window	20	S-0-0076	S-0-0076
S-2-0091	Bipolar velocity limit value	6000	S-0-0044	S-0-0044
S-2-0100	Velocity controller P-gain	20	1	As/rad
S-2-0101	Velocity controller integral action time	15	1	ms
S-2-0104	Position loop KV factor	1	2	1000/min
S-2-0121	Load gear input revolutions	1	0	--
S-2-0122	Load gear output revolutions	1	0	--
S-2-0124	Standstill window	20	S-0-0044	S-0-0044
S-2-0126	Maximum torque threshold	0	S-0-0044	S-0-0044
S-2-0157	Velocity window	50	1	
S-2-0158	Power threshold Px	500	1	
S-2-0159	Monitoring window	3000	S-0-0076	S-0-0076
S-2-0218	Gearstage preselect	0	1	
S-2-0219	IDN list of parameter sets	-	1	
S-2-0222	Spindle positioning speed	1000	S-0-0044	S-0-0044
S-3-0057	Positioning window	20	S-0-0076	S-0-0076
S-3-0091	Bipolar velocity limit value	6000	S-0-0044	S-0-0044
S-3-0100	Velocity controller P-gain	20	1	As/rad
S-3-0101	Velocity controller integral action time	15	1	ms
S-3-0104	Position loop KV factor	1	2	1000/min
S-3-0121	Load gear input revolutions	1	0	--
S-3-0122	Load gear output revolutions	1	0	--
S-3-0124	Standstill window	20	S-0-0044	S-0-0044
S-3-0126	Maximum torque threshold	0	S-0-0044	S-0-0044
S-3-0157	Velocity window	50	1	
S-3-0158	Power threshold Px	500	1	
S-3-0159	Monitoring window	3000	S-0-0076	S-0-0076
S-3-0218	Gearstage preselect	0	1	
S-3-0219	IDN list of parameter sets	-	1	
S-3-0222	Spindle positioning speed	1000	S-0-0044	S-0-0044

Fig. 3-10: List of S-parameters with default values (basic parameters)

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
P-0-0004	Smoothing tme constant	2000	0	us
P-0-0008	Activate E-stop function	1	0	--
P-0-0009	Error number	-	0	--
P-0-0010	Excessive position command value	-	S-0-0076	S-0-0076
P-0-0011	Last valid position command value	-	S-0-0076	S-0-0076
P-0-0012	Command set absolute measurement	-	0	--
P-0-0015	Memory address	0	0	--
P-0-0016	Contents of memory address	-	0	--
P-0-0018	Number of pole pairs / pole pair widths	2	0	pole pairs/mm
P-0-0021	List of scope data 1	-	S-0-0076	P-0-0023
P-0-0022	List of scope data 2	-	P-0-0024	P-0-0024
P-0-0023	Signal select channel 1 - oscilloscope function	1	0	--
P-0-0024	Signal select channel 2 - oscilloscope function	1	0	--
P-0-0025	Trigger source - oscilloscope function	1	0	--
P-0-0026	Trigger signal select channel - oscilloscope function	1	0	--
P-0-0027	Trigger threshold for position data	0	S-0-0076	S-0-0076
P-0-0028	Trigger threshold for speed data	0	S-0-0044	S-0-0044
P-0-0029	Trigger threshold for torque/force data	0	S-0-0086	%
P-0-0030	Trigger edge	1	0	--
P-0-0031	Time resolution	250	0	usec
P-0-0032	Memory size	2	0	--
P-0-0033	Number of samples after trigger	0	0	--
P-0-0035	Delay from trigger to start	-	0	--
P-0-0036	Trigger control word	0	0	--
P-0-0037	Trigger status word	-	0	--
P-0-0038	Signal select analog output channel 1	2	0	--
P-0-0039	Signal select analog output channel 2	3	0	--
P-0-0040	Scaling factor for velocity data channel 1	6000	0	rpm/10V
P-0-0041	Scaling factor for velocity data channel 2	6000	1	rpm/10V
P-0-0042	Scaling of position data analog output channel 1	360.00	2	deg./10V
P-0-0043	Scaling of position data analog output channel 2	360.00	2	deg./10V
P-0-0044	Scaling factor for power of data channel output	50	1	
P-0-0051	Torque/force constant	1	2	Nm/A
P-0-0074	Motor enc. interface	1	0	--
P-0-0075	External encoder interface	0	0	--
P-0-0081	Parallel output 1	0	0	--
P-0-0082	Parallel input 1	-	0	--
P-0-0097	Absolute encoder monitoring window	0	S-0-0076	S-0-0076
P-0-0098	Maximum model deviation	-	S-0-0076	S-0-0076
P-0-0099	Position command smoothing time filter constant	0	2	ms
P-0-0109	Peak torque/force limit	150	S-0-0086	S-0-0086
P-0-0110	Parallel output 2	0	0	--
P-0-0111	Parallel input 2	-	0	--
P-0-0112	Parallel output 3	0	0	--

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
P-0-0113	Parallel input 3	-	0	--
P-0-0115	Analog input 1	-	0	--
P-0-0116	Analog input 2	-	0	--
P-0-0117	Activate NC reaction with fault	0	0	--
P-0-0118	Power shutdown with fault	0	0	--
P-0-0119	Best possible braking	0	0	--
P-0-0121	Velocity mix factor encoder11&encoder2	0	1	%
P-0-0123	Absolute encocer backup buffer	-	0	--
P-0-0124	Allocate ID number -> DEA output	0	0	--
P-0-0125	Allocate DEA output -> ID number	0	0	--
P-0-0126	Maximum decel time	5000	0	ms
P-0-0127	Overload warning	90	0	%
P-0-0141	Thermal controller load	-	0	%
P-0-0145	Trigger threshold expanded oscilloscope function	0	0	--
P-0-0146	Trigger signal address exp. oscilloscope function	0	0	--
P-0-0147	Signal address K1 expanded oscilloscope function	0	0	--
P-0-0148	Signal address K2 expanded oscilloscope function	0	0	--
P-0-0149	Signal select channel list for oscilloscope function	-	0	--
P-0-0150	No. of valid measured val. for oscilloscope function	-	0	--
P-0-0180	Rejection frequency velocity loop	1500	0	Hz
P-0-0181	Rejection bandwidth velocity loop	50	0	--
P-0-0200	Signal select probe 1	0	0	--
P-0-0201	Signal select probe 2	0	0	--
P-0-0202	Difference probe values 1	-	S-0-0076	S-0-0076
P-0-0203	Difference probe values 2	-	S-0-0076	S-0-0076
P-0-0300	Spindle positioning parameter 2	0	0	
P-0-0310	Analog torque command value pro 10 V	0.1	1	%
P-0-0311	Analog speed command pro 10 V	6000	4	r/min
P-0-0508	Commutation offset	-	0	--
P-0-0509	Slot angle	0	0	--
P-0-0510	Moment of inertia of the rotor	0	5	kgm²
P-0-0511	Holding brake current	0	3	A
P-0-0514	Absolute encoder offset	-	0	--
P-0-0523	Commutation setting - measurand	-	S-0-0076	S-0-0076
P-0-0524	Commutation setting command	-	0	--
P-0-0525	Holding brake type	0	0	--
P-0-0526	Holding brake control delay	100	0	msec
P-0-0530	Slip increase	1,5	2	1/100K
P-0-0531	Pull out limit	2000	0	A/Vmin
P-0-0532	Pre-magnetization factor	100	0	%
P-0-0533	Flux loop proportional gain	0,5	3	A/V
P-0-0534	Flux loop integral action time	6000	1	mSec
P-0-0535	Idle voltage of motor	80	1	% DC bus
P-0-0536	Maximum motor voltage	90	1	% DC bus
P-0-0537	S1 kink speed	2000	4	1/min

parameter ID number (Id.no.)	Parameter name	Base value DIAX04	Number of decimal places	Unit in German
P-0-0538	Motor function parameter 1	0	0	
P-0-0600	Scaling factor acceleration analog output	600	1	rad/s²
P-0-0601	Scaling factor acceleration power analog output	600	1	rad²/s^3
P-0-1201	Ramp 1 pitch	0	S-0-0160	S-0-0160
P-0-1202	Final speed of ramp 1	1500	S-0-0044	S-0-0044
P-0-1203	Ramp 2 pitch	0	S-0-0160	S-0-0160
P-0-1215	Cam search speed	50	1	
P-0-1222	Command value smoothing time constant	0	0	msec
P-0-1307	Message 90 %	-	0	-
P-0-4000	Current zero trim phase U	-	2	%
P-0-4001	Current zero trim phase V	-	2	%
P-0-4004	Magnetization current	20	4	A
P-0-4011	Switch frequency	4	0	kHz
P-0-4012	Slip factor	2	2	Hz/100A
P-0-4014	Motor type	2	0	--
P-0-4023	C4 communications phase 2 transition check	-	0	--
P-0-4036	Connected motor type	" "	0	--
P-0-4045	RMS continuous current	-	3	A
P-0-4046	RMS peak current	-	3	A
P-0-4054	Resolver offset			
P-0-4055	Resolver amplitude compensation			
P-1-0180	Speed controller locking frequency	1500	0	Hz
P-1-0181	Bandwidth of locking filter speed controller	50	0	--
P-1-0532	Pre-magnetization factor	100	1	
P-1-1201	Ramp 1 pitch	0	S-0-0160	S-0-0160
P-1-1202	Ramp 1 end speed	1500	S-0-0044	S-0-0044
P-1-1203	Ramp 2 pitch	0	S-0-0160	S-0-0160
P-1-1222	Command value smoothing time constant	0	0	msec
P-2-0180	Lock frequency of speed controller	1500	0	Hz
P-2-0181	Bandwidth of locking filter speed controller	50	0	--
P-2-0532	Pre-magnetization factor	100	1	
P-2-1201	Ramp 1 pitch	0	S-0-0160	S-0-0160
P-2-1202	Ramp 1 end speed	1500	S-0-0044	S-0-0044
P-2-1203	Ramp 2 pitch	0	S-0-0160	S-0-0160
P-2-1222	Command value smoothing time constant	0	0	msec
P-3-0180	Lock frequency of speed controller	1500	0	Hz
P-3-0181	Bandwidth of locking filter speed controller	50	0	--
P-3-0532	Pre-magnetization factor	100	1	
P-3-1201	Ramp 1 pitch	0	S-0-0160	S-0-0160
P-3-1202	Ramp 1 end speed	1500	S-0-0044	S-0-0044
P-3-1203	Ramp 2 pitch	0	S-0-0160	S-0-0160
P-3-1222	Command value smoothing time constant	0	0	msec

Fig. 3-11: List of P parameters with default values (base parameters)

Block Diagram for the Controls

The block diagram for the controls offers an overview of the points at which the parameters effect the status variables of the drive. These variables are also named which the drive can output as analog voltage signals.

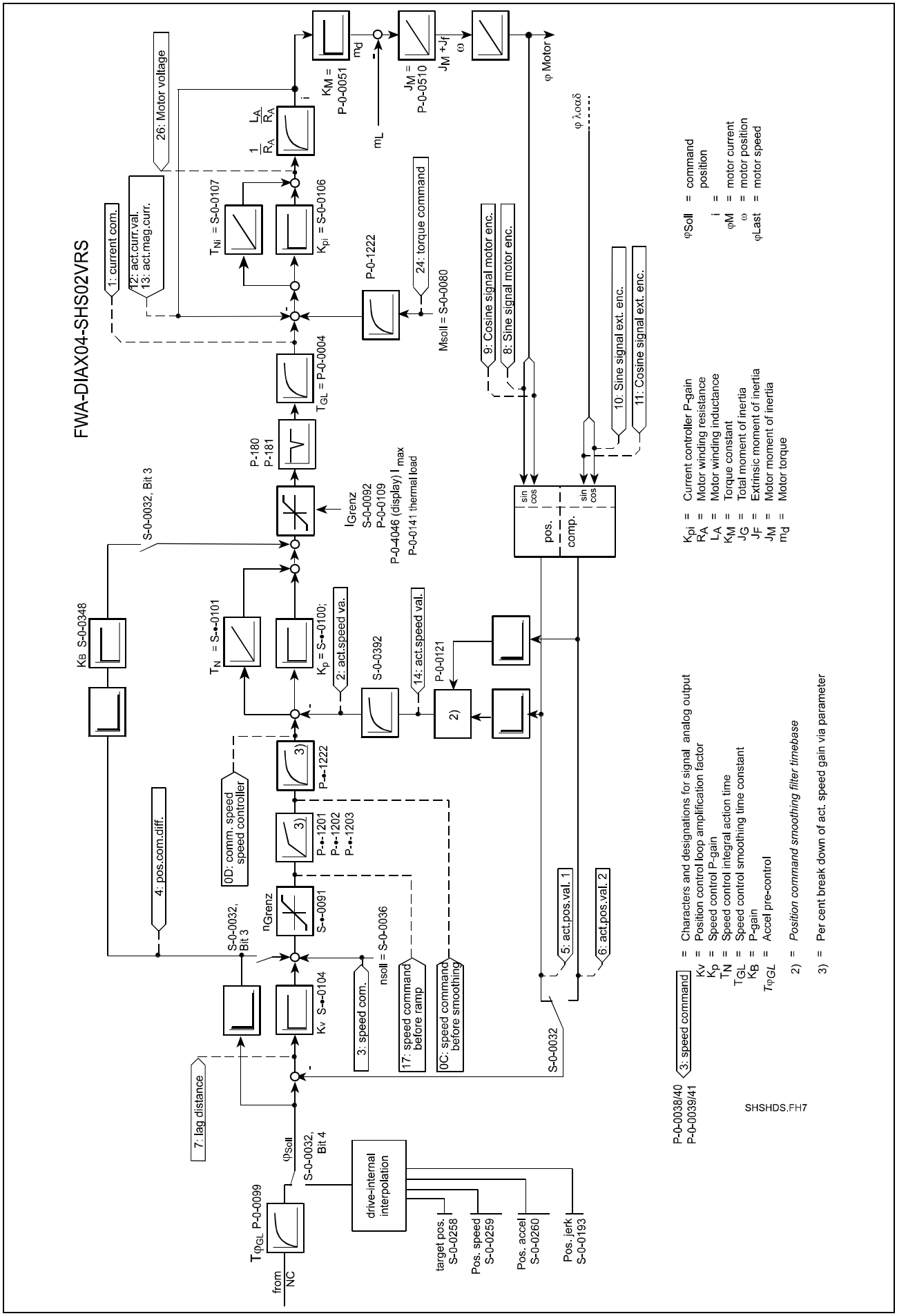


Fig. 3.12: Control block diagram

4 Command Communications via SERCOS Interface

4.1 Overview of SERCOS Communications

The command communications of units with DIAX04 software presently exclusively takes plae via a SERCOS interface. The significant features of this interface are:

- **cyclical data exchange of command and actual values with exact time equidistance**
- **synchronization of measuring time point and command value implementation**
- **total synchronization of all drives connected with the control**
- **minimum cycle time of 0.5 msec / maximum cycle time 65msec**
- **baud rates of either 2 or 4 M bauds**
- **service channel for parametrization and diagnosis**
- **data transmission using fiber optic cable rings**
- **configurable telegram contents**

The function of the interface is only briefly described here. For precise information, see the SERCOS interface specification.

4.2 Cyclical Data Transmission via SERCOS

To synchronize the drive in the ring, the **Master Synchronization Telegram (MST)** is sent at the start of each Sercos cycle. It only contains the communications phase set by the master.

The contents of the master data and drive telegrams can be configured

Once every Sercos cycle a **Master data telegram** (MDT) is sent from the control to every drive. The master control word, the service channel and a configurable data block are included here. In this data block, the command and limit values are contained which are sent by the control according to the operation mode of the drive. The contents of this data block can be configured through the telegram settings.

The master data telegram is received by all drives in the ring at the same time.

A **drive telegram** (AT) is also sent each Sercos cycle from every drive to the control. The drive status word, the service channel and a configurable data block are contained herein. This data block mainly contains actual and status values which are needed to operate the corresponding drives by the control.

Master Control Word

The master control word is a part of the master data telegram. All important control information for the drive is contained herein such as

- **drive ON and drive enable**
- **drive halt**
- **interpolator cycle**
- **command operation mode**
- **real-time control bits 1 and 2**
- **control information for the service channel**

It is structured as follows:

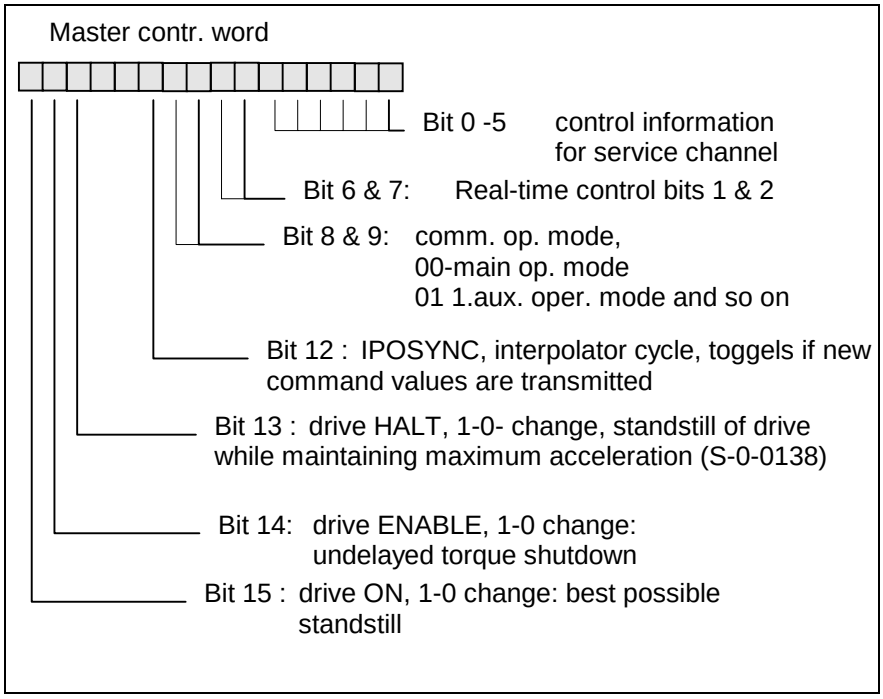


Fig. 4.1: Master control word structure

The master control word can be transmitted to the control and displayed on the monitor using parameters **S-0-0134, Master control word.** This is especially helpful during commissioning.

Control enable

The drive is activated via a 0-1 edge of the drive enable signal. In drive controllers with a SERCOS interface the drive enable signal is the same as bit 15 in the master control word of the master data telegram.

For the drive enable signal to be accepted, i.e., for the drive to switch from an energized to a de-energized state, the following conditions must be met:

- Sercos interface ready to operate (communications phase 4)
- no drive error
- power section on

In this state the drive registers **"Ab"** on the 7-segment display. The drive diagnosis via parameter **S-0-0095, Diagnosis** reads **A012, Control and power sections ready to operate.**

Once the drive enable is set, the 7-segment display shows "**AF**". The drive diagnosis then shows the activated operating mode (e.g., **A101 Drive in position control, encoder 1**).

If the drive enable is activated without DC bus voltage (the H1-display does not read "**Ab**") then error **F226 Under voltage error** is generated.

Drive Status Word

The drive status word is a part of the drive telegram. All important status information for the drive is contained herein such as

- **readiness for the use of control and power sections**
- **drive error**
- **change bits for diagnostics class 2 and 3**
- **current operation mode**
- **real-time status bits 1 and 2**
- **status information for the service channel**

It is structured as follows:

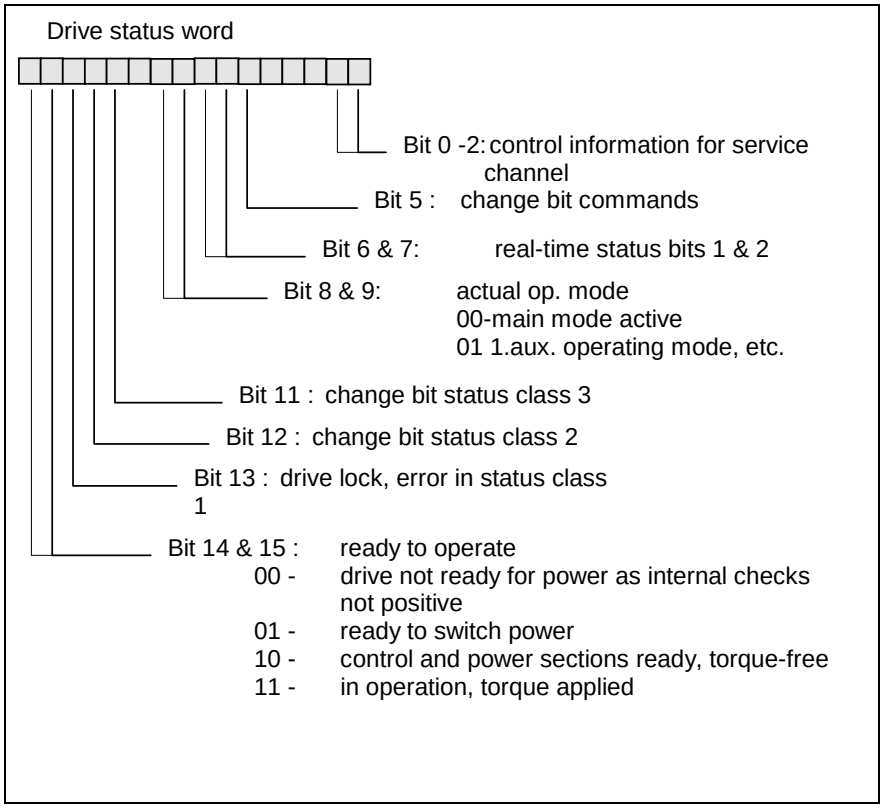


Fig. 4.2: Drive status word structure

For diagnostics purposes, the drive status word can be transmitted via the service channel to the control and displayed on the monitor with the help of parameter **S-0-0135, Drive status word.** This is especially helpful when commissioning.

Acknowledging Drive Enable

The drive acknowledges the control enable setting in the drive status word of the drive telegram. Bits 14 and 15 of "10" (control and power sections ready, torque free) after "11" (in operation, with torque) if the drive enable is activated and accepted.

The confirmation of the control enable setting in the status word is acknowledged after the drive has sufficient time to complete its operation mode. For example, the asynchronous motor uses this time to magnetize itself.

If the control enable is disabled, the drive performs its reaction through parameter **P-0-0119, Best possible standstill.** Time is lost here during resetting and confirming the reset. This time depends on:

- the setting of parameter **P-0-0119, Best possible standstill**
- the existence of a motor brake and its parameters
- the velocity of the axis before the reset of the control enable

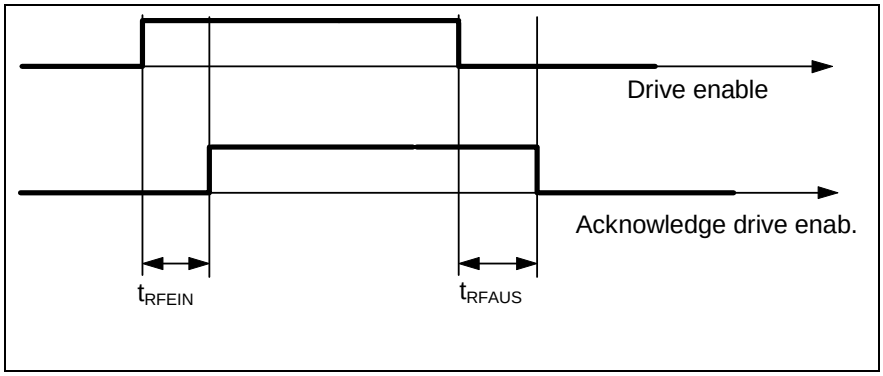


Fig. 4.3: Acknowledge drive enable

Typical values for t_{RFEIN} are about 8msec for synchronous or 300msec for asynchronous motors.

Note:
During time t_{RFEIN} the control should set its command values to reach a set velocity of 0. The triggering of the optional motor brake takes place after the control enable confirmation time (0-1 edge of the drive enable acknowledgement) !

4.3 Real-Time Control and Status Bits

In the master control and drive status words, there are two configurable real time bits. The configuration of these binary signals is achieved through parameters

- **S-0-0301, allocation of real time control bit 1**
- **S-0-0303, allocation of real time control bit 2**
- **S-0-0305, allocation of real time status bit 1**
- **S-0-0307, allocation of real time status bit 2**

The parameter number that will be assigned to the corresponding real time bit is set here. It is sent cyclically to the master or to that parameter in which the real time control bits are depicted.

4.4 Transmission of Required Data Through SERCOS

Required data are not cyclically transmitted parameters but rather parameters that are transmitted through the service channel.

The transmission through the service channel is done in several steps for the MDT and AT and the transmission of an element could last over several Sercos cycles.

The service channel is therefore used for

- **parametrization**

and

- **diagnoses**

4.5 Starting Up the SERCOS Interface

To start the interface you have to first

- **connect the fiber optic cable**
- **set the drive address**
- **set the baud rate**
- **set the transmission power**

All settings are done on the switch on the front panel or directly on the plug-in card of the interface module DSS 2.1.

The settings should be finished before connecting communication to the fiber optic ring.

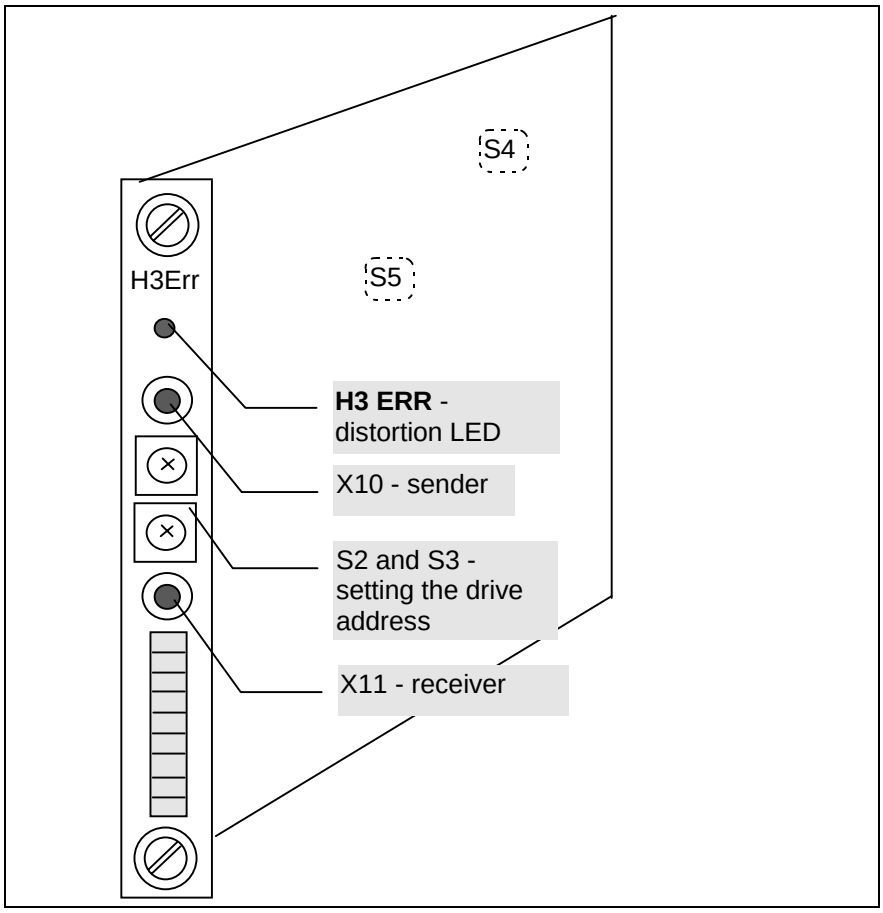


Fig. 4.4: Command communications module DSS2

See Attachment B, Diagnostic Description: **E410 Slave not scanned or address 0**.

Setting the Drive Address on the SERCOS Interface

The drive address is set on the front plate of the DSS 2.1 through switches S2 and S3. Addresses in the range of 0 to 99 can be set. The drive address is not dependent on the sequence of drive connections through the fiber optic ring.

Connecting the Fiber Optics of the SERCOS Interface

The fiber optic communication structure requires that the transmitter of the previous device must be connected with the next device.

The fiber optic cable with the receive signal has to be connected to X11. If a signal is being sent through the cable, then a red light can be seen here. If the control voltage is turned on at the drive power source, then the received light signal is amplified in the interface module and appears at the transmit output (X10). The fiber optic cable that leads to the receiver of the following device must be connected at X10.

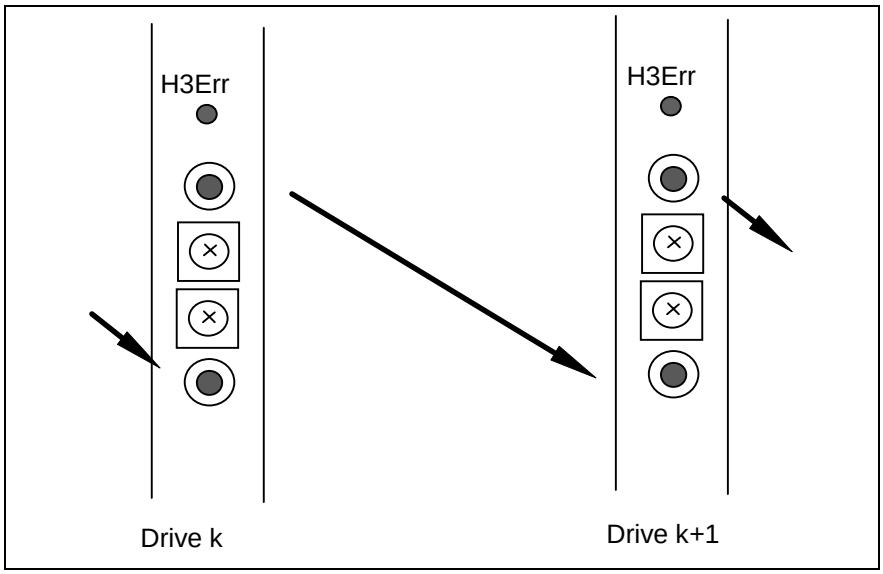


Fig. 4.5: General fiber optic ring connections

Transmission Rate of the SERCOS Interface

The baudrate is set at 2M at the factory. Use switch S4 on the DSS 2.1 for this purpose. But first remove the card from its slot.

Baudrate:	Switch S4:	Comments:
2 MBaud	OFF	state at delivery
4 MBaud	ON	

Tab. 4-1: Setting transmission rates

Transmission Power of the SERCOS Interface

Transmission power is set to -9dBm at that factory. Switch S5 on interface module DSS 2.1 can be used for this purpose. The card must be removed from its slot first, however.

Transmission power:	**S5-B:**	**S5-A:**
-11 dBm	OFF	OFF
-9 dBm	OFF	ON
-8 dBm	ON	OFF
-7 dBm	ON	ON

Tab. 4-2: Setting transmission power

LED Distortion (H3Err) of the SERCOS Interface

The distortion LED indicates if the received signal is too high or too low or no input is recognized at the receive signal. By adjusting the transmission power of the previous ring participant, you can change to a permissible signal range. The LED turns off when the signal is no longer distorted.

4.6 SERCOS Telegram Configuration

The settings of the telegram send and receive times, their lengths and contents have to be transmitted from the SERCOS master to the drive to operate the drive properly.

Configuration of Telegram Send and Receive Times

To calculate the time gap parameter (telegram send and receive times) use parameters:

- **S-0-0003, minimum AT transmit starting time (T1min)**
- **S-0-0004, transmit/receive transition time (TATMT)**
- **S-0-0005, minimum feedback acquisition time (T4min)**
- **S-0-0088, Receive to receive recovery time (TMTSY)**
- **S-0-0090, Command value transmit time (TMTSG)**

The SERCOS master calculates, from the information received from all drives, the time slot parameters for the operation of communications phase 3. Those values are transferred to the drive in communications phase 2 through parameters

- **S-0-0002, SERCOS cycle time (Tscyc)**
- **S-0-0006, AT transmission starting time (T1)**
- **S-0-0007, feedback acquisition starting time (T4)**
- **S-0-0008, command valid time (T3)**
- **S-0-0009, start address in master data telegram**
- **S-0-0010, length of master data telegram**
- **S-0-0089, T2 MDT transmit starting time**

The drive checks these presettings while processing command **S-0-0127, C1 communications phase 3 transition check.** The following error messages may appear:

- **C101 communications parameters invalid (S-0-0021)**
- **C108 time slot parameter > Sercos cycle time**
- **C109 MDT start address (S-0-0009) odd**
- **C110 MDT length (S-0-0010) odd**
- **C111 ID9 + record length - 1 > MDT length (S-0-0010)**
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) faulty**
- **C113 relat. TNcyc (S-0-0001) to TScyc (S-0-0002) faulty**
- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 too small**

Configuration of Telegram Contents

Determining telegram contents is done with parameters

- **S-0-0015, telegram type parameter**
- **S-0-0016, custom amplifier telegram configuration list**
- **S-0-0024, configuration list of MDT**

However, the drive directed conditions for type and number of configured data must be within the set range. This is provided by the drive in

- **S-0-0185, length of configuration data record in AT**
- **S-0-0186, length of configurable data record in MDT**
- **S-0-0187, configurable data list in AT**
- **S-0-0188, configurable data list in MDT**

The drive checks these presettings while processing command **S-0-0127, C1 communications phase 3 transition check.** The following error messages may appear:

- **C104 configurated ID no. for MDT not configurable**
- **C105 configurated length > maximum length for MDT**
- **C106 configurated ID no. for AT not configurable**
- **C107 configurated length > maximum length of AT**

List of configurable data in the AT (S-0-0187)

Parameter ID number (Id. no.)	Parameter name
S-0-0040	**velocity feedback value**
S-0-0051	**actual position value 1**
S-0-0053	**actual position value 2**
S-0-0080	**torque command value**
S-0-0084	**torque actual value**
S-0-0130	**probe value -1 positive**
S-0-0131	**probe value -1 negative**
S-0-0132	**probe value -2 positive**
S-0-0133	**probe value -2 negative**
S-0-0144	**signal status word**
S-0-0182	**manufacturer status class 3**
S-0-0189	**lag distance**
P-0-0082	**parallel input 1**
P-0-0111	**parallel input 2**
P-0-0113	**parallel input 3**
P-0-0115	**analog input 1**
P-0-0116	**analog input 2**
P-0-0202	**differential probe value 1**
P-0-0203	**differential probe value 2**

Fig. 4-3: List of configurable parameter in the drive telegram

List of configurable data in the MDT (S-0-0188)

Parameter ID number (Id. no.)	Parameter name
S-0-0036	**speed command value**
S-0-0047	**position command value**
S-0-0080	**torque command value**
S-0-0092	**torque bipolar limit value**
S-0-0138	**bipolar acceleration**
S-0-0193	**positioning jerk**
S-0-0258	**target position**
S-0-0259	**positioning speed**
S-0-0260	**positioning acceleration**
S-0-0349	**jerk bipolar limit value**
P-0-0081	**parallel output 1**
P-0-0110	**parallel output 2**
P-0-0112	**parallel output 3**

Fig. 4-4: List of configurable parameters in the master data telegram

4.7 SERCOS Interface Errors

If conditions in the drive might prevent a correct operation of the interface or if during the initialization phase error values are recognized, then the drive responds by resetting communications phase 0. This means that no drive telegrams will be sent. The drive itself proceeds with the programmed error reaction (see **P-0-0119, Best possible deceleration**) and waits for re-initialization of the Sercos ring through the master.

Possible errors are:

- **F401 double MST error shutdown**
- **F402 double MDT error shutdown**
- **F403 invalid communication phase shutdown**
- **F404 error during phase progression**
- **F405 error during phase regression**
- **F406 phase switching without ready signal**

Diagnosis of the Interface Condition

To analyze the existing initialization and the current communication phase, parameter **S-0-0014, Interface status** is used.

Error Count for Telegram Interrupts

The drive checks every received master synchronization and master data telegram for

- **correct receive time set points,**
- **the assigned telegram length and**
- **the correct CRC checksum.**

The interrupt of a telegram is registered through the incrementation of an

error counter. These two parameters **S-0-0028, Error counter MST** and **S-0-0029, Error counter MDT** are used for this purpose.

These parameters are deleted by switching communications phase 2 to 3 (S-0-0028) or 3 to 4 (S-0-0029).

5 Motor Configuration

5.1 Features of the Different Motor Types

You can use the following motor types made by Indramat with DIAX04 main spindle drives.

- MHD
- MKD
- 2AD/1MB/ADF

The individual motor types may differ in the following points.

- built-in data memory in motor encoder
- synchronous - asynchronous motors
- temperature monitoring can be parametrized or not
- base load function possible or not
- motor encoder interface can be parametrized or one setting only

The individual motor types have the following properties:

Motor type	Motor feedback memory	Synchronous /asyn.	Temperature monitoring	Motor encoder interface	Base load
MHD/MKD	yes	Synchronous	permanent	permanent (1)	possible
2AD/ADF	no	Asynchronous	parametrized	parametrized	no
1MB	no	Asynchronous	parametrized	parametrized	no

Tab. 5-1: Motor type features

Motor Feedback Memory

The motor feedback memory contains all motor-dependent parameters

MHD and MKD motors have a motor feedback memory in which all motor-dependent parameters are stored. The drive controller automatically recognizes this and reads these parameters out of the data memory after powering up and in command **S-0-0128, C2 communications phase 4 transition check**.

The following parameters are in this data memory:

- **S-0-0109, Peak motor current**
- **S-0-0111, Motor current at standstill**
- **S-0-0113, Maximum motor velocity**
- **S-0-0141, Motor type**
- **P-0-0018, Numbers of pairs of poles**
- **P-0-0051, Torque constant**
- **P-0-0510, Moment of inertia of the rotor**
- **P-0-0511, Holding brake current**
- **P-0-0508, Commutation offset**

They do not have to be entered for operation or after a motor has been replaced.

Synchronous / Asynchronous

Specific parameters are used with synchronous, others with asynchronous motors only.

The following differences are made in the handling and checking of parameters in command **S-0-0128, Communication phase 4 transition check:**

Synchronous:

- **P-0-4004, Magnetization current** is set to 0
- **P-0-0508, Commutation offset** is checked for validity

Asynchronous:

- **P-0-4004, Magnetization current** is initialized
- **P-0-0508, Commutation offset** is not checked

Temperature Monitoring

MHD and MKD motors have a limit switch for the motor temperature monitor which is set to one point only

To check motor temperature use parameters

S-0-0201, Motor warning temperature

S-0-0204, Motor turn off temperature

In MHD and MKD motors, the parameters have been set to the following values and cannot be changed:

S-0-0201, Motor warning temperature = 145°C

S-0-0204, Motor turn off temperature = 155°C

The parameter settings can be changed for all other motor types. Note, however, that the limit turn off cannot be set higher than the maximum allowable temperature of the motor.

The maximum input value for **S-0-0201, Motor warning temperature** is **S-0-0204, Motor turn off temperature**.

If the temperature of the motor exceeds the value set in **S-0-0201, Motor warning temperature** then warning **E251 Motor overtemperature warning** is generated.

If temperature climbs to motor turn off temperature, then error **F219 Motor overtemperature turn off** is generated.

The minimum input value for **S-0-0204, Motor turn off temperature** is **S-0-0201, Motor warning temperature**.

To display motor temperature, use parameter **S-0-0383, Motor temperature.**

The drive controller monitors the motor temperature device and its functions. If any problems are detected, e.g., temperature drops below -10 degrees, then warning **E221 Warning motor temperature monitor defect** is generated for ten (10) seconds. Then error **F221 Error motor temperature monitor defect** is generated.

Base Load Function

MHD and MKD motors are equipped with data memory in their feedback. It contains not only all motor-dependent parameters but also a set of default controller parameters.

The base load function activates these.

(See function "Load Base Values".)

5.2 Setting Motor Type

Motor type can be set either:

- automatically by reading the motor encoder memory or
- by inputting parameter **P-0-4014, Motor type.**

This depends on the motor used.

The motor type setting should be instituted at startup as this affects the following drive functions:

- motor temperature monitoring
- load base values function
- motor parameter settings
- commutation

Motor Type Automatically Set in Motors with Feedback Memory

MHD and MKD motors are equipped with motor feedback memory in which the motor type is stored. The drive controller detects this motor type automatically and

- sets the value of parameter **P-0-4014, Motor type** to the correct value and ensures that it is write protected;
- sets the value of parameter **P-0-0074, Motor encoder interface** to the correct value for that specific motor type and write-protected;
- sets all bits except 6 for absolute/not absolute to "0" in parameter **S-0-0277, Position encoder type parameter 1**;
- reads all motor-dependent parameters in the motor encoder data memory (see Motor Feedback Memory on page 5-2)
- the value of S**-0-0201, Motor warning temperature** is set to 145°C and **S-0-0204, Motor turn off temperature** is set to 155°C.

This procedure is conducted immediately after the device is turned on as is the command **Communications phase 4 transition check** whereby the command error message **C204 Motor type (P-0-4014) faulty** is generated if in **P-0-4014, Motor type,** MHD or MKD motor has been selected, but the relevant string could not be located in the motor encoder data memory.

Setting the Motor Type via P-0-4014, Motor Type

In motors without motor feedback data memory the motor type must be set via **P-0-4014, Motor type**. The following values are to be used for motor types.

Motor type:	**Data:**	**Comments:**
MHD	1	automatic detection
2AD/1MB/ADF	2	must be set
MKD	5	automatic detection
asynchronous motor, rotary with PTC / temperature switch	6	must be set

Tab. 5-2: Setting the motor type

5.3 Motor Feedback

To parametrize the motor encoder use parameters

- **P-0-0074, Motor encoder interface**
- **S-0-0116, Motor encoder resolution**
- **S-0-0277, Position encoder type parameter 1**

This specifies the interface number to the measuring system, the resolution of the encoder as well as the rotational direction and so on. To display the positoin of the motor encoder, use parameter **S-0-0051, Actual position value 1**.

Setting the Encoder Interface of the Motor Encoder

Setting the encoder interface of the motor encoder uses parameter **P-0-0074, Motor encoder interface** . The number of the module to which the motor encoder is connected must be entered there. With some motor types, the motor encoder interface is automatically set in P-0-0074. The parameter is write protected in that case. (See "Features of various motor types".)

Main spindle motors with DSF feedbacks need no plug-in module. **P-0-0074, Motor encoder interface** is set automatically. There is no integrated DSF feedback in motor spindles (mounted spindle motors). The following measuring systems can be used as motor feedbacks.

Motor feedback measuring system:	Plug-in module:	Value for P-0-0074
GDS encoder	- (standard interface X4)	1
Incremental encoder with sine signals, made by Heidenhain, either uA or 1V signals	DLF 01.1M	2
gear wheel made by INDRAMAT (high-resolution main spindle position encoder, high-resolution motor feedback in 2AD/ADF)	DZF02.1M	3
Incremental encoder with squarewave signals made by Heidenhain	DEF01.1M	5
Encoder with EnDat interface	DAG01.2M	8
gear wheel encoder ($1V_{ss}$) made by Lenord & Bauer, Woelke, VS-Sensorik, Siemens	DZF03.1M	9

Tab. 5-3: Motor feedback measuring system, requires plug-in modules and relevant parameter values

Motor Encoder Resolution

To parametrize the motor encoder resolution, use parameter **S-0-0116, Motor encoder resolution.** The number of lines of the motor encoder must be entered here. The resolution for measuring systems with feedback memory can be accessed here and therefore does not need to be entered.

Measuring system	Feedback data memory	Value for S-0-0116
in MHD/MKD motors: type L and M (digital servo feedback)	yes	self-setting
in 2AD and ADF: type 6 and 7 (digital servo feedback)	yes	self-setting
high-resolution motor feedback (in 2AD and ADF: type 3)	no	256
high-resolution main spindle position encoder (in 1MB): MH2-128-5-.../SH2-128-5-... MH2-256-5-.../SH2-256-5-... MH2-512-5-.../SH2-512-5-...	 no no no	 128 256 512
GDS, digital singleturn encoder	yes	self-setting
incremental encoder with square-wave signals TTL	no	see manufacturer's data
incremental encoder with sine signals $1V_{SS}$	no	see manufacturer's data
EnDat encoder	yes	self-setting

Tab. 5-4: Measuring system used as motor feedback and the value to be set in **S-0-0116**

If the motor parameters must be manually entered at startup or if they must be loaded through the data carrier then the correct value must also be entered in parameter **S-0-0116**.

Other motor encoder features

To parametrize any other motor encoder features such as

- motional direction inverted/not inverted
- distance-coded reference marker yes/no
- absolute / not absolute

use **S-0-0277, Position encoder type parameter 1**. This parameter is constructed as follows:

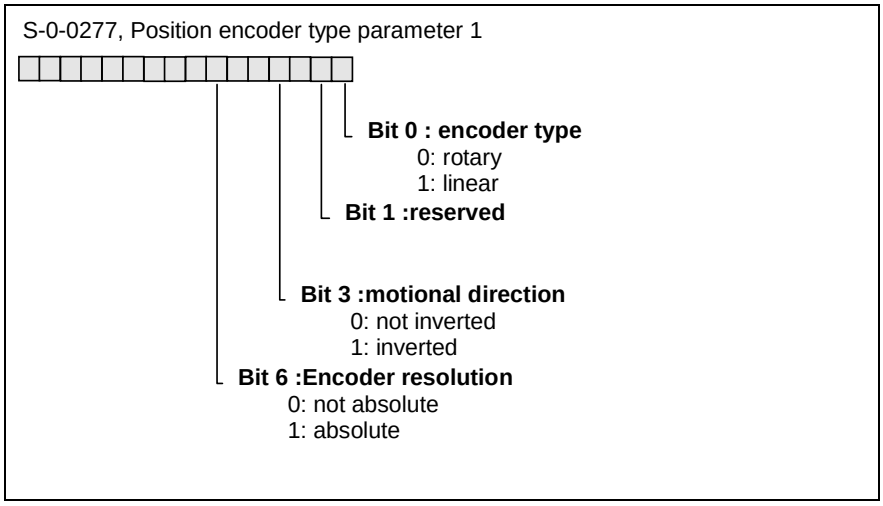


Fig. 5-1: Parameter S-0-0277

This parameter is automatically set in MHD and MKD motors. It does not have to be entered.

In absolute measuring systems, bit 6 is automatically set.

(See sec. 7.3, Supplementary Settings for Absolute Measuring Systems.)

5.4 Asynchronous Motors

With DIAX04 firmware SHS-02VRS it is possible to use asynchronous motors over the entire speed range including constant power range.
Next to the general motor parameters, the asynchronous motor parameter must be set to Indramat motor specifications:

- **P-0-4004, Magnetization current**
- **P-0-4012, Slip factor**
- **P-0-0530, Slip increase**
- **P-0-0531, Kipp current limit**
- **P-0-0533, Flux loop P-gain**
- **P-0-0534, Flux loop integral action time**
- **P-0-0535, Motor voltage no load**
- **P-0-0536, Maximum motor voltage**
- **P-0-0537, S1 kink speed**

The user has two other parameters at his disposal with which the drive can be adapted to his needs:

- **P-•-0532, Pre-magnetization factor**
- **P-0-0538, Motor function parameter 1**

Basic Information on Asynchronous Motors

Asynchronous motors are broken down into three working areas.

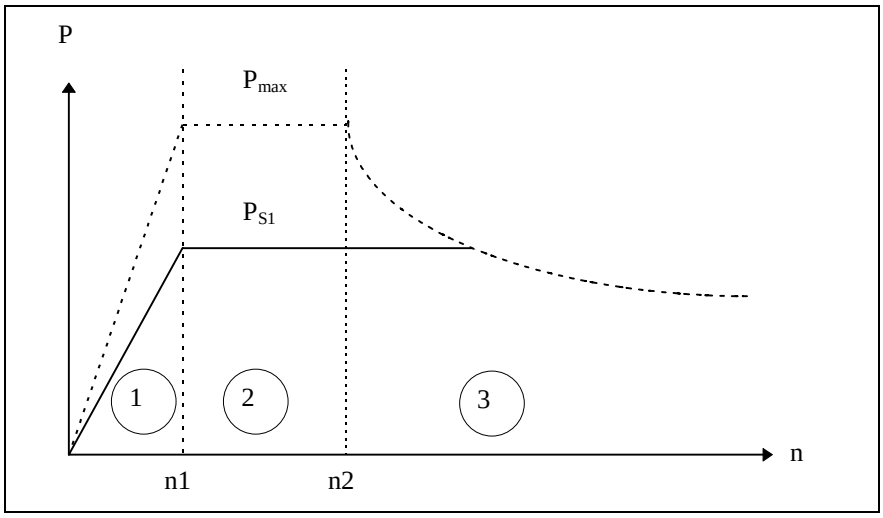


Fig. 5.2: Breakdown of work areas

Area 1:

Basic speed range is defined in terms of a constant torque and locked rotation constant (parameter P-0-0051). In idle, the programmed magnetism voltage is applied. The motor voltage is smaller than the maximum control output voltage. The kink speed is directly proportional to the DC bus voltage.

Area 2:

Constant power range is defined in terms of constant motor voltage, idle current and connected magnetism and torque constants which fall within raising velocity. The play is correspondingly increased.

Adjusting magnetization current and play is automatic and done by the area control. Voltage is lowered during idle to the motor idle voltage (P-0-0535) and when fully extended to maximum motor voltage (P-0-0536).

Area 3:

Area of falling peak power is defined as the motor working at its limit whereby a vector control makes an overload impossible. Depending on parameter "kipp current limit" peak current is lowered to the point where maximum performance cannot be exceeded. If voltage climbs any further, then both power and shaft performance drop. Peak power in range 3 is proportional to the square of the DC bus voltage. Maximum power can be achieved with each DC bus voltage without the need to re-set parameters.

It is evident from the relationships that a more powerful control device cannot increase power in range 3.

Torque Evaluation

Parameters **S-0-0080, Torque/force command value** and **S-0-0084, Torque/force actual value** are per cent values with 100% equalling nominal motor torque in the basic speed range. Since the peak torque of asynchronous motors is limited to 2.5 times nominal torque, torques equalling up to 250% can occur.

The significance of the torque value is altered within the field control range as the control calculates the torque based on the torque generating current Iq. The torque, however, is the product of Iq and air gap induction which decreases within the field control range. The per cent value specified always relates, above the basic speed range, to the continuous motor torque available at a specific speed. The following shows the allocation of the torque value in terms of its dependence on the speed:

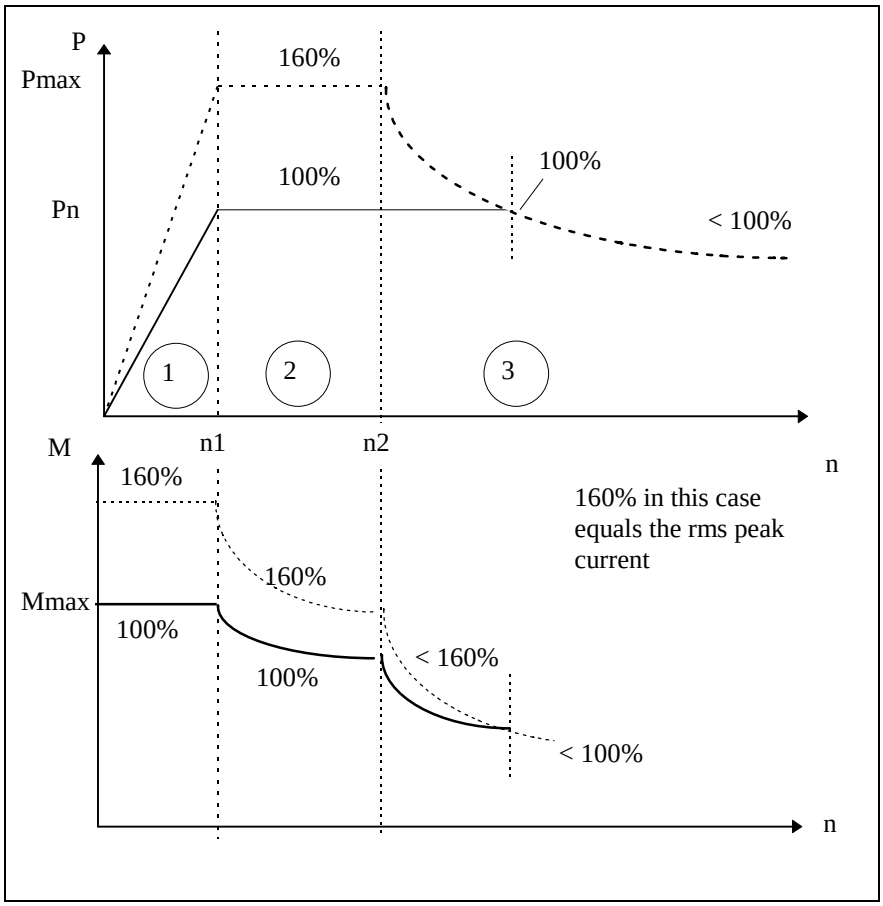


Fig. 5.3: Torque allocation

In area 1 the torque value actually equals the torque, i.e., 100% = nominal torque.

In area 2 the torque value equals the power, i.e., 100% = nominal voltage as per the Selection Lists. (Nominal power of the motor type plate is not relevant here as it can relate to a different DC bus.)

Area 3 corresponds to range 2 although the available torque drops with rising speed depending on the available peak power. At high speeds, maximum torque can drop below 100%.

In brake mode, 50% more torque can be achieved in these areas than when in motor mode!

User-Defined Parametrization of Asynchronous Motors

To operate an asynchronous motor it is necessary to set the specific DIAX04 motor parameters in the drive. The parameters are stored on the DSM module which means that they can be transferred to another control device, if necessary.

Note:
The parameters fixed for one motor are used in all DIAX04 controls (HDD or HDS) in the same manner. The resulting characteristics depend, of course, on rated current but especially on the DC bus voltage. The user also has several parameters at his disposal to optimize drive settings to meet his demands.

Pre-Magnetization Factor

The pre-magnetization factor (P-•-0532) sets the rms magnetization current.

It applies:

rms magnetization current = magnetization curent x pre-magnetization factor

Formel 5-1: Calculating rms magnetizing current

If the pre-magnetization factor is 100%, then the motor is always completely magnetized. There is a linear relationship between command current and torque according to torque constant P-0-0051. Torque builds up immediately. The drive has perfect servo properties.

The disadvantage is the higher iron loss and higher noise level in idle and work modes, especially at a switch frequency of 4kHz, if full magnetization current is flowing. This factor is best set to 50% for main spindle applications. This means that the motor remains cooler and quieter without reducing peak power. The extended start control time (only at jumps which exceed peak torque) and the missing linearity of torque and voltage do not distort the main spindle drives.

The quality of the relationship between pre-magnetization factor and drive behavior is displayed below:

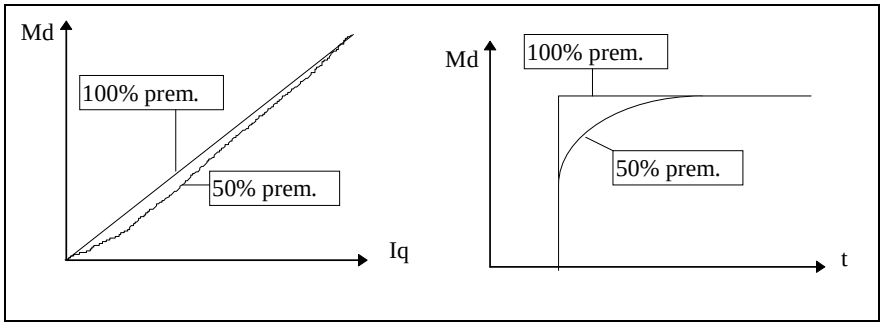


Fig. 5.4: Relationship of pre-magnetization factor and drive behavior

Build up is delayed by about 200ms at 50% pre-magnetization torque. This is the result of the air gap range in relationship to the rotor time constant which can only climb very slowly.

Feed could improve if the pre-magnetization factor is reduced (by about one thousandths of a degree). Distortion torques are reduced. This is due to motor requirements which have been met and unavoidable

distortions of the voltage from a perfect sine line. It is necessary to open the play just so much that it corresponds to the pre-magnetization factor reduction to keep the torque linear. **Note that torque constant, continuous torque and peak torque also drop!**

Example: The feed of a servo drive needs to be improved. The pre-magnetization factor is set to 40% and the slip factor to 2.5 times the original value. Continuous and peak torques drop to about 40%. Kink speed climbs to 2.5 times the speed.

Function „S1 mode“

Function „S1 mode“ is activated by setting bit 0 in parameter „Motor function parameter“.

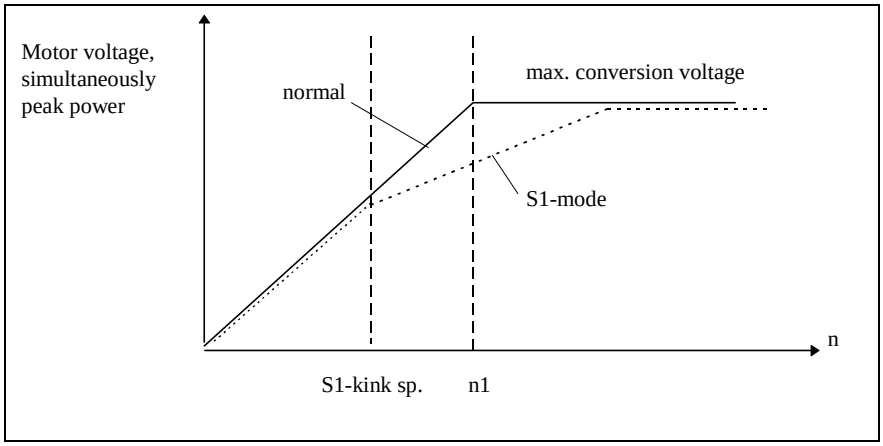


Fig. 5.5: How kink speed works

Even S1 kink speed (P-0-0537) prevents the continuous loss of iron by means of field control. If the motor typical S1 kink speed drops below the DC bus voltage and motor type-dependent kink speed n1, then iron loss in S1 kink speed range is kept constant until the output current is completed. Peak torque drops with loads $\leq$ nominal loads, but motor loss decreases also. Activating „S1 mode“ is thus advantageous in drives operated at constant speed within the mean speed range, as is, for example, the case with printing machines.

In some cases, it is conceivable that the S1 kink speed is clearly below the electrical kink speed n1, especially for non-cooled motors.

S1 operation can also be used in connection with reduced pre-magnetization factor.

Motor Function Parameter 1

Bit no.	Definition
#0	= 0: no drop in magnetization current = 1: S1 magnetization current drop to S1 kink speed active

Tab. 5-5: Definition of P-0-0538, motor function parameter

5.5 Motor Brake

Explanations

DIAX04 controllers (HDD or HDS) enable the user to control a motor brake. This eliminates the need for control logic on the control and additional circuitry. Motor brakes are always correctly controlled by the controls that regulate the motor in terms of its operating state.

The control can regulate motor brakes for main spindle drives and for servo drives.

Technical features

DIAX04 controllers regulate motor brakes with electrical clamps and releases. The controller is informed about the brake through a parameter.

The controllers take clamping and release times into account meaning that there is very little wear.

Voltage and brake current are also monitored. Deviating values generate an appropriate message.

Operating behavior of the electrically released motor brake in main spindle drives:

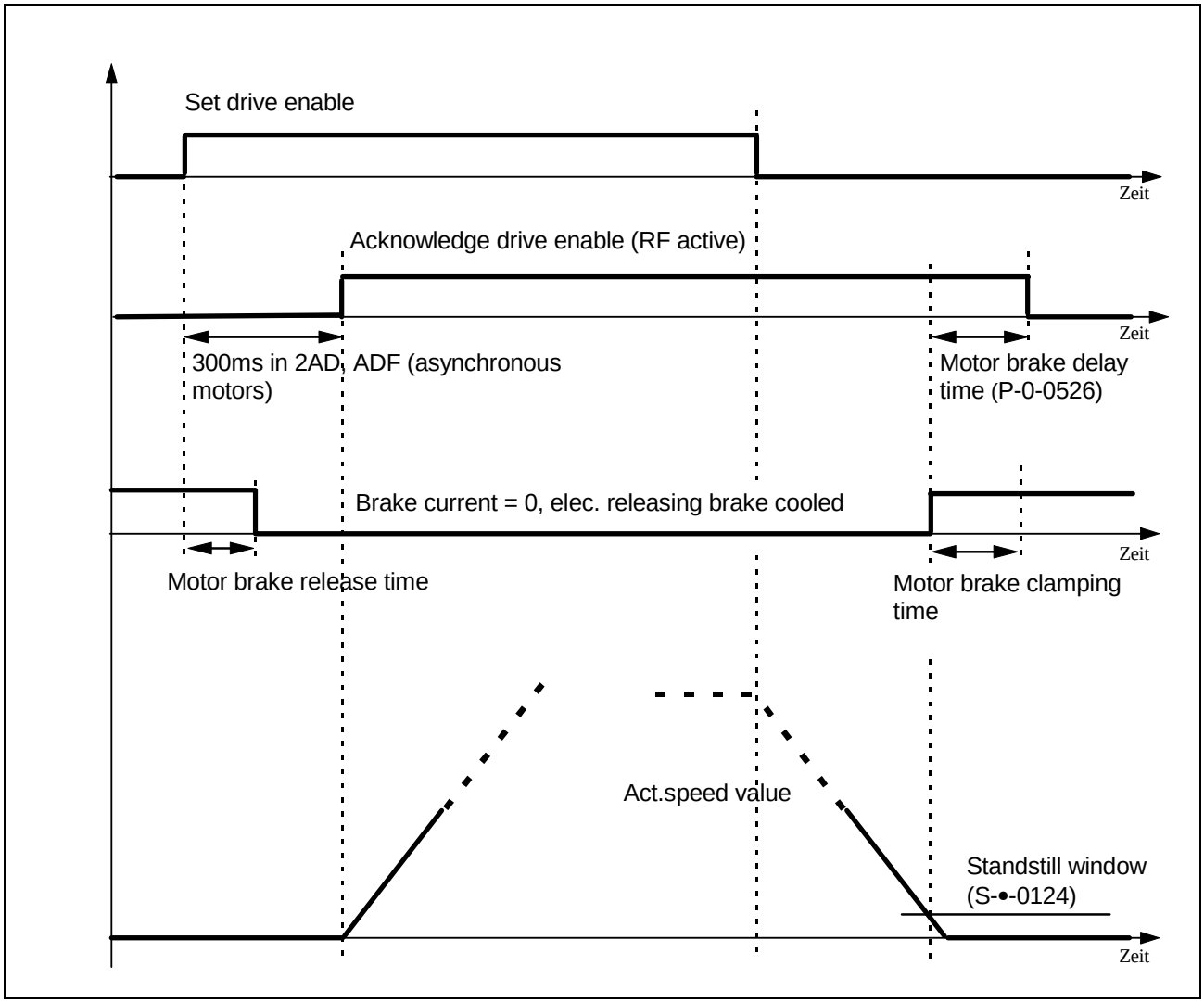


Fig. 5.6: A DIAX04 controller regulating a motor holding brake

The self-releasing holding brake is only closed if the drive enable signal is not set and the motor is standing still. This also applies if there has been a power failure but then in terms of the set error reaction.

Note: Use only releasing holding brakes together with main spindle motors. Clamping holding brakes should not be used in spindle motors as such could be damaged if there is a power failure during machining!

Project Planning

Terminal diagrams

The motor brake is mounted directly to the controller at plug-in clamp X6. These must be supplied with DC24V from the control cabinet.

Note:
For checks without errors of the motor brake voltage it is required to connect the 0V of the brake supply galvanically to the 0V of the drive controller.

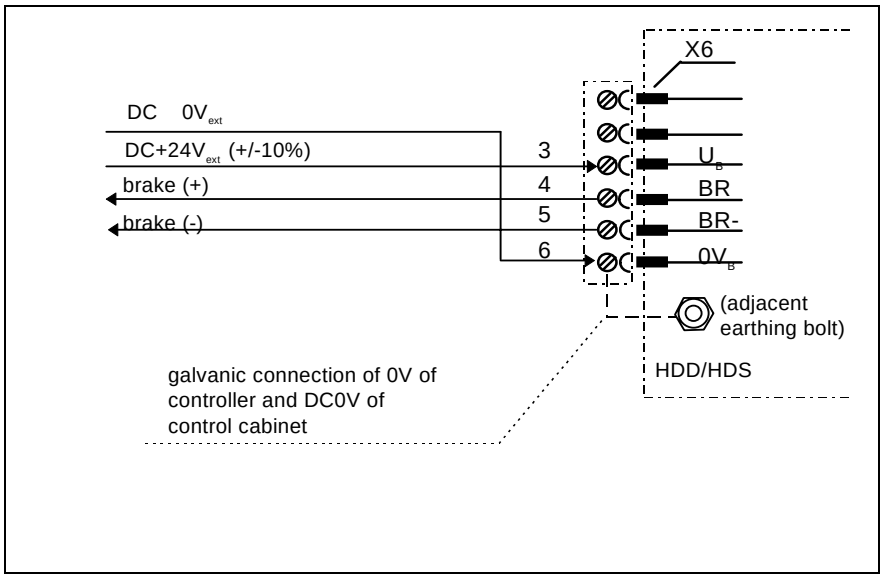


Fig. 5.7: Motor brake connections

Amperage

Available amperage to operate a motor brake are:

- HDS: max. 2.0A, according to the control cabinet side DC24V

If the nominal current of the brake is higher than the current available through the controllers, then the brake must be controlled via a device on the machine.

Commissioning the Motor Brake (2AD and ADF Motors only)

Parameter summary

Parameter ID number (Id. no.)	Parameter name	Comments
P-0-0525	**Motor brake type**	declaration of the motor brake principle
P-0-0511	**Motor brake current**	nominal brake current
P-0-0526	**Motor brake delay time**	time between control and brake response
S-•-0124	**Standstill window**	actual speed threshold to detect spindle standstill

Note: It is necessary to manually input the parameter values for the motor brake in 2AD and ADF motors!

In MHD and MKD motors, the motor brake parameters are stored in the motor encoder and are read in with command "Base load". MHD and MKD motors, however, are not suited for spindle drives and electrically clamping brakes!

⇒ P-0-0525, Setting motor brake type!

CAUTION

Note whether electrically-releasing or clamping brakes are correctly specified!

The brakes in main spindle motors are quickly damaged!

⇒ Check to make sure motor brake and motor brake type set in P-0-0525 agree!

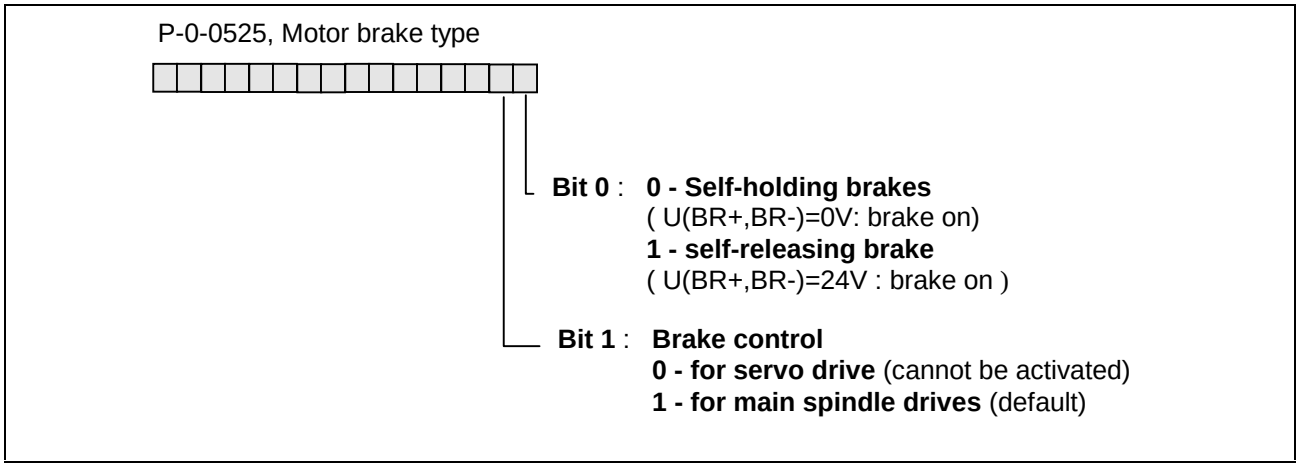


Fig. 5.8: Setting motor brake types

⇒ **P-0-0511, Motor brake current**! Data is specified in the relevant motor documentation (Project Planning)!

⇒ **P-0-0526, Motor brake delay time**! Data is specified in the relevant motor documentation (Project Planning)! With electrically-released brakes, please note that a higher value must be set in **P-0-0526, Motor brake delay time** than is set for the clamping delay time of the brake!

Diagnosis

The activated brake is not diagnosed by the controller. The braking current, however, is monitored once the brake is activated!

Fault clearance

If error message F2-68 flashes:

then the braking current exceeds the allowable range of 0.4...1.6 * **P-0-0511.**

⇒ Check brake power source and motor brake connection!

If there is no motor brake and error message F2-68 flashes:

then the braking current monitor has been falsely activated!

⇒ Deactivate the monitor of the brake current by setting **P-0-0511, Motor brake current** to „0“!

6 Operating Modes

6.1 Operating Modes - Definitions

Operating modes define which command value is to be processed in which way. In parameters

- **S-0-0032, Main operating mode**
- **S-0-0033, Auxiliary operating mode 1**
- **S-0-0034, Auxiliary operating mode 2**
- **S-0-0035, Auxiliary operating mode 3**

it is possible to preselect four (4) different operating modes simultaneously.

The text below only discusses those operating modes supported by DIAX04-SHS software.

6.2 Basic Operating Modes

Torque Control

The drive is given a torque command value in mode **torque control.** The diagnosis with active mode reads **A100 drive in torque control**.

The command value is set in parameter **S-0-0080, torque command value.**

Operating mode specific monitors are

- Monitoring whereby the actual velocity is checked for 1.125 times the value set in parameter **S-•-0091, bipolar velocity limit value.** (See "Limit to bipolar velocity limit value".)

If this value is exceeded, then error **F879 Bipolar velocity limit value exceeded** is generated.

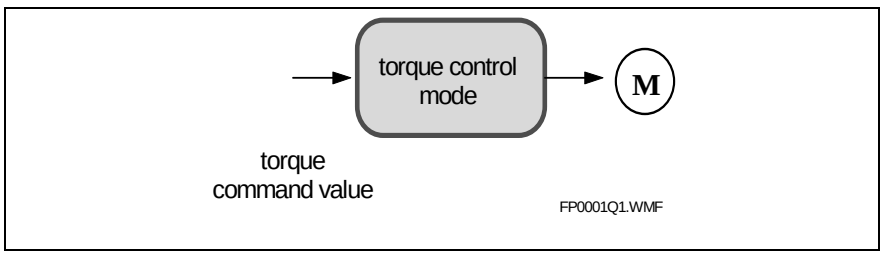


Fig. 6-1: Schematic diagram of torque control

Torque Control

The command value in **S-0-0080, Torque command value** is limited with the rms peak current **P-0-4046, rms peak current.** The rms peak current is calculated from the current and torque limits.

(See "Current limit" and "Torque limit".)

The socalled torque-generating command current Iqsoll results herefrom. This is the command value for the (rms) current control.

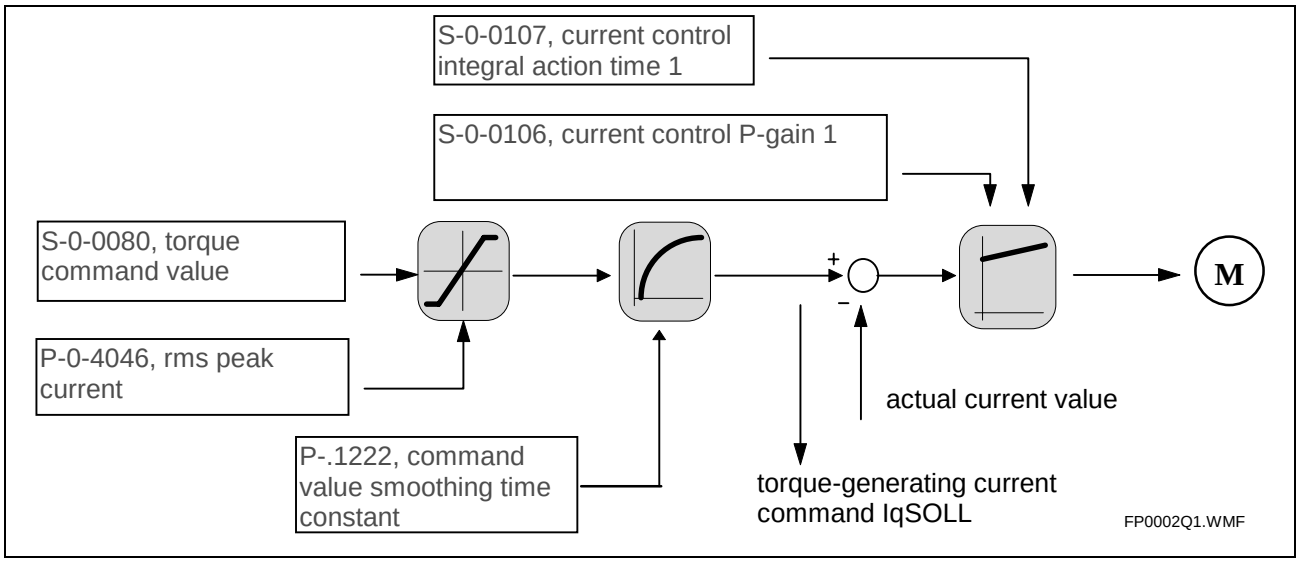


Fig. 6-2: Torque control

Velocity Controller

The drive is given a speed command value in **Velocity control** mode. The diagnosis is **A101 Drive in velocity control** if the operating mode is active.

The command values are specified in parameter **S-0-0036, Velocity command value**.

Operating specific modes are

- Parameter **S-0-0036, Velocity command value** is set to the value of parameter **S-•-0091, Bipolar velocity limit value.** This generates the warning **E263 S-0-0036 Velocity command value exceeds S-•-0091**.

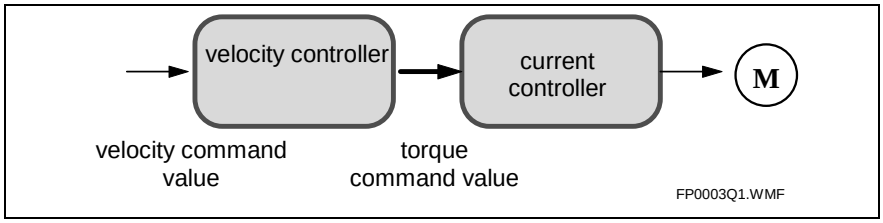


Fig. 6-3: Schematic diagram of velocity control

Velocity Controller

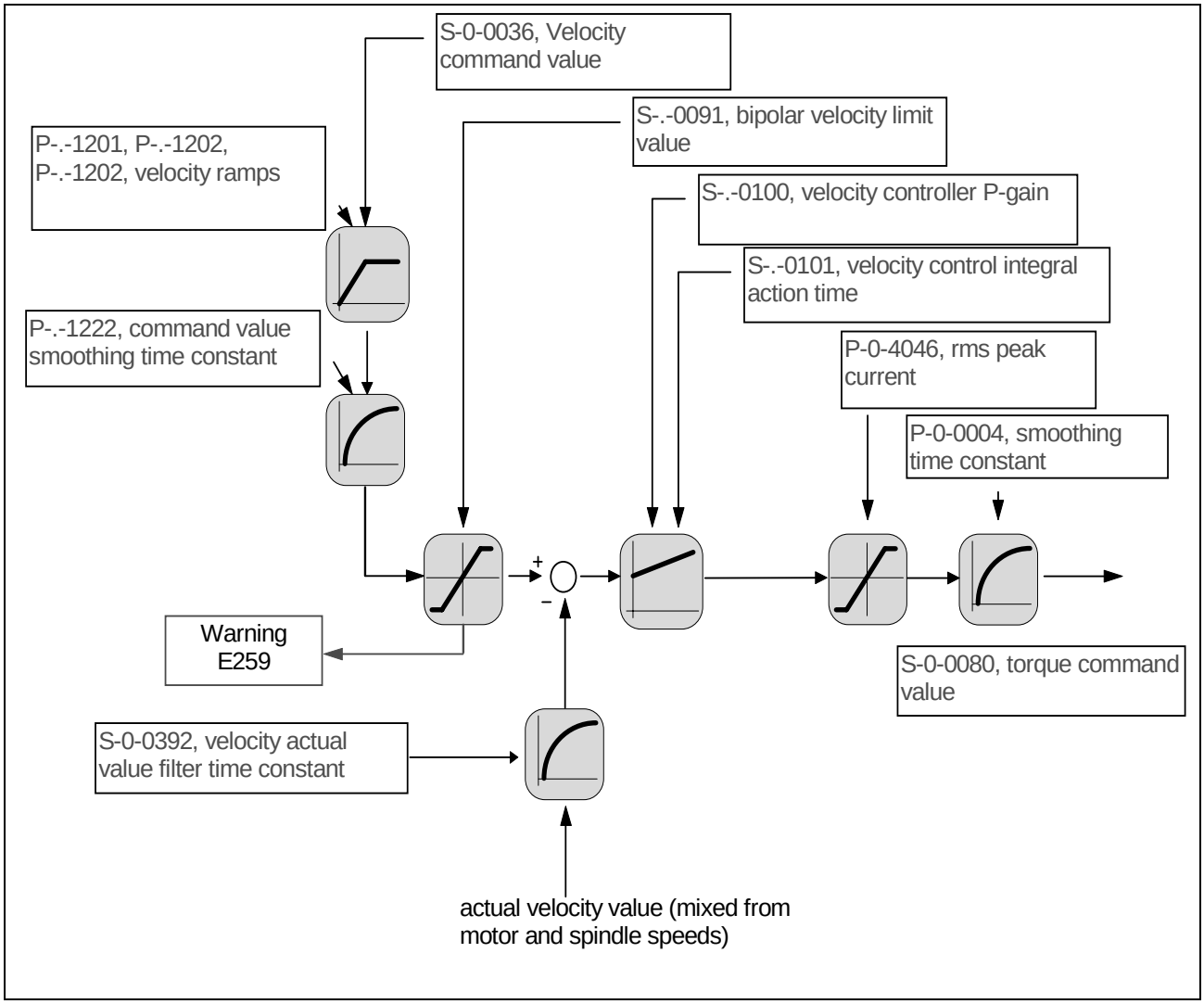


Fig. 6-4: Velocity controller

The actual velocity value of motor and, if available, the spindle feedback are mixed together via a mixing point to generate one actual velocity value for control (see "Setting velocity mix factors").

Position Control

The drive is given a command value in **Position control** that relates to the NC cycle. the diagnosis, if the operating mode is active, is as follows:

- **A102 Position control/Encoder 1**
- **A103 Position control/Encoder 2**
- **A104 Position control/Encoder 1 lagless**
- **A105 Position control/Encoder 2 lagless**

The command value is entered in parameter **S-0-0047, Position command value**.

Operating mode specific monitors are:

- command values monitored for the value in parameter **S-•-0091, Bipolar velocity limit value** (see Velocity Controller on page 6-2).

If this value is exceeded, then error **F237 Excessive position command value difference** is generated.

The command value specified in **S-0-0047, Position command value** first runs through an interpolator to then finally be given to the position controller.

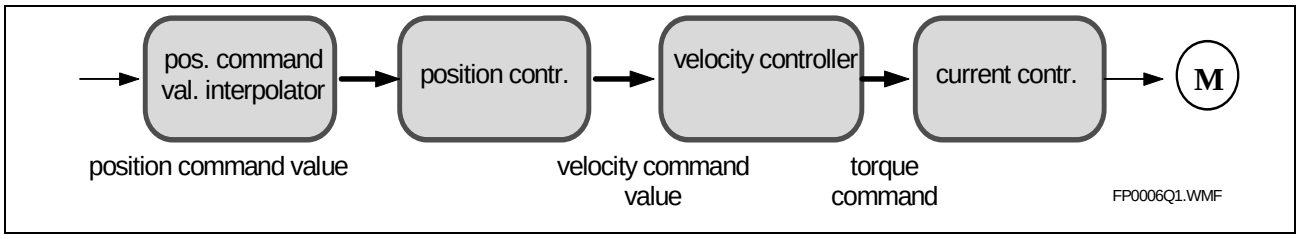


Fig. 6-5: Block diagram - Position control

Generator function: Position command value interpolator

A command velocity is generated using the values of two sequential position command values. The time basis is **S-0-0001, NC cycle time**.

The command velocity must be generated as follows:

$$Vsoll = \frac{pos.com.value(k) - pos.com.value(k-1)}{S-0-0001}$$

Vsoll: velocity command value

Formula 6-1: Generating the command velocity

This velocity is monitored for exceeding **S-•-0091, Bipolar velocity limit value** (see Velocity Controller on page 6-2). If **S-•-0091** is exceeded, then error **F237 Excessive position command value difference** is generated.

The specified position command value profile can be jerk limited using parameter **P-0-0099, Position command value smoothing filter time constant.**

The position controller is closed every 250usec. The position command value in the NC cycle is interpolated for this purpose.

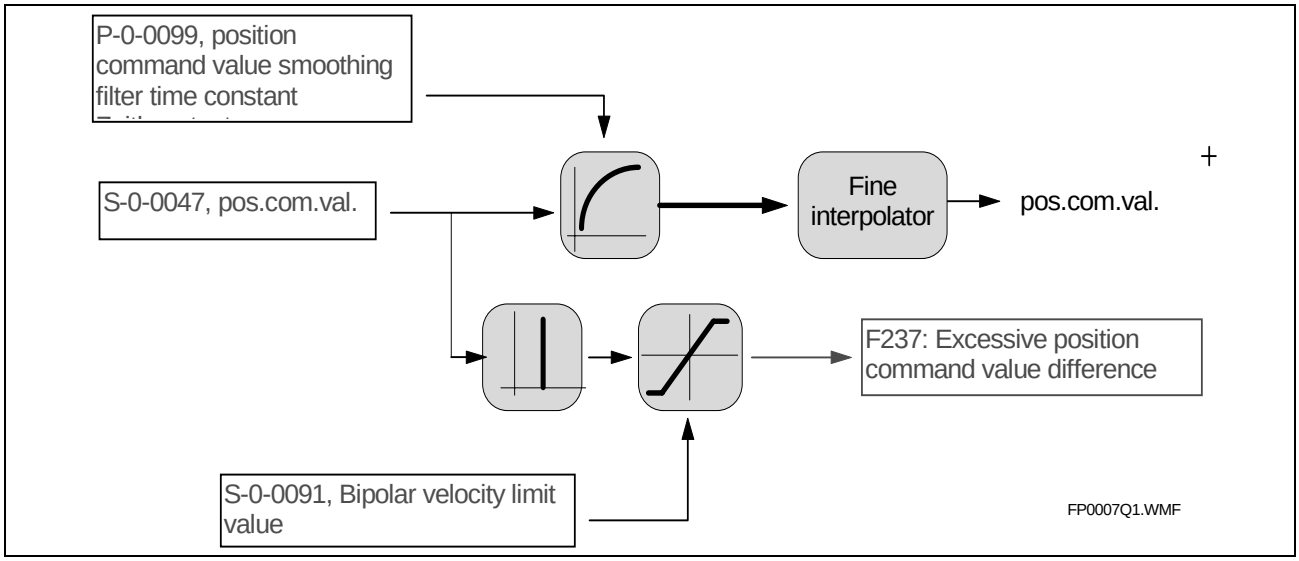


Fig. 6-6: Generator function of the position command value interpolator

See Operating Modes on page 6-1
See Torque Control on page 6-2
See Velocity Controller on page 6-2

Position controller

The effective position command value used in the generator function of the presently active mode and the feedback position value used for the control (motor encoder or external encoder) are used to generate the position control deviation.

This is given to the position controller if control amplifier is set via **S-•-0104, Position controller KV factor.** (See "Setting the position controller".)

Bit 3 in operating mode parameters (S-0-0032..35) specifies whether operation is lagless or with lag.

Lagless position control means that a pre-control proportion which is proportional to acceleration can be set. Parameter **S-0-0348, Acceleration pre-control proportional gain** is used for this purpose.

(See "Setting the Acceleration Pre-control".)

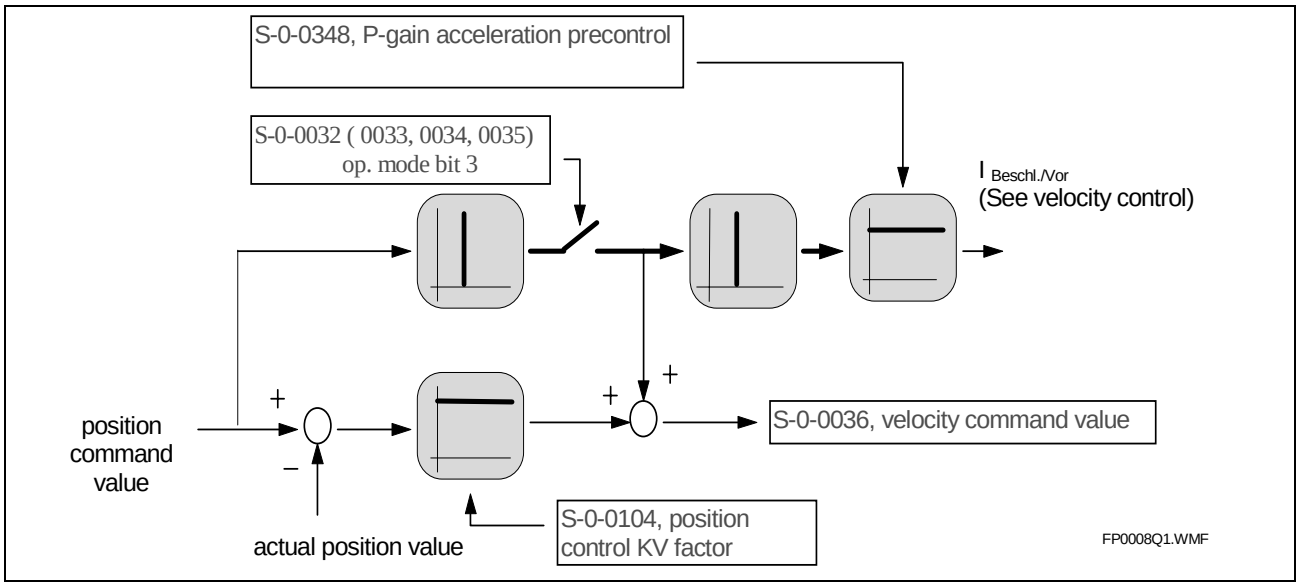


Fig. 6-7: Block diagram - Position controller

See Operating Modes on page 6-1

See Torque Control on page 6-2

See Velocity Controller on page 6-2

Position command value monitoring

If the drive is operated in position control with cyclical position command value default, then the drive receives a new position every SERCOS cycle. The difference between the current and last position command value is determined and checked for plausibility.

Reasons the monitor could be actuated are:

- incorrect command value default from the control
- error in command value transmission

If **Position control** mode is active, then the resulting velocity is compared with the position command value in parameter **S-0-0047, Position command value** and

- **S-•-0091, Bipolar velocity limit value**

The time basis for the calculation of the position command value difference in a velocity supports **S-0-0001, NC cycle time**. It is therefore assumed that position command values are cyclically generated in NC cycles. This is generally the case in position control mode.

If the command velocity resulting from the set position command value exceeds **S-•-0091, Bipolar velocity limit value**, then error

- **F237, Excessive position command value difference**

is generated. Both parameters are then stored for diagnostics purposes

- **P-0-0010, Excessive position command value**
- **P-0-0011, Final valid position command value**

The velocity resulting from the difference of both values generates the error.

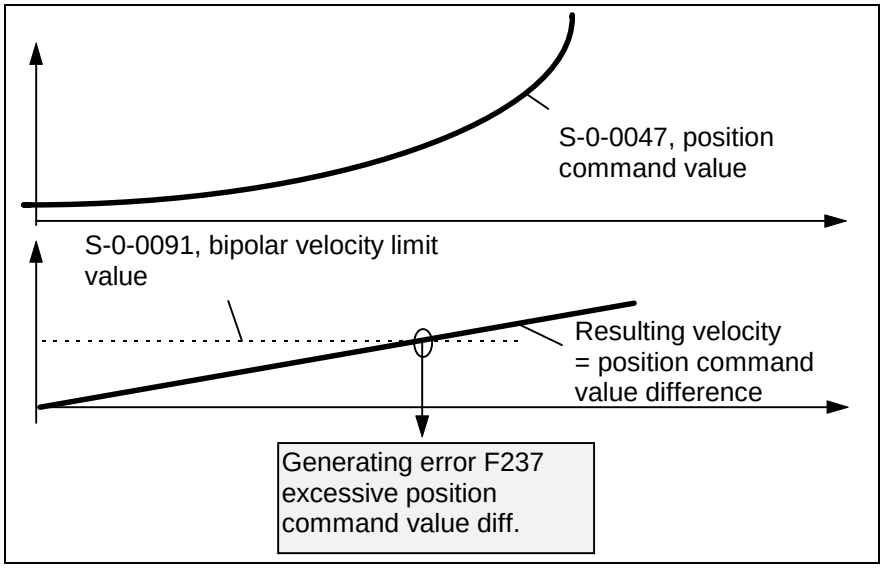


Fig. 6-8: Monitoring position command value differences and generating error F237, Excessive position command value difference

Position command value monitoring - setting

Position command value monitoring works with parameter **S-•-0091 Bipolar velocity limit value**. S-•-0091 should be set to about 5..10% above intended maximum axis speed.

Drive-Internal Interpolation

In **Drive-internal interpolation mode** the drive is given a target position. The diagnosis, with active mode, is one of the following:

- **A106 Drive-internal interpolation, Encoder 1**
- **A107 Drive-internal interpolation, Encoder 2**
- **A108 Drive-internal interpolation, Encoder 1, lagless**
- **A109 Drive-internal interpolation, Encoder 2, lagless**

The following checks are conducted:

- If the position velocity set in **S-0-0259, Positioning velocity** exceeds maximum allowable (**S-•-0091, Bipolar velocity limit value**) then warning **E249, Positioning speed > maximum value** is generated.

  The drive runs to the new target position with the velocity set in **S-•-0091, Bipolar velocity limit value.**

For operating modes especially, there is the signal **S-0-0013, Class 3 diagnostics,** binary signal "target position reached". (See "S-0-0013, C3D") and the IZP signal in **S-0-0182, Manufacturer's C3D**. (See "S-0-0182, Manufacturer's C3D".)

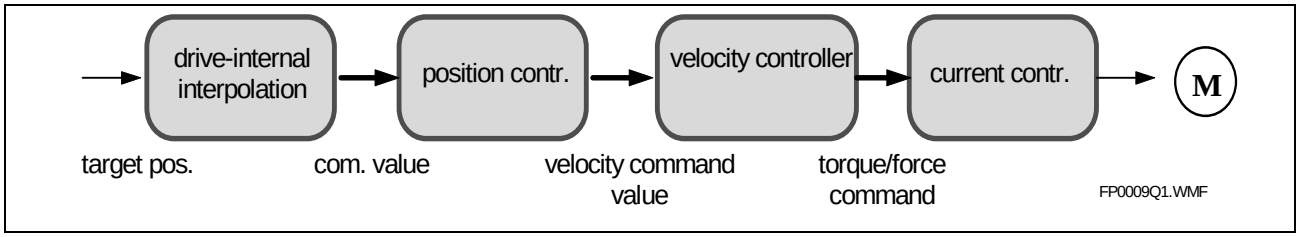


Fig. 6-9: Block diagram - Drive-internal interpolation

Generator function: Drive-internal interpolation

The command value is set in parameter **S-0-0258, Target position.** The drive generates the position command value profile it needs to travel to the target position while maintaining marginal conditions.

- **S-0-0259, Positioning velocity**
- **S-0-0260, Positioning acceleration**
- **S-0-0193, Positioning jerk**
- **S-0-0108, Feedrate override**

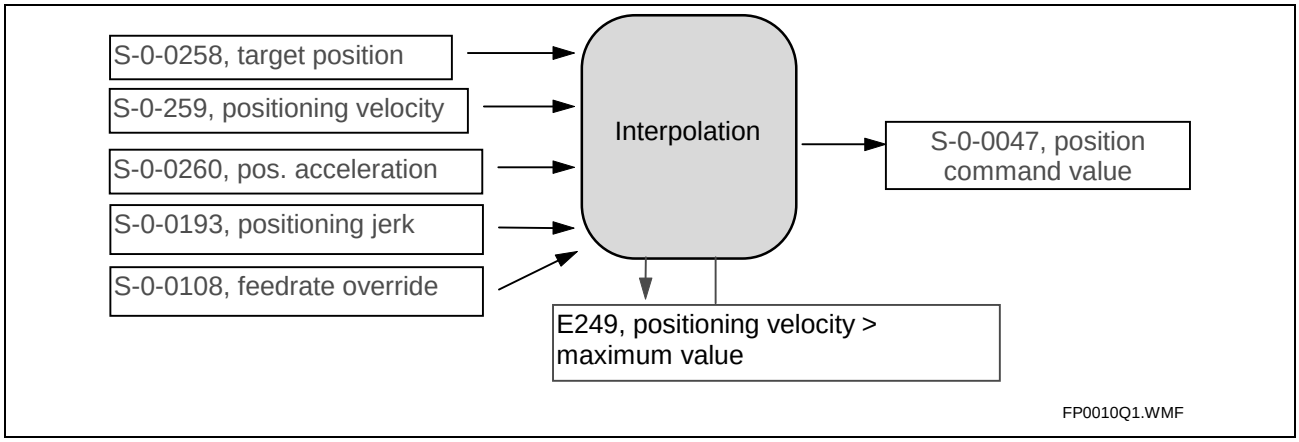


Fig. 6-10: Generator function of drive-internal generator function

If drive-internal interpolation mode is active and zero has been entered in parameter S-0-0108, Feedrate override, then warning **E255 Feedrate override (S-0-0108) = 0** is generated.

See Operating Modes on page 6-1
See Torque Control on page 6-2
See Velocity Controller on page 6-2

6.3 Setting Operating Mode Parameters

With the help of parameters

- **S-0-0032, Main operating mode**
- **S-0-0033, Auxiliary operating mode 1**
- **S-0-0034, Auxiliary operating mode 2**
- **S-0-0035, Auxiliary operating mode 3**

it is possible to simultaneously pre-select four different operating modes.

Which of these four (4) modes is actually active is defined by bits 8 and 9 of the master control word. It is possible to switch between these four modes while operation is running.

The operating modes are pre-selected in parameters S-0-0032..35. The operating modes are selected by inputting a bit strip. Specific positions

are permanently defined in this bit strip. This means it is necessary to select in bit 3 whether position control is to work with or without lag.

It applies:

Bit 3 = 0 Position control with lag
Bit 3 = 1 Position control without lag

Bit strip:	Definition:
0000,0000,0000,0001	torque control
0000,0000,0000,0010	velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Tab. 6-1: Setting operating mode parameters

6.4 Determining the Active Operating Mode

Which of the four (4) pre-selected operating modes is actually effective is decided by bits 8 and 9 of the master control word.

Bit 8 and 9 in master control word:	Effective operating mode:
0 0	main operating mode
0 1	1st auxiliary operating mode
1 0	2nd auxiliary operating mode
1 1	3rd auxiliary operating mode

Tab. 6-2: Determining active operating mode

If "0" is set in the operating mode parameters and if one of them is activated, then error **F207 Switching to non-initialized operating modes** is generated.

7 Basic Drive Functions

7.1 Display Format of Physical Variables

The exchange of data between the controller and the primary control sytem or user interface occurs by reading and writing controller parameters. Information about the unit and the number of digits after the decimal (see parameters) is needed to interpret the operating data of a parameter. The LSB valence of the operating data is produced from these data. The following illustrate this.

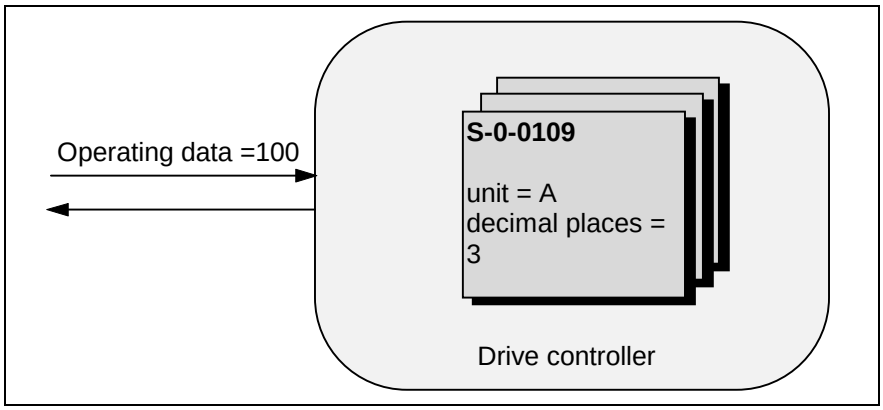


Fig. 7-1: Example of how operating data in drive are interpreted

- or -

The combination of unit and the number of decimal places is defined by the term scaling

The operating data of parameter S-0-0109 is assigned a value of 100 in the figure above. When combined, the A(mps), which belongs to this parameter, and the number of digits after the decimal produce the physical value of 0.100A. Each parameter can therefore be called up with a unit and the number of digits after the decimal. The combination of these two criteria is united under the term scaling. When interpreting operating data, these must always be included in the analysis. Units and number of digits after the decimal are listed along with all other parameter attributes in Attachment A, parameter description for each parameter.

Adjustable Scaling for Position, Velocity and Acceleration Data

The LSB valence of position, elocity and acceleration datea can be set by adjustable scaling

The parameter scaling for

- position
- velocity and
- acceleration data

can be adjusted. It can be set by the user with scaling parameters. It enables

1. the valence of this data to be made compatible for exchange between control system and control drive or, in other words, the data can be exchanged in the control system's internal format. The control system will not need to convert this data;

2. and this data can conform to machine cinematics. Linear movements can be described with linear units, e.g., and rotary movements with rotary units.

There is a choice between linear and rotary scaling and preferred and parameter scaling and between motor and load reference.

Translatory - Rotary Scaling

Adjustable scaling allows either translatory or rotary scaling. Linear motors normally use a linear scale. Rotary motors use either a rotary or linear scale if their rotary movement is converted into a linear movement (with a ball roll spindle, for example). For main spindle drives, however, only translatory scaling makes sense!

Preferred Scaling - Parameter Scaling

Adjustable scaling allows preferred or parameter scaling to be selected. If preferred scaling is set, the appropriate scaling factor and exponent parameters in **S-0-0128, C200 Communications phase 4 transition check** are overwritten with preferred values. This sets a predefined scaling. The scaling factor parameter and scaling exponent parameter do not need to be entered. The concrete preferred scaling adjusts itself to the selection of translatory or rotary scaling.

The following preferred scales are available:

Physical variables:	Rotary preferred scaling:	Translatory preferred scaling (mm):	Translatory preferred scaling (inches):
position data	0.0001 °	0.0001 mm	0.001 inches
velocity data	0.0001 rpm or 10^-6 r/sec	10^-6 m/min	10^-5 in/min
acceleration data	0.001 rad/sec²	10^-6 m/sec²	--

Tab. 7-1: Preferred scaling - parameter scaling

Motor load reference

Either motor or load reference can be selected when adjusting scaling.

With rotary load reference, scaled data from the motor format is converted to transmission output format with transmission ratio **S-0-0122, Output revolutions - load gears** / **S-0-0121, Input revolutions - load gears.**

The following restrictions apply to the motor type being used:

- rotary motor reference cannot be set with linear motors
- linear motor reference cannot be set with rotary motors

Display Format of Position Data

The scaling of drive controller position data and rotary scaling is adjustable. This is done with parameters

- **S-0-0076, Scaling type position data**
- **S-0-0077, Scaling factor position data**
- **S-0-0078, Scaling exponent position data**
- **S-0-0079, Rotary position resolution**

This differentiates between translatory and rotary scaling. To set rotary position scaling use **S-0-0079, Rotary position resolution.** To set translatory position scaling use **S-0-0077, Scaling factor position data** and **S-0-0078, Scaling exponent position data**.

The scaling type is set in **S-0-0076, Scaling type position data**.

The parameter is defined as follows:

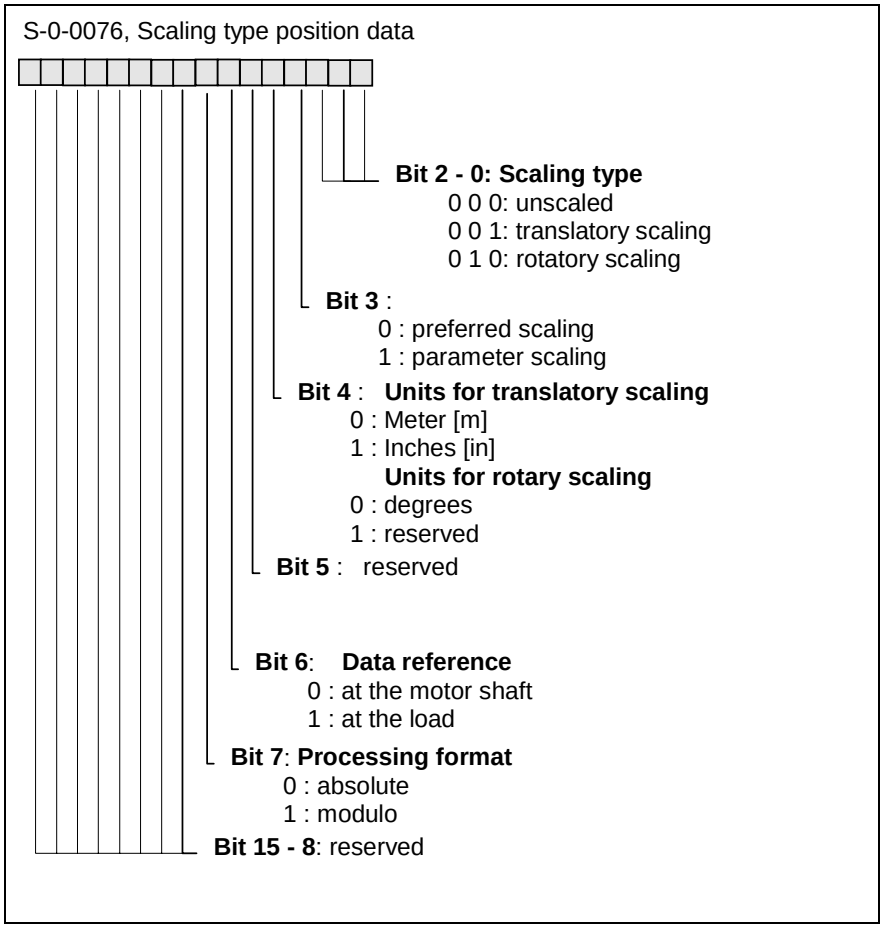


Fig. 7-2: Parameter S-0-0076

The actual scaling type is set in bits 0..2.

In bit 3, preferred scaling, i.e., parameter **S-0-0077, Scaling factor position data**, **S-0-0078, Scaling exponent position data** or **S-0-0079, Rotary position resolution** are predefined and cannot be changed. Parameter scaling can be selected by specifying this parameter (see Preferred Scaling - Parameter Scaling on page 7-2)

Bit 4 sets the dimensional unit. Translatory scaling can be set with either mm or inches.

Bit 6 defines motor or load reference.

Bit 7 decides the processing format (see Display Format of Position Data on page 7-3).

The scaling type setting is checked for plausibility in **S-0-0128, C200 Communications phase 4 transition check.** If necessary, command error message **C213 Scaling position data faulty** can be generated.

Display Format of Velocity Data

The scaling of velocity data of the drive controller can be set.

Use the following parameters for this purpose.

- **S-0-0044, Scaling type of velocity data**
- **S-0-0045, Scaling factor of velocity data**
- **S-0-0046, Scaling exponent of velocity data**

Scaling type is set in parameter **S-0-0044, Scaling type of velocity data.** The parameter is defined as follows:

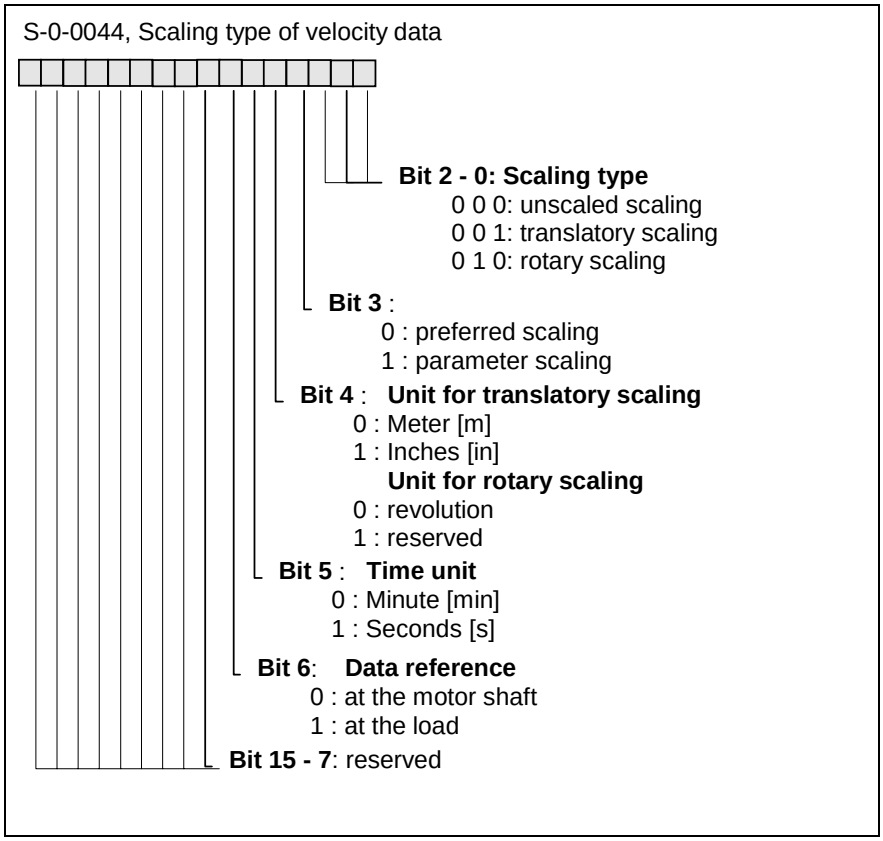


Fig. 7-3: Parameter S-0-0044

The actual scaling is set in bits 0..2.

Bit 3 can be used to preselect either preferred scaling, i.e., parameter **S-0-0045, Scaling factor for velocity data** and **S-0-0046, Scaling exponent of velocity data.** These cannot be changed and parameter scaling, i.e., the scaling, is instituted by selecting this parameter. (See Preferred Scaling - Parameter Scaling on page 7-2)

Bit 4 sets the dimensional unit.

Bit 5 sets the time unit, i.e., minute or second.

Bit 6 defines motor or load reference.

The setting of the scaling type is checked for plausbility in **S-0-0128, C200 Communications phase 4 transition check.** If needed,

command error message **C214 Velocity data scaling faulty** is generated.

Acceleration Data Display Format

The scaling of the drive controller's acceleration data is adjustable.

This is done with parameters

- **S-0-0160, Scaling type of acceleration data**
- **S-0-0161, Scaling factor of acceleration data**
- **S-0-0162, Scaling exponent of acceleration data**

Scaling type is set in **S-0-0160, Scaling type of acceleration data**. The parameter is defined as follows:

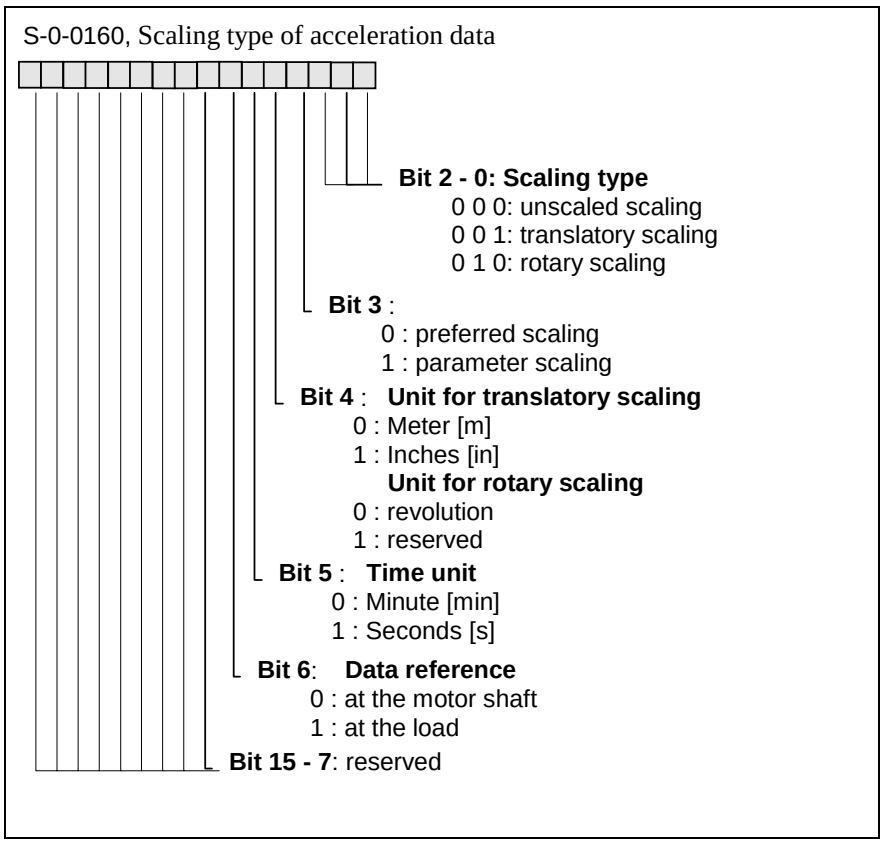


Fig. 7-4: Parameter S-0-0160

The actual scaling is set in bits 0 .. 2.

Bit 3 can be used to pre-select either preferred scalng, i.e., parameter **S-0-0161, Scaling factor of acceleration data** and **S-0-0162, Scaling exponent of acceleration data.** These cannot be changed and parameter scaling, i.e., scaling is instituted by selecting this parameter (See Preferred Scaling - Parameter Scali on page 7-2)

Bit 4 sets the dimensional unit.

Bit 6 defines motor or load reference.

The scaling type set is checked for plausibility in **S-0-0128, C200 Communications phase 4 transition check.** If needed, command error message **C215 Scaling of acceleration data faulty** is generated.

Command and Actual Value Polarities

The drive-internal polarities of position, velocity and torque command and actual values are permanently defined. It applies:

Motor type:	**Definition drive-internal positive direction:**
Rotary motors	clockwise looking onto motor shaft

Tab. 7-2: Definition drive-internal positive direction

All INDRAMAT motors with integrated motor feedback have a positive direction, if the phases have been correctly connected (as per terminal diagram) and the speed command value is positive. If motors are correctly connected and a feedabck is mounted but the rotational direction is not positive, then the rotational direction of the feedback, due to the mechanics, is inverted. In other words, the rotational direction of the motor feedback is changed. (See sec. 5.3, Motor feedback.)

If the drive definition of a positive direction does not conform with demands of the machine, then use parameters

- **S-0-0055, Position polarity parameter**
- **S-0-0043, Velocity polarity parameter**
- **S-0-0085, Torque polarity parameter**

to invert command and actual value polarities.

Note:
If the polarities are to be changed, then all three (3) parameters should be simultaneously inverted so that polarity of position, velocity and torque/force have the same sign.

How the polarity parameter works is illustrated below.

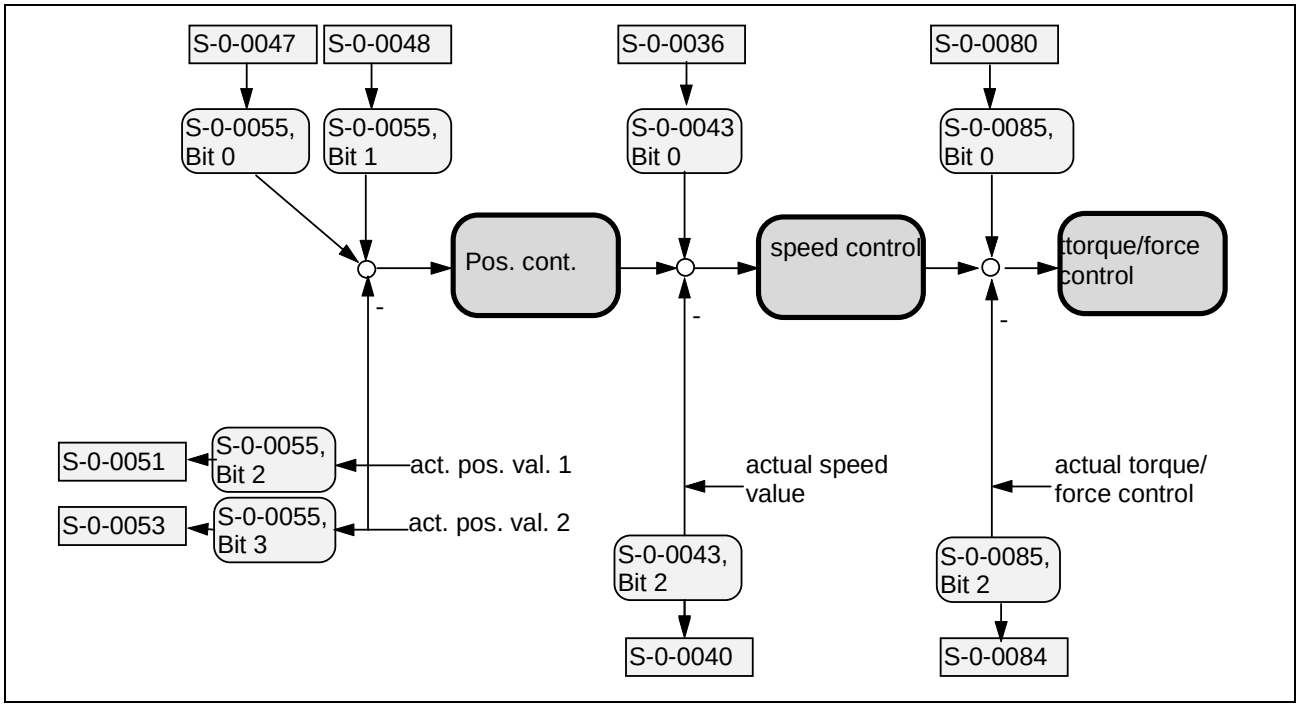


Fig. 7-5: How the polarity parameters work

The polarity parameters do not effect the actual control values but only the displayed values.

Drive software only permits the inversion of all bits within a polarity parameter. If bit 0 is inverted, then all other bits of the relevant parameter are automatically inverted as well. This prevents setting positive feedback in the regulator loops because of faulty command and actual value polarities.

Mechanical Transmission Elements

Mechanical transmission elements are transmission and feed mechanisms between the motor shaft and the load. Entering this data is necessary for the load to convert the positon, velocity and acceleration physical values, if these are scaled for the load. (See

Adjustable Scaling for Position, Velocity and Acceleration Data" on page 7-1). To see if this parameter has been entered correctly, move the shaft and compare the path followed with the position feedback value and the path actually taken.

Transmission ratio

The transmission ratio can be determined with parameters

- **S-0-0121, Load input revolutions of load gear** and
- **S-0-0122, Load output revolutions of load gear**

The ratio between transmission input and output is parametrized here.

Example:

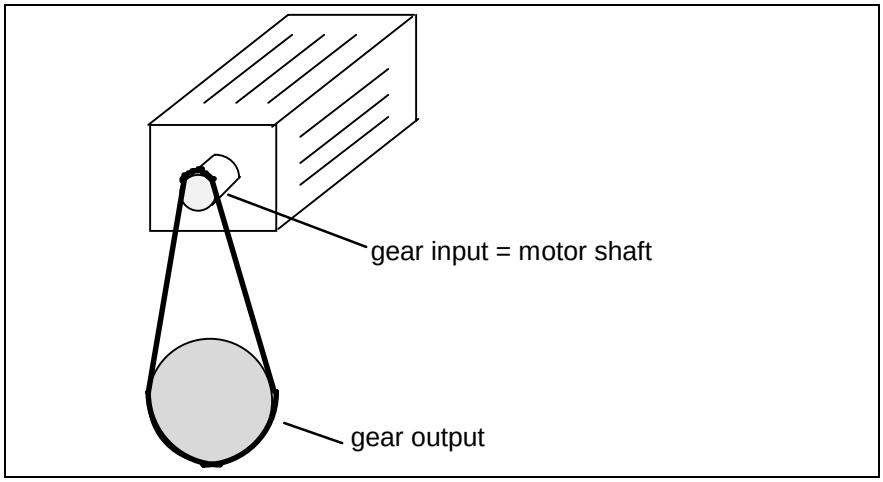


Fig. 7-6: Parametrizing transmission ratio

In the above illustration, five transmission input revolutions (= motor revolutions) and two transmission output revolutions are shown:

S-0-0121, Load input revolutions of load gear = 5

S-0-0122, Load output revolutions of load gear = 2

Modulo Function

With activated modulo function, all position data within modulo range are displayed

If the modulo function is activated, all position data in the range of 0 .. modulo value -1 are displayed. This relates the value range of the position data to one revolution of the spindle, e.g., 1 revolution = 360°. Given an infinite spindle resolution, there is no overflow in the positiion data as the feedback position value starts with zero after every spindle revolution.

The modulo vlaue can be set in parameter **S-0-0103, Modulo value**.

The modulo function is set in parameter **S-0-0076, Scaling type position data**.

(See Display Format of Position Data" on page 7-3)

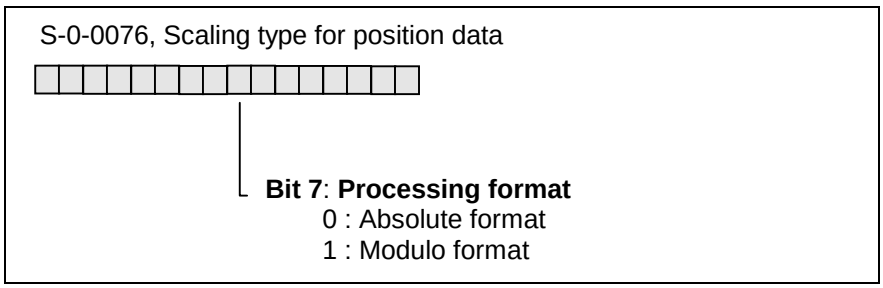


Fig. 7-7: Setting absolute and modulo format

The following illustration elucidates the difference between displaying position data in absolute and modulo formats:

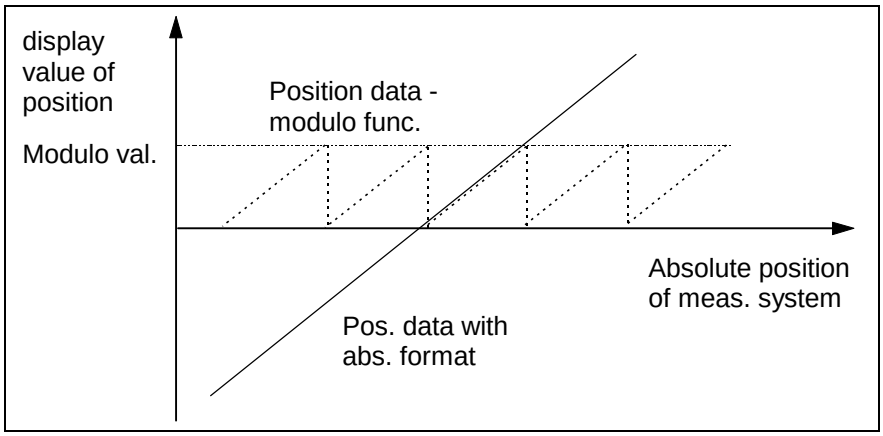


Fig. 7-8: Display value of positions in absolute and modulo formats

Modulo processing - limiting conditions

If modulo processing of position data is selected in connection with

- the activated operating mode and
- the set position scaling

then the following limiting conditions for error-free processing of the position data must be observed. Compliance with the limiting conditions is checked in **S-0-0128, C2 Communications phase transition check 4** and, if necessary, the command is ended with error **C227 Modulo range error**.

The limiting conditions for error-free processing of modulo values are:

- **S-0-0103, Modulo value** for spindles should be set to 360° (default value).
- If rotary position scaling with load reference is set, then the product of **S-0-0103, Modulo value**, **S-0-0116, Rotary encoder resolution 1** and **S-0-0121, Load input revolutions of load gear** must be smaller than 2^63.

If an external measuring system is aso used, then it aso applies:

- If rotary position scaling with motor reference is set, then the product of **S-0-0103, Modulo value**, **S-0-0117**, **Rotary encoder resolution 2** and **S-0-0122, Load output revolutions of load gear** must be smaller than 2^63.

Processing Command Value in Modulo Format, Shortest Path - Direction Selection

The interpretation of position command values such as **S-0-0047, Position command value** and **S-0-0258 Target position** with modulo function activated depends on the set mode.

There are the following possibilities:

- shortest path
- positive direction
- negative direction

To set the mode, use parameter **S-0-0393, Command value mode in modulo format**. This parameter is only effective if the modulo format has been activated in **S-0-0076, Scaling type position data**.

The following settings are possible:

S-0-0393:	Definition:
0	shortest path
1	positive direction
2	negative direction

Tab. 7-3: Selecting modulo mode

Modulo mode "Shortest path"

The next command value is reached with the shortest path. If the difference between two successive values is larger than half of the modulo value, the drive moves towards the command value in the opposite direciton.

Modulo mode "Positive direction"

The command value is always approached in a positive direction regardless of whether or not the difference between the two successive command values is larger than half of the modulo value.

Modulo mode "Negative direction"

The command value is always approached in a negative direction regardless of whether or not the difference between the two successive command values is larger than half of the modulo value.

7.2 Setting the Measurement System

DIAX04 controllers can use the following measuring systems:

- digital servo feedback
- resolver
- incremental encoder with sine signals
- incremental encoder with square-wave signals
- gearwheel encoder
- measuring systems with SSI interface
- measuring systems with EnDat interface

The evaluation of the measuring system can take the form of:

Evaluation as:	**Comments:**
Motor encoder	urgently needed
External encoder	optional

Tab. 7-4: Measuring system evaluation

The drive is connected to a feedback interface (standard), i.e., digital servo feedback or resolver. Additional plug-in cards are available for implementing different types of feedbacks.

Each plug-in module has a number which must be specified when determining the encoder interface. The module number must be set in parameters

- **P-0-0074, Motor encoder interface**
- **P-0-0075, External encoder interface**

When writing to the encoder interface parameters, a check is made to determine if the module is actually connected. If not, the drive reacts with error message "0x7008, Data not correct."

(See "Possible Error Messages When Reading and Writing Operating Data").

This check is also run in command **S-0-0128, Communications phase transition check 4**. Command error **C203 Parameter conversion error (->S-0-0022)** is also generated.

Displaying the position feedback values of the individual measurement systems is done with parameters

- **S-0-0051, Actual position value 1**
- **S-0-0053, Actual position value 2**

Setting the absolute relationship of the position feedback values ½ to the machine zero point is done with commands

- **S-0-0148, C6, Drive-controlled homing** as well as
- **P-0-0012, C3, Set absolute dimension**

Limiting Restrictions for Encoder Evaluation

The following limitations exist

- modules DLF, DZF and DEF 1 may not be simultaneously operated within a controller

  ⇒ **Danger of damage!**

  DLF and DZF cannot be combined. The DEF2 module can be used to operate an incremental encoder with square-wave signals while simultaneously using either a DLF or DZF module.

- Module DAG 1.2 has a switch which allows the interface to be changed to an SSI interface (7) or an EnDat interface (8). Make sure that the switch is set correctly.
- If attempting to implement an external encoder with an SSI interface, then only measurement systems with a resolution of 4096 increments/revolution and absolute resolution can be used. If the position loop is closed via this measurement system, only a limited dynamics can be achieved because of the serial transmisison from feedback to controller.
- Only the standard modules DLF, DYF or DAG 1.2 can be used as motor feedback.
- Resolvers cannot be used as an external measurement system.

Motor Encoder

See sec. 5.3, Motor feedback

External Encoder

Use the following parameters to parametrize an external encoder (spindle feedback):

- **P-0-0075, External encoder interface**
- **S-0-0117, Resolution of external encoder**
- **S-0-0115, Position encoder type parameter 2**

These specify the interface number to which the measurement system is connected, the motor feedeback resolution as well as the direction of motion and so on. The parameter **S-0-0053, Actual position value 2** displays the position of the motor feedback.

The external encoder should always be parametrized so that **S-0-0053, Actual position value 2** and **S-0-0051, Actual position value 1** run parallel when the measuring systems, connected via the mechanical system of the machines are in motion.

Determining encoder interface of the external encoder

Determining the encoder interface of the motor feedback uses parameter **P-0-0075, External encoder interface**. Enter the module number to which the motor feedback is connected in the parameter. The motor feedback interface is automatically set with some motor types and the parameter is write protected.

Measuring system:	**Plug-in module:**	**Value for P-0-0075**
(none)	- -	0
GDS encoder from INDRAMAT	DFF01.1M	4
incremental encoder with sine signals from Heidenhain, either uA or 1V signals	DLF 01.1M	2
Gearwheel encoder from INDRAMAT	DZF02.1M	3
Incremental encoder with square-wave signals made by Heidenhain	DEF01.1M DEF02.1M	5 6
Encoder with SSI interface (only 4096 increments/revolution)	DAG01.2M	8
Encoder with EnDat interface	DAG01.2M	8
Gearwheel encoder ($1V_{ss}$) from Lenord & Bauer, Woelke, VS-Sensorik, Siemens	DZF03.1M	9

Tab. 7-5: External measuring systems, required plug-in modules and relevant parameter values

If "0" is set as a modulo number, then the encoder evaluation of the external encoder has been switched off.

WARNING

Encoder with SSI interface not to be used in connection with velocity control and position control modes!

⇒ Long deadtimes with an SSI interface evaluation will occur.

Resolution of the external encoder

An external encoder resolution is parametrized with parameter **S-0-0117, Resolution of the external encoder**. The number of lines of the external encoder must be entered here. The resolution is read out by measuring systems with intrinsic feedback data memory and do not have to be entered. The following are measuring systems with intrinsic feedback memory.

Measuring system	Feedback data memory	Value for S-0-0117
High-resolution main spindle position encoders: (Gearwheel encoder from INDRAMAT) MH2-128-5-.../SH2-128-5-... MH2-256-5-.../SH2-256-5-... MH2-512-5-.../SH2-512-5-...	 no no no	 128 256 512
GDS, digital single-turn encoder	yes	self adjusting
Incremental encoder with square-wave signals TTL	no	see manufacturer's notes
Incremental encoder with sine signals $1V_{SS}$	no	see manufacturer's notes
EnDat encoder	yes	self adjusting

Tab. 7-6: Measuring systems usable as external encoders and their resolutions

Actual Position Monitoring

Applications using an external measuring system offer additional safety with the actual position value monitor. This can diagnose such errors as:

- slip in the mechanical coupling unit
- measuring system error (if not detected via the additional measuring system monitors)

Use the following parameter to set the monitoring function

- **S-0-0391, Monitoring window external encoder**

Error **F236 Excessive actual position difference** is generated with an error.

Basic principle of actual position monitoring

The actual position monitoring function compares actual positon value of motor and external encoder. If the deviation of both values is greater than **S-0-0391, Monitoring window external encoder**, then error **F236 Excessive actual position difference** is generated. This aso clears the position of motor and external encoder.

The actual position monitor is only active if an external encoder is present and evaluated and **S-0-0391, Monitoring window external encoder** has not been parametrized to "0".

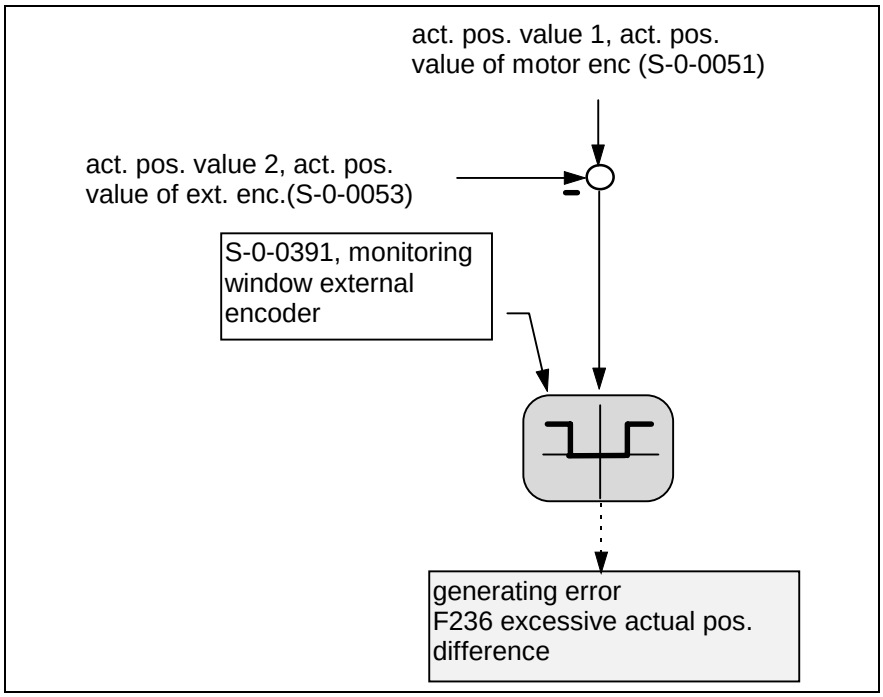


Fig. 7-9: Basic principle of actual position monitoring

Setting the Actual Position Monitoring Window

The prerequisites for setting the position feedback value monitor are:

- all control loops of the drive must be correctly set
- the spindle mechanics must be in its final state
- the spindle must be homed

Setting the monitoring window must take the following application aspects into consideration. Hereby, proceed as follows:

- Typical production cycles must be run; set the intended acceleration and velocity data of spindle while doing so.
- In parameter **S-0-0391, Monitoring window external encoder** gradually enter ever smaller values until the drive generates error **F236 Excessive actual position value difference**. Depending on the mechanics, start with about two degrees and gradually decrease the size of the window.
- The value at which monitoring is to be triggered must be multiplied with a tolerance factor of 2 ... 3 and entered in parameter **S-0-0391, Monitoring window external encoder**.

When determining the monitoring window, make sure that the position feedback value monitor works dynamically. This means that even dynamic deviations of both position feedback values in acceleration and braking phases are registered. This is why it is not enough to use statistical shaft errors as the basis for the setting. **S-0-0391, Monitoring window external encoder** must be taken into account!

Deactivating actual position monitoring

It is possible to turn off the position feedback value monitor in applications wherer the externally connected measurement system does not control the shaft position but is used for other measurements. To do this, enter 0 in parrameter **S-0-0391, Monitoring window external encoder**.

Other external feedback features

To parametrize the important characteristics of the external feedback such as

- direction of motion not inverted/inverted
- distance-coded homing yes/no
- rotary measuring system
- absolute / not absolute

use **S-0-0115, Position encoder type parameter 2.**

This parameter is structured as follows:

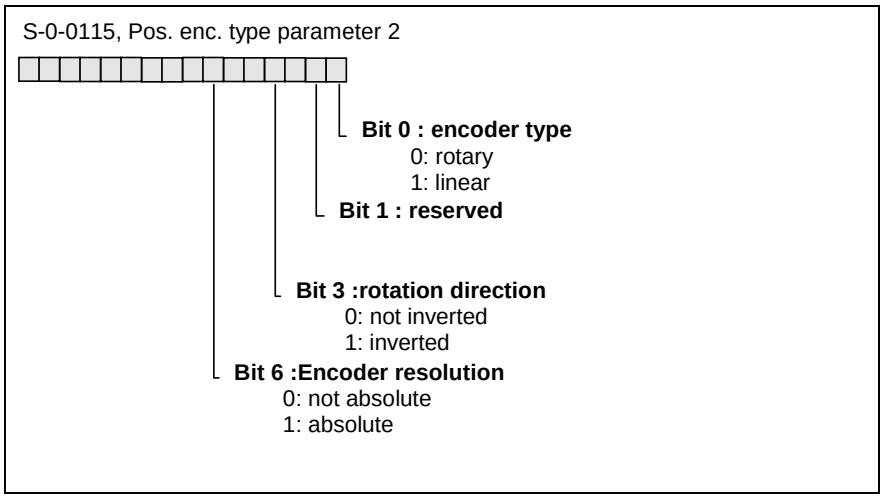


Fig. 7-10: Parameter S-0-0115

Bit 6 is set automatically in absolute measuring systems.

(See Supplementary settings for abs. measuring systems on page 7-20).

Actual position values non-absolute measuring systems after Initialization

If an absolute measuring system is not present then the actual position values in command **S-0-0128, C2 Communications phase transition check 4** are initialized to the basic value of the motor encoder or the external encoder.

P-0-0019 written:	Actual position value 1:	Actual position value 2:
no	init. basic motor encoder value	init. basic motor encoder value
yes	position start value	position start value

Tab. 7-7: Actual position values of non-absolute measuring systems after initialization



WARNING

There are no valid actual position values prior to initialization of the measuring system.
Initialization is run with transition from phase 3 to 4.

During measuring system initialization note that some measuring systems have restrictions respective the maximum velocity**.**

Measuring system	max. initialization speed
Multiturn DSF	300 rpm
EnDat	initialization at standstill
Multiturn resolver	300 rpm

Tab. 7-8: Allowable speeds during initialization

7.3 Supplementary Settings for Absolute Measuring Systems

Absolute measuring systems can be used as motor or external measuring systems.

The following table outlines which absolute measuring system can be used as a motor or external encoder and which needs a plug-in module.

Measuring system:	Module (no.):	as motor encoder:	as external encoder:
Multiturn DSF	Standard(1)	yes	yes
Multiturn DSF	DFF(4)	no	yes
Multiturn resolver	Standard(1)	yes	no
SSI encoder with 4096 increments/rev.	DAG 1.2(7)	no	yes
Rotary encoder made by Heidenhain with EnDat interface	DAG 1.2(8)	no	yes

Tab. 7-9: Modules required for absolute measuring systems

Measuring systems, except for SSI encoders, can be accessed by way of a data storage device from which information on whether it is an absolute dimension system or not is taken.

Bit 6 in the relevant position encoder type parameter (absolute/not absolute) is set during command **S-0-0128, Communications phase transition check 4**.

With SSI encoders, this bit can be set by the installer.

Set Absolute Dimension

When an absolute measuring system is installed, its position feedback value displays a value that is arbitrary and has no relationship to the machine zero point. In this case, the value of **S-0-0403, Status actual position values** equals "0".

The position feedback value of this measurement system can be set to the desired value with command "Set absolute measuring". After this, the position feedback value has a defined relationship to machine zero point.

All information will be available after reset because all necessary data from the absolute dimension system is buffered in feedback data memory or in parameter data memory. The position feedback value retains its reference to the machine zero point.

The following parameter is available for executing the function:

- **P-0-0012, C3 Command set absolute dimension**

In addition, the following parameters are needed or are affected by the function:

- **S-0-0154, Spindle positioning parameter**
- **S-0-0052, Reference dimension actual position value 1**
- **S-0-0054, Reference dimension actual position value 2**
- **S-0-0403, Status actual position values**

"Set absolute dimension" Functional Principle

The feedback connected to the mechanics is brought to an exactly measured position. The value desired for the position feedback value of the measurement system is entered in parameter **S-0-0052, Reference dimension actual position value 1** (for motor encoder) or **S-0-0054, Reference dimension actual position value 2** (for external encoder). Command **P-0-0012, C3 Command Set absolute dimension** is started. The actual position value is set to the value in the respective homing measurement and the position status becomes "1".

If only one absolute measuring system is available, the command automatically refers to this measurement system. If two are connected, then the choice is set in bit 3 or **S-0-0154, Spindle positioning parameter**.

When executing the command, three different cases can be distinguished:

1.) Set absolute dimension without drive enable.

2.) Set absolute dimension with drive enable, function executed by subsequently starting the command "drive-controlled homing".

3.) Set absolute dimension with drive enable, function executed by subsequently removing the control enable.

Set absolute dimension without drive enable

With set absolute measuring without drive enable, the shaft is moved to the precisely measured position and, while the enable is removed, command **P-0-0012, C3 Command set absolute dimension** is started after the homing dimension has been overwritten with the desired position feedback value at this position.

The command immediately sets the position feedback value of the system to the homing position and the position status becomes "1". The command is completed in the control drive and can be erased.

Generally, this simple method of executing the command is all that is needed. However, if the application has to do with a "hanging load" or if the approached position without control enable is not stopped for some other reason, the command can also be executed with drive enable under specific circumstances.

Set absolute dimension with drive enable and subsequent "Drive-controlled homing"

By setting absolute dimension during drive enable and subsequently starting command "drive-controlled homing" the actual position value of a controlled shaft can be changed. This may under some circumstances be necessary but is depicted for the sake of completeness.

The procedure is as follows:

- Move the shaft to the measure position (e.g., in position control).
- Enter the desired actual position values in the relevant reference dimension actual position value parameter.
- Start command **P-0-0012, C3 Command Set absolute dimension**. The position data will not be switched yet.
- Start command **S-0-0148, C6 Command drive-controlled homing.** This function detects that it is dealing with an absolute measuring system and executes "Set absolute dimension" or the actual position

value is set to the reference dimension. Simultaneously, however, the position command value (**S-0-0047, Position command value**) is set to the same value. As with each execution of "Drive-controlled homing", the position command value is read via the service channel and the control system position command value is set to this value before the reference command is deleted.

Note: Ensure that bit 3 of **S-0-0154, Spindle positioning parameter,** is set to the correct encoder.

- Clear commands **P-0-0012, C3 Command Set absolute dimension.**

Set absolute dimension with drive enable and turn off drive enable

By setting command „Set absolute dimension“ with drive enable and subsequently starting "Drive-controlled homing" command, the position feedback value of a controlled shaft can be changed. Switching the position feedback value after the drive enable is turned off.

The procedure to do this is as follows:

- Move the shaft to the measured positon.
- Enter the desired actual position values in the relevant reference dimension actual position value parameter.
- Start command **P-0-0012, C3 Command set absolute dimension**. The position data will not be switched yet.
- Turn off drive enable, atual position value is set to the reference dimension. The command is completed by the drive.
- Clear command **P-0-0012, C3 Command set absolute dimension.**

Actual position values according to the absolute dimension

The condition of the actual position value from motor encoder and, if necessary, from the external encoder after executing the command set absolute dimension, depends on bit 3 in **S-0-0154, Spindle positioning parameter,** and whether an absolute encoder is available as motor or external encoder.

Motor encoder:	External encoder:	S-0-0154 bit 3:	Actual position value 1	Actual position value 2:
absolute	non-absolute or not available	any	ref. dim. 1	ref. dim. 1
non-absolute	absolute	any	ref. dim. 2	ref. dim. 2
absolute	absolute	0	ref. dim. 1	ref. dim. 1
absolute	absolute	1	ref. dim. 2	ref. dim. 2

Tab.7-10: Actual position value as per set absolute dimension

Actual position values of absolute encoders after switching on

(See Absolute Measurement System Actual Position Values after Initialization on page 7-24)

Possible error messages with set absolute dimension

While executing the command, the following errors could occur:

- **C302 No absolute measuring system available.** Command **P-0-0012, C3 Command set absolute dimension** was started without an absolute measuring system being available.

Absolute Encoder Monitoring

If a measuring system with absolute encoder is used, activating the absolute encoder monitor can create an additional safety margin. The monitor function basically works as follows:

When turning off the drive's power supply, the current actual position of the shaft is loaded into resident memory. When the shaft is turned back on, the difference between the stored position and the new one as read by the measurement system is formed. If this difference is larger than the parametrized position window **P-0-0097, Absolute encoder monitoring window** then error **F276 Absolute encoder exceeds monitoring window** is generated**.**

The following applications are appropriate for using the absolute encoder monitor:

- Motor equipped with brake.
- Drive mechanics is self-locking and cannot be moved manually.

Setting Absolute Encoder Monitoring

The absolute encoder montioring window is set by the user. Setting the window requires the answer to the question by how much the shaft can be moved when turned off. Assuming the shaft has a brake or is self-locking, 0.1 motor revolutions (36° in reference to motor shaft) can be entered for parameter **P-0-0097, Absolute encoder monitoring window**.

Deactivating the absolute encoder monitor

The absolute encoder monitor is generally superfluous. This means that the absolute encoder monitor should usually be turned off to prevent unnecessary error conditions.

The absolute encoder monitor is turned off by writing 0 to P-0-0097.

Modulo Evaluation of Absolute Measuring Systems

The following limitations are applicable if an absolute measurement system is being used and modulo evaluation of the position data has been activated.

If both motor encoder and an external encoder with absolute measuring systems are available, then that one is used as absolute encoder in which bit 3 is set in parameter **S-0-0154, Spindle positioning parameter**. (See "Setting the Measurement System" on page 7-13).

Absolute Measurement System Actual Position Values after Initialization

The state of the actual position values from motor encoder and, if available, external encoder after initialization of the actual position values in command **S-0-0128, C2 Communications phase transition check 4**, depends on:

- Bit 3 in **S-0-0154**, **Spindle positioning parameter**
- availability of an absolute encoder as motor or external encoder.

Motor encoder:	External encoder:	Bit 3 , S-0-0154:	S-0-0051, actual pos. value 1:	S-0-0053, actual pos. value 2:	S-0-0403, position status:
absolute	not absolute	0	absolute value from motor encoder	absolute value from motor encoder	1
absolute	not absolute	1	absolute value from motor encoder	absolute value from motor encoder	0
not absolute	absolute	0	absolute value from ext. encoder	absolute value from ext. encoder	0
not absolute	absolute	1	absolute value from ext. encoder	absolute value from ext. encoder	1
absolute	absolute	any	absolute value from motor encoder	absolute value from ext. encoder	1

Tab. 7-11: Actual position value absolute measuring systems after initialization

7.4 Drive Limits

Current Limits

The *current limit* limits the command current to parameters

- **P-0-4046, effective peak current, or**
- **P-0-4045, effective continuous current**

The effective continuous current designates that current which can be continuously taken from the controller whereas the effective peak current is only available for short periods of time.

If the peak current is demanded from the control drive for longer periods of time, the controller's internal thermal load monitor will make sure that the allowable output current is reduced from the effective peak to the effective continuous current.

Both parameters are produced from the applicable controller data such as the peak current of the amplifier (**S-0-0110, Peak amplifier current)** as well as the contents of parameter

- **P-0-4004, Magnetization current**
- **S-0-0109, Peak motor current**
- **S-0-0140, Controller type current**
- **S-0-0092, Bipolar torque limit value**
- **P-0-0109, Peak torque limit**
- **P-0-4011, Switching frequency**

Setting effective peak current

Parameter **P-0-4046, Effective peak current** cannot be set separately but is instead a factor of the following parameters

- **S-0-0110, Peak amplifier current**
- **S-0-0109, Peak motor current**
- **P-0-4004, Magnetization current**
- **S-0-0092, Bipolar torque limit value**
- **P-0-0109, Peak torque/force limit**

In addition:

- The allowable peak amplifier current is limited to **S-0-0109, Peak motor current,** if this is smaller.
- As the process continues, the value fixed in 1 is reduced in connection with **P-0-4004, Magnetization current**. The magnetization current is 0, if we are dealing with a synchronous motor.
- Dynamic reduction during operation by monitoring the thermal load of the controller. (See **Checking thermal load** on page 7-28)
- Limiting **P-0-0109, Peak torque limit** and **S-0-0092, Bipolar torque limit value**
  (See **Torque/Force Limit** on page 7-29.)

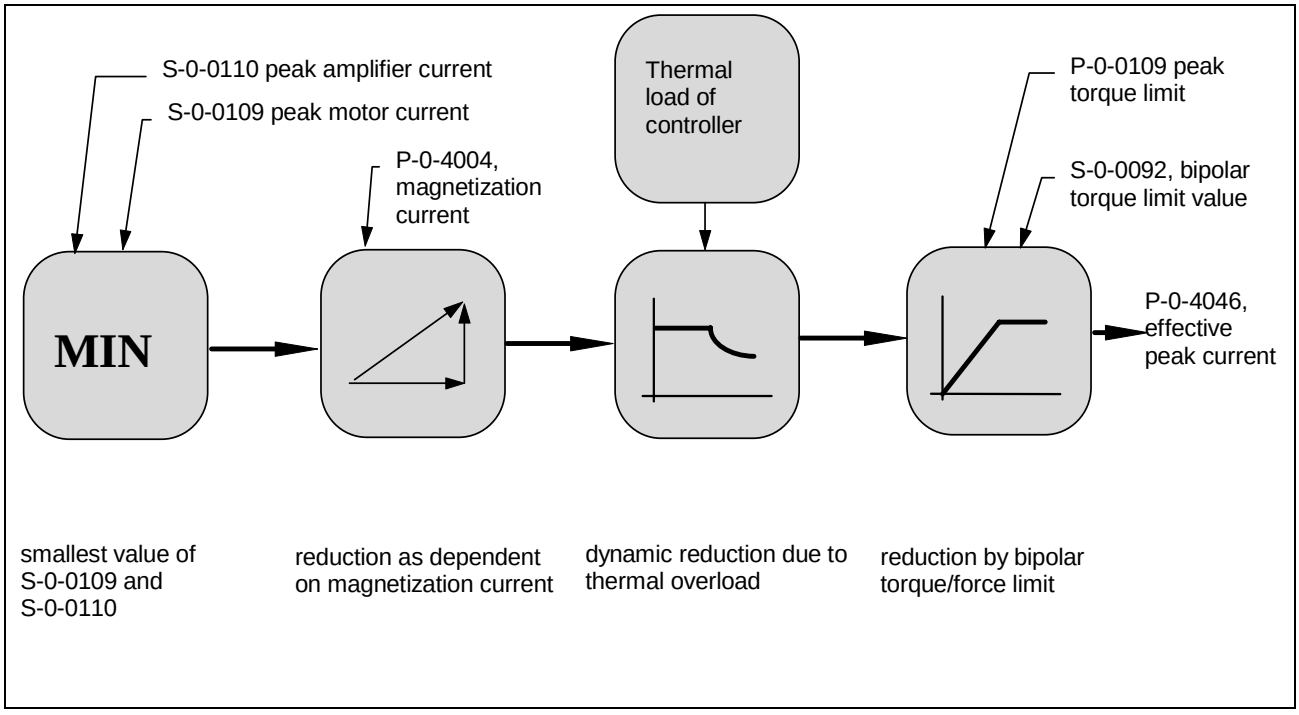


Fig. 7-11: Determining the torque-generation peak current

Setting the effective continuous current

The contents of parameter **P-0-4045, Effective continuous current** equals

- **P-0-4011, Switching frequency**
- **P-0-4004, Magnetization current**
- **P-0-4046, Effective peak current**
- **P-0-0140, Controller type**

This means

- based on the switching frequency selected via the controller type, the relevant continuous current is determined.
- As the process continues, the value determined in 1 is reduced in terms of **P-0-4004, Magnetization current**. Magnetization current is 0 if we are dealing with a synchronous motor.
- Limited to determined value of **P-0-4046 effective peak current**.

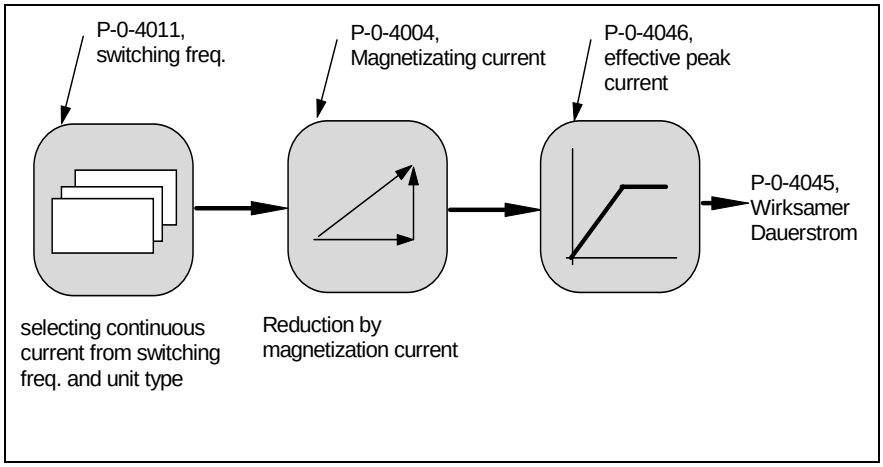


Fig. 7-12: Setting the effective continuous current

Monitoring thermal load

The thermal controller load indicates how heavily the controller's power stage unit is loaded by the command current being delivered. Additionally, information from

- the controller-specific data,
- the command current profile and
- the selected switching frequency

are used to continuously calculate the power transistor chip overtemperature. This may not exceed allowable chip overtemperature. If this condition is reached, the control drive will react by dynamically reduce the command current.

(See Setting effective peak current on page 7-26).

The controller will generate the warning **E257 Continuous current limit active**.

For diagnostic purposes, a prewarning threshold can be programmed using **P-0-0127, Overload warning.** For practical purposes, a value of 80% thermal load is programmed here. This value should not be exceeded during normal drive operation. If thermal load exceeds the value programmed in **P-0-0127, Overload warning** the controller will generate the warning **E261 Continuous current limit prewarning.**

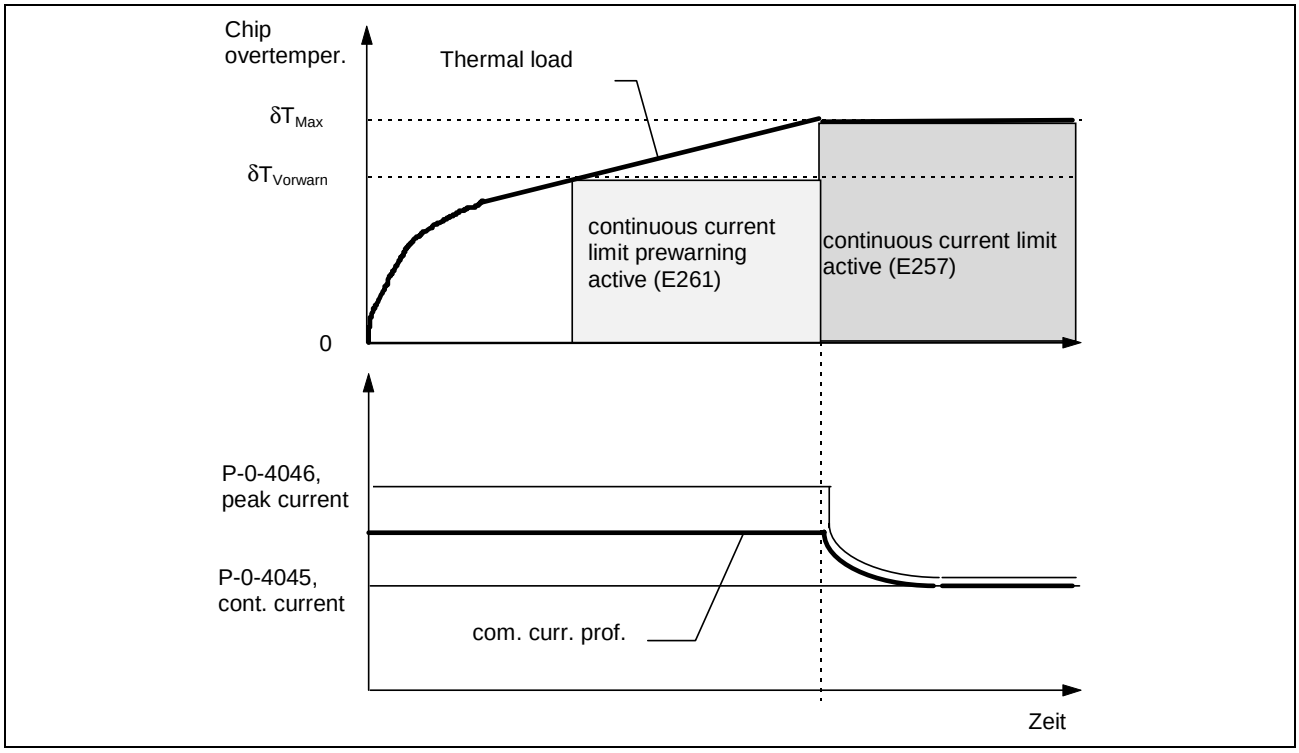


Fig. 7-13: Monitoring thermal load and continuous current limit

Checking thermal load

Parameter **P-0-0141, Thermal controller load** supports diagnostics. Thus 0% equals a chip overtemperature of 0 Kelvin, 100% equal maximum chip overtemperature. The thermal load should not exceed a value of 80% for the applied operating cycles if the drive is set up correctly.

It typically takes about ten minutes to warm up a controller power stage to its ultimate temperature. To check the thermal load of a drive during installation without having to run operating cycles during this period of time, the controller load can be preset to 80%. This can happen by writing an arbitrary value to parameter **P-0-0141, Thermal controller load.** A typical operating cycle must be run simultaneously for a short while. The thermal load should be observed during this time and there should be visible falling tendencies. Otherwise, the drive is incorrectly set up for the application. To check thermal load for further rising above 80%, the

- overload prewarning means **P-0-0127, Overload warning** and/or
- the output of the thermal load at the analog output

may be used. The following illustrates the typical process of the thermal load, as it can be observed by the analog output. During the execution of an operating cycle, the load is preset with 80% by writing to P-0-0141.

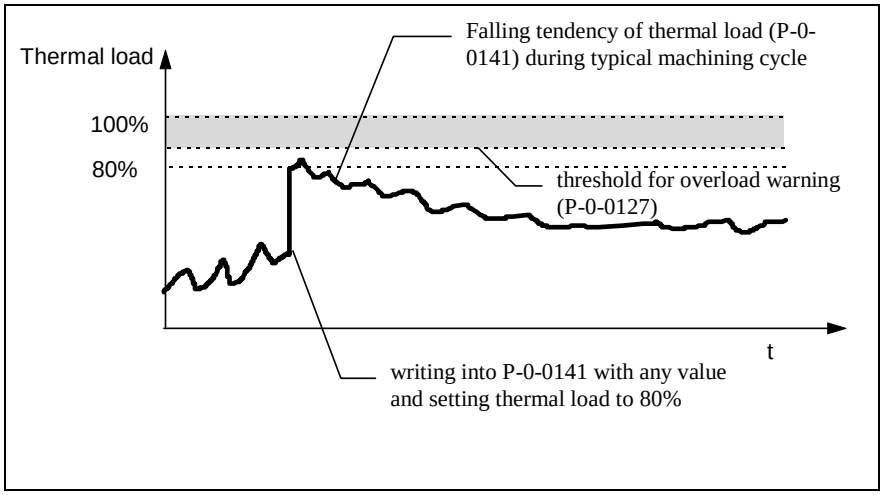


Fig. 7-14: Checking thermal load

Torque/Force Limit

The maximum allowable torque can be limited by the user with parameters

- **S-0-0092, Bipolar torque limit value** and
- **P-0-0109, Peak torque limit**.

These parameters determine the per cent value of **S-0-0111, motor standstill current** available to the user.

Parameter S-0-0092, Bipolar torque limit value is designed to allow variable limits of the maximum drive torque to values smaller than the maximum allowable drive torque while it is in operation. This is useful when temporarily moving towards a positive step, for example.

Reduce maximum torque via parameter **P-0-0109, Peak torque limit**. This parameter cannot be cyclically changed and is thus usable as statically limited to the peak torque and application-dependent. The peak torque is derived from the maximum allowable current of the motor/controller combination.

The current low value of parameter **S-0-0092, Bipolar torque limit value** and parameter **P-0-0109, Peak torque limit** is effective as torque limitation.

Together with current limit, in other words, maximum output current is displayed in **P-0-4046, Effective peak current**.

(See **Current Limits** on page 7-26.)

The following illustrates the interplay of current and torque limits when determining maximum output current.

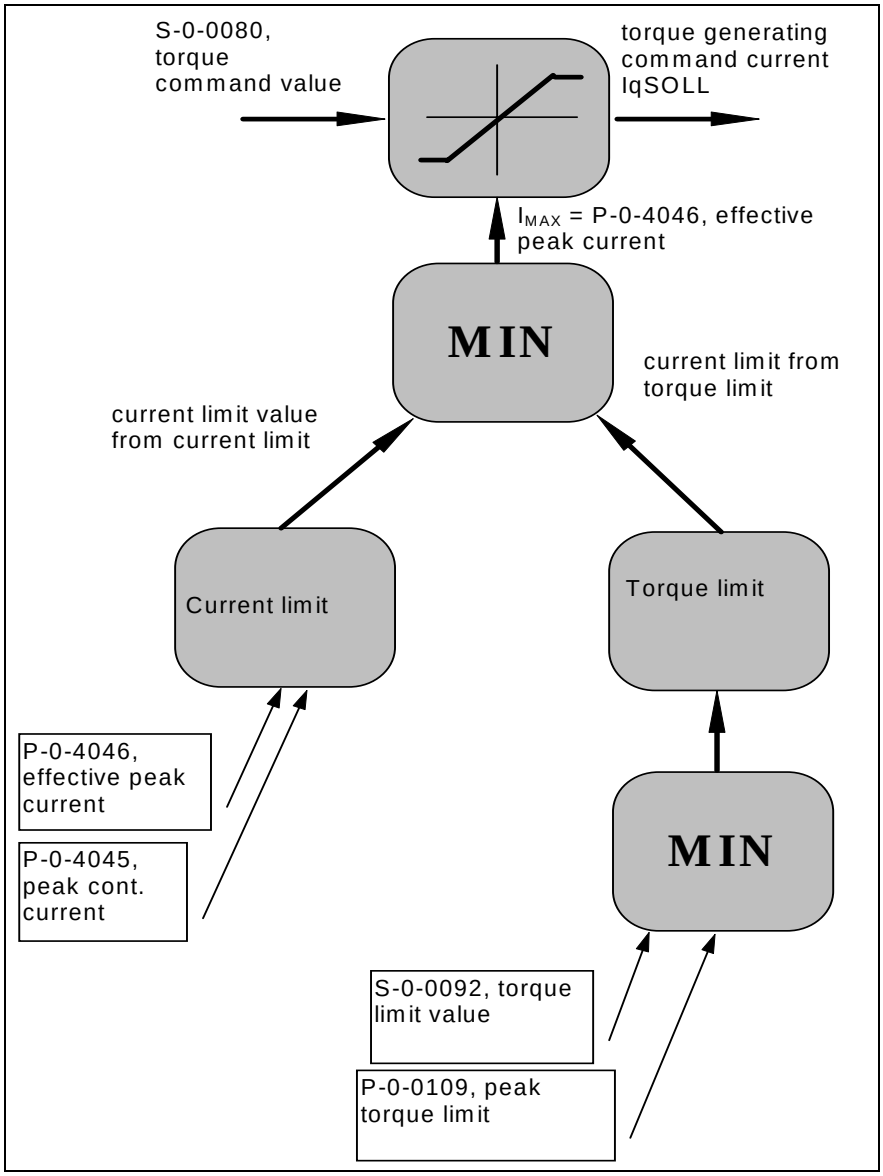


Fig. 7-15: Current and torque limits

Current and torque limits both limit the torque-generating command current.

The smaller value of

- current limit value of current limitation or
- current limit value of torque limitation is always effective.

It is displayed in parameter **P-0-4046, Effective peak current.**

Limiting Velocity

Use the following parameters to limit velocity of the controlled drive:

- **S-0-0113, Maximum speed of the motor**
- **S-0-0091, Bipolar speed limit**

Parameter **S-0-0091, Bipolar speed limit** can allow variable limits of the maximum velocity to values smaller than maximum allowable velocity while in operation.

Parameter **S-0-0113, Maximum speed of the motor** identifies maximum possible motor speed. It is in the motor feedback memory of MHD and MKD motors and does not have to be entered. Use the value specified in the motor parameter sheets for any other motor types.

Limiting to Maximum Motor Speed

Maximum motor speed defines the maximum speed of the drive for the drive. It becomes active as

- maximum input value of parameter **S-0-0091, Bipolar speed limit value.**

Limiting to Bipolar Speed Limit

The bipolar speed limit defines the maximum speed of the drive for the user. It becomes active as

- the monitor of the actual speed in **torque control mode**
- the limit for the resulting command value in the velocity controller
- the monitor of the position command value different in **position control mode**. (See **Position command value monitoring.)**
- the limit for S-0-0036, **speed command value in speed control mode**

Monitoring actual speed in torque control mode

Monitoring in **torque control mode** occurs at 1.125 times the value of **S-0-0091, Bipolar speed limit value.** If this is exceeded, then fatal error

- **F879 S-0-0092, Speed limit value exceeded**

is generated. The drive goes torque free.

Limiting the resulting command value in speed control mode

In all modes in which the speed controller is active (this includes all modes except **torque control**) the speed command value is limited to the value set in **S-0-0091, Bipolar speed limit.** If this state is achieved, then the warning

- **E259 Speed command value limit active**

is generated.

Limiting S-0-0036, Velocity command value in speed control mode

In speed control mode, **S-0-0036, Velocity command value** input is limited to **S-0-0091, bipolar speed limit** value. If the input value exceeds the limit in S-0-0036, then this warning is generated:

- **E263 S-0-0036 Speed command value exceeds S-0-0091**.

7.5 Starting Lockout

Manufacturing systems, transfer roll trains and tool machines often consist of physically separate work areas such as processing units, transport, distribution and storage systems.

Persons in one of these units must often work in dangerous areas while other parts of the machine continue to operate. If persons will be in the working area of a motor, it should be brought to a standstill and secured against inadvertent operation.

The drive interlock provides a security margin for inadvertent operating of a connected motor when an error occurs. It ensures that separate work areas in a machine or system are turned off.

HDD and HDS drive controllers are equipped with a starting lockout. Activating it separates the power output control electronics from the power output with a relay contact.



DANGER

Danger of accident due to torque-free coasting of the spindle!

The starting lockout is actuated by spindle standstill and the spindle coasts uncontrolled!

⇒ Activate starting lockout after the spindle is standing still!

Activating the Starting Lockout

The lockout is activated by putting +24V on clamps AS+ and AS- of connector X3. The relay found in the control drive is switched by closing the potential free acknowledgement contact (outputs ASQ -ASQ) starting at the control system.

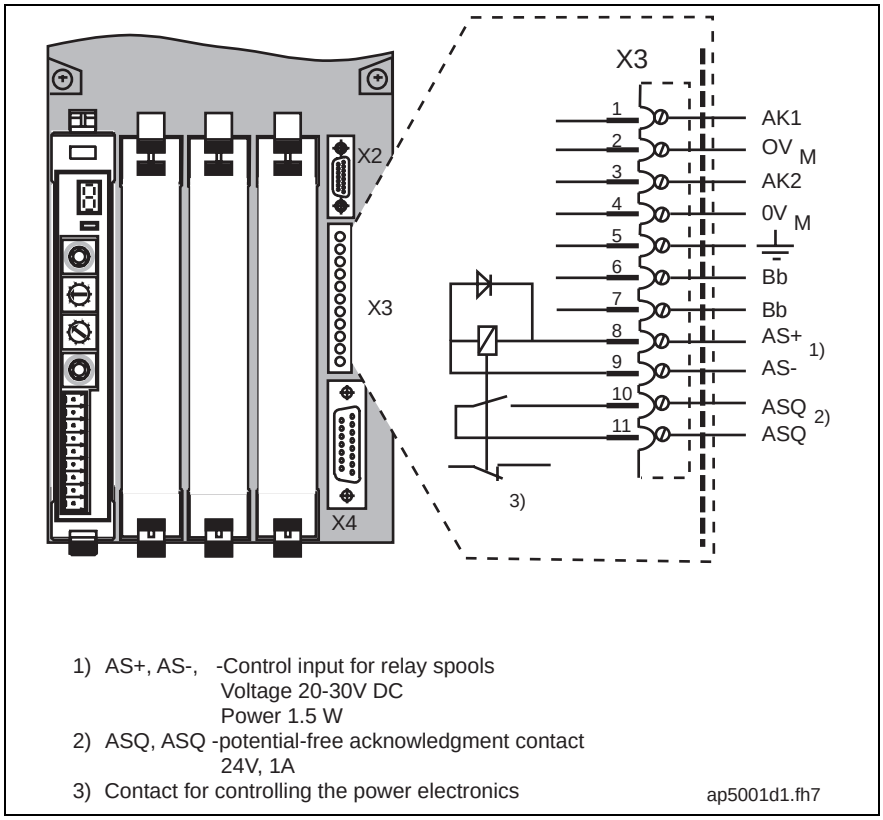


Fig. 7-16: Control and message output of the strting lockout at the drive

When the lockout is activated, the drive controller message **"AS"** is on the H1 display.

The relevant diagnosis read: **A011 starting lockout active.**

7.6 Error Reaction of the Drive

The error reaction depends primarily on the class of the occurring error

If the controller recognizes a drive, then it responds with the set error reaction.

This drive error reaction depends on the error class of the error which occurred as well as the setting of the parameter

- P-0-0117, Activating NC reaction with fault
- P-0-0118, Power off with fault
- P-0-0119, Best possible standstill

Note:
The error class determines the extent to which the drive reaction with fault set in the above-referenced parameters can be executed or not.

There are four error classes with prioritiy hierarchy (See "Error Classes").

Error class	Diagnoses	Drive reaction
Fatal (priority 1= highest priority)	F8xx	The error reaction settings in **P-0-0117, Activating NC reaction with fault** and **P-0-0119, Best possible standstill** are ignored as a drive response is not possible. Torque/force is instantly disabled.
travel range (priority 2)	F6xx	(Irrelevant with spindle drives!)
interface (priority 3)	F4xx	An NC reaction not possible as communications to NC inoperative. The drive proceeds instantly with **P-0-0119, Best possible standstill**.
Non-fatal (priority 4= lowest priority)	F2xx	The drive proceeds with **P-0-0117, Activating NC reaction with fault** and **P-0-0119, Best possible standstill.** If an NC reaction is activated with an error, then the drive will continue to operate for 30 seconds after detecting an error as if an error had not been detected. The NC is available for this period of time to bring the axis to a controlled standstill. The drive then executes the set reaction via P-0-0119.

Tab. 7-12: Error classes of DIAX04 drives

Error Reaction with Fatal Errors

Torque Disconnect

The drive is switched torque free if a fatal error occurs. The spindle remains at speed, only the friction brings about any braking. It can take considerable time to bring the drive to a standstill. The error reaction "Torque disconnect" must be actuated as braking, i.e., with end stages or a defective feedback, is no longer possible!



DANGER

Spindle continues to turn without deceleration!

It is dangerous to open the safety doors of a machining cell while the spindle is turning!

⇒ Check spindle speed (e.g., with **S-0-0040**, **Actual speed value,** if possible) and wait until the spindle stands still!

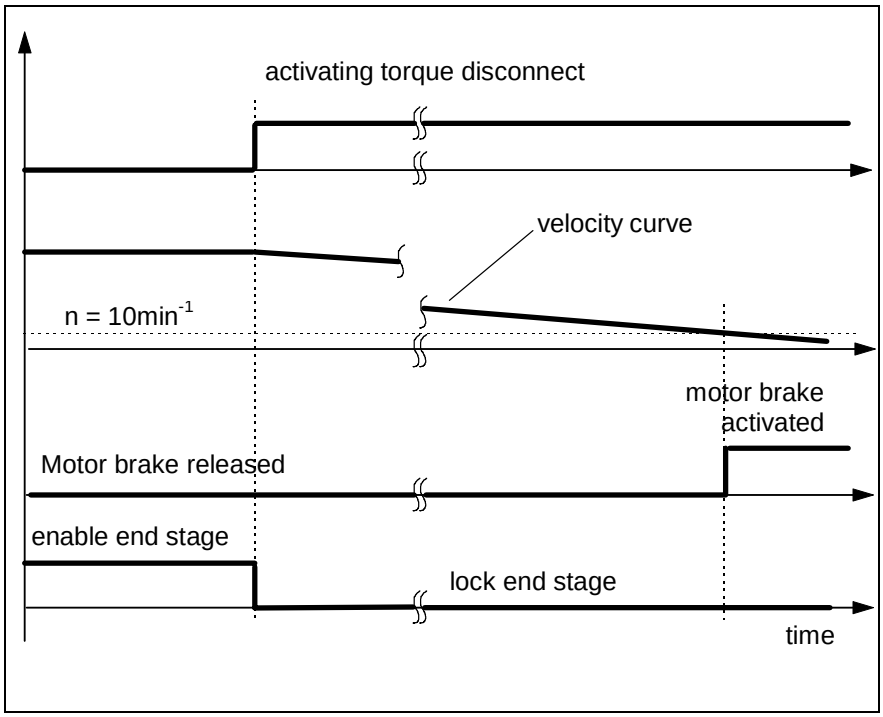


Fig. 7-17: Time diagram of a torque disconnect procedure

Error Reaction with Interface and Non-Fatal Errors

The drive reaction can be set with **P-0-0119, Best possible standstill**. At the end of each reaction, after motor standstill, the drive goes torque free (with "Torque disconnect" the drive immediately goes torque free!).

The following error reactions can be set:

Value of P-0-0119:	Reaction:
0	speed command value to zero (quick stop)
1	torque disconnect
2	speed command value to zero with speed command ramp and filter

Tab. 7-13: Settings for „Best possible standstill“

The value of **P-0-0119 Best possible standstill** also sets the drive reactions

- change drive enable signal from 1 to 0 (drive enable signal disconnect)
- switching from operating mode into parametrization mode with drive engble signal applied (communications phase regression)

Speed command value to zero (quick stop)

If parameter P-0-0119 Best possible standstill is set to „0“, then speed command value to zero is suddenly set in the event of an error in the drive in drive control mode. The drive then brakes at maximum possible torque (see current limits).

The following illustrates the chronological order of the motor brake control (if there is a motor brake) and the end stage release with speed command value to zero:

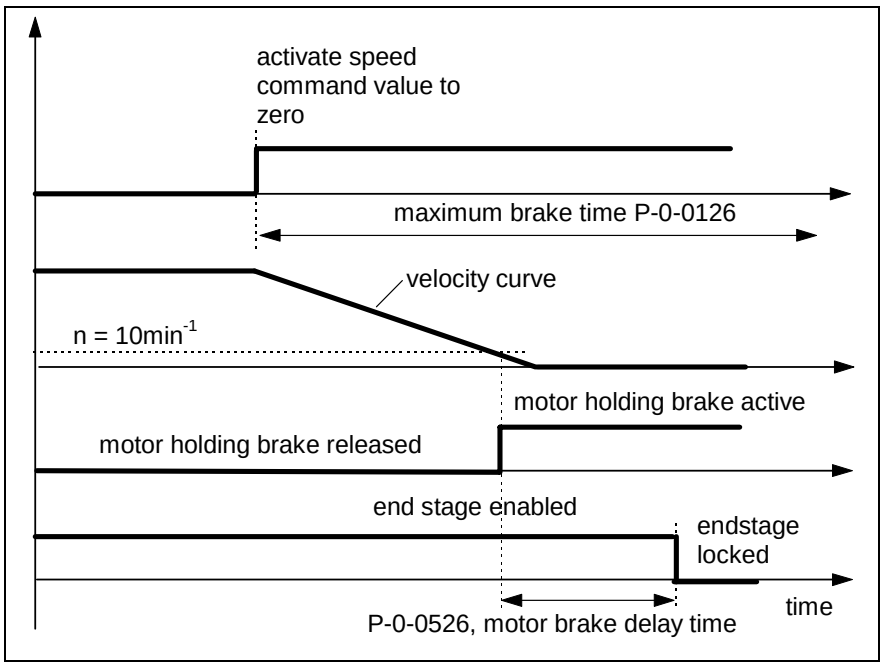


Fig. 7-18: Time diagram of the speed command value to zero

If a too small value is entered for **P-0-0126 Maximum deceleration time,** then it is possible that the error reaction is terminated without the axis standing still.

DANGER

Spindle continues to turn with error!

Opening the safety doors of a machining cell while the spindle is turning is dangerous!!

⇒ The value for **P-0-0126,** Maximum deceleration time must be set larger than the time needed to brake the spindle with speed command value to zero while taking maximum speed into consideration.

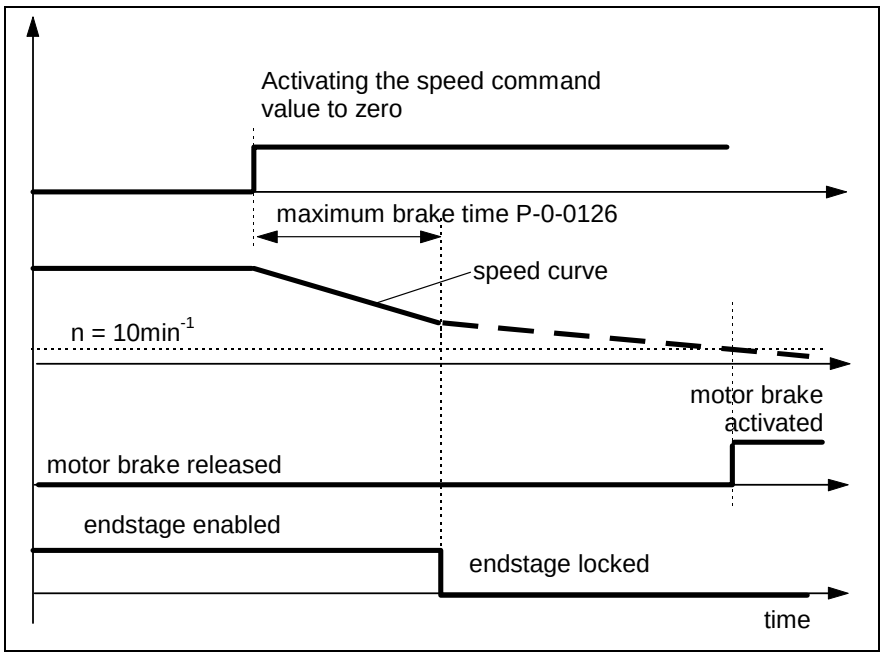


Fig. 7-19: Time diagram of the speed command value to zero with a maximum deceleration time set too short

Setting

The value of **P-0-0126, Maximum deceleration time** must be set larger than the time that the spindle needs with maximum speed and moment of inertia (including workpiece or tool) to come to a standstill. Otherwise, the error reaction will be terminated before the spindle is standing still.

Torque disconnect

If parameter **P-0-0119 Best possible standstill** is set to „2“, then the drive goes torque free in the event of an error. The spindle remains at speed, with only friction braking it. It can take a considerable length of time until standstill. The error reaction "Torque disconnect" should basically not be set for spindle drives! (See „Error Reaction with Fatal Errors“)



DANGER

Spindle continues to turn in the event of an error!

Opening the safety doors of a machining cell while the spindle is turning is dangerous!!

⇒ Set error reaction with standstill!

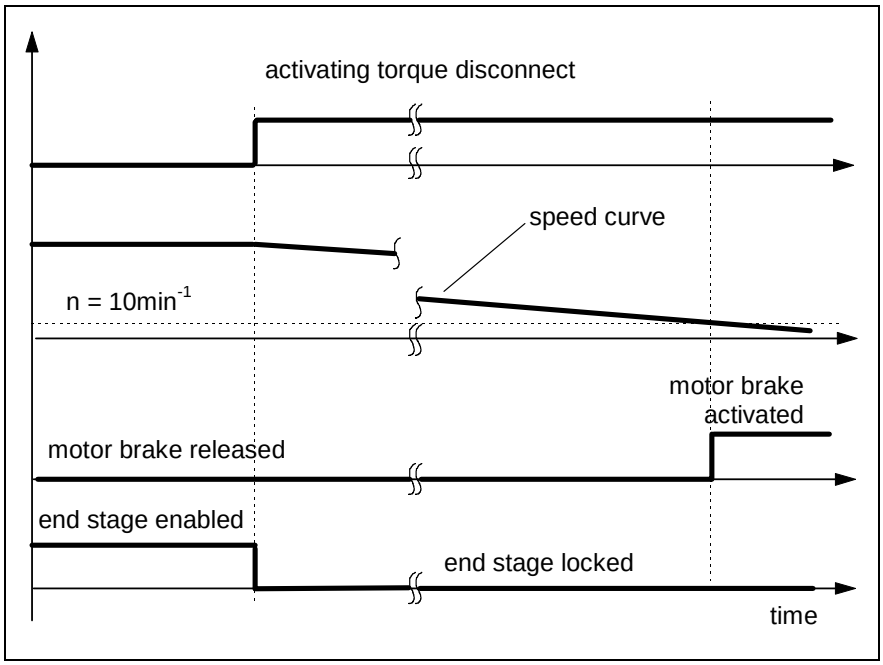


Fig. 7-20: Time diagram of torque disconnect

Speed command value to zero with filter and ramp

If parameter **P-0-0119 Best possible standstill** is set to „2“, then, in the event of an error, the drive in speed control mode is brought to a standstill with a command value ramp with an end value of zero. The speed command value is also controlled through a jerk-limited command value smoothing filter.

The motor brake, if present, is not activated until motor speed has dropped below 10min^{-1}.

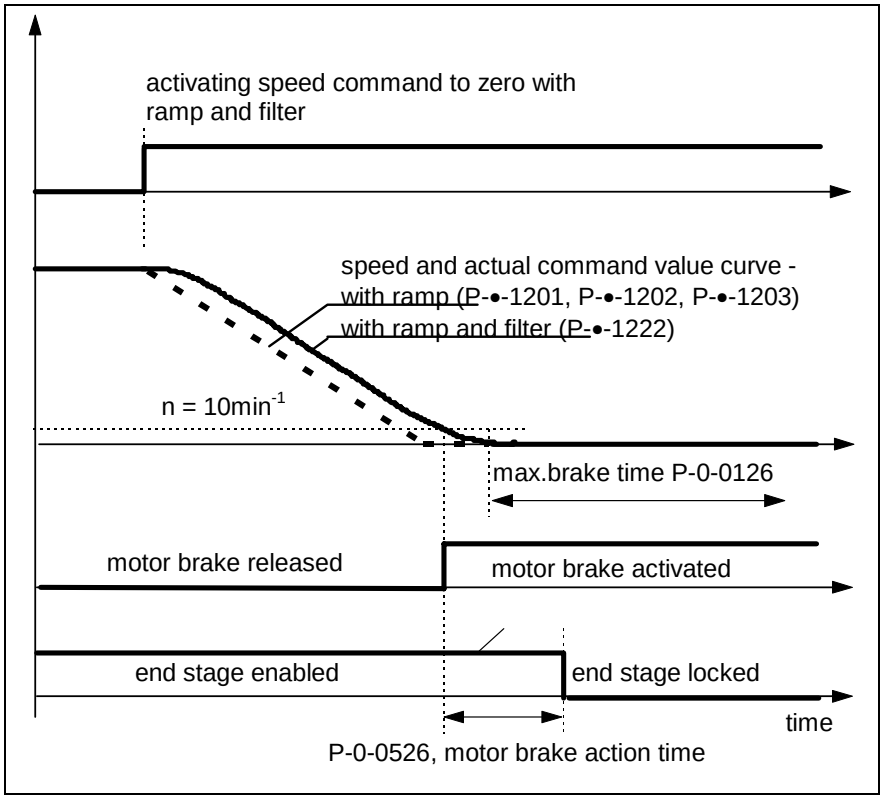


Fig. 7-21: Time diagram with command value to zero with filter and ramp

If the drive does not follow the brake ramp with an error, then the value in parameter **P-0-0126, Maximum deceleration time** is the time over which the braking procedure must be maintained after the brake ramp is brought to zero. Braking is then terminated by locking out the end stage.

This eliminates unnecessarily long feedback operations and the error message connected therewith if the drive is rigidly mechanically coupled to another drive and the drive is not braked. This could, for example, occur with two spindles positioned opposite each other in synchronous mode with a workpiece clamped at both ends.

The motor brake, if mounted, is not activated if motor speed falls below 10min^{-1}.

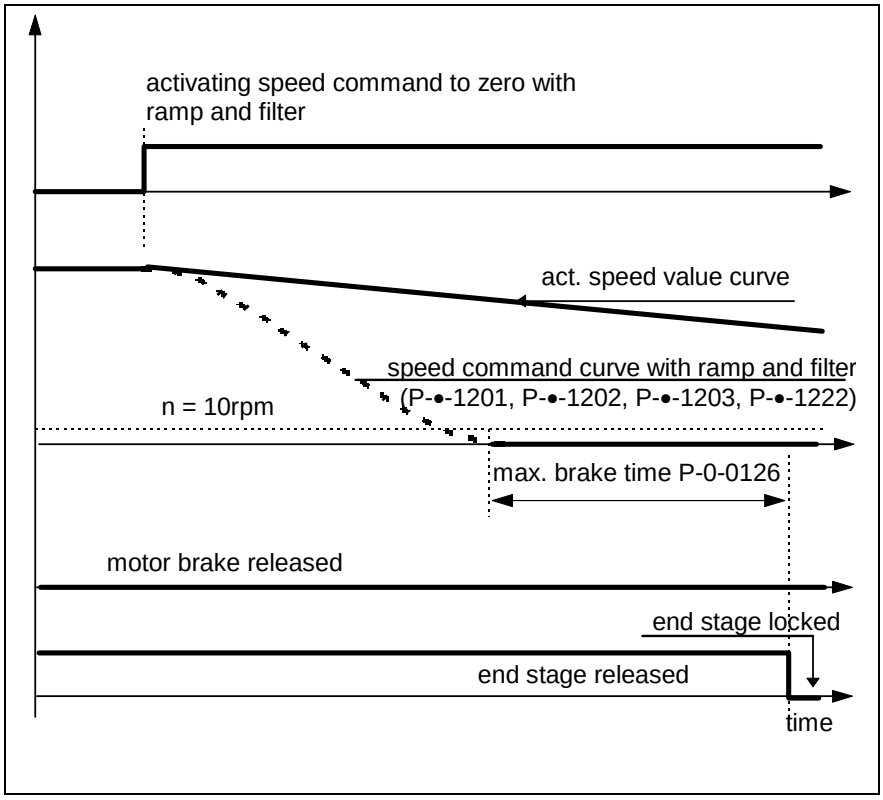


Fig. 7-22: Time diagram with command value to zero with filter and ramp with terminated error reaction

Setting

The value of **P-0-0126, Maximum deceleration time** should be set to consider the time the spindle needs at maximum speed and maximum moment of inertia (including workpiece or tool) to come to a standstill. The value can, however, be set to other application-specific criteria.

When settings ramps and smoothing, see sections 8.4 and 8.5.

Power Off with Fault

A signal line of the control voltage bus can be used to inform the power supply module about whether the drive has detected an error or not that will probably lead to a power off situation. If the power supply module receives such a message, then it switches the DC bus voltage off and, possible, the DC bus short circuit on. All other controllers connected to the same power suply module also recognize this and, in turn, conduct the drive reaction as set in **P-0-0119, Best possible standstill.** With DC bus short circuit, all drives with MHD and MKD motors with quick stop responds, spindle drives with 2AD, ADF or 1MB motors, however, just run out without braking!

The signalling of a drive error to the power supply module can be activated in parameter **P-0-0118, Power off with fault**.

Value of P-0-0118:	Function:
0	no signal to the power supply module in the event of a fault
1	signal about the fault to the power supply module

Tab. 7-14: Drive fault signal

The signal is conducted through the bus connecting cables on the front (connector X1, pin 2).

NC Reaction in the Event of a Fault

If a drive controller detects a non-fatal error, then the control is informed of this in the form of a C1D (class 1 diagnostics) error reaction. The drive can then bring the spindle to a standstill with "Travel procedure for error situation" and thus prevent damage.

If this is desired, then the drive-controlled error reaction must be delayed to allow the axes to continue to move to the value set by the contorl. This is achieved by setting the time delay between recogniztion of the error and the drive error reaction. This can be set in parameter **P-0-0117, NC Reaction in the event of a fault**.

Value of P-0-0117	Function
0	Drive immediately goes to reaction defined in "best possible deceleration" after error
1	Drive continues for 30 seconds in the selected operating mode, then follows "best possible deceleration".

Tab. 7-15: NC reaction in the event of a fault

Note:
"Activating NC reaction with fault" only makes sense for controls that have a corresponding error reaction procedure.

Emergency Stop Function

Explanations

Controllers are equipped with a control input (E-STOP) which uses a voltage signal to shutdown the drive.

Application notes

If the emergency stop (E-STOP) button is pressed, then a dangerous situation must be dealt with.

In most cases such a situation reseults from

- mechanical motions and/oder
- high voltages

at machines and installations.

In E-stop situations it is necessary to shutdown all machine axes and bring the spindle to a standstill while shutting power off.

Spindle drives are generally equipped with motors of the 2AD, ADF and 1MB lines. The quickest way to stop these motors (asynchronous principle) given an E-stop situation or with a fault is if the controller remains operable and is being supplied with power.

In modular drive systems, the servo axes are equipped with MHD or MKD motors. These (synchronous principle) can be quickly braked in an emergency stop or fault situation (e.g., controller defective) even with a DC bus intermediate circuit.

Servo drives and spindle drives in modular drive systems use one power supply module. An E-stop means the drive system must respond in terms of the demands:

- The recommended control circuit for supply modules only, if the E-stop button is pressed, switches the main contctor off, the DC bus intermediate circuit is not activated. All drives go into braking mode. The main spindle and the functional servo controllers receive some of the regenerated energy, the rest is converted into heat via the integral bleeder. All drives brake to a standstill if this has been as the reaction.
- An E-stop input should be used in spindle drives as this signal is treated as if it were a non-fatal drive error. It actuates the DC bus intermediate circuit if it is to be followed by power off. The servo axes brake, the spindle would not, in this case, decel unbraked.
- The E-STOP input can only be used for selective braking of spindle or servo axes, outside of SERCOS communication. Power off may not be set due to actuation of the error reaction for all drives connected herewith!
  Ensure that none of the drive selected for braking with error (F2-••, F4-••, F6-••, F8-••) can trigger the error reaction for all drives!

Technical Features

The E-STOP function activated with the input is displayed to the control with an error message of "C1D" type. The drive remains in an E-stop state even if the E-stop signal has been removed. Readiness to operate is not re-established until after the danger has been eliminated with a reset command.

Project Planning

Terminal Diagram

When activating the E-STOP function, the DC24V power supply is automatically monitored for undervoltage!

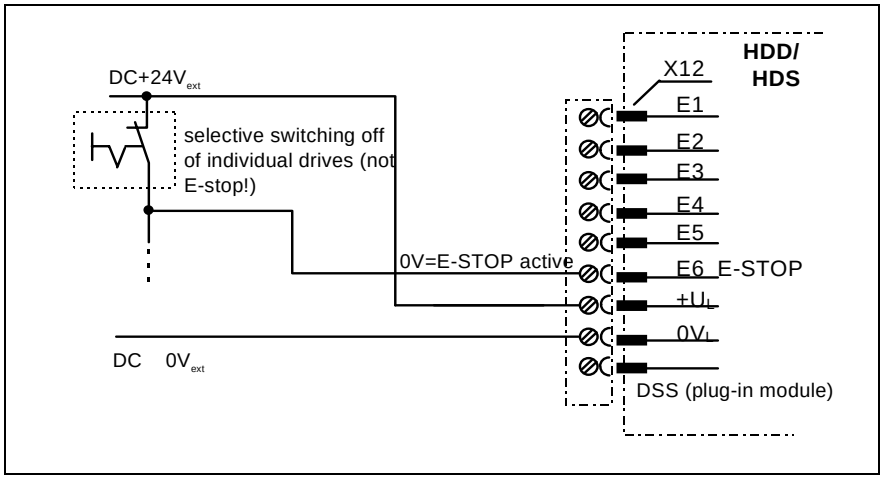


Fig. 7-23: Terminal diagram for selective braking of single drives in a modular drive system (not E-stop!)

Commissioning

Parameter overview

Parameter ID number	Parameter name	Comments
P-0-0117	**Activating NC reaction with fault**	see above, Section 7.6
P-0-0118	**Power off with fault**	see above, Section 7.6
P-0-0119	**Best possible standstill**	see above, Section 7.6
P-0-0008	**Activating E-STOP function**	see below
S-0-0011	**Class 1 diagnostics**	see section 3
S-0-0099	**Reset C1D**	see section 3
S-0-0144	**Signal status word**	detecting spindle standstill

Tab. 7-16: Parameter for „E-stop“-Function

- **P-0-0008 Activating E-STOP function**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X	X	X			**P-0-0008**
															0	inactive
															1	active
														0		as in P-0-0119, best possible standstill
														1		speed command value to zero (quick stop)

Tab. 7-17: Parameter values of E-STOP function

Settings

⇒ Parameter **P-0-0119 Best possible standstill**.

⇒ Parameter **P-0-0008 Activating E-STOP function** set inactive (bit 0 =„0“)

Note: The E-stop sequence must be implemented at the recommended control circuit of the power supply module used. The spindle is decelerated in an E-stop situation according to the response set in **P-0-0119 Best possible standstill**.

If an error diagnosed within a modular drive system (not an E-stop) must trip the simultaneous error raction of all drives:

⇒ Parameter **P-0-0118 Power off with fault** in all drives of the modular drive system must be set with „1“.

⇒ Parameter **P-0-0117 Activating NC reaction with fault** in all drives of the modular drive system must be set with „0“.

Note: The servo axes are quickly brought to a standstill independent of priority and type of error occurring with the use of the DC intermediate circuit. This also applies to fatal errors with unit or feedback defects. The spindle, however, decelerates unbraked. As this error, in contrast to an E-stop, generally represents no danger to personnel, the missing spindle deceleratoin is acceptable.
Rapidly braking linear axes generally cause no machine damage. The still turning spindle also causes no machine damage. One exception is a gear cutting machine!

If the drives in, e.g., gear-cutting machines must be decelerated positon controlled by the NC control:

⇒ Set "1" in parameter **P-0-0118 Power off with fault** in all drives of the modular drive system.

⇒ Set "1" in parameter **P-0-0117 Activating NC reaction with fault** in all drives of the modular drive system.

Note: A position-controlled deceleration by the NC control is only possible with non-fatal errors (F2-••). The error is immediately signalled via **S-0-0011 Class 1 diagnostics** to the NC. If the drive is not brought to a standstill after 30 seconds, then the simultaneous braking of all servo drives, as set in the error reaction, is triggered. The DC bus intermediate circuit is activated and any turning spindle decelerates unbraked.

Diagnoses

If the E-STOP input is activated, then display H1 flashes „**F2-34“.**

Fault Notes

If the controller is flashing error F2-33:

There is a problem with the $DC24_{ext}$ voltage on the machine!

⇒ Check wiring!

⇒ Check $DC24_{ext}$ voltage on machine to make sure it is within acceptable tolerance (18....32V)!

If after deactivating the E-stop input error message F2-34 continues to flash:

Reset error message „E-STOP“ (C1D) was not executed!

⇒ Command **S-0-0099 Reset C1D** must be triggered!

7.7 Control Loop Settings

General Information on the Control Loop Settings

The control loop settings in a digital control drive are important for the characteristics of the servo shaft. Determining these settings requires extensive knowledge.

An „Optimization" of the control loop settings are generally not necessary!

For this reason, all digital INDRAMAT drives have control parameters specified to an application. These parameters can be retrieved from the drive data source DRIVEDAT or are accessible at startup through the programs SERCTOP or DRIVETOP. (See **Load** on page 7-48).

In some cases, however, it may be necessary to adjust the control loop settings for a specific application. The following section gives a few simple but important basic rules for setting control loop parameters. In each situation, the prescribed methods should only be viewed as guidelines which lead to a control setting. Specific aspects of some applications may require settings which deviate from these guidelines.

Load Default Settings

Using the **base load** function it is possible to activate the default controller parameters of motor types with a motor feedback data memory such as

- MHD
- MKD

With these parameters, the corresponding control parameters for the motor type used can be set. The parameters are defined for the moment of inertia relation of $J_{eigen} = J_{fremd}$.

Most applications can work with those values. Default values can be set for the following parameters:

- **S-0-0106, Current control P-gain**
- **S-0-0107, Current control integral action time**
- **S-0-0100, Velocity control P-gain**
- **S-•-0101, Velocity control integral action time**
- **P-0-0004, Smoothing time constant**
- **S-•-0104, Position control KV factor**
- **S-0-0392, Actual speed value filter timebase**

The base load function can be activated in two different ways:

- Automatic activation during execution of the command **S-0-0128, C200 Communications phase 4 transition check** with initial operation of motor type with this controller.
- While executing command **S-0-0262, C700 Base load**.

Automatic execution of base load function

The drive recognizes and retains the motor type the first time the drive is used with this motor type. While executing the command **S-0-0128, C200 Communications phase 4 transition check** it compares it with parameter **S-0-0141, Motor type** which is read from the motor feedback data memory with the buffered value of the parmeter in the memory of the control device **P-0-4036, Connected motor type**. If the two are different, then error **F208 Motor type has changed** is generated. Message **"UL"** appears in the 7-segment display.

The user has the option of saving the current drive parameters before resetting the error to start the bootload.

Error **F2-08, Motor type has changed** can be reset in two different ways:

1.) execute command **S-0-0099, Reset class 1 diagnostics**

2.) actuate the S1 key

In both cases, the base load function is activated.

If execution of load default settings is not possible, then the command error or command **S-0-0262, C700 Base load** appears.

(See "Error Causes when Executing the Load Default Settings Function" on page 7-48.)

Executing the Base Load Function as a Command

Through parameter **S-0-0262, C700 Base load** it is possible to execute the function as a command. This can be useful if manually altered control parameters must be reset to their base values.

Executing the command with set drive enable is not possible.

Error Causes when Executing the Load Default Settings Function

If the procedure is started by running command **S-0-0262, C700 Base load** but is not successfully processed, then the reason for the error is displayed on either the 7-segment display or the diagnosis parameter **S-0-0095**.

The following reasons could cause an error during bootload:

SS Display:	Diagnoses:	Cause:
C701	Base load with drive enable set not possible	at the start of the command, drive enable is set, this is not allowed
C702	No default parameters available	base load not possible with motor type set, only with MHD or MKD
C703	Default parameter invalid	connection controller to motor feedback data memory interrupted or feedback defective
C704	Default parameter faulty	the existing default value cannot be processed as, e.g., extreme value exceeded by default value

Tab. 7-18: Possible errors with command base load

If an error occurs during the load default procedure, then the default values for the indicated invalid parameters can be set. This protects and helps in diagnosing additional errors.

Setting the Current Controller

The parameters for the current control loop are set by INDRAMAT and cannot be adjusted for specific applications. The manufacturing defined parameter values can be retrieved from the drive data memory DRIVEDAT or can be accessed at startup for operating in DRIVETOP and SERCTOP.

The parameters for the current controller are set via parameters

- **S-0-0106, Current controller P-gain 1**
- **S-0-0107, Current control integral action time 1**



WARNING

A change in the values set by INDRAMAT
can damage the motor and drive controller.
⇒ Changes in the current controller parameters are not permitted!

Setting the Velocity Loop

Use the following parameters to make settings here

- **S-•-0100, Velocity loop P-gain**
- **S-•-0101, Velocity control integral action time**
- **P-0-0004, Smoothing time constant**

These can be set either by running the load default parameters procedure or following the procedure described below.

Preparations for Setting the Velocity Loop

A number of preparations must be made to set the velocity loop:

- The mechanical system must be set up in its final form to have true relationships while setting the parameters.
- The drive must be properly connected as set in the user manual.
- The safety limit switches must be checked (if available).
- The velocity control operating mode must be selected in the drive.

The control settings must be selected at start of parametrization as follows:

S-•-0100, Velocity loop P-gain = standard value of connected motor.

S-•-0101, Velocity control integral action time = 6500 ms

P-0-0004, Smoothing time constant = minimum value (250µs)

S-0-0392, Actual speed value filter timebase = 500µs

When determining velocity control parameters, no compensation functions should be activated.

Definition of critial proportional gain and P-0-0004, Smoothing time constant

- After turning the drive enable on, let the drive move at a low speed. (rotary motors: 10...20 rpm; linear motors: 1...2 m/min)
- **S-•-0100, Velocity control P-gain** must be increased until unstable operating behavior occurs (continuous oscillations).
- The frequency of the oscillation has to be captured by displaying the actual velocity (see "Analog output"). If the oscillation frequency is greater than 500Hz, then increase **P-0-0004, Smoothing time constant** oscillation ceases. Then continue to increase **S-•-0100, Velocity control P-gain** until instability occurs again**.**
- **S-•-0100, Velocity control P-gain** must be reduced until oscillations cease on their own.

The value thus found is the „**Critical Velocity Control P-gain**“.

Determining Critical Integral Action Time

- Set **S-•-0100, Velocity control P-gain** = 0.5 x critical P-gain.
- **S-•-0101, Velocity control integral action time** lowered until unstable behavior occurs.
- **S-•-0101, Velocity control integral action time** increased until continuous oscillations stop.

The value thus found is the **"Critical Integral Action Time".**

Determining Velocity Loop Setting

The critical values can be used to derive a control setting which possesses the following characteristics:

- Independent of changes to the shaft since there is a large enough safety margin to the stability boundaries
- Safe reproduction of the characteristics in production machines

The following table shows many of the most frequently used application types and the corresponding control loop settings.

Application type:	Velocity loop P-gain:	Velocity loop integral time:	Comments:
C axis drive	Kp = 0.5 x Kpkrit	Tn = 1.5...2xTnkrit	high load stiffness and good responsiveness
spindle drive with elastic mechanical transmission elements	Kp = 0.25 x Kpkrit	Tn = 4 x Tnkrit	smooth running, stable drive

Tab. 7-19: Velocity control settings identified

See Attachment B of Diagnostics Description: **F878 Error in velocity control loop**.

Setting the Position Loop

To set the position loop, use parameter

- **S-•-0104, Position loop KV factor**

This can be set by either executing the default settings procedure once or by following the process described below.

Preparations for Setting the Position Loop

In order to be able to execute the position loop settings, it is necessary to make a number of preparations:

- The mechanical system must be set up in its final form in order to have true relationships while setting the parameters.
- The drive must be properly connected as described in the manual.
- Select operating mode position control in the drive.
- The velocity controller must be properly tuned. The starting value selected for the K_v factor must be relatively small ($K_v = 1$).
- While determining the position loop parameters, no compensation functions should be activated.

Determining the Critical Position Loop Gain

- Operate the drive in a mode that closes the position loop in the drive.
- Move axis at a slow velocity, i.e., with a jog function at a connected control (rotary motors: 10...20 rpm).
- K_v factor must be increased until instability occurs
- Kv factor must be reduced until the continuous oscillations cease on their own.

The thus determined Kv factor is the **„Critical Position Loop Gain“.**

Determining Position Control Settings

In most applications, an appropriate position control setting will range between 50 and 80 of the critical position control loop gain.

This means:

S-•-0104, position loop KV factor = 0.5 ... 0.8 x K_{vkrit}

Position Loop Monitoring

The position loop monitor helps to diagnose errors in the position control loop.

A triggering of the position loop monitor can result if:

- the torque or acceleratioin capabilities of the drive are exceeded
- the axis mechanics are blocked

- there are problems in the position feedback

The position control loop monitor is only active if the operating mode is activated in which the position control loop in the drive is closed. There are two parameters to set and diagnose the monitoring function:

- **S-•-0159, Monitoring window**
- **P-0-0098, Maximum model deviation**

If the drive detects an error in the position loop, then

- **F228 Excessive control deviation**

is generated.

General Operating Features of the Position Loop Monitor

To monitor the position loop, a model actual positon value is computed which depends only on the commanded position value profile and the set position loop parameters. This model position is compared continuously to the actual position. If the deviation exceeds **S-•-0159, Monitoring window** for more than 50 seconds**,** then **F228 Excessive control deviation** is generated**.**

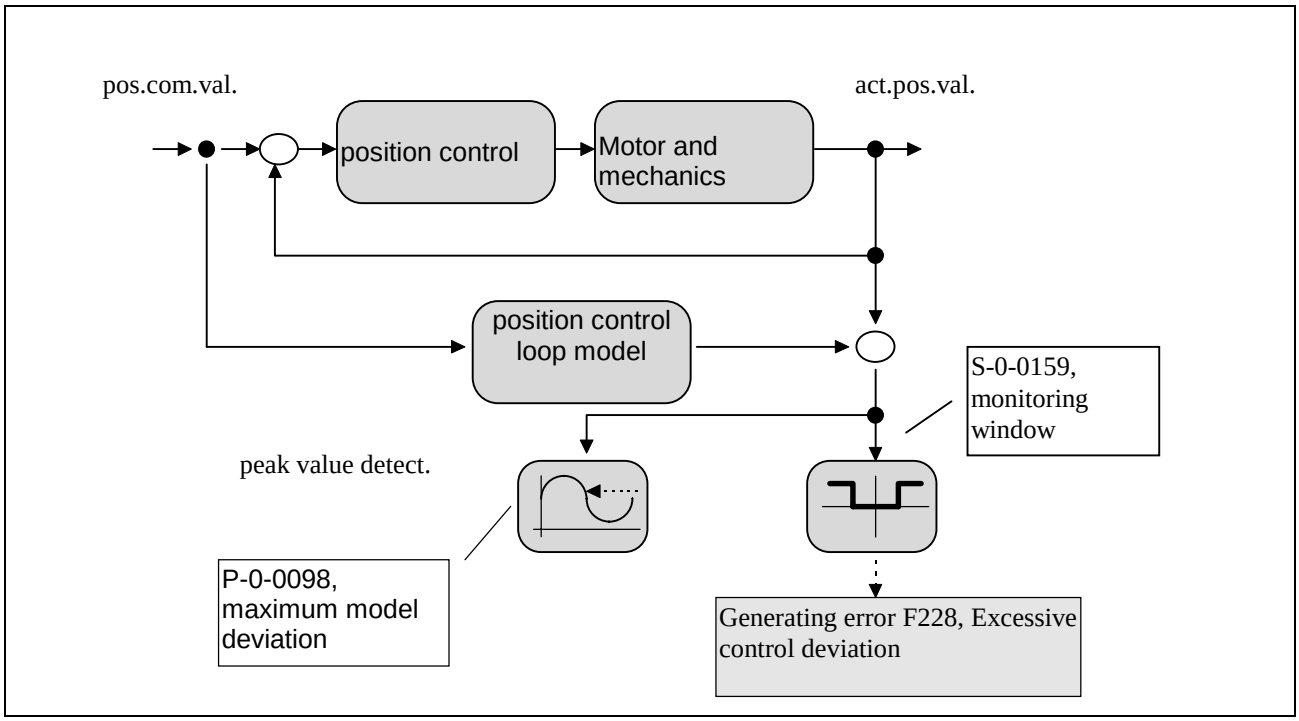


Fig. 7-24: Principle of the position control loop monitor

For accurate monitoring, the position feedback value from the position loop is used. This means that for position control with motor encocder position feedback value 1 is used, for position control with external encoder, value 2 is used.

Setting the Position Loop Monitor

Prerequisites for setting up position control loop monitoring are:

- Check to make sure velocity and position control loops are appropriately set prior to setting the position loop monitor.
- The relevant axes should be checked mechanically and for their final state.

The position control loop monitor should be set as follows:

- Through the connected control, proceed in a typical operating mode. In this mode, move at maximum command speed.
- In parameter **P-0-0098, Maximum model deviation** the maximum deviation between the actual position value and the expected one is always displayed. (Note: the contents of this parameter are not saved, i.e., after enabling the drive this parameter equals zero.)
- This value can be used to help set the monitoring window. In parameter **S-•-0159, Monitoring window** the contents of the

parameter **P-0-0098, Maximum model deviation** must be multiplied with a safety factor. A suggested one equals 1.5 to 2.0.

Example:

Contents of P-0-0098, maximum model deviation:

0.1 mm

-> determination of parameter **S-0-0159, Monitoring window**:

0.2 mm (= 2 x 0.1 mm)

Deactivating the Position Control Loop Monitor

It is recommened to activate the position loop monitor. However, there rae eceptions for which the position loop monitor has to be deactivated. This can be done with parameter **S-•-0159, Monitoring window** by setting it to very high values.

Setting Acceleration Feed Forward

In spindle applications where the highest degree of precision at high speeds is important (e.g., slave spindle), it is possible to increase the precision of the drive during the acceleration and deceleration phases by activating the acceleration feed forward.

Use the following parameters to set acceleration feed forward

- **S-0-0348, P-gain acceleration feed forward**

This value can be determined as follows:

Prerequisites to Set Acceleration Feed Forward

- Velocity and position control loops must be correctly set.
- For position control preselect lag-distance free operation mode.

Setting Acceleration Feed Forward

The correct acceleration feed forward can be set by the user since it depends on the inertia momentum.

The setting requires two steps:

- How to compute the set value for acceleration feed forward. For this purpose you need the size of the complete inertia reduced for the motor shaft ($J_{Motor}+J_{Last}$) of the axis. This value is known approximately from the axis scaling. Additionally, the torque constnat of the motor is neeed. This data can be retrieved from the motor data sheet or parameter **P-0-0051, Torque constant**. The value is computed:

$$acceleration\ feed\ \ forward = \frac{J_{Motor} + J_{Last}}{Kt} * 1000$$

Acceleration feed forward [mA\rad\s²]
J*Motor*: moment of inertia of the motor [kgm²]
J*Last*: moment of inertia of the load [kgm²]
Kt: torque constant of motor [NM/A]

Formula 7-1: Set value for the acceleration feed forward

The determined set value is entered in parameter **S-0-0348, Acceleration feed forward**.

- Check the reliability of acceleration feed forward and the precision of the make up of parameter **S-0-0348, P-gain acceleration feed forward**.
  The difference of the position actual value to the position set value is displayed through the analog diagnosis output of the control device. To check the reliability of the acceleration feed forward, oscilloscope the signal whle moving the axis through the desired operation cycle. The dynamically controlled deviation of the acceleration feed forward is reduced in the acceleration and deceleration phases.

Setting the Velocity Mix Factor

With the help of the velocity mix factor, the velocity control set value can be generated from the motor and external measurement systems. This might be an advantage for play or torsion endangered clutches between motor and load. To set the mix relationship, use parameter

- **P-0-0121, Velocity mix factor encoders 1 and 2.**

This factor can, of course, only be used if an external measuring system is mounted. If it is not, then **P-0-0121** automatically goes to 0%.

The speed value mixture can be continuously varied:

- 100% velocity feed value of the motor encoder
  /
  0% actual value of the external encoder (P-0-0121 = 0)
  and
- 0% actual velocity value of the motor encoer
  /
  100% actual value of external encoder (P-0-0121 = 100)

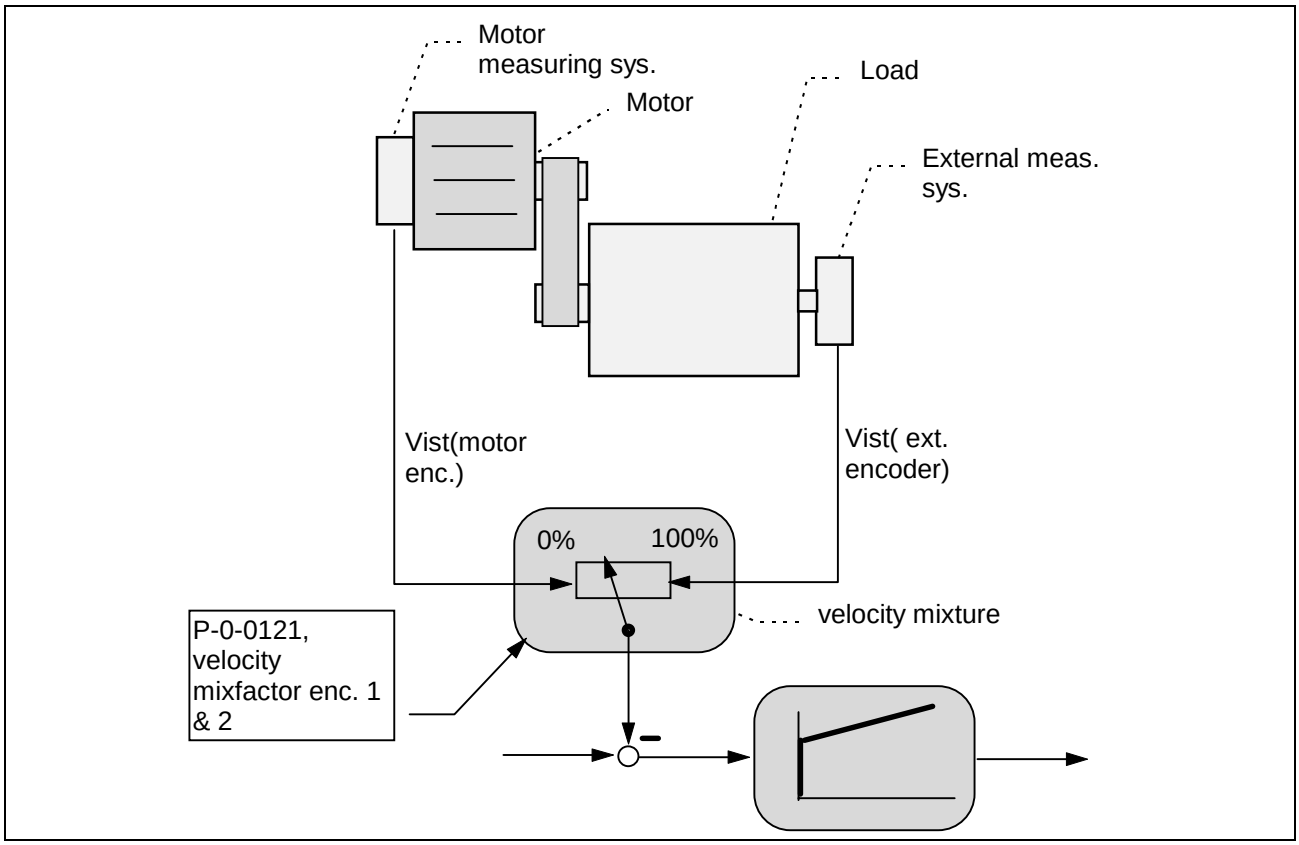


Fig. 7-25: Function principle of velocity mixture

7.8 Drive Halt

The drive halt function serves to stop the axis with a defined acceleration and jerk.

The function is activated either by deleting the drive halt bit (bit 13) in the master control word or by interrupting a drive control command (e.g., drive-controlled homing).

The following parameters are used for this purpose:

- **S-0-0138, Bipolar acceleration**
- **S-0-0349, Bipolar jerk limit value**

The following are also used for diagnostics:

- **S-•-0124, Standstill window**
- **S-0-0182, Manufacturer's class 3 diagnostics**

Function Principle of Drive Halt

If bit 13 is changed in the master contol word from "1" to "0", then this function is activated. The drive no longer follows the command value of the active operating mode but changes to position control and decelerates the axis with parameters **S-0-0138, Bipolar acceleration** and **S-0-0349, Bipolar jerk limit value**. The SSI display shows **AH**, the diagnoses in S-0-0095 reads **A010 Drive halt**.

If the actual velocity falls below the value set in parameter **S-•-0124, Standstill window**, then bit **"Drive halt acknowledge"** in **S-0-0182, Manufacturer's class 3 diagnostics** is set.

If bit 13 in the master control word is set back to "1", then the selected mode is activated again.

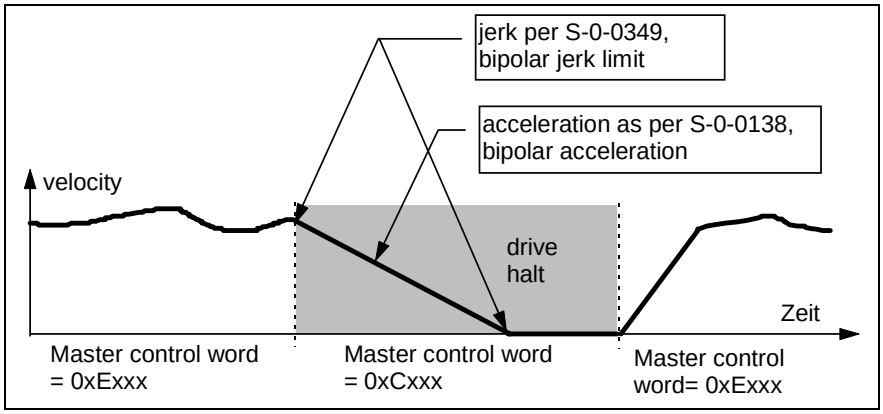


Fig. 7-26: The basic principle of drive halt

The position controlled standstill is done with lagless positioning if the previous operating mode was lagless. If this was not the case, then this function proceeds without lagless control.

7.9 Drive-Controlled Referencing

Explanations

As a result of a command from the control, the drive independently establishes a reference dimension between spindle and spindle position measuring system.

Application notes

Establishing reference dimensions is only required with relative not absolute position measuring systems if the spindle is to work position controlled. Such is the case, for example with

- C axis operation
- spindle positioning
- position-synchronized operations with a double spindle

Command „Drive-controlled referencing“ must be conducted

- before the spindle can take up position-controlled operations
- if the reference dimension (offset) between spindle and measuring systems has changed, e.g., with an offset setting procedure before changing or correcting the offset value.

Command „Drive-controlled referencing“ need **not** be conducted if

- the spindle is only being operted in a speed-controlled manner or
- if, in speed control mode, the command „Spindle positioning“ should be executed as the drive references on its own with the first positioning command (see section 8.3).

Technical Features of Drive-Controlled Referencing

The position difference between the zero pulse of the measuring system and the reference point, zero point, of the spindle is added in via an offset value.

The actual position value generated by the drive does not reference the zero position of the spindle until after the first command has been completed.

Referencing sequence

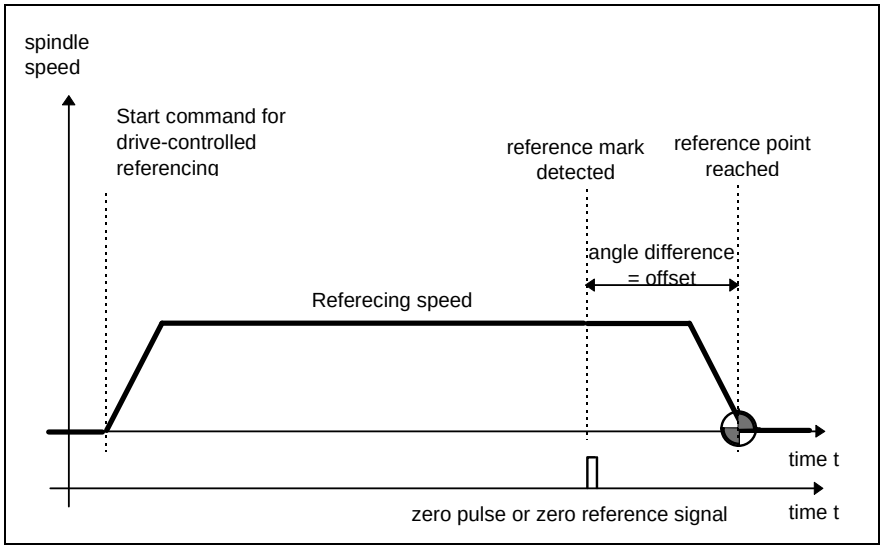


Fig. 7-27: Velocity-time diagram for drive-controlled referencing in direct measuring systems

Project Planning Drive-Controlled Referencing

Direct spindle position measurement

As rotary position measuring systems measure relatively and generate only one zero pulse per revolution, it is possible, with direct spindle position measurements, to use it as a reference mark in terms of:

- zero pulse of the motor feedback of motor spindles (1MB kit motors)
- zero pulse of an external spindle position encoder directly connected to the controller with mechanical transmission components with slip (V-belts, poly-V-belts, etc.)

Indirect spindle position measurement

With rotary measuring systems, i.e., indirect measure, the zero pulse of the measuring system with gear ratios of i > 1 occurs several times per spindle revolution and cannot be used as a reference mark. As a result, it is necessary to mount a reference switch to the spindle, if the motor feedback is used as a spindle position, to generate a reference mark.

Note: There can be no slip in the mechanics between spindle motor and spindle with indirect spindle position measurement!

Spindle reference switch information

The spindle reference switch must be mounted to the controller.

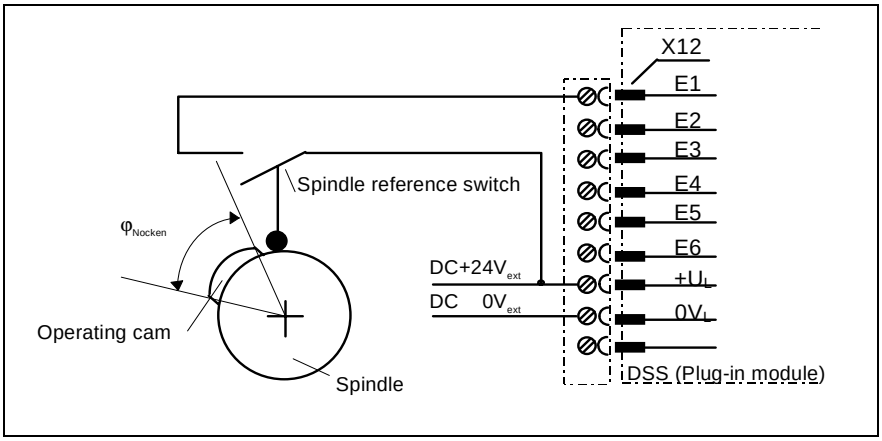


Fig. 7-28: Electrical connections of the spindle reference switch

To ensure that the spindle reference mark is properly read, the operating cam must cover a minimum angle:

$$\varphi_{Nocken} > \varphi_{Nockenmin} = n_{ref} * 250\mu s * \frac{360° * min}{60s}$$

φ_{Nocken} :	operating cam angle
$\varphi_{Nockenmin}$	minimum angle of operating cam
n_{ref}:	referencing velocity in min^{-1}

Formula 7-2: Dimensioning the cam angle

The minimum angle of the operating cam calculated as above equals the systematic inaccuracy of the reference mark detection.

Spindle reference signal detection occurs independent of the rotational direction and always occurs at the same location. With clockwise movement, the rising switch edge is set and with counterclockwise, the falling edge is set as reference position.

Commissioning Drive-Controlled Referencing

Note: It is possible to reference using either command **S-0-0148 C6 Drive-controlled referencing** or **S-0-0152, C9 Spindle positioning.** If the latter is used, then referencing takes place with the first **Command S-0-0152** (see section 8.3)!

Parameter overview

Parameter ID number	Parameter name	Default value, Comments
S-0-0148	**C6 Command drive-controlled referencing**	
S-•-0222	**Spindle positioning speed**	maximum spindle referencing speed
S-0-0154	**Spindle positioning parameter**	Parameter for setting reference options
S-0-0150	**Referencing dimension offset 1**	Distance between zero mark of motor encoder (position via motor feedback) and spindle reference point
S-0-0151	**Referencing dimension offset 2**	Distance between zero mark of external encoder (position via spindle feedback) and reference point of spindle
S-0-0076	**Scaling type position data**	Determining data processing format „Modulo“
S-0-0103	**Modulo value**	Degrees of angle of a revolution (360°)
S-0-0403	**Status of actual position value**	Position data reference
P-0-0074	**Motor encoder interface**	ID number of encoder interfce for relevant motor feedback (see section 7.2)
S-0-0116	**Resolution motor encoder**	Resolution of the motor feedback (see section 7.2)
S-0-0277	**Position encoder type parameter 1**	Setting of the feedback type (see section 7.2)
P-0-0075	**External encoder interface**	ID number of encoder interface for relevant spindle feedback (see section 7.2)
S-0-0117	**Resolution external encoder**	Resolution of the spindle feedback (see section 7.2)
S-0-0115	**Position encoder type parameter 2**	Setting of the feedback type (see section 7.2)
S-•-0121	**Load gear input revolutions**	Transmission ratio of load gear i = S-•-0121/S-•-0122
S-•-0122	**Load gear output revolutions**	Transmission ratio of load gear i = S-•-0121/S-•-0122

Tab. 7-20: Parameter for drive-controlled referencing

Parameter ID number	Parameter name	Comments
P-0-0300	**Spindle positioning parameter 2**	Setting type of position measurement and actual position status
S-0-0151	**Referencing dimension offset 2**	Distance spindle reference switch signal and reference point of spindle
P-0-1215	**Cam search speed**	Speed for reading in spindle reference signal
S-0-0400	**Referencing point switch**	Trigger message of spindle reference switch

Tab. 7-21: Additional parameters for drive-controlled referencing with indirect measuring systems

Pre-Settings

⇒ Set parameter for the definition of position data:

S-0-0076 Scaling type position data to

- rotary scaling in angular degrees
- modulo format and
- load reference

⇒ Set parameter **S-0-0103 Modulo value** to „360“

⇒ Set parameter value of installed measuring system:

- motor feedback parameters (see section 7.2)

P-0-0074 Motor encoder interface,
S-0-0116 Resolution motor encoder
S-0-0277 Position encoder type parameter 1

If spindle position measurement uses a spindle feedback:

- spindle feedback parameters (see section 7.2)

P-0-0075 External encoder interface
S-0-0117 Resolution externer encoder
S-0-0115 Position encoder type parameter 2

⇒ Set parameter **S-•-0222, Spindle positioning speed,** to a smaller value, e.g., 50...100 min^{-1}

⇒ Only applies to indirect spindle position measurement (motor feedback with spindle reference switch):
Parameter **P-0-1215, Cam search speed,** must be set to a value relevant to the precision needed (see section 8.3.3).
Parameters **S-•-0121** and **S-•-0122, Lload gear input and output revolutions** must be set with relevant values.

⇒ Set parameter **S-•-0159, Monitoring window,** as per section 7.8, „Position control monitoring“.

⇒ Set parameters that define drive-controlled referencing:

- **S-0-0154 Spindle positioning parameter**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X					S-0-0154
														0	0	clockwise
														0	1	counterclockwise
														1	0	shortest path
													0			absolute positioning
													1			relative positioning
												0				pos. with motor feedb.
												1				position with spindle feedback

Tab. 7-22: Parameter value for referencing options

- **P-0-0300 Spindle positioning parameter 2**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X	X	X			P-0-0300
																Measuring system:
															0	-Motor or spindle feedback (default)
															1	-Motor feedb. and spindle ref. switch
														0		Status act. pos. value not referenced ..not set (defaults)
														1		..set

Tab. 7-23: Parameter value for indirect spindle position measurement

Setting Reference Dimensions of Measuring System and Spindle

How to proceed:

⇒ Set parameters **S-0-0150, S-0-0151 Reference dimension offset 1, and 2** and parameters **S-0-0052, S-0-0054 Reference dimension actual position value 1** and **2** to „0“.

⇒ Set parameter **S-0-0154, Spindle positioning parameter,** to „absolute positioning“.

⇒ Set position command value in parameter **S-0-0153, Angle position of spindle** to 0 ∠-°.

⇒ Start command **S-0-0152, Spindle positioning**.

Once the command is complete, spindle position control is on the reference mark (zero pulse of the motor or spindle feedback or switching edge of the spindle reference switch).

Determine position difference to spindle zero position:

⇒ Estimate position difference of assumed position to spindle zero position. Run spindle while **Command S-0-0152, Spindle positioning,** is set by inputting relevant position command value in **S-0-0153, Angle position of spindle,** to spindle zero position.

⇒ Enhter the value of **S-0-0153, Angle position of spindle,** which leads to the correct spindle zero position in **S-0-0150** or **S-0-0151, Reference dimension offset 1** or **2.** Then set **S-0-0153, Angle position of spindle** to „0“.

⇒ Conduct command **S-0-0148 C6 Drive-controlled referencing**.

Note: Each time the values in parameter referencing dimension offset 1 or 2 are changed, the command drive-controlled referencing must be conducted for the changed offset values to be used in the actual position computations!

The reference dimension between the relative measuring system and spindle is now set and can be established automatically via command **C6 Drive-controlled referencing**.

Referencing the Measuring Systems

Before the spindle can be run in position control it is necessary to establish the reference dimension between the measuring system and spindle. The referencing procedure must, in relative measuring systems, be executed after each new start of the machine and each time the gear stage is changed!

⇒ Conduct command **S-0-0148 C6 Drive-controlled referencing**.

- If direct measuring system is used (motor or spindle feedback), then drive-controlled referencing bit 0 of **S-0-0403, Actual position value status,** must be set from „0“ to „1“. The actual position value changes suddenly. It now relates to the zero position of the spindle. The established absolute reference dimension is retained until the supply voltage is shutdown if actual position values do not fail (e.g., excessive spindle feedback speeds).

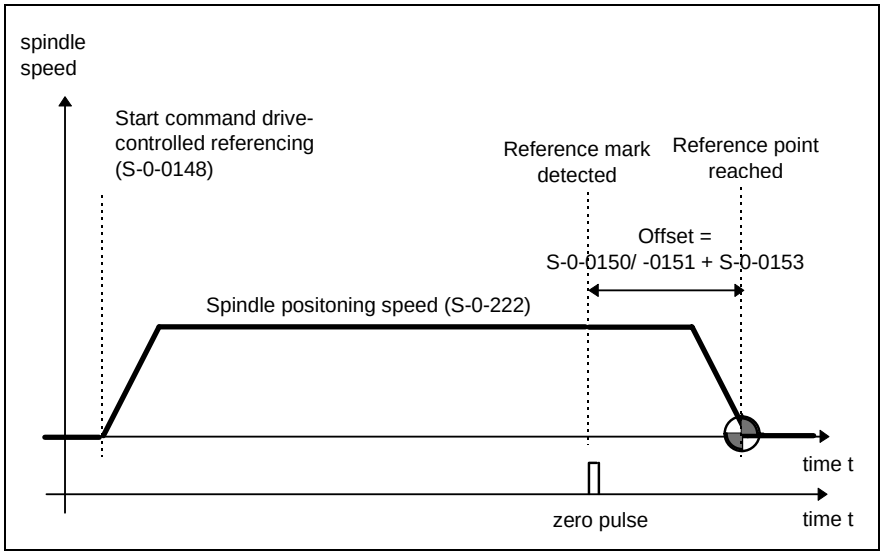


Fig. 7-29: Velocity-time diagram of drive-controlled referencing with direct measuring systems with relevant parameters

- If an indirect measuring system (motor feedback with spindle reference switch) the drive-controlled referencing bit 0 of **S-0-0403, Actual position value status,** is only set from „0“ to „1“ if bit 1 in **P-0-0300, Spindle positioning parameter 2**, is set to „1“.
  The established absolute reference dimension is retained until the gears are changed or until the supply voltage is powered down.

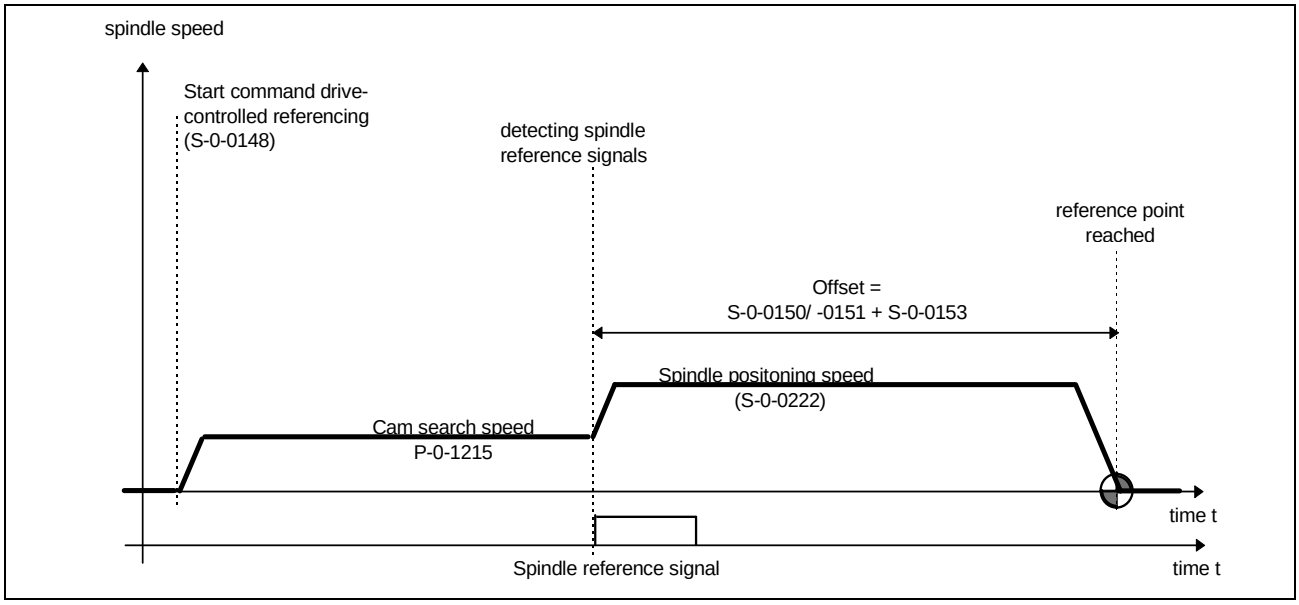


Fig. 7-30: Velocity-time diagram for drive-controlled referencing with indirect measuring systems using relevant parameters

Diagnoses

When executing this command, the message **"C6"** appears in the H1 display of the controller.

Fault Notes

If error message C6-01 is flashing:

The control enable signal not set at start of command.

⇒ Set drive enable prior to command stasrt!

If error message C9-04 is flashing:

The direct measuring system needed accordng to the spindle positiong parameter (spindle feedback or external encoder) is either missing or has not yet been connected.

⇒ Check spindle feedback for correct connection.

If error message C6-04 is flashing:

Motor or spindle feedback is set as absolute encoder.

⇒ Conduct command **P-0-0012 C3 Set absolute dimension** (see section 7.3)

If the spindle turns after command start without referencing:

- Spindle reference switch not detected.

⇒ Check spindle switch and wiring!

- or -

- The scaling type of position data is set to „Absolute format“

⇒ Bit 7 of parameter **S-0-0076, Scaling type of position data** must be set to „1“ (modulo format).

If the actual position value does not agree with the spindle position in an indirect measuring system:

- Ratio is not correct.

⇒ Ratio in parameters **S-•-0121** and **S-•-0122**, **Load gear input and output revolutions** must be entered correctly

- or -

- motor feedback missing or incorrectly set

⇒ motor feedback and its settings must be checked in the relevant parameters

7.10 Filtering Mechanical Resonance Oscillations

Explanations

DIAX04 drives are in a position to supress oscillations occurring due to the drive train between motor and axis or in the spindle mechanics along a narrow band. This achieves increased drive dynamics with good stability.

Application notes

If the windings of the drive mechanics are rigid then the mechanical system of rotor/drive train and load can be stimulated to mechanical oscillations due to position or speed regeneraiton in a closed loop. This behavior described as "Two Mass Oscillation" generally specifies behavior occurring within a frequency range of 400 to 800 Hz, depending on the stiffness of the mechanics and the spatial expansion of the system.

This „Two Mass Oscillation“ generally has a very clear resonance frequency which can be selectively surpressed by the band-stop filter built into the drive.

When suppressing the mechanical resonance frequency, the dynamics of the velocity control loop and position control loop in terms of control can be considerably improved without band-stop filter.

The results are increased contour accuracy and shorter cycle times for positioning procedures with sufficient clearance to the stability limits.

Technical Features

The band-band-stop frequency and the width of the filter can be set. The attenuation of the band-band-stop frequency is greatest, the bandwidth fixes the frequency range whereby attenuation is less than -3dB. Greater bandwidth means less attenuation of the band-band-stop frequency!

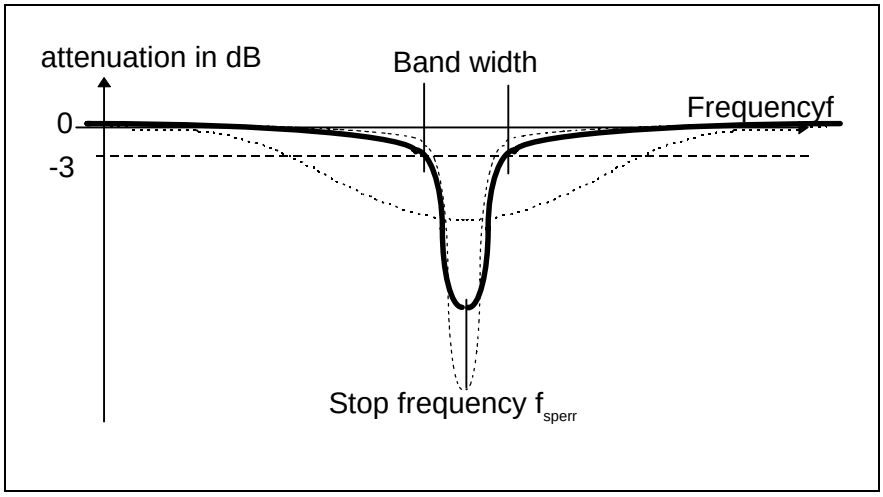


Fig. 7-31: Amplitude of the band-stop filter as dependent on quality of bandwidth

The filter works within the velocity control loop and is within the four switchable parameter blocks. Depending on the respective mechanical coupling of the load, e.g., with switchable gears, it is possible to activate optimum filter parameter values.

Project Planning

Filtering mechanical resonance oscillations occurs completely at a parameter level. No additional cables are needed to activate this function!

Commissioning

Parameter overview

Parameter ID number	Parameter name	Comments
P-•-0180	**Stop frequency of speed controller**	four-fold existing switchable parameter (• ∈ {0,1,2,3}), frequency at maximum attenuation (?dB)
P-•-0181	**Bandwidth stop filter**	four-fold existing switchable parameter (• ∈ {0,1,2,3}), attenuated frequency range

Presettings

Stop filter must first be set inactive:

⇒ In parameter **P-•-0181 Bandwidth stop filter** enter „0“

Determining resonance frequency

⇒ Switch drive to phase 4, do not set drive enable

⇒ Oscilloscope must be connected to analog output channel, set „Actual speed value after mixing and filtering“

- or -

⇒ Use oscilloscope function of drive to display „Actual speed value after mixing and filtering“.

⇒ Set **S-0-0392, Actual speed value filter time constant** to 250µs (Default value see section 3).

⇒ Excite drive mechanics to oscillate (a slight tangential tap with a rubber hammer is suggested).

⇒ Record chronological curve of the velocity oscillations using an oscilloscope or such a function and analyze the salient frequencies.

Output state of control behavior

⇒ Set drive enable and speed control loop by optimizing inactive stop filter (see 7.7, Setting speed controller)

⇒ Record response of „Actual speed value after mixing and filtering“ and „Torque-generating command current“ at low speed command step (the torque-generating command current may not move into the limitation).

Band-stop filter of and check affect

⇒ Enter the clearly salient frequency in Hz in parameter **P-•-0180 Band stop frequency of speed controller**.

⇒ In parameter **P-•-0181 Band width of stop filter** enter a minimum band width (e.g., 25Hz)

⇒ Record previous step response.

If step response reifies itself as a slight over-oscillation and has a short duration:

⇒ Check whether a change in the value of **P-•-0181 Band width of stop filter** brings about another improvement

- or -

⇒ check whether the change in value of **P-•-0180 Band stop frequency of speed controller** brings about another improvement.

If the step response behavior remains unchanged:

⇒ Analyze the resonance frequency

- or -

⇒ set value in **P-•-0181 Band width of stop filter** to a higher value

Stop filter or speed control optimized

⇒ Using the already optimized values of **P-•-0180 Band stop frequency of speed controller** and **P-•-0181 Band width of stop filter** to optimize the speed controller again (see above).

The step response defined above must have a similar appearance in the case of higher values for **S-•-0100 Velocity control P-gain** and/ or smaller values of **S-•-0101 Velocity control integral action time**.

⇒ It may be necessary to execute another optimization run for **P-•-0180 Band stop frequency of speed controller** and **P-•-0181 Band width of stop filter** using the step response (see above).

Optimizing the position control loop

After the velocity control loop has attained the maximum possible dynamics, optimize the position control loop (see section **7.7 Setting the Position Loop**).

Diagnoses

The activated stop filter is not diagnosed!

Fault Notes

There are no fault notes for the stop filter!

7.11 Language Switching

Parameter **S-0-0265, Language switching** can be used to change the language of

- parameter names and units
- diagnostic texts

Presently, the following languages are used:

Value of S-0-0265:	Language
0	German
1	English

Tab. 7-24: Language switching

8 Main Spindle Functions

8.1 Parameter Block Switching

Explanation

DIAX04 main spindle drives are equipped with four parameter blocks which can be switched during operation. One of the four is always active. A control command triggers the switch.

Application Instructions

In addition to cutting jobs, main spindle drives mounted to high-performance machine tools can also fulfill such tasks as

- C axis mode
- positioning operations for tool change with different transmission ratios
- drive-controlled gear changes
- synchronous spindle mode for slicing or conveying of parts to be turned while a spindle is running
- specific functions during different parts of the machine cycle

To meet the demands of these varying tasks, it must be possible to flexibly and automatically adapt the drive.

Technical Features

The switchable parameter blocks make the following main spindle features settable in terms of:

- Speed command value ramp, two-stage (with ramp change threshold)
- Smoothing time constant for speed command value smoothing
- Speed limit value
- Monitor window for „speed reached“, spindle standstill and „Position reached“
- Speed control setting (P-gain, integral action time)
- Position control setting (P-gain, positioning speed, lag error monitoring window)
- Signal threshold for drive load
- Pre-magnetization factor to adapt the drive to servo (C axis) / spindle demands
- Gear transmission (for gear-change gearbox)
- Filter to attenuate mechanical resonance oscillations

Given the relevant setting, the parameter block switch can also trigger the drive-controlled gear or winding switching process.

Project Planning

The parameter block change is done purely at the parameter level. No additional cables are required to activate this function.

Commissioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0217	**Parameter block preselect**	Parameter block number of the parameter block to be switched into
S-0-0216	**d1 Command switch parameter block**	
S-0-0254	**Current parameter block**	Acknowledge currently active parameter block
S-0-0219 **S-1-0219** **S-2-0219** **S-3-0219**	**ID no. list parameter block**	List of switchable parameters contained in relevant parameter block
P-•-1201	**Ramp 1 slope**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.4
P-•-1202	**Ramp 1 end speed**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.4
P-•-1203	**Ramp 2 slope**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.4
P-•-1222	**Command value smoothing time constant**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8-1
S-•-0091	**Bipolar velocity limit value**	four-fold switchable parameters (• ∈{0,1,2,3}), see section 6.2
S-•-0157	**Velocity window**	four-fold switchable parameters (• ∈{0,1,2,3})
S-•-0124	**Standstill window**	four-fold switchable parameters (• ∈{0,1,2,3}),
S-•-0057	**Positioning window**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 0
S-•-0100	**Speed control P-gain**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 7.7
S-•-0101	**Speed control integral action time**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 7.7
S-•-0104	**Position control P-gain**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 7.7
S-•-0222	**Spindle positioning speed**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 0
S-•-0159	**Monitoring window**	four-fold switchable parameters (• ∈{0,1,2,3})
S-•-0126	**Torque threshold M_{dx}**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.8
S-•-0158	**Power threshold P_x**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.8
P-•-0532	**Premagnetization factor**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 5.3
S-•-0121	**Load gear input revolutions**	gear ratio load gears i = S-•-0121/S-•-0122,
S-•-0122	**Load gear output revolutions**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.6

S-•-0218	**Gearstage preselection**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 8.6
P-•-0180	**Stop-band frequency velocity controller**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 7.10
P-•-0181	**Bandwidth stop-band filter**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 7.10
P-•-0532	**Pre-magnetizing factor**	four-fold switchable parameters (• ∈{0,1,2,3}),see section 5.3

Tab. 8-1: Parameter for gear changes and switchable parameters

Initial state

After powering up, parameter block „0“ is always active and in **S-0-0254, current parameter block**, „0“ is displayed.

Execute parameter block switch

⇒ Enter the number of the parameter block to be switched into in parameter **S-0-0217, Parameter block preselect**.

⇒ Start commands **S-0-0216, Command switch parameter block** via the control.

⇒ Check whether switch has been successfully completed using **S-0-0254, current parameter block.** The new parameter block number must be acknowledged here.

⇒ Clear command **S-0-0216, Command switch parameter block,** via the control.

Diagnosiss

While the command is being executed, the H1 display of the controller reads „d1“.

Fault clearance

If the error message d1-01 is flashing:

The drive is not in Sercos phase 4 at the start of the command.

⇒ Command **d1, switch parameter block**, can only be activated in phase 4!

8.2 Drive-Controlled Oscillating

Explanation

Given the command from the control, the main spindle drive will ignore the cyclical command default value and will independently turn in either a positive or negative direction (oscillating speeds). The cyclical velocity curve can be set with the use of parameters. It can be either symmetrical or asymmetrical.

Application Instructions

With oscillating speeds, the main spindle drive supports:

- engaging gear wheels when switching gear drive
- engaging form-fitting coupling units (e.g., when coupling test specimen of combustion motors to test stands)

Technical Features

Drive-controlled oscillating is adapted via parameters to the individual needs of the engage process. Oscillating cycle time, oscillating speed and oscillating offset speed can be set. Using the oscillating offset speed it is possible to structure the oscillating process asymmetrically to overcome tooth-to-tooth positions during the engage process.

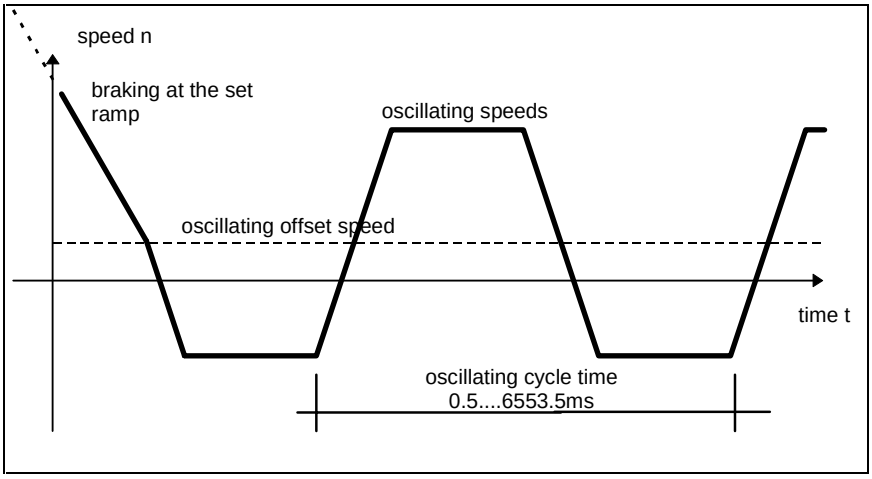


Fig. 8.1: Velocity curve during drive-controlled oscillating

The drive-internal command value for oscillating is generated cyclically from the oscillating offset speed +/- oscillating speed. Any slopes that have been set drive-internally are not active.

The parameter values for drive-internal oscillating can be changed during the oscillating process. The drive will respond to new values directly after the completion of the cycle time.

Upon completion of the command, the drive accelerates on the set slope to the currently pending velocity command value.

Project Planning

Drive-controlled oscillating procedures take place purely at a parameter level. No additional cables are needed to activate this function.

Commissioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0190	**d2 Command drive-controlled oscillating**	
S-0-0215	**Oscillating cycle time**	oscillating cycle time
S-0-0213	**Oscillating speed**	amplitude of oscillating cycle
S-0-0214	**Oscillating offset speed**	speed level of the oscillating cycle, mean value of oscillating speed

Tab. 8-2: Parameter for drive-controlled oscillating

Pre-settings

⇒ The value in **S-•-0157 Speed window** may not equal zero!

⇒ The parameter values in **S-0-0215, Oscillating cycle time**, **S-0-0213, Oscillating speed** and **S-0-0214, Oscillating offset speed** must be checked and set with values suitable for the spindle mechanics, if necessary. The value in **S-0-0215, Oscillating cycle time,** must range between 0.5 and 6553.5ms (incremental width 0.5ms)!

Execute oscillation

⇒ Starten **Command S-0-190, d2 Command drive-controlled oscillating**, via the control.

Once the command is started, the drive brakes speed controlled to the set slope if the motor was at speed and then goes into oscillating mode.

⇒ Clear commands **S-0-0190, d2 Command drive-controlled oscillating,** via the control if the control recognizes that the gear shaft is engaged.

Once the command is cleared, the drive goes speed controlled to the set ramp to its command velocity if a cyclical command value has been applied.

Diagnosis

While the command is being executed, the message „d2“ appears in the H1 display of the controller.

The command is acknowledged as executed if the motor speed achieves the internally generated oscillating velocity command value within the relevant window of the active parameter block, **Speed window S-•-0157**.

Fault guidelines

If the error message d2-01 is flashing:

The drive enable signal had not yet been set at the start of the command.

⇒ Set drive enable before command start!

If the error message d2-02 is flashing:

The spindle turns with **Oscillating offset speed, S-0-0214**, but does not achieve internal acknowledgement of oscillating offset velocity as the value in parameter **Speed window, S-•-0157**, equas zero!

⇒ • The value in parameter **Speed window, S-•-0157,** must be greater than zero!

If the drive oscillates but does not acknowledge the command in data status:

The drive cannot completely comply with the internally generated velocity command value.

⇒ Oscillating cycle time S-0-0190 must be increased, oscilllating speed S-0-0213 decreased.

8.3 Spindle Positioning

Explanations

Following a command from the control, the drive directs the spindle to the spindle zero position. The command position can be set via parameters. it can be set as either an absolute or a relative position.

Application Instructions

Spindle positioning is used in milling and drilling spindles

- to prepare for tool change. The spindle remains in a defined position to enable tool exchange.

Spindle positioning enables spindle alignment in the main spindles of lathes

- when changing the workpiece, if necessary,
- to bring workpieces into balance during a boring procedure and
- to index workpieces for more machining.

Spindle positioning enables a revolving machine

- to move a revolving table forward to bring the workpieces of the various machining stations into a defined machining position

Technical Features of Spindle Positioning

Command spindle positioning makes a drive and position controlled positioning of the spindle in speed control mode at standstill possible without having to switch from velocity into position control. The velocity command value set by the control is ignored for the duration of the command.

Positioning Process

The positining process depends on how the motor is mechanically coupled to the spindle:

Spindle / motor coupling	Positioning process: Spindle positioning via ...		
rigid coupling, i = 1	...motor feedback		
gear and gear change without slip, i≠1		...motor feedback with spindle reference switch	...spindle feedback
belt coupling with slip			... spindle feedback

Tab. 8-3: Combinations of spindle/motor coupling and positioning process

Positioning accuracy

Measuring systems	Use as ...	Positioning accuracy
high-resolution motor feedback (in 2AD and ADF: type 3)	motor feedback	abs.:±0.02 ° (±1.2') rel.: ±0.01'
digital servo feedback (in 2AD and ADF: type 6 and 7) (in MHD: type L and M)	motor feedback	abs.:±0.009° (±0.5') rel.: ±0.01'
high-resolution main spindle position encoder (in 1MB)	motor feedback	see doc. no. 209-0042-4119
high-resolution main spindle position encoder	spindle feedback	see doc. no. 209-0042-4119
incremental encoder with square-wave signals TTL	spindle feedback	abs.:see manuf. rel.: entspr.Ink.
incremental encoder with sine signals $1V_{SS}$	spindle feedback	abs.:see manuf. rel.: 2^{-10}/Inkr.
GDS, digital singleturn encoder	spindle feedback	see doc. no. 209-0069-4360

Tab. 8-4: Measuring systems and their resolutions relevant to spindle positioning

The achievable positioning accuracy at the spindle is, with the exception of the absolute precision of the measuring system, used as feedback, also dependent on the accuracy of the mechanical transmission elements.

Spindle positioning sequence via motor or spindle feedback

Spindle positioning can be started at spindle standstill or if the spindle is turning. The turning spindle brakes at the set velocity command slope (or with activated command value smoothing) to spindle positioning speed and then runs to the command position with absolute positioning.

The position assumed is held drive-internally and position-controlled at the command position.

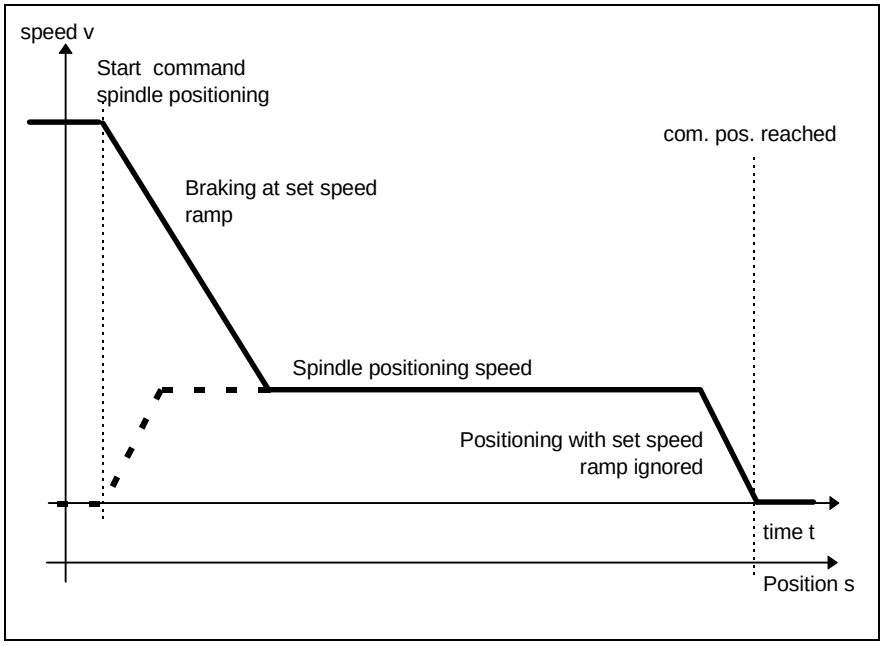


Fig. 8.2: Velocity-time diagram - spindle positioning

With relative spindle positioning the spindle moves around the set angle difference. It only makes sense if, prior to activating relative spindle

positioning, the spindle is standing in a defined positon, i.e., with a turning spindle, relative positioning can only lead to an uncertain standstill.

Upon completion of the command, the drive accelerates to the pending speed command value. The spindle positioning procedure is adapted with parameters to the demands of the machine:

- position command value - absolute or relative
- spindle positioning speed
- positioning direction
- position control P-gain
- message window „Position reached“,
- message window „Lag error monitoring“,
- select the positioning procedure

Spindle positioning with spindle reference switch

With a slip free, stiff gear with i ≠ 1 or gear-change gearbox, it is also possible to position via the motor feedback using a spindle reference switch mounted to the spindle.

The position difference of the spindle zero positon to the spindle reference signal can be set machine-dependently via parameters.

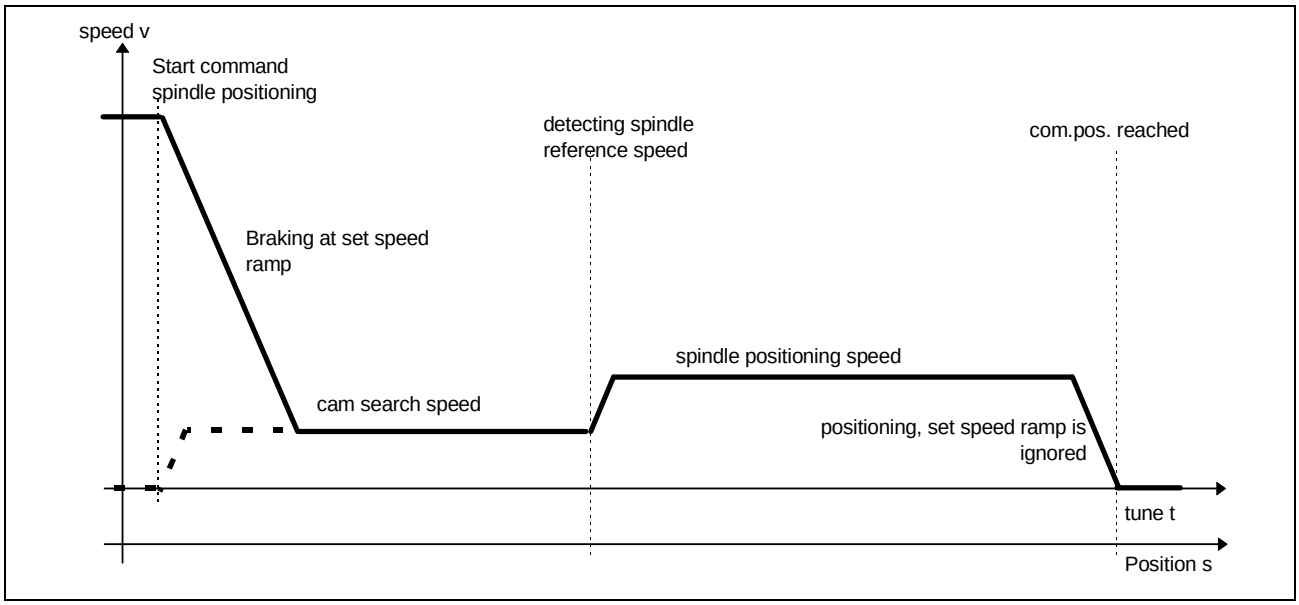


Fig. 8.3: Velocity-time diagram - spindle positioning with spindle reference switch

Accuracy of spindle reference signal detection

$$\Delta\varphi_{max} = n_{such} * 250\mu s * \frac{360° * min}{60s}$$

$\Delta\varphi_{max}$: greatest inacccuracy with spindle reference signal detection

n_{such}: cam search speed in min^{-1}

Equation 8-1: Calculating the systematic inaccuracy of the spindle reference signal detection process

The data on positioning accuracy applies as well!

The spindle reference signal is detected without regard to rotational direction at the same spot. Clockwise referencing sets the reference

positioning at the rising, while counterclockwise at sets the position at the falling switching edge.

Project Planning - Spindle positioning

Mechanical designs of spindle measuring systems

Measuring system	Mechanical design	How coupled to spindle
high-resolution main spindle position encoder	gear-wheel encoder made up of -measuring wheel with drill hole - sensor (kit)	measuring wheel mounted to spindle, sensor mounted to housing
digital singleturn encoder (GDS)	encoder with housing and encoder shaft	toothed belt

Tab. 8-5: Mechanical data on measuring systems made by Indramat

Plug-in modules for motor or spindle feedback

Plug-in modules are needed for the electrical connections of motor or spindle feedbacks depending on selected measuring systems:

Motor or spindle feedback	Plug-in module
digital servo feedback on motors (DSF), digital singleturn encoder (GDS) as motor feedback	not needed, X4 (motor feedback connection) always on housing of controller
high-resolution motor feedback on motors high-resolution main spindle position encoder (gear-wheel encoder) as spindle feedback	DZF1.1
digital singleturn encoder (GDS) as spindle feedback	DFF1.1
incremental encoder with square-wave signals (TTL) as spindle feedback	DEF1.1
incremental encoder with sine signals ($1V_{SS}$) as motor o. spindle feedback	DLF1.1

Tab. 8-6: Allocation of the plug-in modules to mains spindles on motor or spindle feedback measuring systems

The acceptable combinations of plug-in modules for motor and spindle feedbacks are outlined in the document „DIAX04 Main spindle drives; Drive Configurations“.

Electrical connections of plug-in modules

The terminal diagrams for plug-in modules are shown in doc. DIAX04 Plug-in modules for digital intelligent drive controllers; Project Planning, DOK-DIAX04-PLUG*IN*MOD-PRJ1-EN-P.

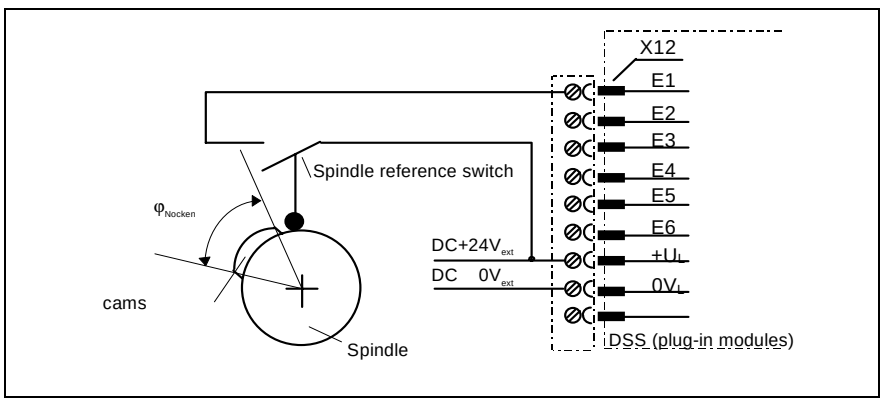


Fig. 8.4: Cam angle and electrical connections of a spindle reference switch

To ensure that the spindle reference signal is correctly read, the cam must cover a minimum angle:

$$\varphi_{Nocken} > n_{such} * 250\,\mu s * \frac{360° * min}{60s}$$

φ_{Nocken} : cam angle

n_{such}: cam search speed in min^{-1}

Equation 8-2: Calculating the cam angle

The minimum angle of the cam calculated as above also equals the systematic inaccuracy of the spindle reference signal detection (see above).

Commissioning - Spindle Positioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0152	**C8 Command spindle positioning**	
S-0-0153	**Spindle angle position**	absolute position command for spindle positioning
S-0-0180	**Spindle path**	relative command travel angle of spindle
S-•-0222	**Spindle positioning speed**	maximum speed with which spindle moves into position
S-0-0154	**Spindle positioning parameter**	parameter for setting options for spindle positioning
S-0-0150	**Reference offset 1**	distance between zero mark of motor encoder (pos. via motor feedback) and reference point of spindle
S-0-0151	**Reference offset 2**	distance between zero mark of ext. encoders (Pos. via spindle feedback) and reference point of spindle
S-0-0052	**Reference dimension actual positon value 1**	Pos. diff. between ref. and zero point of spindle or absolute measure set (position via motor feedback)
S-0-0054	**Reference dimension actual positon value 2**	Pos. diff. between ref. and zero point of spindle or absolute measure set (position via spindle feedback)
S-•-0057	**Positioning window**	message „In Position“, if position actual value in ± of positioning window around commant value
S-•-0104	**Position loop KV factor**	P-gain factor of position control loop
S-•-0159	**Monitoring window**	maximum allowable deviation of actual and commant position values
S-0-0076	**Scaling type position data**	determining data processing format „Modulo“
S-0-0103	**Modulo value**	setting degree of angle (360°)
P-0-0074	**Motor encoder interface**	ID number of encoder interface for relevant motor feedback (see section 5.3)
S-0-0116	**Resolution motor encoder**	Resolution of motor feedback (see section 5.3)
S-0-0277	**Position encoder type Parameter 1**	setting feedback type (see section 5.3)
P-0-0075	**External encoder interface**	ID number of encoder interface of relevant spindle feedback (see section 7.2)
S-0-0117	**Resolution external encoder**	Resolution of spindle feedback (see section 7.2)
S-0-0115	**Position encoder type Parameter 2**	setting feedback type (see section 7.2)
S-•-0121	**Load gear input revolutions**	gear ratio load gears i = S-•-0121/S-•-0122
S-•-0122	**Load gear output revolutions**	gear ratio load gears i = S-•-0121/S-•-0122

Tab. 8-7: Parameter for spindle positioning

Parameter-ID no.	Parameter name	Comment
P-0-0300	**Spindle positioning parameter 2**	determining spindle position with spindle reference switch
S-0-0151	**Reference dimension offset 2**	distance spindle reference switch signal and reference point of spindle
P-0-1215	**Cam search speed**	speed for reading in spindle reference switch signals
S-0-0400	**Reference point switch**	Actuating the spindle reference switch

Tab. 8-8: Additional parameters for spindle positioning with spindle reference switch

Pre-settings

⇒ Parameter for setting position data definition:
S-0-0076 Scaling type position data settings for

- rotatory scaling in angular degrees
- modulo format and
- load reference

⇒ Parameter **S-0-0103 Modulo value** set to „360“
⇒ Setting parameter values for the installed measuring systems:

- motor feedback parameter (see sec. 7.2)

P-0-0074 Motor encoder interface,
S-0-0116 Resolution motor encoder
S-0-0277 Position encoder type Parameter 1

If positioning via a spindle feedback:

- spindle feedback parameter (see sec. 7.2)

P-0-0075 External encoder interface
S-0-0117 Resolution external encoder
S-0-0115 Position encoder type parameter 2

⇒ Set parameter **S-•-0222, Spindle positioning speed,** to a value smaller than, e.g., 50...100 min^{-1}
⇒ Only in spindle positioning via motor feedback with spindle reference switch:
Set parameter **P-0-1215, Cam search speed,** to a value relevant to accuracy. Parameters **S-•-0121** and **S-•-0122, Load gears input and output revolutoins** must be set with relevant values.
⇒ Set parameter **S-•-0159, Monitoring window,** per sec. 7.8, „Position control loop monitoring“.
⇒ Set for spindle positioning features:

- **S-0-0154 Spindle positioning parameter**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X					S-0-0154
														0	0	clockwise
														0	1	counterclockwise
														1	0	shortest path
													0			absolute positioning
													1			relative positioning
												0				pos. via motor feedb.
												1				pos. via spindle feedb.

Tab. 8-9: Parameter values for spindle positioning options

- **P-0-0300 Spindle positioning parameter 2**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		P-0-0300
																- spindle positioning via...
															0	- motor or spindle feedback
															1	- motor and spindle reference switch feedb.
														0		status act. pos. value not set in referencing
														1		...set

Tab. 8-10: Parameter value for spindle positioning via motor feedback with spindle reference switch

Setting the reference dimension of relative measuring system / spindle

Procedure:

⇒ Set parameter **S-0-0150, S-0-0151 Reference dimension offset 1, 2** and parameters **S-0-0052, S-0-0054 Reference dimension actual position value1** and **2** set to value „0“.

⇒ Set parameter **S-0-0154, Spindle positioning parameter,** to „absolute positioning“.

⇒ Set position command value in **Parameter S-0-0153, spindle angle position**, to 0 ∠- degrees.

⇒ Start command **S-0-0152, C8 Spindle positioning**.

Upon completion of the command, the spindle is position-controlled on the reference mark (zero pulse fo the motor or spindle feedback or switching edge of the spindle reference switch).

Position difference to spindle zero position must be determined:

⇒ Estimate position difference of the assumed position to spindle zero position. Run spindle while **Command S-0-0152, spindle positioning,** is set by inputting relevant position command values in **S-0-0153, Spindle angle position,** orienting toward spindle zero position.

⇒ Enter the value of **S-0-0153, Spindle angle position,** which leads to correct spindle zero position in **S-0-0150** or **S-0-0151, Reference dimension offset 1** or **2**.

⇒ Execute command **S-0-0148 C6 Drive-controlled referencing**.

Note: Each change in the values in parameter **Reference dimension offset 1** or **2** means that the command **Drive-controlled referencing** must be executed so that the changed values in the drive-internal command position can be included in the computations!

The reference dimension between a relative measuring system and the spindle is now set.

Setting the reference dimension of the absolute measuring system / spindle

Procedure

⇒ Set parameter **S-0-0052, S-0-0054 Reference dimension actual position value1** and **2** to „0“.

⇒ Set parameter **S-0-0154, Spindle positioning parameter,** to „absolute positioning“.

⇒ Set position command value in **S-0-0153, Spindle angle position**, to 0 ∠- degrees.

⇒ Start command **S-0-0152, C8 Spindle positioning.**

Upon completion of the command, the spindle is position-controlled on the reference mark (zero pulse of the motor or spindle feedback or switching edge of the psindle reference switch).

Determining positioning diference to spindle zero position:

⇒ Estimate position difference of the assumed positon to spindle zero position. Run spindle while **Command S-0-0152, C8 Spindle positioning,** is set by inputting relevant position command value in **S-0-0153, Spindle angle position,** orienting toward spindle zero position.

⇒ If the actual position value does not equal "0" after the spindle position is assumed, then set parameters **S-0-0052** or **S-0-0054 Reference dimension actual position value 1** or **2** to the desired value.

⇒ Execute command **P-0-0012, C3 Set absolute dimension.**

The reference dimension between an absolute measuring system and the spindle is now set.

Referencing the Measuring Systems

Before the spindle can be positioned, it is necessary to establish the reference dimension between measuring system and spindle. The referencing procedure is conducted automatically in relative and absolute measuring systems once the command to start spindle positioning is given - if the absolute dimension is not already established:

- with spindle positioning via motor or spindle feedbacks, the drive references itself and the spindle during the first positioning procedure. Bit 0 of parameter **S-0-0403, Status of actual position value,** is set by the drive to „1“. The atual position value changes with a step function. it now references the zero position of the spindle. The established absolute reference dimension is retained until the power voltage is swtiched off, if the actual position value does not fail (fail, i.e., in the event of excessive spindle feedback speed). If the reference dimension is lost, then each new spindle positioning command generates another refrencing procedure.
- With spindle positioning via motor feedback with spindle reference switch, the drive references itself and the spindle with each new spindle positioning command automatically if in **P-0-0300, Spindle positoning parameter 2**, bit 1 is set to „0“. Bit 0 of **Parameter S-0-0403, Status of actual position value**, remains at „0“.

If in **P-0-0300, Spindle positioning parameter 2**, bit 1 is set to „1“ then referencing only occurs, e.g., in drives with gear-change gearbox within the active gear stage at the start of the first positioning procedure. Bit 0 of **Parameter S-0-0403, Status of actual position value**, goes to „1“, the actual position values have absolute reference, further positioning procedure run directly (without homing). Only after the active gear stage is changed, will there be a renewed referencing procedure.

- Execute Spindle Positioning

⇒ Start command **S-0-0152, C8 Spindle positioning**. Upon completion of the command, the spindle is position-controlled at the command (**S-0-0153, Spindle angle position**) or has continued to turn around the (**S-0-0180, Spindle path**).

Optimizing the spindle positioning procedure:

The spindle must be completely mounted. Everything affecting the entire moment of inertia including the additional mechanical components (tool, workpiece and similar) must be completely mounted.

⇒ First optimize the control loop parameter of the velocity and position control loops (see sec. 7.8, “Control loop settings“).

⇒ Permit the spindle to turn at low speed (approx. 100 min-1).

⇒ Start command **S-0-0152, Spindle positioning.**

⇒ Increase preset **Spindle positioning speed (S-•-0222)** until the spindle oscillates when assuming the command position (monitor spindle speed at analog output with oscilloscope, for settings of analog outputs, see section 9.1, „Analog output“).

⇒ Now lower the set **Spindle positioning speed (S-•-0222)** until oscillations cease.

Spindle positioning speed is now set to its maximum value. **Spindle positioning** now takes place in the shortest possible length of time.

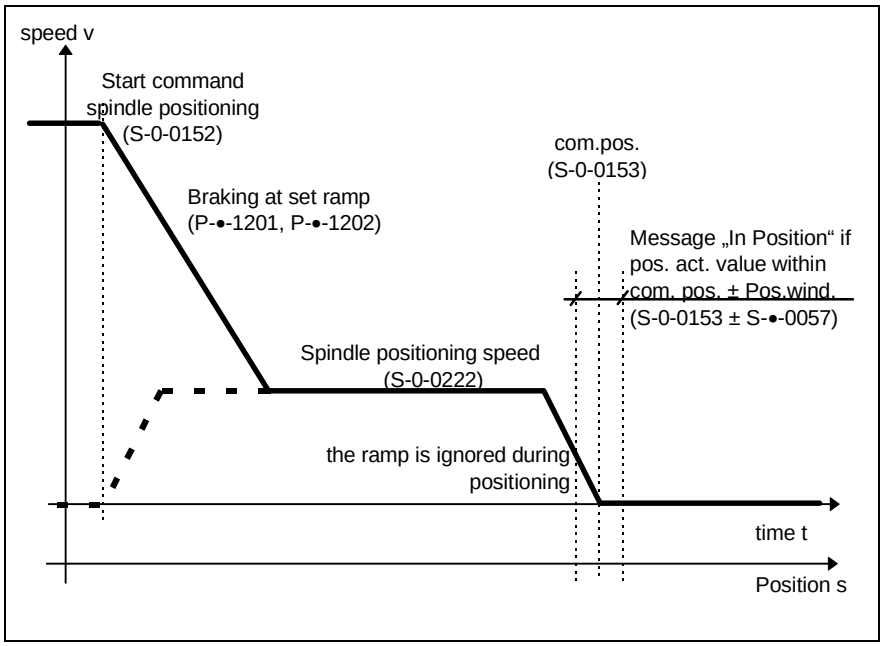


Fig. 8.5: Velocity-time diagram for spindle positioning in a direct measuring system with parameters relevant to the positioning procedure

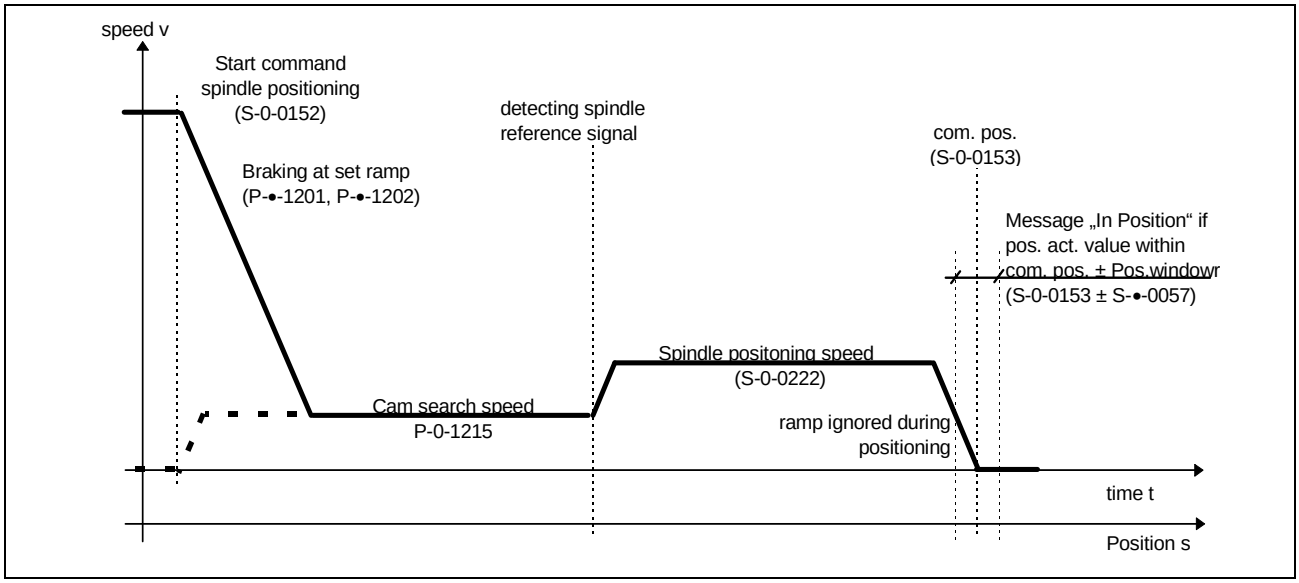


Fig. 8.6: Velocity-time diagram for spindle positioning in indirect measuring system with parameters relevant to positioning procedure

Note:

The directions "clockwise" or "counterclockwise" are only conducted if the spindle was at a standstill before the command was started or was turning at a speed less than that set in **S-•-0124 Standstill window**.

It makes sense to have the spindle standing still before switching from absolute to relative positoning. This starts the travel angle from a defined start position as the switch between absolute and relative positioning (bit 2 in **S-0-0154 Spindle positioning parameter**) takes place immediately even while the command is being executed.

Diagnosis

While the command is being executed, the H1 display of the controller reads „C8“.

The command is not ackowledged in the data status but is displayed in **S-0-0013, class 3 diagnostics** and in **S-0-0144, Signal status word**, if the spindle positon is within the tolerance range around the command position (**S-0-0153, Spindle angle position, ± S-•-0057, Positioning window**).

Fault guidelines

If the error message C9-02 is flashing:

The drive enable not set at the start of the command.

⇒ Set drive enable prior to command start!

If the error message C9-04 is flashing:

The direct measuring system specified as per spindle positioning parameter (spindle feedback or external encoder) if either not there or is not connected.

⇒ Check spindle feedback for correct connection.

If the error message C9-05 is flashing:

The motor or spindle feedback is an absolute encoder. The spindle cannot, however, position as command "Set absolute dimension" has not yet been executed.

⇒ Execute command **P-0-0012 C3 Set absolute dimension (**see section 7.3)

If the spindle turns without positioning after command start:

- The spindle reference switch is not detected.

⇒ Check spindle reference switch and wiring for correct functioning!

- **or -**

- The scaling type of the position data is set to „Absolute format“

⇒ • In parameter **S-0-0076, Scaling type for position data,** bit 7 is set to „1“ (modulo format).

If the spindle runs to wrong target position:

- The value in parameter **S-0-0103 Modulo value** is not equal to 360.
- Gear ratio is wrong (in positioning via motor feedback with spindle reference switch).

⇒ Gear ratio in parameters **S-•-0121** and **S-•-0122**, **Load gears input revolutions** and **output revolutions** must be entered correctly.

- **or -**

- motor or spindle feedback wrong or incorrectly set

⇒ motor or spindle feedback and its settings in relevant parameters must be checked

If the drive switches off with error F2-28 „Excessive position deviation":

The spindle cannot comply with the internally set position command values

⇒ Check whether spindle is mechanically blocked.

⇒ Check whether the parameter value in **S-•-0159, Monitoring window**, is set high enough, and if in doubt, increase!

⇒ Value in parameter **S-•-0222 Spindle positoning speed** may be too high! Set lower value!

If the spindle is standing in the desired positon, but „spindle in position“ is not signalled (S-0-0144 Signal status word, Bit 6 =1)):

The spindle position cannot be held by positon control within the positioning window around the position command value

⇒ check value in parameter **S-•-0057, Positioning window,** increase if necessary

⇒ if **S-•-0057, Positioning window** cannot be increased, oscillate actual position value by minimizing the position and velocity control parameters!

8.4 Drive-Internal Speed Command Value Ramp

Explanations

DIAX04 main spindle drives can internally transform step function changes in the velocity command value conducted by the control into a ramp-shaped velocity command value path.

Application Instructions

Spindle drives in machine tools are operated with velocity control to retain the correct cutting velocity of the workpiece. The mechanical coupling unit of the drive/spindle limits the acceleration of the drive to working speed.

As only the required working speed is important to the machine controls, it suffices to give the working speed to the drive, using a step function, if acceleration can be limited to acceptable values by means of a ramp function integrated into the drive.

Two settable ramp rates of rise make it possible to take the acceleration capabilities of the amin spindle drive into consideration as far as constant torque and power within the speed range are concerned.

The ramps can be switched to different ramp values with parameter block progressions (e.g., with gear changes).

Technical Features

The rise of the drive-internal velocity command value ramp can be set above or below a settable velocity threshold with different rates of rise:

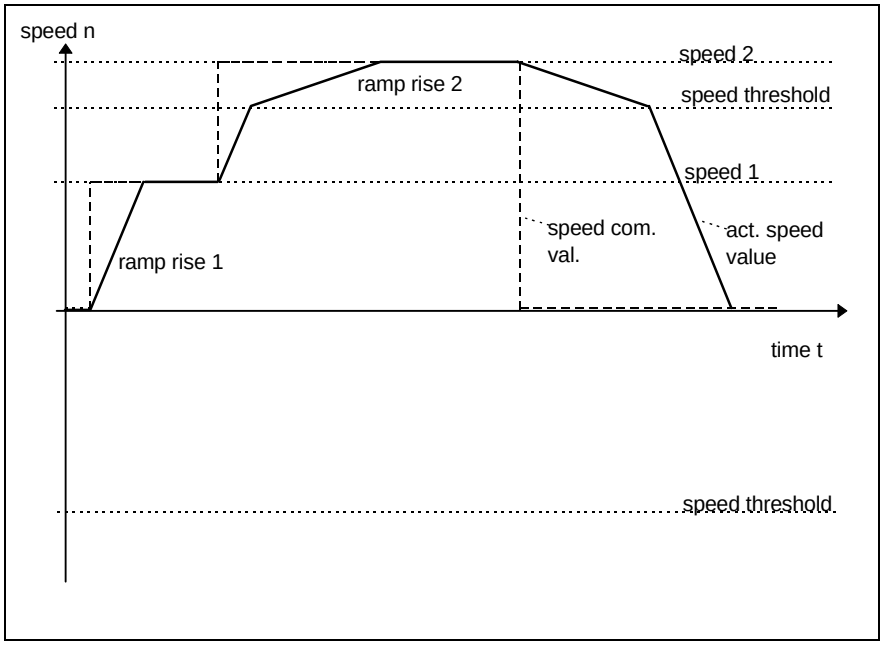


Fig. 8.7: Speed-time diagram of speed command and actual values in drive-internal speed command value ramp

The rise values and the velocity threshold can be matched during operation of the drive to different gear stages of a gear-change gearbox. The automatic parameter block switches take care of this.

Project Planning

The drive-internal velocity command value ramps are activated at a parameter level. No additional cables are required for this funciton.

Commissioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
P-•-1201	**Ramp 1 slope**	ramp rate of rise 1 (four-fold switchable; • ∈ {0;1;2;3})
P-•-1202	**Ramp 1 end speed**	speed threshold, change of ramp 1 rise to ramp 2 rise (four-fold switchable; • ∈ {0;1;2;3})
P-•-1203	**Ramp 2 slope**	ramp rate of rise 2 (four-fold switchable; • ∈ {0;1;2;3})

Tab. 8-11: Parameter for drive-internal speed command value ramp

Pre-settings

The parameter values for **P-•-1201, Ramp 1 slope** and **P-•-1203, Ramp 2 slope** are automatically active. Each velocity change is now limited to the ramp rate of rise which has been set.

⇒ Parameter values **P-•-1201, Ramp 1 slope, P-•-1203, Ramp 2 slope** and **P-•-1202, Ramp 1 end speed,** must be set with values usable with the spindle mechanics!

Drive-internal ramps active

If both ramp rate of rise parameters are set with values exceeding "0", then the ramps are automatically actie. Each elocity change is now limited to the ramp rate of rise which has been set.

If only one ramp rise has been set, then both ramp rise parmeters must have the same value!

Diagnosis

The drive does not diagnose the ramp functions!

Fault guidelines

If the drive still accelerates at the final limit despite a set ramp function:

- one of the parameters **P-•-1201, Ramp 1 slope, P-•-1203, Ramp 2 slope** is set with „0“.

⇒ Check parameter values! There may be no „0“!

- **or**
- Faulty parameter values in **parameter P-•-1201, Ramp 1 slope, P-•-1203, Ramp 2 slope**! Ramp rate of rise exceeds acceleration capabilities of drive!

⇒ Check parameter values! Enter smaller values!

8.5 Speed Command Value Smoothing

Explanation

The velocity command values supplied by the CNC control can be smoothed with a filter integrated into the main spindle drive. Smoothing can be switched on and off. The smoothing time constant can be set.

Application Instructions

When cutting windings, C-axis operations and all other machining processes for which the NC control generates a velocity command value, the command values are transmitted to the drive with the output cycle of the control. This command value path is step like with velocity changes.

Depending on the command value output cycle of the NC control (NC cycle time) this step like command value path can generate damaging torque surges in the spindle drive and the drive will not run quietly. With a filter integrated in the drive and set to the cycle time, the step like command value path can be smoothed and the spindle mechanics protected against torque surges.

The smoothing time constant can be switched while the spindle drive is operating so that the drive can automatically be adjusted to different machining processes.

Technical Features

The time constant of speed command value smoothing can be set from 0 to 999ms.

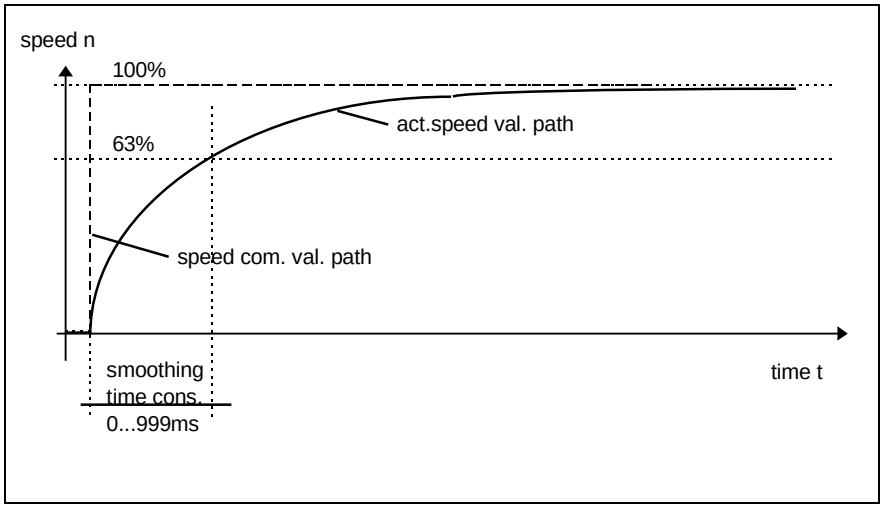


Fig. 8.8: Speed-time diagram of speed command value smoothing in command value steps

The command value smoothing filter is arranged in terms of the drive-internal velocity ramp. In other words, if the velocity command ramp is active, then the ramp like command value was smoothed. This attenuates the sudden change occurring with the ramp function.

Matching the smoothing time constant to different machining processed is done automatically with different parameter block changes.

Project Planning

The speed command value smoothing is done purely at a parameter level. No additional cables are required.

Commissioning

Parameter-ID no.	Parameter name	Comment
P-•-1222	**command value smoothing time constant**	time constant for speed command value smoothing (four-fold switchable; • ∈ {0;1;2;3})

Tab. 8-12: Parameter for speed command value smoothing

Pre-settings

The parameter value for **P-•-1222, Command value smoothing time constant,** is set to "0" at delivery. This means that smoothing is not active.

⇒ The parameter value of **P-•-1222, Command value smoothing time constant,** must be set to match the NC cycle time.

Recommendation:

Enter the NC cycle time in **P-•-1222.** Optimize drive behavior by inputting deviating values!

Speed command value smoothing activate

If parameter **P-•-1222, Command value smoothing time constant,** is set with values greater „0“, then the speed command value smoothing is automatically active. The set speed command value smoothing now effects each speed command value change.

Diagnosis

The speed command value smoothing is not diagnosed by the drive!

Fault guidelines

If the drive still does not run smoothly due to torque surges despite speed command value smoothing:

- Unacceptable parameter value in **P-•-1222, Command value smoothing time constant**! Smoothing time constant too low in terms of the NC cycle time!

⇒ Check parameter values! Enter higher values!

Attention: If smoothing time constants are too high, then considerable deviations between velocity command and actual values can occur! This can cause problems in higher-ranking position control.

8.6 Automatic Gearshift

Explanation

Given a command from the control, the drive independently switches the gear ratio of a two-stage gear-change gearbox. The drive brakes after the command until it is standing still and supports the prohresion process with oscillating speeds. A switching motor integrated into the gear conducts the transition. It is controlled directly by the controller via auxiliary contactors.

The successful transition of gear stages is signalled to the controller via acknowledgement contacts integrated into the gears. The spindle accelerates after the acknowledgement back to the currently pending command value.

Application Instructions

With a switchable gear it is possible to adjust the torque-power characteristics of the spindle with the same spindle drive to different machining requirements:

material removal (roughing): high torque, low speeds

fine machining (dressing): high speeds, low torque

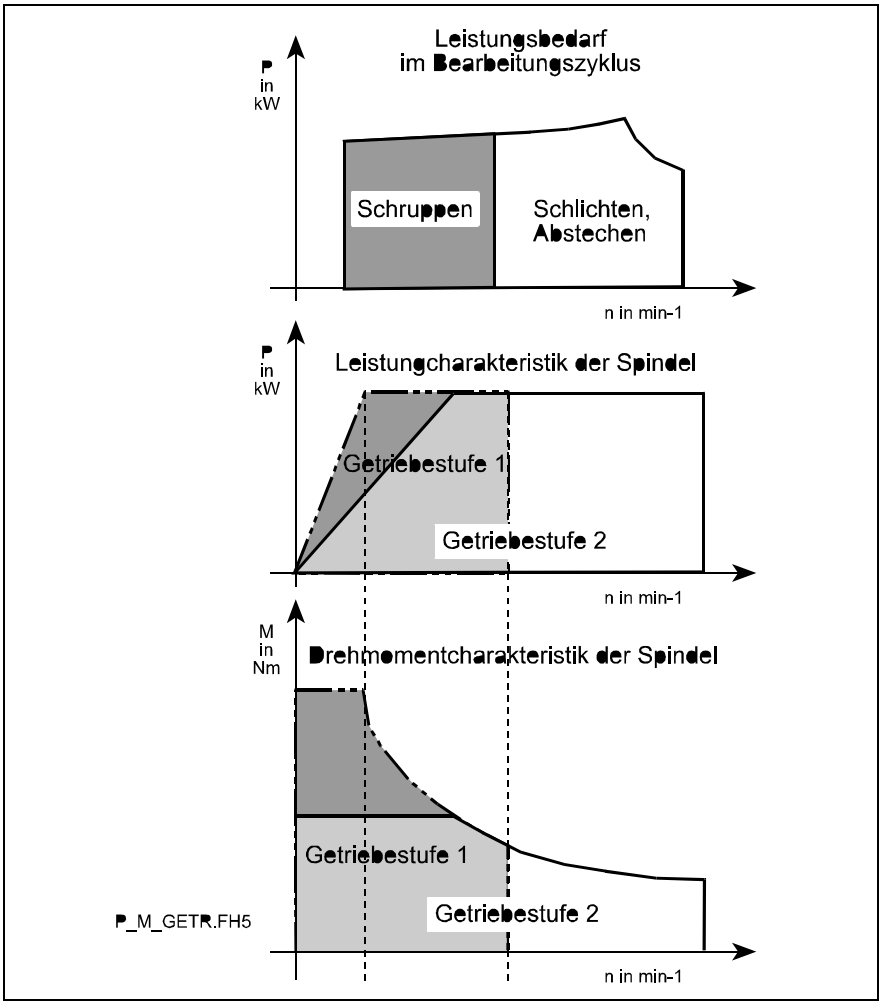


Fig. 8.9: Operating curve of a lathing spindle with gearbox

Gearshifting makes it possible to shift between high and low speeds over the entire speed range of the constnat spindle output range (the machining range).

Technical Features of the Gearshift

A gearshift is actuated by changing into a different parameter block which has a diffferent gear ratio. It is possible to shift gears during a machining cycle. The drive automatically returns to machinng speed upon sucessful completion of the change.

Sequence

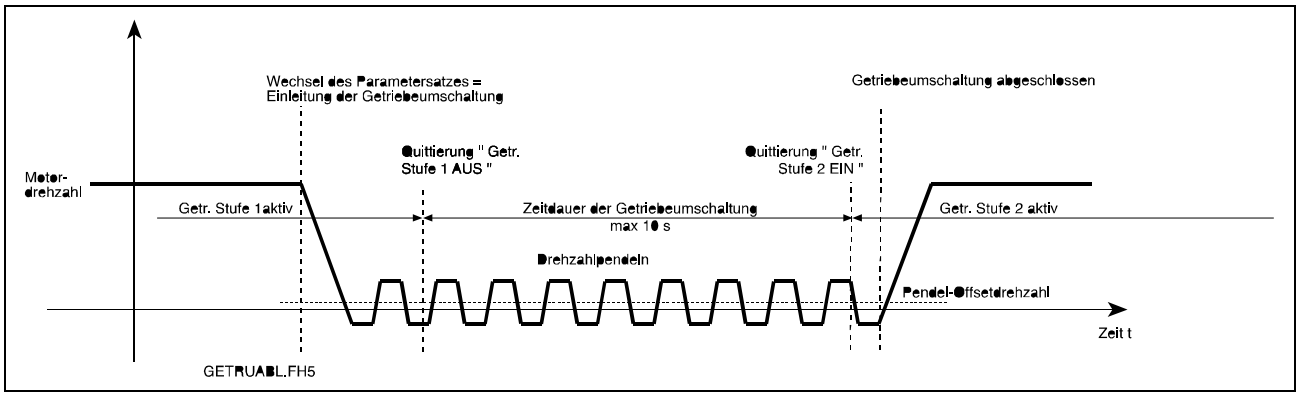


Fig. 8.10: Velocity-time diagram for automatic gearshift

Oscillating speed, cycle time and oscillating offset speed can be set to meet gear requirements. Oscillating offset speed is a constant speed value which is added to the oscillating speed. This overcomes tooth-to-tooth settings of the gearstages during a gearshift procedure.

Note: Gearshift can be used simultaneously with a start-delta connection!

Project Planning - Gearshift

If the controller is to automatically shift gears, a two-stage gearbox with switching motor and acknowledgement contacts is needed.

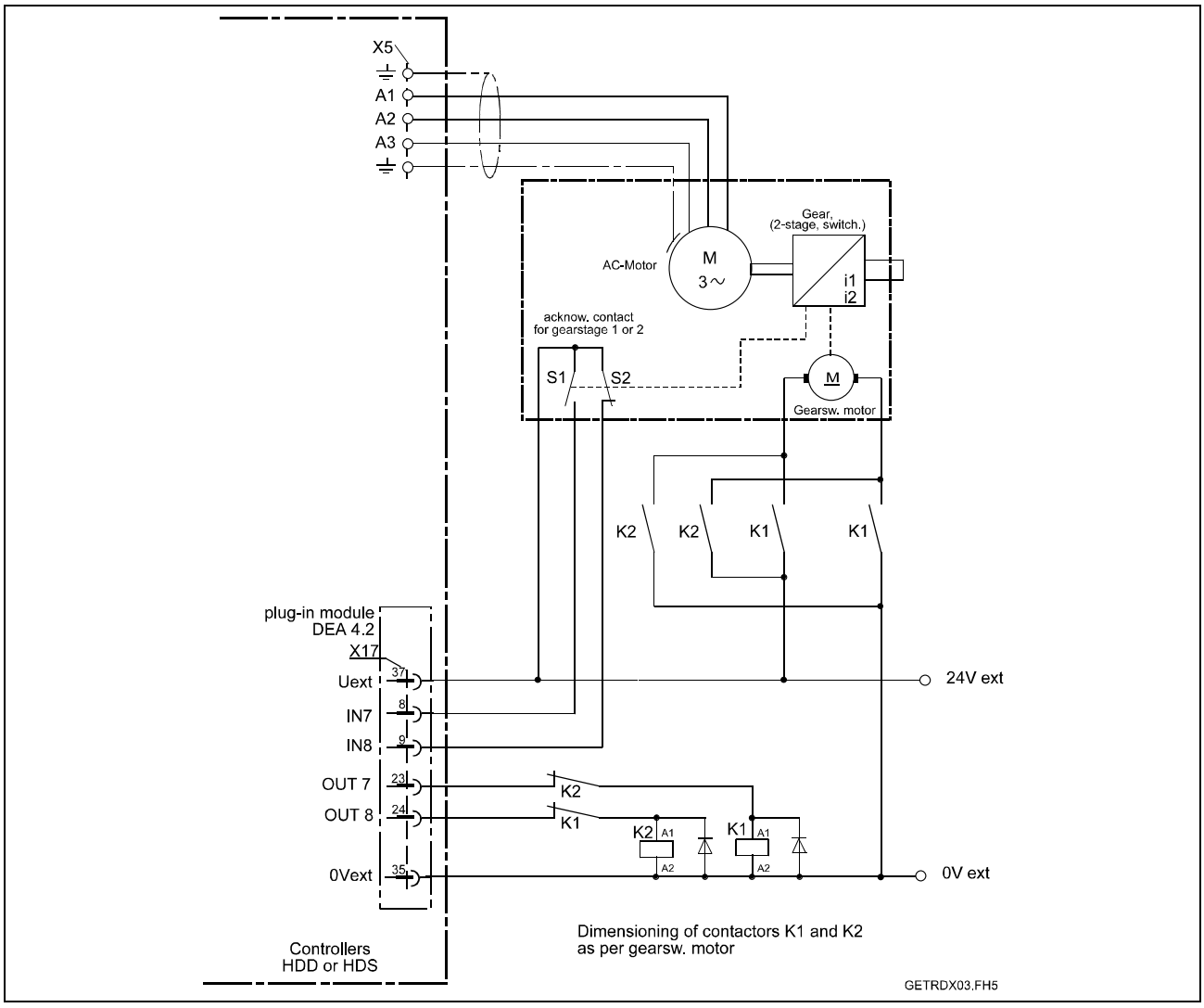


Fig. 8.11: Terminal diagram for gear switching

- **or**

Contactors with smaller holding power can be supplied with power from the power supply module (HVE or HVR), i.e., $24V_L/0V_L$. This voltage remains constant even with a power failure as long as the drive regenerates energy during deceleration!

Gearshift Commissioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0216	**d1 Command switch parameter block**	start up gearshifting (if set)

S-•-0218	**Gearstage preselect**	allocate gearstages to switchable parameter blocks
S-0-0213	**Oscillating speed**	amplitude of speed oscillation
S-0-0214	**Oscillating offset speed**	average speed of speed oscillation
S-0-0215	**Oscillating cycle time**	period of speed oscillation
S-0-0255	**Current gearstage**	signal of currently active gearstage
S-•-0121	**Load gears input revolutions**	gear ratio load gears i = S-•-0121/S-•-0122
S-•-0122	**Load gears output revolutions**	gear ratio load gears i = S-•-0121/S-•-0122

Tab. 8-13: Gearshift parameters

Pre-settings

⇒ Set parameters allocated to gearshifting:

- **S-•-0218 Gear-stage preselect**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
0	0	0	0	0	0	0	0	0	0	0	0	0	0			S-•- 0218
														0	0	Gearstage preselect - none
														0	1	- Gearstage 1
														1	0	- Gearstage 2

Tab. 8-14: Parameter values for allocating gearstages in relevant switchable parameter block

Note: If a switchable gearbox is controlled by the drive, then each of the four switchable parameter blocks must be allocated one gearstage (1 or 2) even if not all parameter blocks are being used!

⇒ Enter parameters **S-•-0121/S-•-0122, Load gears input/output revolutions** into parameter blocks which are gearstage dependent. Unused parameter blocks can remain at the default value („1“).

⇒ Set parameter values for oscillating speed: for 2AD or ADF motors with built-in two-stage gears made by ZF, the following recommendations apply:

Parameter number	Parameter name	Recommended value
S-0-0213	Oscillating speed	8 min^{-1}
S-0-0214	Oscillating offset speed	1 min^{-1}
S-0-0215	Oscillating cycle time	400 ms

Fig. 8-15: Parameter values for gearshift

⇒ Value in **S-•-0157 Speed window** may not equal zero!

Executing a gearshift



WARNING

Drive does not move until first drive enable is applied to the selected gearstage, if already active.

Danger from sudden speed oscillations!

⇒ Secure range of motion of spindle!

⇒ Start command **S-0-0216 d1 switch parameter block.**

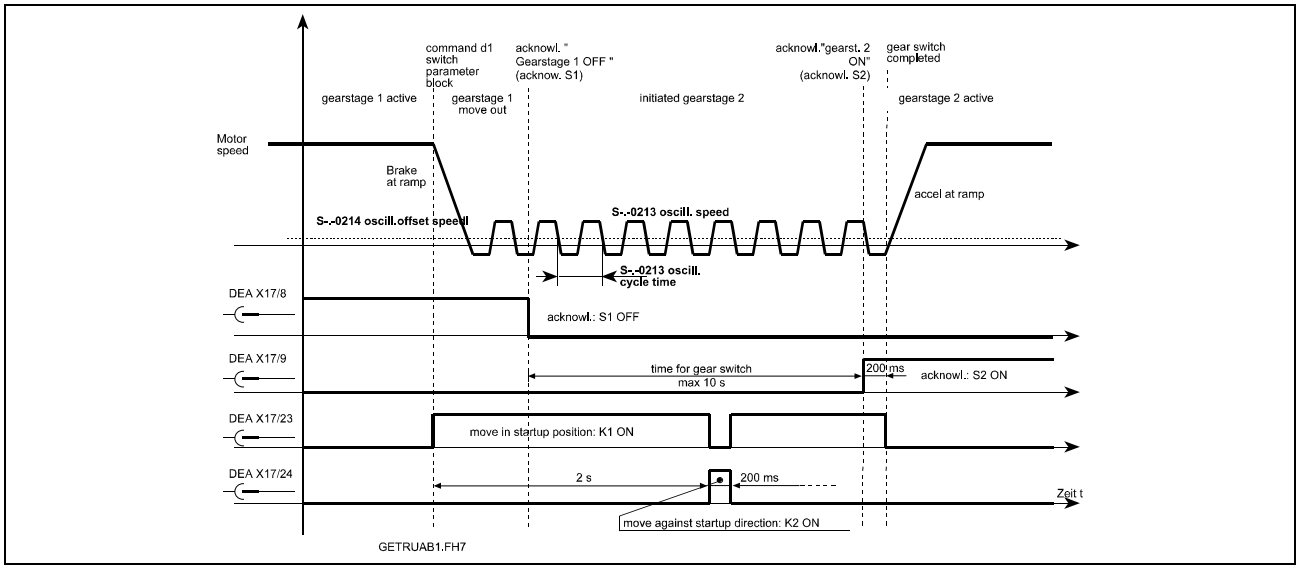


Fig. 8.12: Time diagram of the signal for gearshifting (shifting from 1 to 2)

Once gearshift is completed, the drive accelerates to the currently pending velocity command value and continues machining!

Diagnosis

While the command is being executed, in the H1 display of the controller, the message „d1“ appears.

Fault guidelines

If the error message C2-29 is flashing:

Plug-in module DEA 4.2 not in controller!

⇒ Equip controller with plug-in module DEA 4.2!

If the error message C2-30 is flashing:

Gearstage allocation incomplete!

⇒ Preselect gear-stage for each of the switchable parameter blocks! (See above „Pre-settings).

If the error message F8-62 is flashing:

Gearshift acknowledgement missing!

⇒ Check gearbox for correct switching and acknowledgement functions.

⇒ Check wiring and signal voltage.

If the error message d1-02 is flashing:

Oscillating offset speed **(S-0-0214)** cannot be achieved!

⇒ Parameter **S-•-0157 Standstill window** must be set not equal to 0.

⇒ Check whether spindle is mechanically blocked.

⇒ Check whether there is a break in the motor cable.

8.7 Automatic Star-Delta Switch

Explanation

Upon receiving a command from the control, the drive independently initiates the windings swich of the spindle motor. If the drive is running, it remains at speed, becomes currentless for the duration of the switch and, with completion of the switch, continues to work at the current command value.

The start-delta switch is conducted via power contactors which are controlled via auxiliary contactors directly by the controller.

Auxiliary contactors of the power contactors akcnowledge the switch and signal its completion to the controller.

Application Instructions

A star (Y) delta (Δ) switch makes it possible to adapt the torque power features of the spindle in short-term operations to various machining requirements without the need for mechanical transmission elements:

material removal (roughing): high torque, low speeds

fine machining (dressing): high speeds, low torque

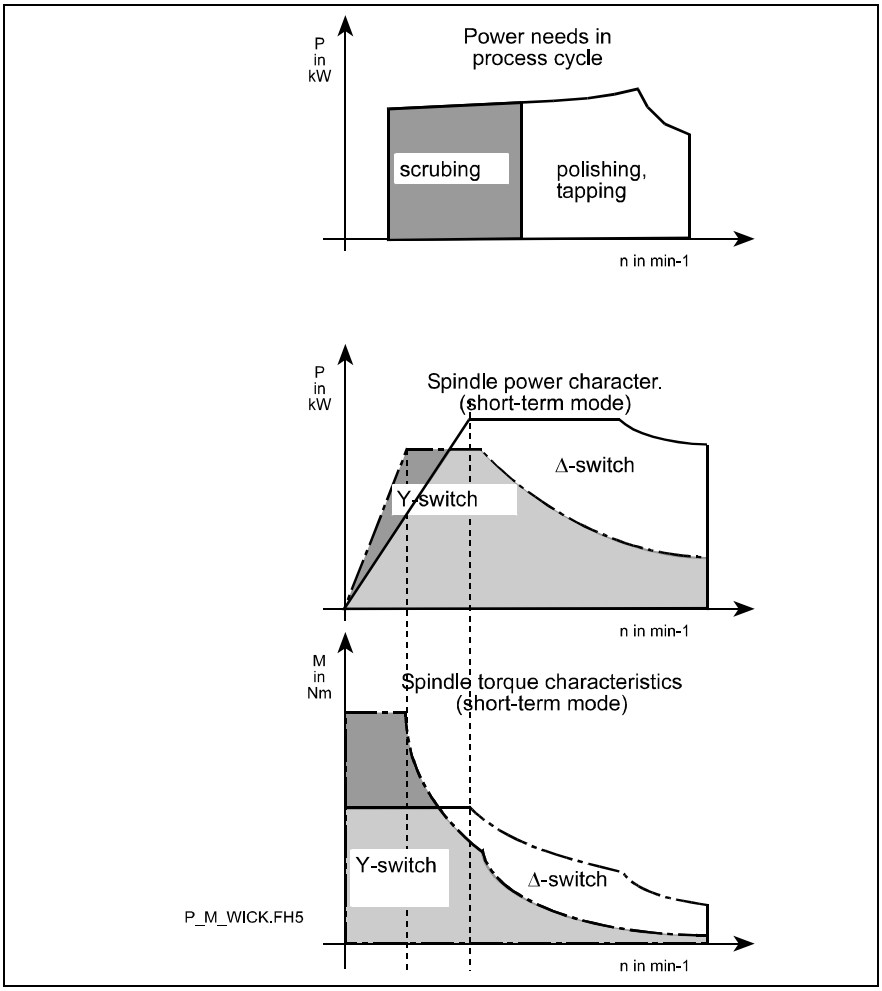


Fig. 8.13: Operating curves of a spindle with windings switch

Spindle output at the time of a Y switch is only about 2/3 of the output of a delta switch, i.e., a start-delta switch is not a complete substitute for a gearshift because with each gearstage the same output is available!

The increased torque during short-term operations with a star-switch, in comparison to a delta switch, does not mean an increase in the continuous torque of the spindle!

Note: An increase in short-term operation torque can be achieved by increasing the rated current of the controller with a permanently wired motor in place of a Y-Δ switch. This eliminates long-term maintenance which the contactors require and which are accompanied by additional wiring and deceleration problems resulting from a power failure!

A star-delta switch is not recommended for use with milling spindles due to the long runup times it requires!

Technical Features of the Star-Delta Switch

Motor design

The star-delta switch can only be used in specially designed INDRAMAT motors. All six winding ends in these are fed into a motor terminal box. Standard motors are permanently wired internally. Only three power connenctions are accessible.

Power connections

Motor power connectons can only implement terminal boxes!

Switching during operations

The switch is tripped by changing into a diferent parameter block to which a different winding is allocated.

For the switch to take place even when the motor is turning, the power connection of the motor and the contactor must be phase coincident as shown in the terminal diagram below (motor voltage is twisted between Y- and Δ- switch by 60°, the output voltage of controller is switched forward or with lag).

The drive automatically returns to machining speed upon successful completion of the switch.

Braking during power failure

Braking the spindle with a power failure is only possible if the power contactor remain on during a power failure for the duration of the deceleraotin process. Braking the spindle takes place in the active parameter block. This can lead to extensive deceleration times with a Y switch!

Note: Star-delta switches can be simultaneously used during a gearshift!

Project Planning - Star-Delta Switch

Terminal diagram

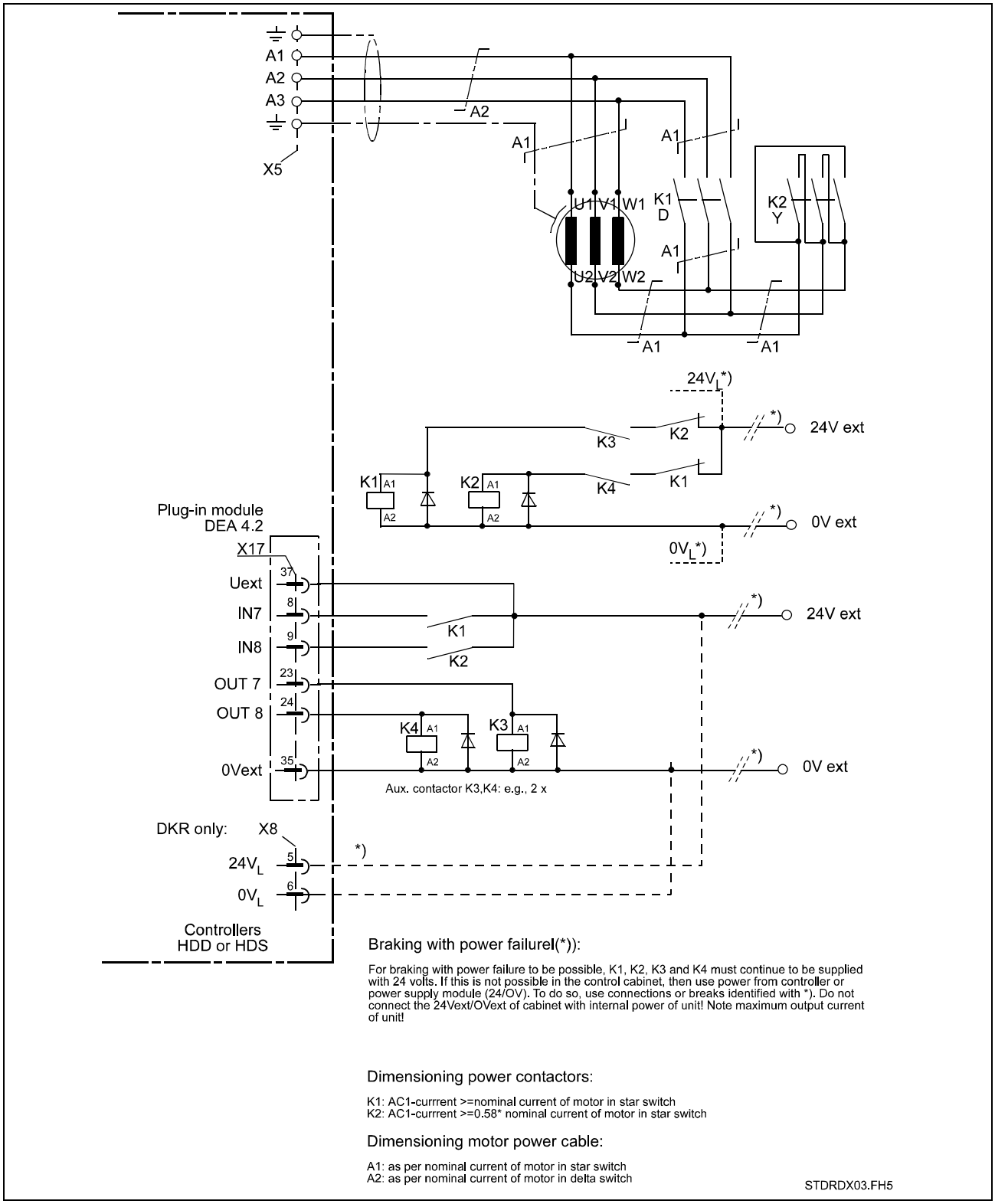


Fig. 8.14: Terminal diagram of a Y-Δ switch

Contactors with small holding power can be supplied with $24V_L/0V_L$ voltage from the power supply module. This voltage does not drop off during a power failure as long as energy is fed back to the drives during braking!

Commissioning a Star-Delta Switch

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0216	**d1 Command switch parameter block**	start winding switch (if set)
S-•-0218	**Gear-stage preselect**	allocate winding switch to switchable parameter blocks
S-0-0255	**Current gearstage**	signal currently active winding switch

Tab. 8-16: Parameter for winding switch

Pre-settings

⇒ Set the parameter to allocate the winding:

- **S-•-0218 Gear-stage preselect**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(bit numbers)
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				**S-•- 0218**
													0	0	0	windings - none
													0	1	1	- Δ- switch
													1	0	0	- Y- switch

Tab. 8-17: Parameter value for allocating a winding to the relevant switchable parameter block

⇒ Set the values in the Y-switch parameters blocks **S-•-0100 Velocity control P-gain.** In contrast to the basic settings, these must be multiplied by a factor or 0.6!

Note: If a motor with a switchable winding is being activated, then each of the four switchable parameter blocks must have an interconnection type (Δ or Y) allocated to it even if not all the parameter blocks are used!

Note: The controller automatically computes the motor parameters internally to the changed windings connection. The recomputed parameter values cannot be called up! Only the motor parameter values of the delta connection are displayed.

Executing a Winding Switch

⇒ Start command **S-0-0216 d1 switch parameter block**.

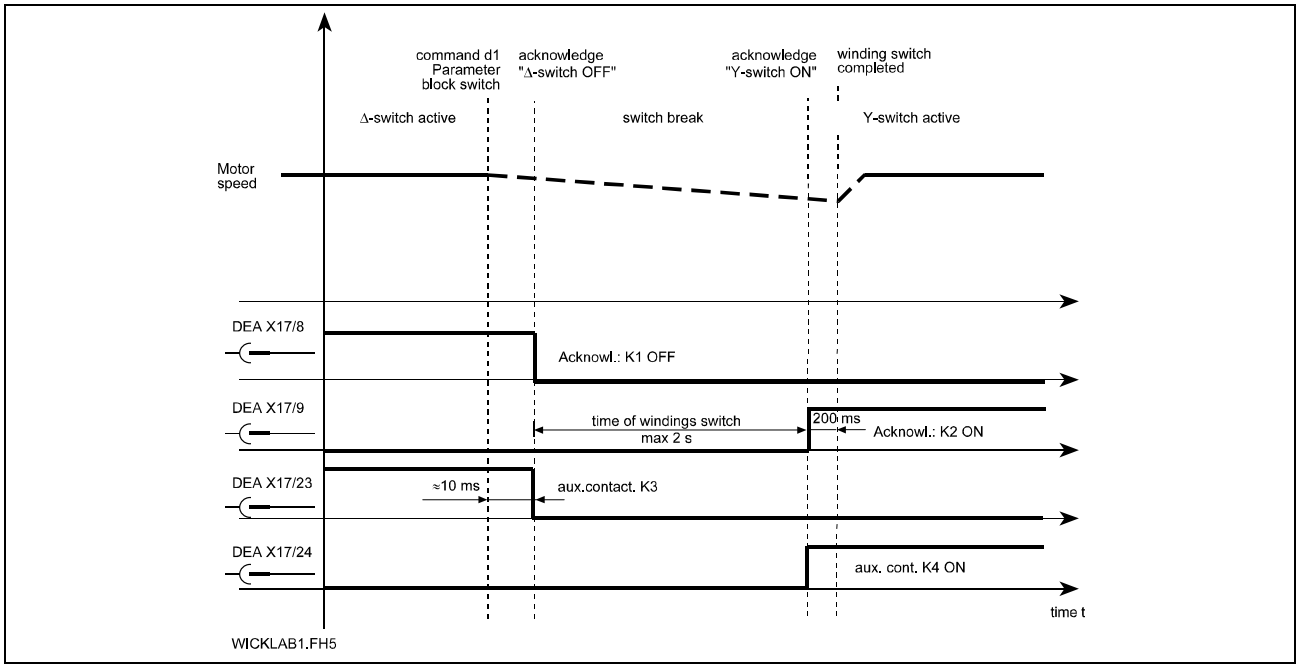


Fig. 8.15: Time diagram of signals for winding switch (switching from Δ to Y)

Note: The speed control parameter **S-•-0100 Speed control P-gain** and **S-•-0101 Speed control integral action time** must be separately optimized for each windings changeover because the torque constants are different for each type of switch!

Diagnosis

While the command is being executed, the H1 display of the controller reads „d1“.

Fault guidelines

If the error message C2-29 is flashing:

Plug-in module DEA 4.2 not mounted in controller!

⇒ Mount plug-in module DEA 4.2!

If the error message C2-30 is flashing:

Allocation of windings switch incomplete!

⇒ Windings switch for each of the switchable parameter blocks must be entered (see above „Pre-settings).

If the error message F8-63 is flashing:

Acknowledgement of windings switch missing!

⇒ Check contactor wiring and signal voltages.

⇒ Check contactor functions.

8.8 Main Spindle Messages

Explanation

DIAX04 main spindle drives signal operating states, that are important to the working cycle, back to the control so that it can execute processing or the changeover of command blocks in a mnanner which ensures operating safety and is appropriate to the process.

Application instructions

As soon as the machining speed of the spindle is reached, the process of feeding the tools can start. Gearshifts and decelerations, however, may not be activated until the spindle is safely sstanding still. The drive signals these speed-dependent operating states.

A tool change means that the spindle must decelerate and remain standing in a defined position. Not until this state is signalled by the drive may the control trigger the tool change mechanism.

The spindle drive needs sufficient reserves during machining to accommodate short-term peak loads so that machining speed does not drop. The drive signals if loads exceeding 90% are demanded of it.

Worn down tools lead to an increase in power and poorer results. One way to tecognize tool wear is generated by the drive if drive torque or power exceed a threshold value. This value can be set.

Technical Features

DIAX04 main spindle drives offer three different types of messages:

- SERCOS and manufacturer-specific collective diagnostic messsages summarized in „Class 3 diagnostics (C3D)" and „Manufacturer's C3D“ (see section 3.2).
- Collective diagnostic messages in parameter „Signal status word“
- Individual messages in the form of a parameter

Depending on the allowable time between the occurrence of and the recognition of a message and the number of parameters which can be transmitted in the drive telegram over an aceptable length of time, the contorl accesses the forementioned types of messages:

- With the class diagnostics, messages are relayed via a change bit in the drive status to the control. The actual messge can only be read through the not real-time capable service channel of the SERCOS interface. It is not necessary, in this case, to cyclically transmit additional data (parameter).
- With the „Signal status word“ it is possible to collect the message and relay these to the controls in real time, if the „Signal status word“ has been built into the drive telegram in the form of cyclical data.
- With the use of individual parameters, it is also possible to relay the messages in real-time to the NC control. In this case, a message can be allocated to one of the two real-time status bits in the drive status (see the „SERCOS interface“ manual). Additional data (parameter) does not have to be cyclically transmitted in this case.

Project Planning

The messages occur purely at a parameter level. No additional circuitry is required!

Commissioning

Parameter Overview

Parameter ID no.	Parameter name	Comment
S-0-0013	**class 3 diagnostics**	collective message of operating states sec. 3.2)
S-0-0182	**manufacturer's class 3 diagnostics**	collective message of add. manufac. operating states (see sec. 3.2)
S-0-0144	**Signal status word**	collective messages of operating states
S-0-0330	**Mesage nist = nsoll**	„speed reached" (see bit 0 of S-0-0144)
S-0-0331	**Message nist = 0**	„spindle standing" (see bit 1 of S-0-0144)
S-0-0333	**Message Md > Mdx**	„torque threshold exceeded" (see bit 3 of S-0-0144)
S-0-0335	**Message nsoll > ngrenz**	„torque command too high" (see bit 5 of S-0-0144)
S-0-0336	**message in-position**	„spindle in position" (see bit 6 of S-0-0144)
S-0-0337	**message P > Px**	„power threshold exceeded" (see bit 7 of S-0-0144)
P-0-1307	**message 90% load**	„load limit reached" (see bit 10 of S-0-0144)

Tab. 8-18: Parameter for main spindle messages

Explanations on parameters

- **S-0-0144, Signal status word,** (this parameter is permanently configured, in contrast to „SERCOS interface" manual)

Bit 0	**=1,** if $n_{ist} = n_{soll}$, the actual speed value **(S-0-0040)** is within ± of the speed window **(S-•-0157)** around the speed command value **(S-0-0036).** *(Only applies to speed control mode.)*
Bit 1	*In speed control mode:* **=1,** if $\|n_{ist}\| = 0$, the actual speed value **(S-0-0040)** and command value **(S-0-0036)** is then smaller than the standstill window **(S-•-0124)** *With torque and speed control modes:* **=1,** if $\|n_{ist}\| = 0$, the actual speed value **(S-0-0040)** is then smaller than the standstill window **(S-•-0124)**
Bit 2	(reserved for „Spindle error")
Bit 3	**=1,** if $\|M_d\| > M_{dx}$, the actual torque value M_d **(S-0-0084)** is then greater than the torque threshold M_{dx} **(S-•-0126)**
Bit 4	(not allocated)
Bit 5	**=1,** if $\|n_{soll}\| > n_{grenz}$, the speed command value **(S-0-0036)** then exceeds the speed limits $\pm n_{grenz}$ **(S-•-0091)**
Bit 6	**=1,** if „spindle in position", the actual position value 1/-2 **(S-0-0051/-0053)** is then within ± of the positioning window **(S-•-0057)** around the command position. *(Only with spindle positioning)*
Bit 7	**=1,** if $\|P\| > P_x$, the output power P **(S-0-0382)** iexceeds the power threshold P_x **(S-•-0158)**

Bit 8	(not allocated)
Bit 9	(not allocated)
Bit 10	**=1**, if drive load exceeds 90% of maximum load, then there is a control reserve of less than 10%
Bit 11	(not allocated)
Bit 12	**=1**, if status of actual position value (S-0-0403) is equal to 1
Bit 13	**=1,** if the drive lock is active. (24V/0V at terminals AS+(X3/8) and AS-(X3/9))
Bit 14	(not allocated)
Bit 15	(not allocated)

Fig. 8-19: Definition of bits in the signal status word

- **S-0-0330, S-0-0331, S-0-0333, S-0-0335, S-0-0336, S-0-0337, P-0-1307**

Bit 0	**=1**, if message is pending

Fig. 8-20: Message bit of the message parameter

9 Optional Drive Functions

9.1 Analog Output

With the help of the "Analog output" function drive-internal signals and status variables can be generated in the form of analog voltage signals. By connecting an oscilloscope to the analog outputs, it is possible to examine these.

The conversion of the values which are in digital format in the drive is done by mean s of two 8-bit digital analog converters. The maximum output voltage equals +/-10 volts.

The following parameters are available for the functions:

- **P-0-0038, Signal select analog output channel 1**
- **P-0-0039, Signal select analog output channel 2**
- **P-0-0040, Scaling factor for velocity analog channel 1**
- **P-0-0041, Scaling factor for velocity analog channel 2**
- **P-0-0042, Scaling factor for position data analog channel 1**
- **P-0-0043, Scaling factor for position data analog channel 2**
- **P-0-0044, Scaling factor for analog output power**

Analog Output of Pre-Set Signals

There are pre-defined channel select numbers for the analog output of certain signals. The selection is made by inputting values for the channel select numbers (hexidecimal format) into parameters P-0-0038 and P-0-0039.

The following pre-defined signals are available:

Input value (Format HEX.)	Signal select	Standard
0	--	--
1	Torque-generating command current	not settable, 10V = S-0-0110, peak-current controller
2	Actual speed value after mixing and filtering	settable, 10V = P-0-0040/P-0-0041
3	S-0-0036, speed command value	settable, 10V = P-0-0040/P-0-0041
4	Position command difference	settable, 10V = P-0-0040/P-0-0041
5	S-0-0051, actual position value 1	settable, 10V = P-0-0042/P-0-0043
6	S-0-0053, actual position value 2	settable, 10V = P-0-0042/P-0-0043
7	S-0-0189, lag distance	settable, 10V = P-0-0042/P-0-0043
8	sine signal motor encoder	
9	cosine signal motor encoder	

10	sine signal external encoder	
11	cosine signal external encoder	
12	torque-generating actual current	not settable, 10V = S-0-0110, peak-current controller
13	actual magnetizing current	not settable, 10V = S-0-0110, peak-current controller
14	actual speed value of motor encoder	settable, 10V = P-0-0040/P-0-0041
15	thermal load of controller	10V = 100%
17	speed command value input of speed command value rampe	settable, 10V = P-0-0040/P-0-0041
18	motor temperature	10V = 150°C
24	per cent load of controller in terms of current possible maximum thermal load	not settable, 10V=P-0-4046, effective peak current that the controller can currently supply for thermal reasons
25	effective magnetizing current	not settable, 10V = S-0-0110, peak-current controller
26	motor voltage	10V = U_{DC} (DC bus voltage)
27	motor acceleration	settable, 10V = P-0-0600
28	acceleration capacities	settable, 10V = P-0-0601
c	speed command value input speed command value smoothing	settable, 10V = P-0-0040/P-0-0041
d	speed command vaue input speed controller	settable, 10V = P-0-0040/P-0-0041
e	DC bus power	settable, 10V = P-0-0044
f	DC bus amount	settable, 10V = P-0-0044

Tab. 9-1: Signal select for analog output

Note:

During acceleration or deceleration, the signal „Acceleration power“ reproduces the acceleration power Pacc given to the motor shaft – if measured values (rad2/s3) are multiplied by the total amount of inertia of both the spindle and the motor!

Data Memory of Bit and Byte Outputs

The use of this function is only possible with the information about the structure of the data memory of the drive processor. The structure is different, however, depending on the version. This function can, therefore, only be used by the developer.

The selection is also made via the signal select parameter. However, a preset number is not entered but rather the address and the bit number of shift number of the bit/bytes to be generated.

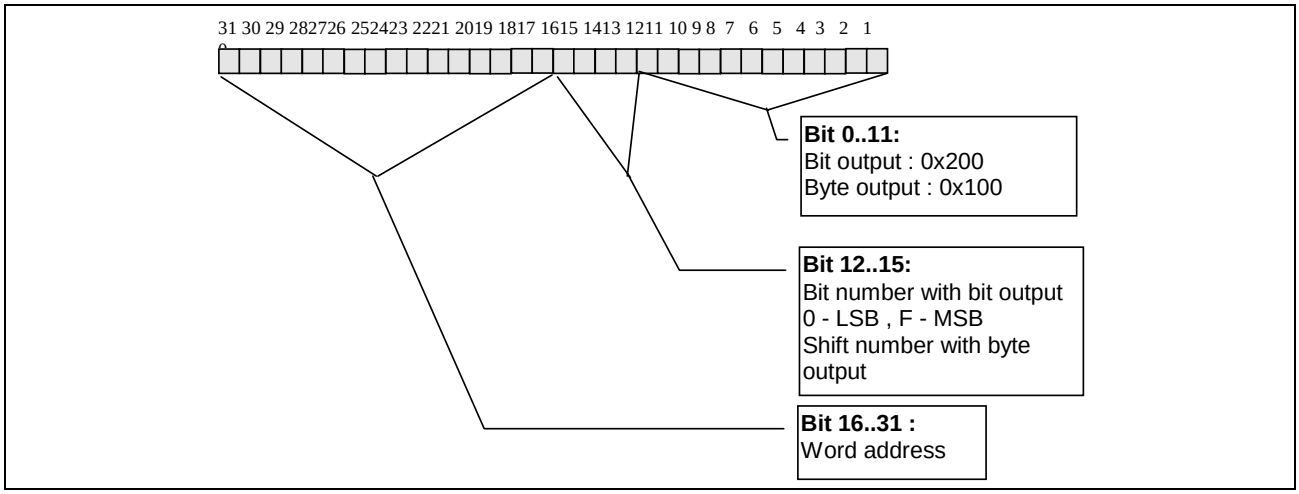


Fig. 9-1: Parametrizing bit or byte output

Terminal Assignment for Analog Output

Analog signals are output at connector X3 of the basic unit.

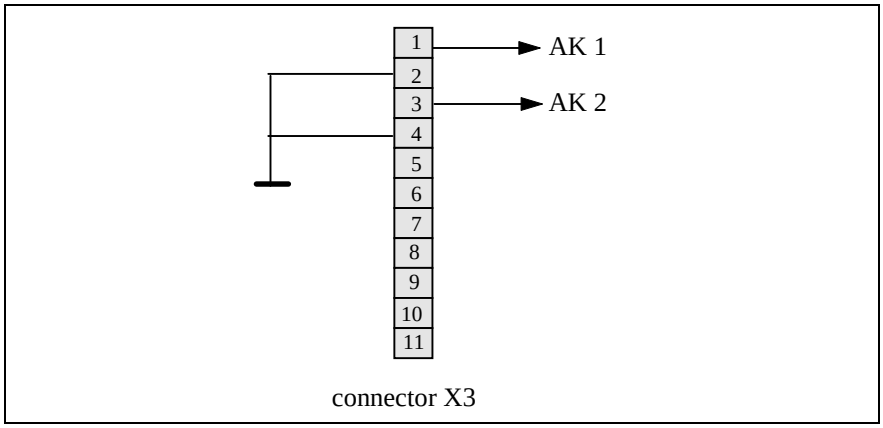


Fig. 9-2: Terminal assignment of analog output

9.2 Analog Inputs

Module DRF-1 may not be used conjunction with DLF-1 or DZF-1 modules.

Interface module **DRF 1** is used to measure analog voltage. Two input channels are available for this purpose. Both channels lead to a 12-bit analog digital converter with a maximum input range of +/- 10 volts. Input amplification can be set to 1,2,4 and 10.

The digitalized voltages are stored in parameters

- **P-0-0115, Analog input 1**
- **P-0-0116, Analog input 2**

Note:
Module **DRF 1** may not be used with **DLF 1** or **DZF 1 modules.**

Both analog signals are coupled in via differential amplifiers, then amplified according to G0 and G1 and then fed to a 12-bit ADU. It then digitalizes the analog voltages into a 16 bit two's complement, whereby the upper four bits are further qualified with a relevant operational signal.

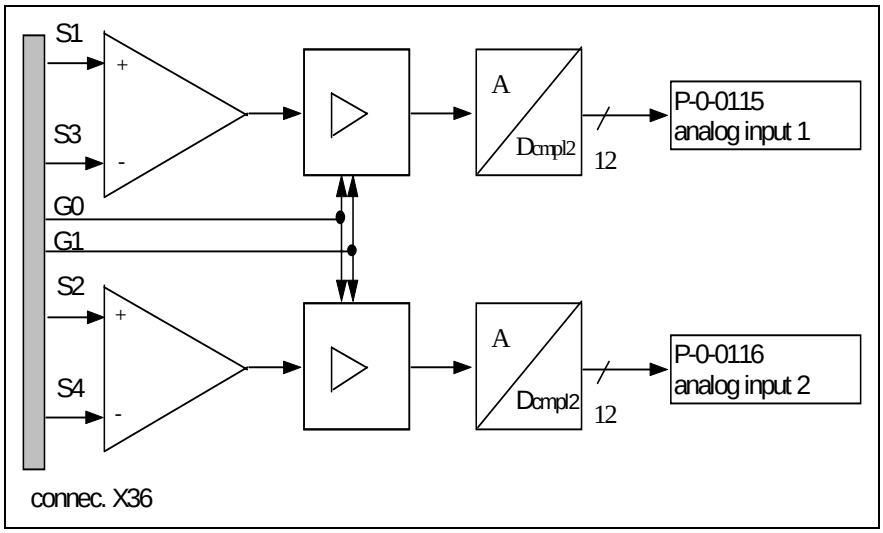


Fig. 9-3: Analog input block diagram

Input amplification is determined via the circuit of connector X36 on the **DRF-1 module.**

It applies:

X36,Pin 7 (A1):	X36,Pin 14 (A0):	Amplification:
n.c.	n.c.	2 (1LSB = 2.44mV)
n.c.	Ground	1 (1LSB = 4.88mV)
Ground	n.c.	4 (1LSB = 1.22mV)
Ground	Ground	10 (1LSB = 0.49mV)

Tab. 9-2: Determining input amplification of analog intputs

Terminal Assignment DRF-1

The connector assignment of X36 of the DRF-1 module for the processing of analog inputs is as follows:

Pin no. on connector X 36:	Function:
2	S3
3	S4
6	Ground
7	A1
9	S1
10	S2
11	Ground
13	Ground
14	A0

Tab. 9-3: Terminal assignment DRF-1

9.3 Digital Inputs/Outputs

Function "Digital input/output" permits the implementation of binary inputs and outputs by using a DEA plug-in module. Each module has 15 binary inputs and 16 binary outputs.

The following DEA modules are supported:

- DEA 4.1
- DEA 5.1
- DEA 6.1

Only one of the modules DEA 4.1, DEA 5.1 or DEA 6.1 may be used. Altogether this means that for each controller, there are 45 inputs (3*15) and 48 outputs (3*16).

The following parameters are available for the function:

- **P-0-0081, parallel output 1**
- **P-0-0082, parallel input 1**
- **P-0-0110, parallel output 2**
- **P-0-0111, parallel input 2**
- **P-0-0112, parallel output 3**
- **P-0-0113, parallel input 3**
- **P-0-0124, allocation of ID numbers-> DEA output**
- **P-0-0125, allocation of DEA input -> ID number**

It is also possible to assign a DEA output to the operating data of any parameter or a DEA input to any parameter.

Functional Principle of the Digital Inputs/Outputs

Parameters "Parallel input" and "parallel output" can be cyclically configured

The 15 binary intputs and 16 binary outputs are each depicted in two parameters "Parallel intput" and "parallel output". Each DEA thus has two parameters. The following applies:

DEA module:	parameter for input:	parameter for output:
DEA 4.1	P-0-0082	P-0-0081
DEA 5.1	P-0-0111	P-0-0110
DEA 6.1	P-0-0113	P-0-0112

Tab. 9-4: Digital input/outputs: relevant parmeters

By reading parameter "Parallel input" it is thus possible to obtain a copy of all 15 binary inputs of a DEA. By writing the parameter "parallel output" all 16 binary outputs are updated.

The allocation of the individual binary inputs and outputs to the bit numbers of their relevant parameters is defined below.

Pin no. input:	Bit no. in parameter:	Pin no. output:
1	0 (LSB)	16
2	1	17
3	2	18
4	3	19
5	4	20
6	5	21
7	6	22
8	7	23
9	8	24
10	9	25
11	10	26
12	11	27
13	12	28
14	13	29
15	14	30
--	15 (MSB)	31

Tab. 9-5: Digital input/output: Allocation of bit output - DEA module

Parameter "parallel output" is copied to the DEA port and "DEA port" on "Parallel input" takes place every 250 usec.

Note:
An external voltage source must be connected to operate a DEA card.

Pin 37: 24 V_{ext}
Pin 35 0 V_{ext}

If there is no such power source, then error **F233 External voltage power supply** is generated.

Allocation ID Numbers - Parallel Input/Output

The operating data of any parameter can be generated on the binary inputs of a DEA. This also means that the binary inputs of a DEA can be shown on the operating data of any parameter.

This function is set via parameters

- **P-0-0124, Allocation of ID numbers -> DEA output**
- **P-0-0125, Allocation DEA input -> ID number**

The parameters are constructed as follows:

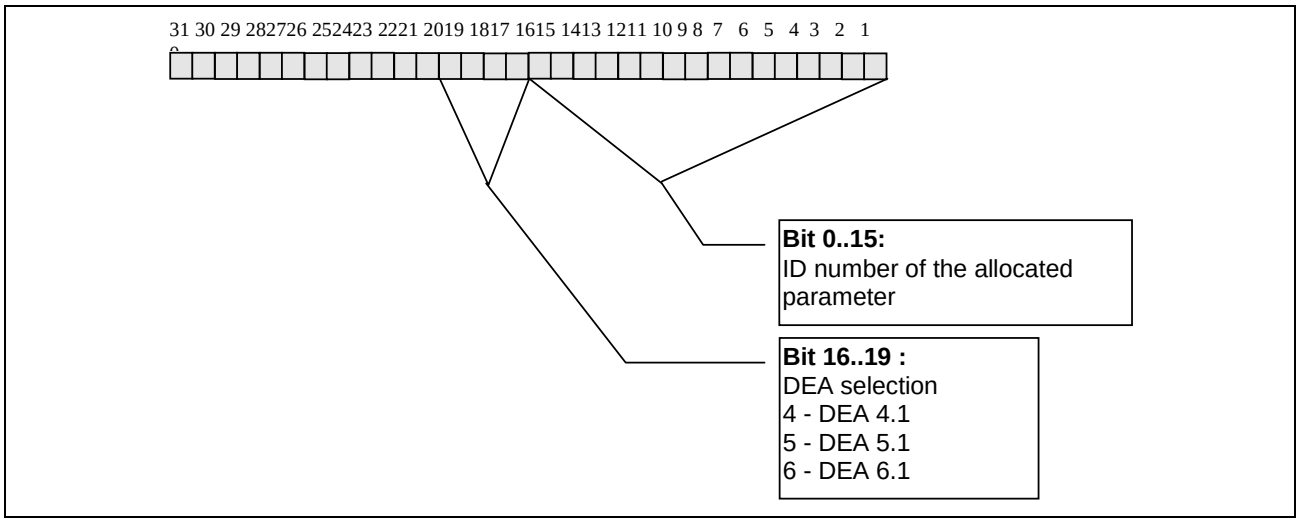


Fig. 9-4: Structure of parameters P-0-0124 and P-0-0125

Allocation ID numbers-> DEA output

The allocation of ID numbers-> DEA output means that the operating data of the allocated parameter is copied to the parameter DEA output which is given to the DEA outputs.

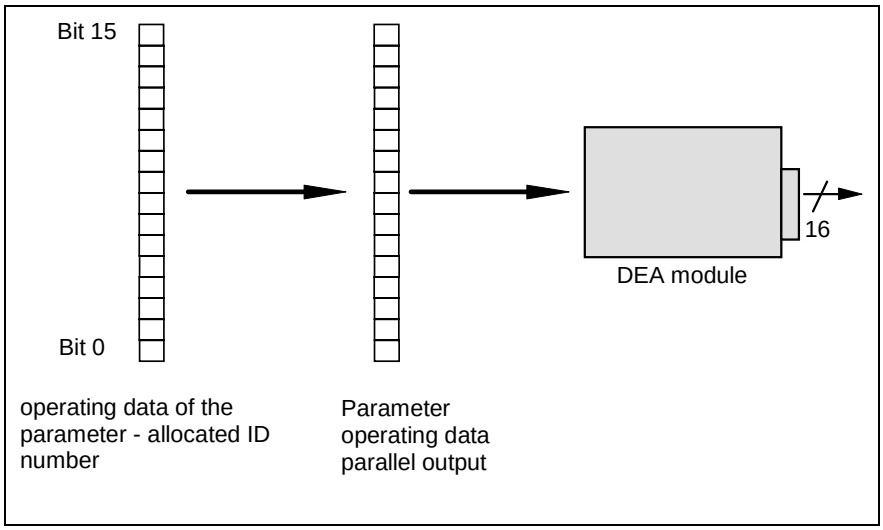


Fig. 9-5: Basic allocation ID number - DEA output

If the data length of the operating data of the allocated ID number is greater than 16 bits, then the upper bits of the oeprating data are cut off.

If parameter **P-0-0124, Allocation of ID numbers -> DEA output** is write accessed, then the following checks are performed:

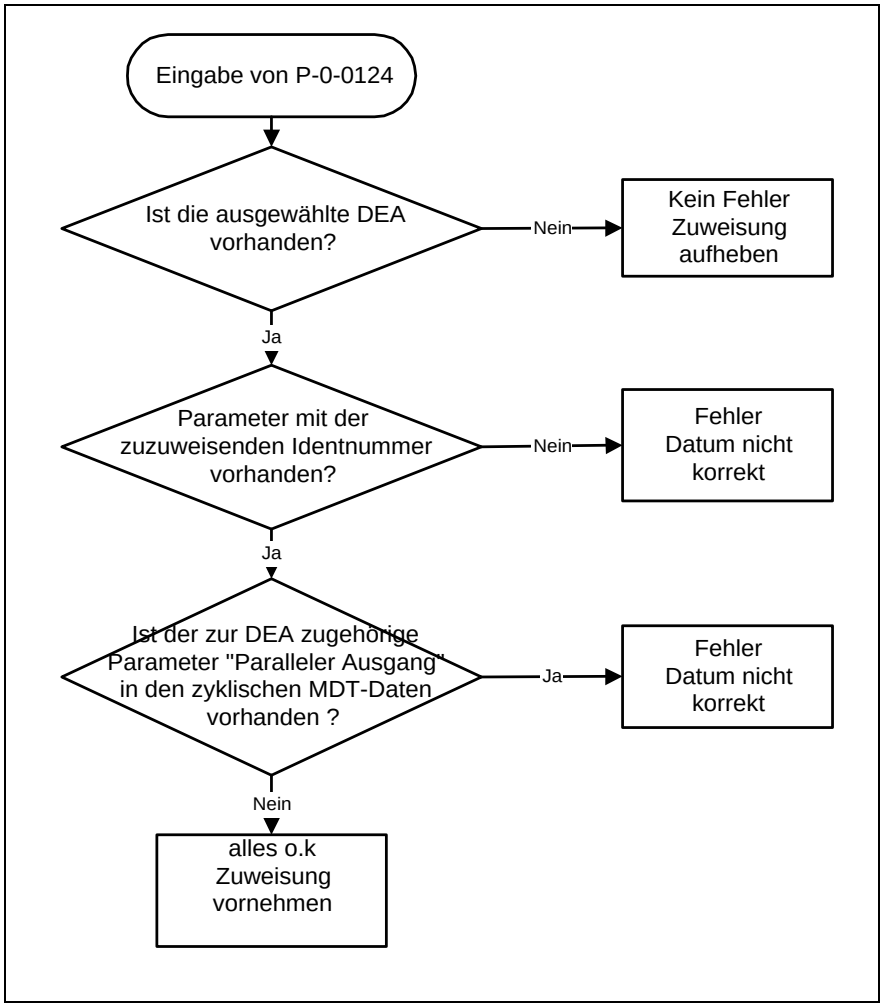


Fig. 9-6: Checking the input of parameter P-0-0124, Allocation of ID numbers-> DEA output

Allocation DEA input -> ID number

When allocating "DEA input -> ID number" the binary inputs of the DEA are shown in parameter "DEA input" which is copied to the operating ata of the allocated parameter.

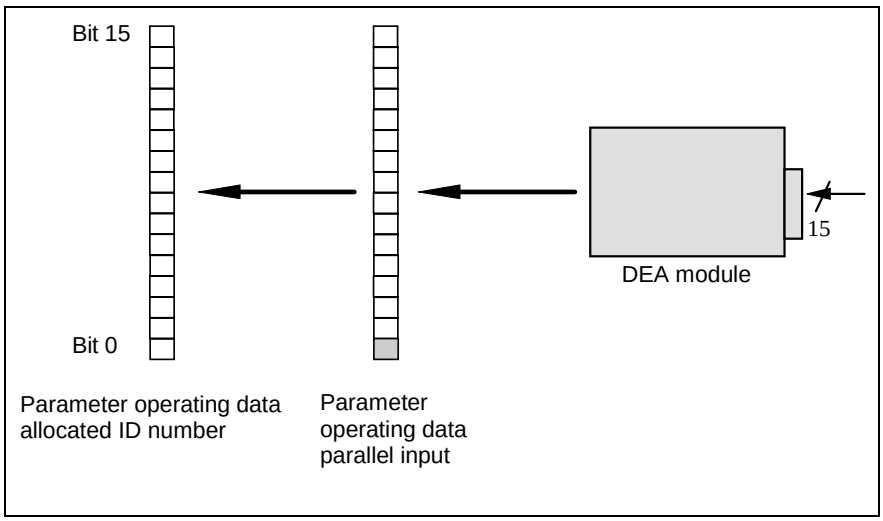


Fig. 9-7: Basic allocation DEA input -> ID number

If the data length of the operating data of the allocated ID numbers exceeds 16 bits, then the upper bits of the operating data are cut off.

If parameter **P-0-0125, Allocation DEA input -> ID numbers** is write accessed, then the following checks are performed.

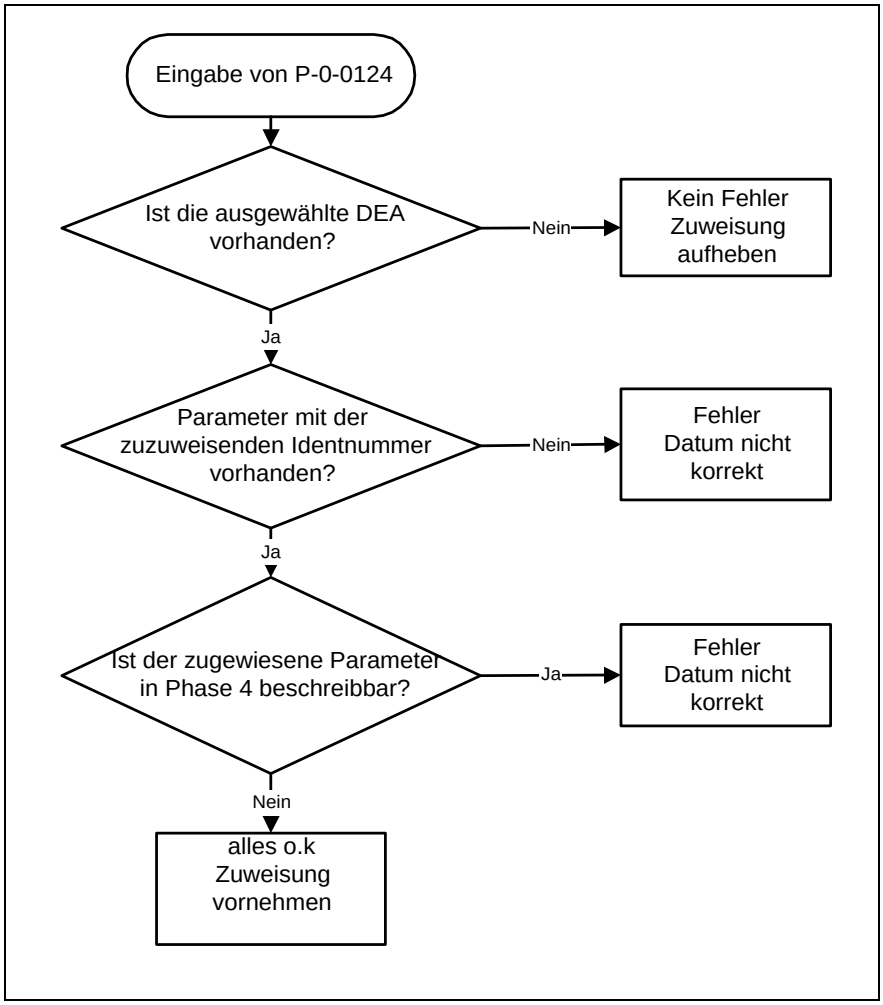


Fig. 9-8: Checks run when inputting parameter P-0-0125, Allocation DEA input -> ID number

9.4 Oscilloscope Function

The oscilloscope function support the recording of internal and external signals and variables. Its functions can be compared to that of a simple two channel oscilloscope. The following parameters are avaialble in conjunction with this function:

- **P-0-0021, Measurand list 1 (always 4 byte data)**
- **P-0-0022, Measurand list 2 (always 4 byte data)**
- **P-0-0023, Signal select channel 1**
- **P-0-0024, Signal select channel 2**
- **P-0-0025, Trigger source**
- **P-0-0026, Trigger signal select**
- **P-0-0027, Trigger threshold for position data**
- **P-0-0028, Trigger threshold for velocity data**
- **P-0-0029, Trigger threshold for torque/force data**
- **P-0-0030, Trigger edge**
- **P-0-0031, Time resolution**
- **P-0-0032, Memory depth**
- **P-0-0033, Number of measurands after trigger event**
- **P-0-0035, Trigger control offset (no write access)**
- **P-0-0036, Trigger control word**
- **P-0-0037, Trigger status word**
- **P-0-0145, Trigger threshold exp. oscilloscope function**
- **P-0-0146, Trigger signal addresss exp. oscilloscope function**
- **P-0-0147, Signal address K1 exp. oscilloscope function**
- **P-0-0148, Signal address K2 exp. oscilloscope function**
- **P-0-0149, Signal selection list for oscilloscope function**
- **P-0-0150, Number of valid measurands for oscilloscope function**

Functional Principle of the Oscilloscope Function

The oscilloscope function is activated via parameter **P-0-0036 Trigger control word** by setting bits 2. Starting at this point, all data are recorded which were selected by parameters **P-0-0023 Signal select channel 1** and **P-0-0024 Signal select channel 2**. The selection is defined in terms of numbers which are allocated to different signals.

Triggering is activated by setting bit 1 in parameter trigger control word. Trigger conditions can be fixed with parameters **P-0-0025 Trigger source, P-0-0026 Trigger signal select** and **P-0-0030 Trigger edge**. The signal amplitude at which the trigger is actuvated can be set via parameters **P-0-0027 - P-0-0029 Trigger threshold**.

If a trigger event has been detected, then parameter **P-0-0033 Number of measurands after trigger event** are recorded and the function completed. Via parameters **Time resolution P-0-0031** and **Memory depth P-0-0032** the time it takes to record and the measurand intervals are defined.

The measurands are stored in **parametersn P-0-0021 and P-0-0022 Measurand list.** The control can read access them.

Parametrizing the Oscilloscope Function

Oscilloscope function with permanently defined recording signals

The choice of preset signals and variables is conducted using **parameters P-0-0023** and **P-0-0024 Signal select.** The selection is made by entering the signal number (hexidecimal format) into the relevant signal select parameter. The selected signal number defines the unit of the data stored in the measurand list. The following signals are pre-defined by number.

number:	Signal select:	Unit of the measurand list :
0x00	channel not activated	--
0x01	actual position value mode-depdendent S-0-0051 or S-0-0053	position scaling dependent
0x02	actual speed value parameter (S-0-0040)	speed scaling dependent
0x03	speed control deviation (P-0-0160)	speed scaling dependent
0x04	lag distance parameter (S-0-0189)	position scaling dependent
0x05	torque/force command value parameter S-0-0080	per cent
0x06	not assigned	

Tab. 9-1: Select pre-defined signals

For the control to be able to recognize whether the number of the preset number has been changed, parameter **P-0-0149, Signal selection list for oscilloscope function** was introduced. The parameter is constructed in the form of a list parameter and transmits the ID numbers of the possible signals.

List entry:	ID numbers of:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	P-0-0160
4	S-0-0189
5	S-0-0080
6	S-0-0051
7	S-0-0053
8	P-0-0147
9	P-0-0148

Tab. 9-2: Assignment of parameter P-0-0149

Expanded oscilloscope recording function

In addition to the oscilloscope function with pre-set signals, the DIAX04 also offers the option of recording any internal signals. The use of this function, however, only makes sense in conjunction with the information about the sturcture of the internal data storage which is why they can only be effectively used by the respective developer. This function is activated via parameters **Signal select P-0-0023 & P-0-0024** by setting bit 12 = „1“. Bit 13 defines the format that the data to be secured must have.

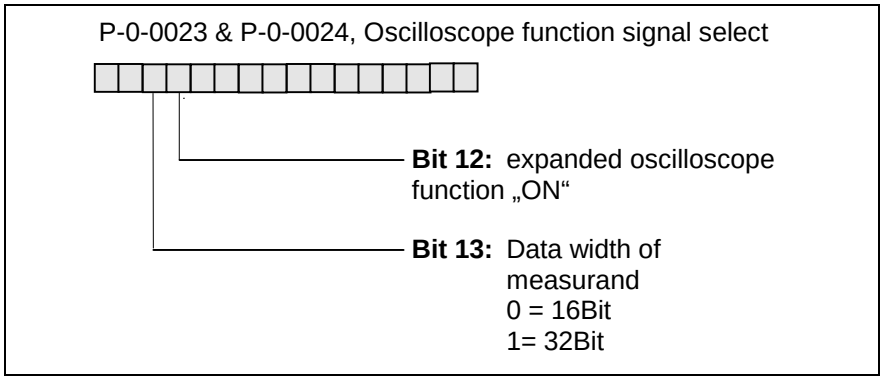


Fig. 9-9: Structure of parameters P-0-0023 and P-0-0024

If the expanded signal select has been parametrized, then the desired signal address can be defined in parmeters **P-0-0147 Signal address expanded signal select K1** and **P-0-00148 Signal address expanded signal select K2**. The contents of the selected addresses are stored in the measurand list during the recording process.

Note:
If a 16 bit data width is selected, then the signal data is stored as a qualifying-signal expanded 32 bit value.

Trigger source of the oscilloscope function

A choice of two trigger types is available and can be set via parameter **P-0-0025 Trigger source**.

External trigger (P-0-0025 = 0x01)

The control activates triggering bit 0 in **Trigger control word P-0-0036.** This makes it possible to tansmit a trigger event to several drives. Parameter P-0-0035 is supported during this parametrization. This parameter is needed to visualize the recording data.

Internal trigger: (P-0-0025 = 0x02)

Triggering is conducted by monitoring the parametrized trigger signal. Once the selected edge is detected, then the trigger is actuated. The parameter trigger control ofset is set to zero.

Selecting the trigger edge

Various trigger edges can be selected via parameter **P-0-0030 Trigger edge.** The following is possible:

Number:	Trigger edge:
0x01	Triggering on a positive edge of the trigger signal
0x02	Triggering on a negative edge of the trigger signal
0x03	Triggering on either positive or negative edge of trigger signal
0x04	Triggering if trigger signal same as trigger threshold

Tab. 9-3: Selecting the trigger edge

Select permanently defined trigger signal

Parameter **P-0-0026 Trigger signal select** determines the signal which is monitored on the parametrized edge change. As with the signal select, there are also permanently defined rive-internal trigger signals. These are activated by inputting the relevant number.

The following signal numbers are possible:

Trigger signal number:	Trigger signal:	Relevant trigger threshold:
0x01	actual position value depends on active mode	position data (P-0-0027)
0x02	actual speed value parameter S-0-0040	velocity data (P-0-0028)
0x03	speed deviation parameter	velocity data (P-0-0028)
0x04	lag distance parameter P-0-0189	position data(P-0-0027)
0x05	torque command value parameter S-0-0080	torque data (P-0-0029)
0x06	actual torque value parameter S-0-0084	torque data (P-0-0029)
0x07	position command value parameter S-0-0047	position data (P-0-0027)

Tab. 9-4: Select permanently defined trigger signals

Select expanded trigger signals

DIAX04 ofers, in addition to trigger signal select with pre-set signals, the option of trigger any internal signal. The use of such a function only makes sense in conjunction with the structure of the internal data storage which is why it should only be used by the relevant developer. This function is activated via parameter **P-0-0026 Trigger signal select** by setting bit 12 = „1“.

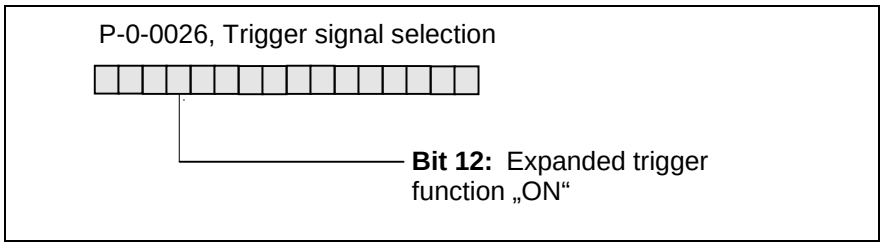


Fig. 9-10: Structure of parameter P-0-0026

Once the expanded trigger function is activated, the trigger signal addresss must be defined via parameter **P-0-00146 Trigger signal address for expanded signal select**. The relevant trigger threshold is entered in parameter **P-0-0145 Trigger threshold for expanded trigger signal.** This parameter is defined as follows:

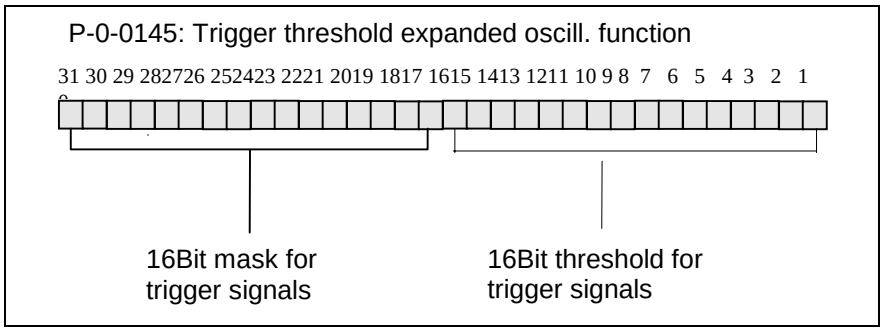


Fig. 9-11: Structure of parameter P-0-0145

The 16 bit value of the trigger threshold is monitored whereby the trigger signal is linked via the mask for AND trigger signals.

Parametrizing Time Resolution and Memory Size

Parameters **P-0-0031 Time resolution** and **P-0-0032 Memory size** can be used to define the recording range of the oscilloscope function. The maximum memory depth in this case is defined with 512 measurands. If fewer are needed, then this can be set via the memory depth.

The time resolution can be set at 250usec to 100msec within a grid of 250usec. It fixes the intervals at which measurands are recorded. This means that the minimum recording duration equals 128msec, the maximum equals 51.2sec.

It generally applies:

Recording duration = time resolution * memory size [usec]

Setting the Trigger Delays

By parametrizing parameter **P-0-0033 Number of measurands after trigger event** it becomes possible to record even measurands before the trigger event occurs (trigger delay function of an oscilloscope). Parametrization uses the units as set in the parametrized time resolution. The input value determines the number of measurands still to be recorded after the trigger event. By inputting 0[time resolution] only that data is recorded which preceded the trigger event. If the value of parameter **Memory depth P-0-0032** is entered, then only those measurands are recorded that followed the trigger event.

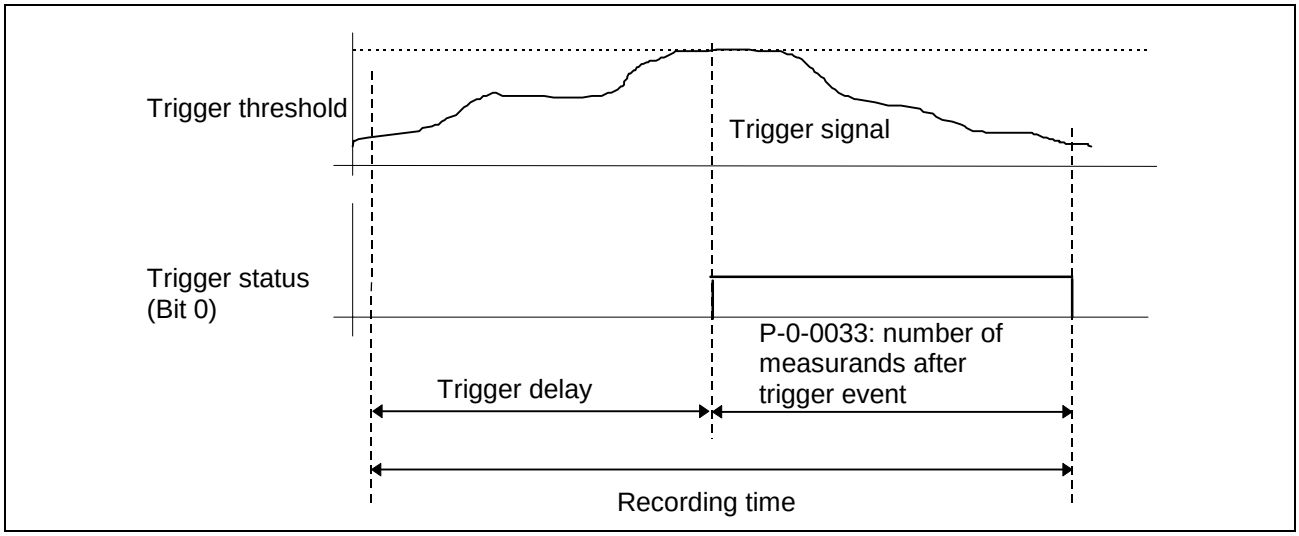


Fig. 9-12: Trigger delay - number of measurands after trigger event

Activating the Oscilloscope Function

The oscilloscope function is activated via parameter **P-0-0036 Trigger control word**. It is defined as follows:

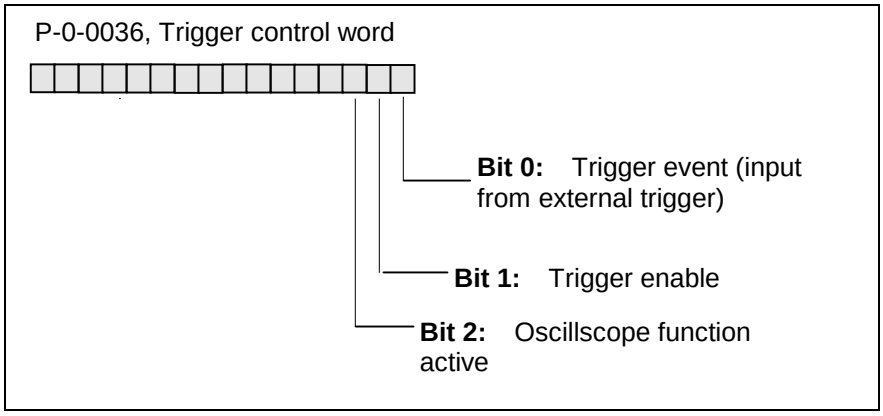


Fig. 9-13: Structure of parameter P-0-0036

Inputting a „1“ into bit 2 activates the oscilloscope function. In other words, the selected measuring signals are constantly being written into the internal measurand memory. If bit 1 is set, then the trigger monitor is activated and the oscilloscpe function waits for the selected edge to appear. If a valid edge is detected, then measurand storage is completed as parameterized in parameter **P-0-0033** and the oscilloscope function deactivated by resetting bits 1 & 2 in the trigger control word.

Oscilloscope function mit external trigger and internal trigger conditions

If triggering is set in parameter **P-0-0025 Trigger source** via the control bit of the trigger control word, then the trigger is actuvated with 0->1 edge of bit 0 of the trigger control word.

With this drive it is also possible to monitor the trigger condition of the trigger signal. If the trigger condition is detected, then bit 0 is set in the trigger status but the trigger is not actuated. This means it is possible to signal the trigger event with real-time status and the control bits via the control for several drives simultaneously and to actuate the trigger.

As the transmission of the trigger event via the control causes a delay in time between recognition of the trigger event and the actuation of the trigger, the drive measures this temporal displacement and stores the information in parameter **Trigger control offset, P-0-0035**. By taking the parameter into account when visualizing the measurand, it is possible to guarantee that the signal is shown with correct time.

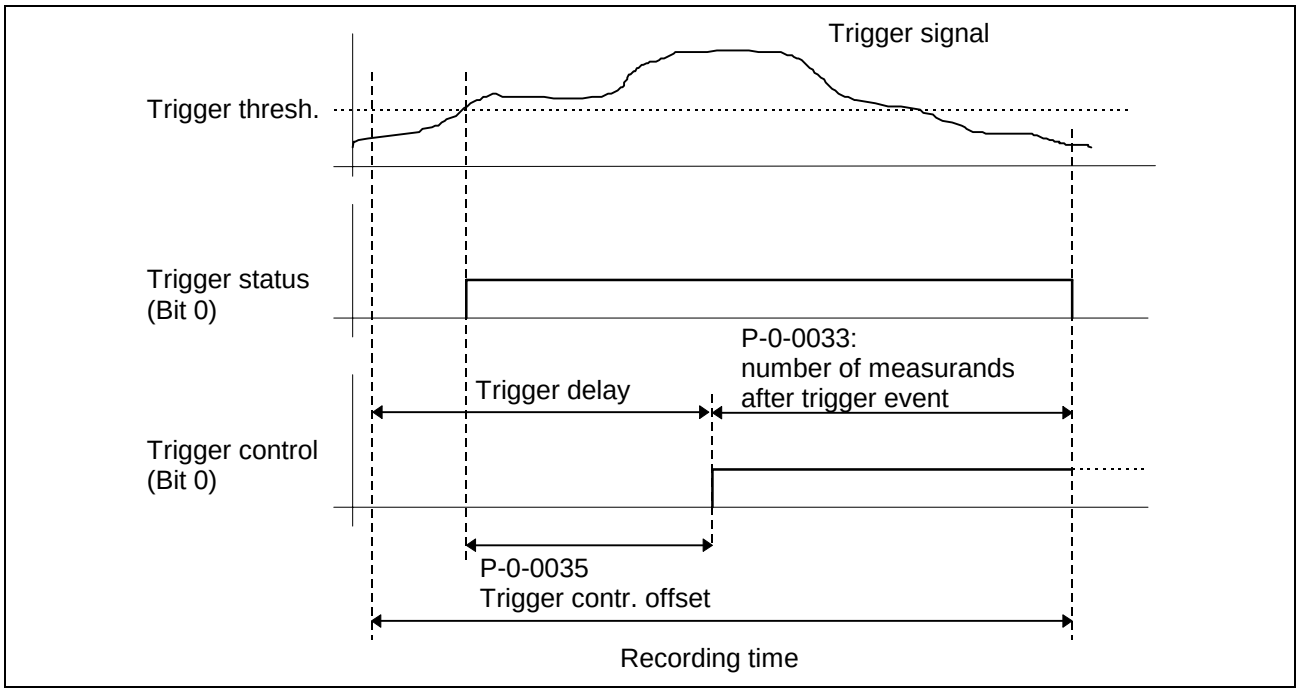


Fig. 9-14: Trigger control offset

Status messages of the oscilloscope function

The oscilloscope function is activated via **P-0-0037, Trigger status word.** The control receives information about the status of the oscilloscope function as shown below.

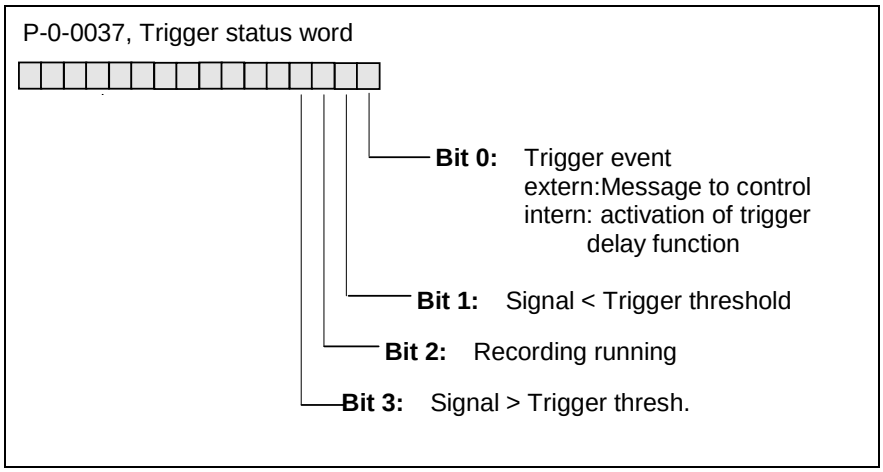


Fig. 9-15: Structure of parameter P-0-0037

Number of valid measurands

As soon as bit 2 of **P-0-0036, Trigger control word** is set, the drive begins to record the measurands.

If the trigger event is detected after the bit is set, then the oscilloscope function still records the number of measurands after the trigger event and concludes the recording process.

Depending on how memory depth, time resolution, the number of measurands after the trigger event and the point in time the trigger event is to occur have been parametrized, it is possible that not necessarily the entire memory is writtten into for the current measurement. In other words, the memory still contains measurands that do not apply to this particular measurement.

Parameter **P-0-0150, Number of valid measurands for oscilloscope function** specifies the number of valid measurands of the current recording process.

9.5 Probe Function

There are two probe inputs on the DSS 2.1 command communications module. These make it possible to measure positions and times with two binary input signals. With these inputs it is possible to measure

- the actual position value 1/2 or
- a relative internal time in [usec]

at the edges of both inputs at a defined point in time.

both absolute values of these signals at the time the positives or negative edge occurs as well as their difference can be read with the use of parmeters whereby the following are available for this funtion.

- **S-0-0170, Command probe cycle**
- **S-0-0401, Probe 1**
- **S-0-0402, Probe 2**
- **S-0-0169, Probe control parameter**
- **P-0-0200, Signal select probe 1**
- **P-0-0201, Signal select probe 2**
- **S-0-0405, Probe 1 enable**
- **S-0-0406, Probe 2 enable**
- **S-0-0130, Measurand 1 positive**
- **S-0-0131, Measurand 1 negative**
- **P-0-0202, Probe difference 1**
- **S-0-0132, Measurand 2 positive**
- **S-0-0133, Measurand 2 negative**
- **P-0-0203, Probe difference 2**
- **S-0-0409, Probe 1 positive latch**
- **S-0-0410, Probe 1 negative latch**
- **S-0-0411, Probe 2 positive latch**
- **S-0-0412, Probe 2 negative latch**

Functional Principle of Probe Evaluation

The function is generally activated with **S-0-0170, Command probe cycle**. The function is activated as a command but does not supply a command acknowledgement. The KA bit is not used.

To activate the function, write "3" into S-0-0170.

From this time point, the probe signal status is displayed in parmeters **S-0-401, Probe 1** and **S-0-402, Probe 2**.

A probe input enable is activated with parameters **S-0-0405, Probe 1 enable** or **S-0-0406, Probe 2 enable**. The 0-1 change of this signal activates the trigger mechanism for the evaluation of the positive and/or negative edge of the probe signal.

If an edge of a probe is detected thereafter, then the selected signal is stored in parameter **Measurand positive** or **Measurand negative** while

the difference between the two is displayed and stored in **Measurand difference**. The status messages **S-0-0409, Probe 1 positive latch** and **S-0-0410, Probe 1 negative latch**, or **S-0-0411, Probe 2 positive latch** and **S-0-0412, Probe 2 negative latch** are set to "1".

By clearing the probe enable, the status messages **S-0-0409, Probe 1 positive latch** and **S-0-0410, Probe 1 negative latch**, or **S-0-0411, Probe 2 positive latch** and **S-0-0412, Probe 2 negative latch** are cleared.

Note:
After the 0-1 edge of the probe enable, only the first positive and the first negative edge of the relevant input are evaluated. For each new measurement it is necessary to set the probe enable back to 0 and then to 1 again. Clearing the probe enable also clears the relevant measurand latch parameter.

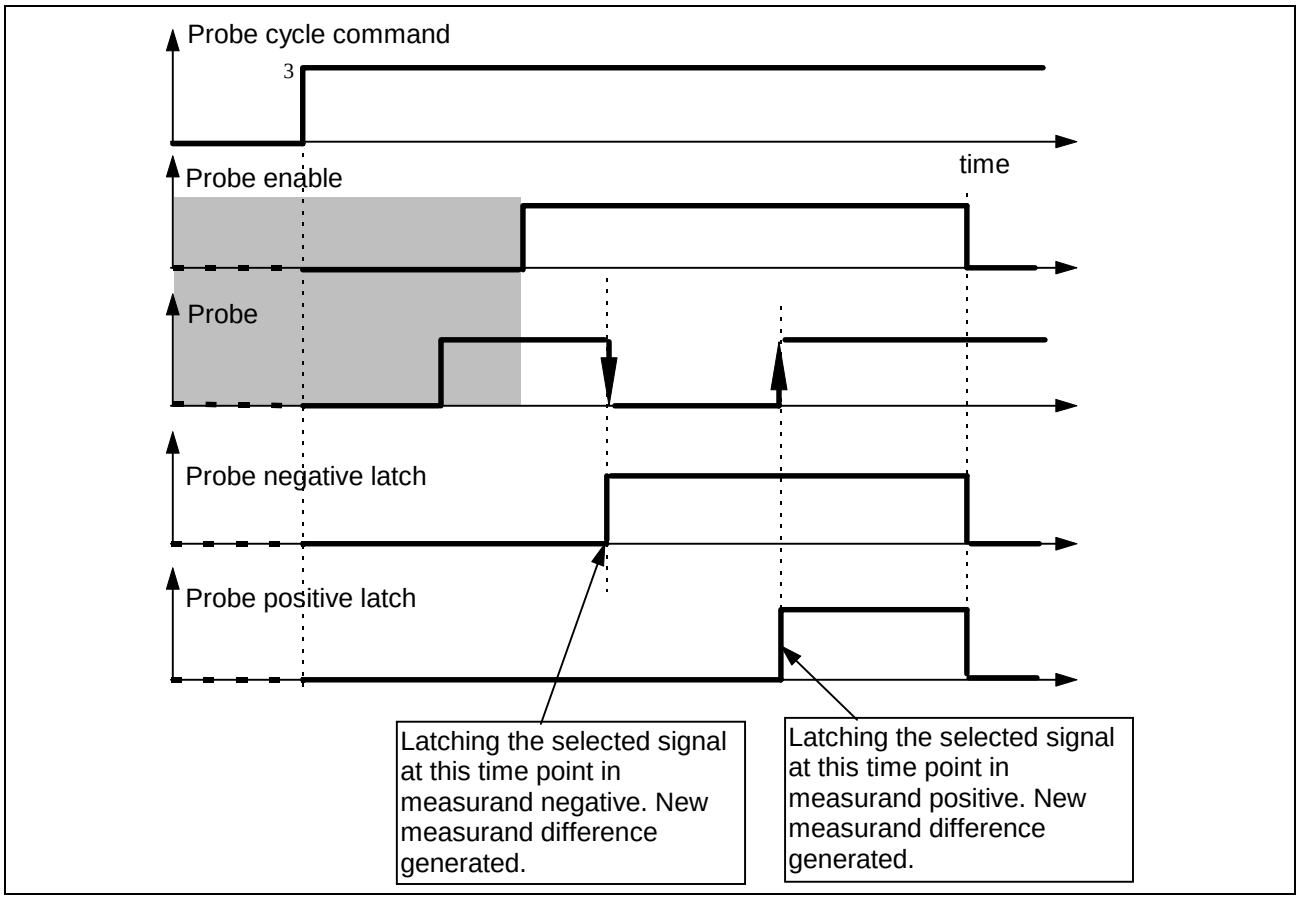


Fig. 9-16: Evaluating probe edges with evaluation of positive and negative edges switched on in probe control parameter

Operations when write-accessing S-0-0170, probe cycle command with "3"

Writing a "3" into parameter **S-0-0170, Probe cycle command** starts the probe function. This

- sets the status of S-0-0170, probe cycle command to "7"
- sets all measurands and measurance differences to "0"
- clears all measurand latch parameters
- Activates the external voltage monitor (if it has not already been activated).

Select Edge of Probe Inputs

There is a positive and negative measurand for each probe input. Measurand positive is allocated to the 0-1 edge and measurand negative to the 1-0 edge of the probe signal. Whether both occurring edges are actually evaluated or not and lead to a storing of the measurand in either measurand positive/negative must be specified in parameter **S-0-0169, Probe control parameter**.

The value should be entered into the parameter before the function is ativated. Its structure is as follows:

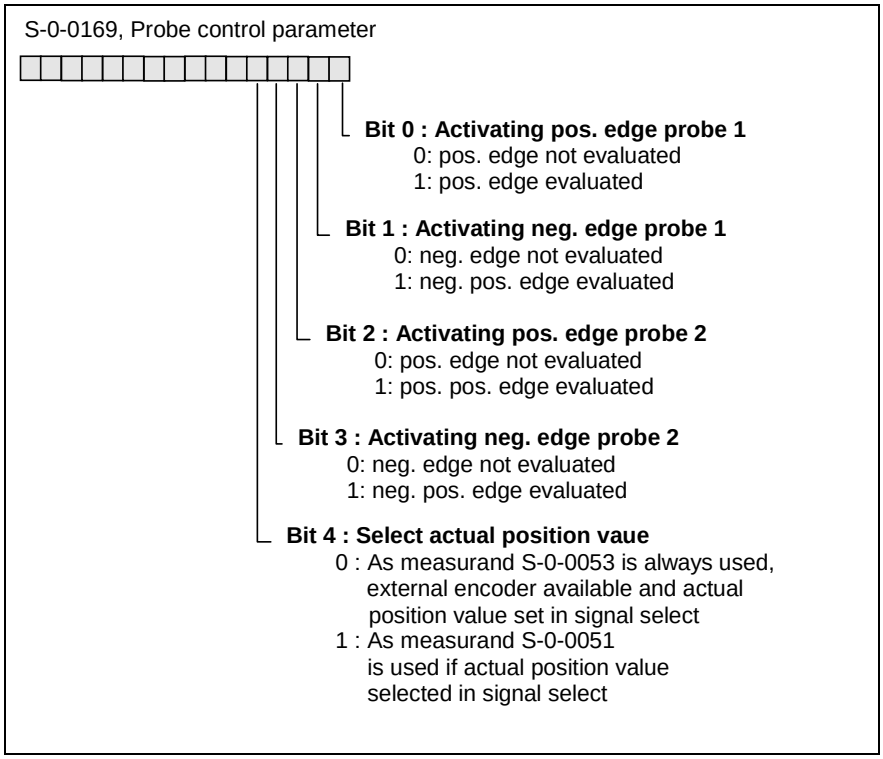


Fig. 9-17: Structure of parameter S-0-0169, Probe control parameter

Signal Select of the Probe Inputs

Available signals to be measured are:

- actual position value 1 (motor encoder)
- actual position value 2 (external encoder, only if available)
- internal time

The signal is selected via parameter **P-0-0200, Signal select probe 1** and **P-0-0201, Signal select probe 2**, as well as bit 4 of **S-0-0169, Probe control parameter**.

Using P-0-0200 and P-0-0201 it is possible to individually specify whether an actual position value or the internal time is to be measured for the probe inputs.

Value of P-0-0200/201:	Signal:
0	actual position value 1/2
1	time
2	master axis position

Tab. 9-5: Probe function - determining the signal

Both units and decimal places of the parameters measurand positive and negative and difference of the relevant probe are switched in terms of this input.

If the actual positive value has been selected in the signal select parameters, then bit 4 in **S-0-0169, Probe control parameter** decides whether **S-0-0051, actual position value 1** or **S-0-0053, actual position value 2** is to be used.

Connecting the Probe Inputs

The probes are connected at E4 or E5 of the X12 connector on the DSS plug-in module.

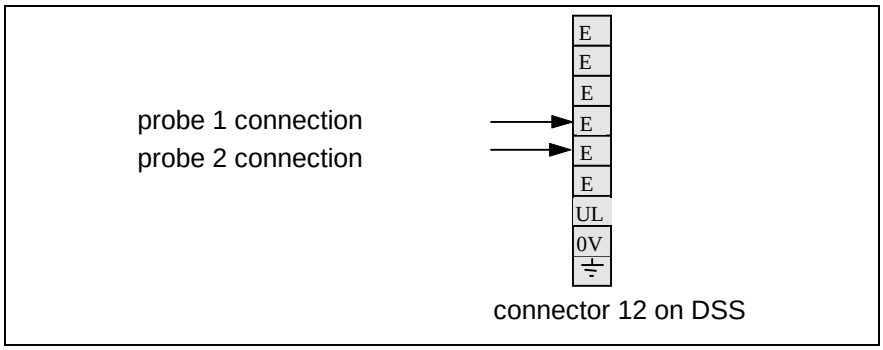


Fig. 9-18: Connecting the probe on the DSS

The following levels apply to the probe inputs:

Low : 0..+6V

High: +14V..U_{ext}(max)

The inputs are galvanically isolated and therefore require an external power source.

It applies:

U_{ext} = +18V (min.) +24V(nom.) +32V(max.)

If the external voltage exceeds this range, then error message **F233 External voltage supply error** is generated.

10 Glossary

Operating modes

Operating modes are selected in parameters S-0-0032..35. They determine the way in which a command value is processed in the drive to generate axis motions. The mode defines how the command value reaches the drive.

Operating data

Operating data is defined as data block element 7 of a parameter. The value of the parameter is stored therein.

Operating modes

All drive-internal initializations have been completed in the drive. The progression commands to phases 3 and 4 have been executed. The interface is in communications phase 4. Some parameters can no longer be write accessed. By switching the power and the drive enable signal, the drive can now be activated.

Data Status

Each parameter has a data status. This can be read via the required data channel by the control. Information about the validity of the parameter or command acknowledgement are contained therein.

Diagnoses

The drive diagnoses inform about current drive states. A diagnosis is made up of a diagnosis number and text. It is available in the form of a 7-segment display (H1 display) and in parameters **S-0-0390, Diagnosis number** and **S-0-0095, Diagnosis.**

External Encoder

The external measuring system is optional. It is generally mounted directly to the load. The position command value of the encoder is in S-0-0053, actual position value 2. By activating the position control operating modes with encoder 2, the position control loop of the external encoder is closed.

Faults/Errors

During the operation of a drive, a number of monitoring functions are performed. If a state is thereby detected that can no longer support proper functioning, then the drive generates an error. By executing the error reaction, the drive brakes itself.

Error Reaction

If an error is detected in the drive, then it responds by executing an error reaction itself. At the end of each such a reaction, the drive deactivates. The type of error reaction depends on the error class of the error occuring, as well as what was set in parameter P-0-0117..119.

Command

With the help of commands, complex functions can be controlled in the drive. Each command has a parameter. By means of command acknowledgment, a part of the data status, the drive signals the current level of execution of the command.

Modulo Format

The actual position and command values can be processed in absolute or modulo formats. If modulo is set, then the position data are within the range of 0..S-0-0103, modulo value. The function enables the implementation of infinitely turning axes.

Motor Encoder

A motor encoder is a measuring system with the help of which commutation can be performed. The measuring system is absolutely necessary. The actual positon value of the encoder is in S-0-0051, Actual position value -1. By activating the position control operating mode with encoder 1, the position control loop is closed with the help of the actual position value of the motor encoder.

Parameters

Communications with the drive controller takes place via read/write of data block elements of the drive parameters. Parameters are addressed with their ident number (data block element 1).

Parametrization Mode

The drive is in parametrization mode if communications phases 1 to 3 are set. An activation of the drive (applying drive enable) is not possible. First, the operating mode must be switched into. Several parameters can only be write accessed via parametrization mode.

SERCOS-INTERFACE

This is a digital interface for communications between controls and drives in numerically-controlled machines. This necessitates one or more ring structures. The physical connection of the participants is a fiber optic cable.

Software Modules

Software modules store software and parameters. It is inserted in slot U5. When exchanging the controller, the software module and its contents can simply by inserted into the new unit.

Base load

In MHD and MKD motors, motor feedback data storage control parameters are stored. These make a trouble-free working together of drive controller and motor possible. The control parameters are not optimized for each application.

Warnings

Warnings support diagnoses of states which can or cannot lead to a shutdown of the drive. The cause of the warning must, however, be cleared as otherwise an error will ultimately be generated. This will cause the drive to shut itself down.

Scaling

The combination of unit and number of decimal places of a parameter is identified as scaling. It can be set for position, velocity and acceleration data.

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DIAX04 Main Spindle Drives

Attachment A: Parameter Description

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

Title

DIAX04 Main Spindle Drives

Type of documentation

Function Descirption - Attachment A: Parameter Description

Document code

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

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The purpose of this documentation

This document is Attachment A of Function Description DOK-DIAX04-SHS-02VRS**-FKB1-EN-P. It lists standard and product-specific parameters belonging to firmware HSM01.1-SHS-02VRS.

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1 General Information

Document Structure

All standard and product-specific parameters are listed in numeric order in this section.

In addition to the information supplied in the Function Description, it is a complete description of all parameters of the DIAX04 software

The description of a parameter is broken down into two parts.

1) General description

The function or definition of a parameter and aids in its parametrization are outlined here.

2) Description of its attributes

The values and features listed here support the classificaiton of the parameter. They are needed to complete the parameter description. They are, however, not relevant when wanting to quickly obtain an overview of the definition of the parameter.

Definitions

The following terms are used:

Data length:

2Byte - the data length of the operating data equals 2 bytes

4Byte - the data length of the operating data equals 4 bytes

1Byte variable - this is operating data with variable length (list), the length of a data element equals 1 byte.

2Byte variable - this is operating data with variable length (list), the length of a data element equals 2 bytes.

4Byte variable - this is operating data with variable length (list), the length of a data element equals 4 bytes.

Format :

BIN - the display format of the operating data is binary.

HEX - the display format of the operating data is hexadecimal.

DEC_OV - the display format of the operating data is decimal without qualifying sign.

DEC_MV - the display format of the operating data is decimal with qualifying sign.

ASCII - the operating data is a string

IDN - the operating data is an ID number

Editability:

no - the operating data cannot be changed

P2 - the operating data can only be changed in communications phase 2

P23 - the operating data can only be changed in communications phases 2 and 3

P234 - the operating data can be changed in every phase

P3 - the operating data can only be changed in communications phase 3

P4 - the operating data can only be changed in communications phase 4

Memory:

permanent - the operating data is permanently programmed in the drive

no - the operating data is not backed up in the drive, the value after powering up the drive controller is not defined.

Parameter EEPROM - the operating data is backed up in the EEPROM of the programming module (DSM).

Amplifier EEPROM - the operating data is backed up in the EEPROM of the drive.

Feedback EEPROM - the operating data is backed up in the EEPROM of the motor feedback memory (only applies to MHD and MKD motors).

Validity check:

no - the validity of the operating data is not checked.

Phase 2 - the operating data is checked in command "Communications phase 3 transition check".

Phase 3 - the operating data is checked in command "Communications phase 4 transition check".

Extreme value check:

no - when writing, the extreme value of the operating data is not checked

yes - when writing, the extreme value of the operating data is checked

Combination check:

no - when writing the operating data is not checked for valid combinatioins (bit strips).

yes - when writing the operating data is checked for valid combinatioins (bit strips).

Cyclical transmission:

no - the operating data cannot be configured as cyclical data either in the master data telegram or in the drive telegram.

AT - the operating data can be configured as cyclical data in the drive telegram.

MDT - the operating data can be configured as cyclical data in the master data telegram.

2 Standard Parameters

S-0-0001, NC Cycle Time (TNcyc)

Description:

The NC cycle time specifies the intervals at which the NC makes new command values available. The NC cycle time must be transmitted during communications phase 2 by the master to the slave and taken into account in the slave starting with communications phase 3. The NC cycle time must be a multiple integer of **S-0-0002, SERCOS cycle time T_{Scyc}.**

$$T_{Ncyc} = T_{Scyc} * j, \quad \text{with } j = 1,2,3.....$$

See Function Description: "Position command value monitoring"

S-0-0001 - attributes

ID number:	S-0-0001
Name in German :	NC-Zykluszeit (TNcyc)
Name in English :	NC Cycle Time (TNcyc)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	500
Maximum input value:	65000
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0002, SERCOS cycle time (TScyc)

Description:

The cycle time of the interface specifies the transmission intervals of cyclical data. The interface cycle times are set at 500 us, 1ms, 2ms,... to 65 ms in increments of 1ms. The SERCOS cycle time must be transmitted by the master to the slave in communications phase 2 and activated in both as well as starting with communications phase 3.

See Function Description: "Configuration of telegram end and receive times"

S-0-0002 - attributes

ID number:	S-0-0002
Name in German :	SERCOS-Zykluszeit (TScyc)
Name in English :	SERCOS Cycle Time (Tscyc)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	500
Maximum input value:	65000
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0003, Minimum AT transmit starting time (T1min)

Description:

In the value of this parameter, the slave specifies the minimum time requirement between the end of the received master synchronization telegram and the transmission of its drive telegram.

Time $T1_{min}$ is read by the master in communications phase 2 to calculate the transmission time of the drive telgram T1 **S-0-0006, AT transmission starting time of drive telegram (T1)**.

See Function Description: "Configuration of telegram end and receive times"

S-0-0003 - attributes

ID number:	S-0-0003
Name in German :	Sende-Reaktionszeit AT (T1min)
Name in English :	Minimum AT Transmit Starting Time (T1min)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0004, Transmit/Receive Transition Times (TATMT)

Description:

The value of this parameter specifies the time the slave needs to switch to master data telegram reeive after a drive telegram has been sent.

The transition time transmit/receive is read by the master in communications phase 2 to calculate transmit time of the master data telegram T2 **S-0-0089, T2 Transmit time MDT**.

See Function Description: "Configuration of telegram end and receive times"

S-0-0004 - attributes

ID number:	S-0-0004
Name in German :	Umschaltzeit Senden-Empfangen (TATMT)
Name in English :	Transmit/Receive Transition Time (TATMT)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0005, Minimum feedback acquisition time (T4min)

Description:

Minimum time requirements of slave feedback acquisition and end of master synchronization telegram. This value is specified by the drive in such a way that the current feedback values can be transmitted to the NC with the next drive telegram.

The master reads this value in phase 2 to be able to set the acquisition time of the feedback value T4 **S-0-0007, Feedback acquisition starting time (T4)** for all drives.

See Function Description: "Configuration of telegram end and receive times"

S-0-0005 - attributes

ID number:	S-0-0005
Name in German :	Mindestzeit Istwerterfassung(T4min)
Name in English :	Minimum Feedback Acquisition Time(T4min)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0006, AT transmission starting time of drive telegram (T1)

Description:

The AT transmission starting time permanently fixes when the slave must send its drive telegram at the end of the master synchronization telegram in communications phase 3 and 4.

This parameter is transmitted in phase 2 by the master to the slave and is activated as of communications phase 3.

The AT transmission starting time must be set equal to or greater than transmit staring time **S-0-0003, Minimum AT transmit starting time (T1min)** eingestellt werden:

It applies:

$$T1min \leq T1$$

See Function Description: "Configuration of telegram end and receive times"

S-0-0006 - attributes

ID number:	S-0-0006
Name in German :	Sendezeitpunkt Antriebstelegramm (T1)
Name in English :	AT Transmission Starting Time (T1)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	12
Maximum input value:	65535
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0007, Feedback acquisition starting time(T4)

Description:

Feedback acquisition starting time specified by master at the end of the master synchronization telegram. The master can thus specify the same acquisition starting time for all drives that are working together. This ensures the synchronization of feedback acquisition in the relevant drives. The cyclically transmitted command values are processed at the same T4 time.

The master must set the feedback acquisition starting time smaller or equal to the differene between **S-0-0002, SERCOS cycle time** and the queried **S-0-0005, Minimum feedback acquisition time**:

It applies:

$$T4 \leq T_{Scyc} - T4min$$

See Function Description: "Configuration of telegram end and receive times"

S-0-0007 - attributes

ID number:	S-0-0007
Name in German :	Messzeitpunkt Istwerte (T4)
Name in English :	Feedback Acquisition Starting Time (T4)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	0
Maximum input value:	65535
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0008, Command valid time (T3)

Description:

"Command valid time" specifies the time at which the drive may access the new command values.

Thus, for all drives working together, the master can set the same "Command valid time". The drive activates "Command valid time" starting with phase 3.

See Function Description: "Configuration of telegram end and receive times"

S-0-0008 - attributes

ID number:	S-0-0008
Name in German :	Zeitpunkt für Sollwert gültig (T3)
Name in English :	Command Valid Time (T3)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	0
Maximum input value:	65535
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0009, Beginning address in master data telegram

Description:

This parameter sets the beginning address of the data block of a drive into the MDT printed as a byte position. Starting with 1 for the first data byte after the address field in MDT.

The beginning adress of the drive data block in the MDT is transmitted to every drive by the master druing communications phase 2 and becomes active as of communications phase 3.

See Function Description: "Configuration of telegram end and receive times"

S-0-0009 - attributes

ID number:	S-0-0009
Name in German :	Anfangsadressse im Master-Datentelegramm
Name in English :	Beginning Address in Master Data Telegram
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	1
Maximum input value:	65531
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0010, Length of master data telegram

Description:

The length of the MDT stated in bytes contains the data blocks of all drives. The length of the MDT is transmitted by the master in phase 2 to all drives and is activated by master and slave as of phase 3.

See Function Description: "Configuration of telegram end and receive times"

S-0-0010 - attributes

ID number:	S-0-0010
Name in German :	Länge Master-Datentelegramm
Name in English :	Length of Master Data Telegram
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	4
Maximum input value:	65534
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission	no

S-0-0011, Class 1 diagnostics

Description:

Function: drive locking

An error situation of the class 1 diagnostic type detected by the drive causes the drive to:

1. Generate an error reaction in the drive as in Function Description described under "
2. Set "1" of static error bit for C1D in drive status.
   The error bit is set by the drive back to "0" if C1D is cleared and command **S-0-0099, Reset C1D diagnostics** has been received in the service channel by the drive.

Parameter Structure:

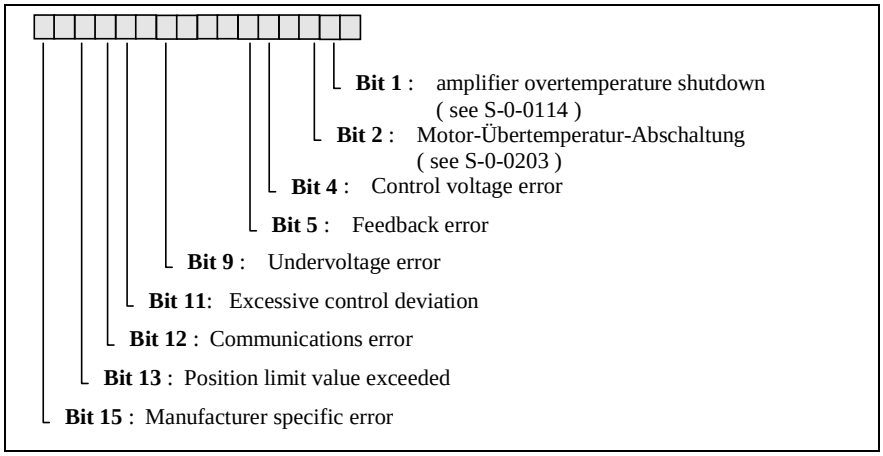


Fig. 2-1: S-0-0011, Class 1 diagnostics

Note:

Only the bits specified here are software supported.

See Function Description: "S-0-0011, Class 1 diagnostics"

S-0-0011 - attributes

ID number:	S-0-0011
Name in German :	Zustandsklasse-1
Name in English :	Class 1 Diagnostics
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0012, Class 2 diagnostics

Description:

Function: Shutdown pre-warning.

The activation of or resolution of a warning in Class 2 diagnostics results in the setting of a "1" in the change bit for Class 2 diagnostics in the drive status. By reading C2D via the service channel, the change bit of the C2D in the drive status is reset to "0".

Parameter Structure:

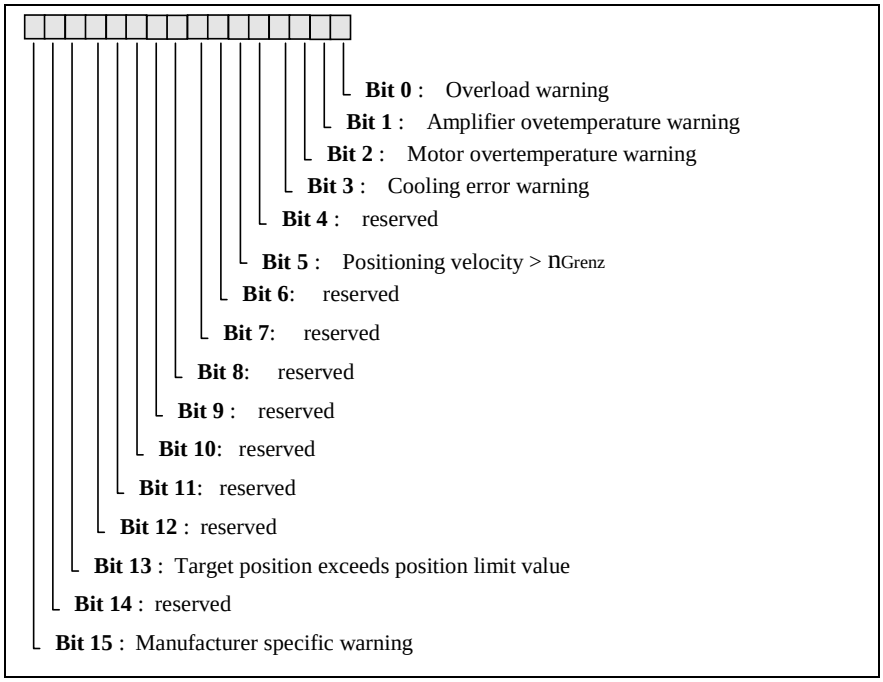


Fig. 2-2: S-0-0012, Class 2 diagnostics

Note:

Only the bits specified here are software supported

See Function Description: "S-0-0012, Class 2 diagnostics"

S-0-0012 - attributes

ID number:	S-0-0012
Name in German :	Zustandsklasse-2
Name in English :	Class 2 Diagnostics
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0013, Class 3 diagnostics

Description:

Function: Signals operating states

The activation or resolution of a warning in C3D means a "1" is set in the change bit for C2D (Class 2 diagnostics) in the drive status. By reading C3D (Class 3 diagnostics) via the service channel, the change bit of C3D in the drive status is set to "0".

Parameter Structure:

Bit 0	**=1,** if $n_{ist} = n_{soll}$, the actual speed value **(S-0-0040)** is within ± of the speed window **(S-0-0157)** around the speed command value **(S-0-0036).** *(only in speed control mode)*
Bit 1	*With speed control mode:* **=1,** if $\|n_{ist}\| = 0$, the actual speed **(S-0-0040)** and command value **(S-0-0036)** is smaller than the standstill window **(S-0-0124)** *In torque and position control mode:* **=1,** if $\|n_{ist}\| = 0$, the actual speed value **(S-0-0040)** is smaller than the standstill window **(S-0-0124)**
Bit 2	(not assigned)
Bit 3	**=1,** if $\|M_d\| > M_{dx}$, The actual torque value M_d **(S-0-0084)** is greater than the torque threshold M_{dx} **(S-0-0126)**
Bit 4	(not assigned)
Bit 5	**=1,** if $\|n_{soll}\| > n_{grenz}$, the speed command value **(S-0-0036)** exceeds speed limits $\pm n_{grenz}$ **(S-•-0091)**
Bit 6	**=1,** if „Spindle in position“, actual positions 1/2 **(S-0-0051/-0053)** are outside ± of the positioning window (**S-•-0057**) around the command position. *(Only with spindle positioning)*
Bit 7	**=1,** if $\|P\| > P_x$, the output power P **(S-0-0382)** is greater than the power threshold P_x **(S-0-0158)**
Bit 8	(not assigned)
Bit 9	(not assigned)
Bit 10	(not assigned)
Bit 11	(not assigned)
Bit 12	(does not apply to spindle drives)
Bit 13	(does not apply to spindle drives)
Bit 14	(does not apply to spindle drives)
Bit 15	**=1,** if at least one message is pending in manufacturer's class 3 diagnostics **(S-0-0182)**

Fig. 2-3: S-0-0013, Class 3 diagnostics

Note:
Only the bits specified here are software supported.

See Function Description: "S-0-0013, Class 3 diagnostics"

S-0-0013 - attributes

ID number:	S-0-0013
Name in German :	Zustandsklasse-3
Name in English :	Class 3 Diagnostics
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0014, Interface Status

Description:

This parameter shows, in bits 3 to 15, when a communications error has taken place:

It applies:

all bits 3 .. 15 = 0 => no error

one bit in 3 .. 15 = 1 => error pending

If a communications error occurs, then bit 12 is set in parameter **Class 1 diagnostics** (**S-0-0011**). The drive does not reset the communications error back to "0" if an error at the interface is no longer pending and the command **S-0-0099, Reset Class 1 diagnostics** has been received via the service channel.

The current communications phase can be queried via the first three bits (0, 1, 2).

Parameter Structure:

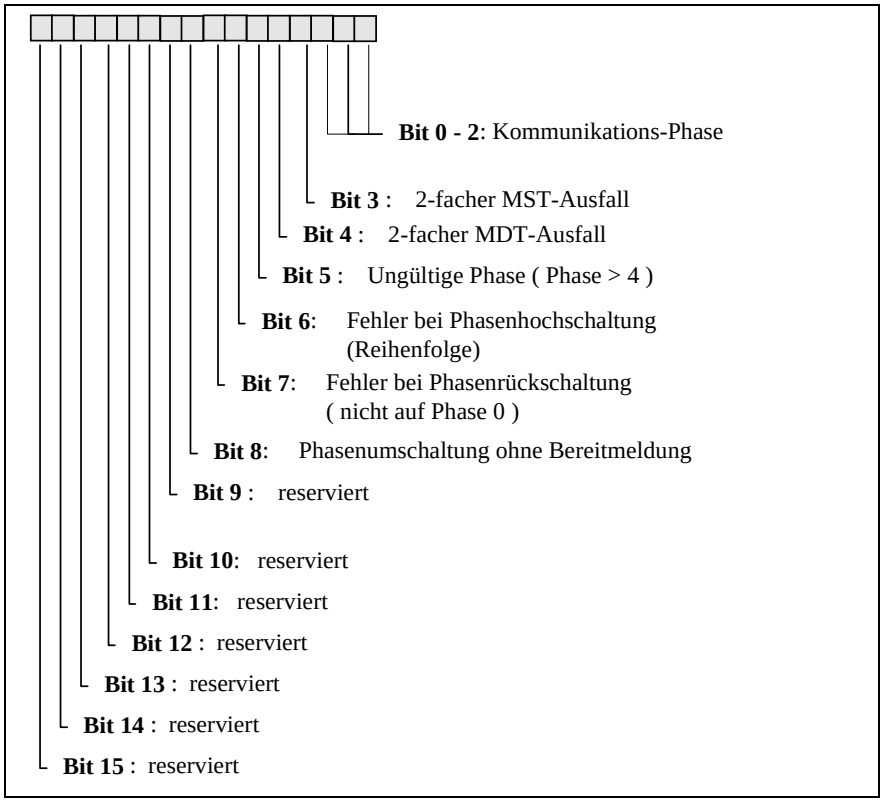


Fig. 2-4: S-0-0013, Interface status

See Function Description: "Diagnosing Interface States"

S-0-0014 - attributes

ID number:	S-0-0014
Name in German :	Schnittstellen-Status
Name in English :	Interface Status
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0015, Telegram type parameter

Description:

In the telegram type parameter it is possible to choose between preferred telegram and configured telegram.

The set telegram type is activated in the master and slave as of communications phase 3.

Parameter Structure:

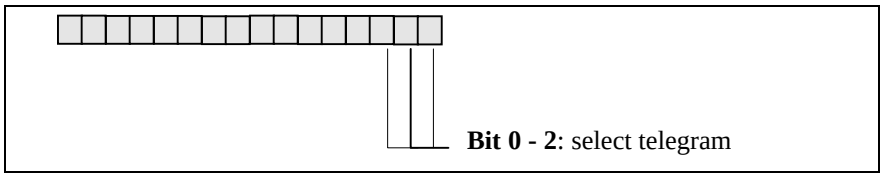


Fig. 2-5: S-0-0015, Telegram parameter

Note:

Only the bits specified here are software supported.

Telegrams:

Bit 0-2:		MDT:	AT:
0	VZ 0	no cyclical data	no cyclical data
1	VZ 1	**DF1**: S-0-0080 Torque command value	no cyclical data
2	VZ 2	**DF1**: S-0-0036 Velocity command value	**DF1**: S-0-0040 Position command value
3	VZ 3	**DF1**: S-0-0036 Velocity command value	**DF1**: S-0-0051/S-0-0053 Actual position 1
4	VZ 4	**DF1**: S-0-0047 Position command value	**DF1**: S-0-0051/S-0-0053 Actual position 1
5	VZ 5	**DF1**: S-0-0047 Position command value **DF2**: S-0-0036 Velocity command value	**DF1**: S-0-0051/S-0-0053 Actual position 1 **DF2**: S-0-0040 Actual velocity value
6	VZ 6	**DF1**: S-0-0036 Velocity command value	no cyclical data
7	configurable telegram		

Tab. 2-1: Supported bits

with VZ : Preferred telegram
DF1/2 : data field 1 / 2

See Function Description: "Configuration of telegram contents"

S-0-0015 - attributes

ID number:	S-0-0015
Name in German :	Telegrammarten-Parameter
Name in English :	Telegram Type Parameter
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0016, Drive telegram configuration list

Description:

If the configured telegram has been set in **S-0-0015, Telegram type parameter,** then the configurable data block is configured via this list in the AT in application-specific terms.

It may only contain those operating data that are listed in parameter **S-0-0187 List of configurable data in the AT**.

See Function Description: "Telegram content configuration"

S-0-0016 - attributes

ID number:	S-0-0016
Name in German :	Konfig.-Liste Antriebs-Telegramm
Name in English :	Custom Amplifier Telegram Configuration List
Function :	Parameter
Data length :	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0017, IDN List of Operating Data

Description:

The ID numbers of all operating data in the drive are filed in this ID number list.

See Function Description: "Parameter"

S-0-0017 - attributes

ID number:	S-0-0017
Name in German :	IDN-Liste aller Betriebsdaten
Name in English :	IDN List of all Operation Data
Function :	Parameter
Data length :	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0021 IDN List of invalid operating data phase 2

Description:

Before the drive conducts the command **S-0-0127, Communications phase 3 transition check** coming from the drive, it checks whether all communications parameters are complete and correct.

If the drive sees that one or more IDN's are invalid, then it writes the still required or invalid operating data into the ID number list. This is displayed via the fault diagnosis **C101, Communications parameter incomplete**.

See Function Description: "**S-0-0127, C1 Communications phase 3 transition check**"

S-0-0021 - attributes

ID number:	S-0-0021
Name in German :	IDN-Liste ungültige Betriebsdaten Phase 2
Name in English :	IDN List of Invalid Op. Data for Comm. Ph.2
Function :	Parameter
Data length :	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0022, IDN List of invalid operating data phase 3

Description:

Before the drive conducts the command **S-0-0128, Communication phase 4 transition check**, it checks the parameter in terms of the following:

- parameter validity
- is parameter within possible input range
- "compatibility" with other parameters

If the check is negative for one of the parameters, then it writes these operating data into the ID number list.

The drive then acnowledges the transition command with the message:

- **C201 Parameter block incomplete or**
- **C202 Parameter limit value error or**
- **C203 Parameter conversion error**

See Function Description: "S-0-0128, C2 Communications phase 4 transition check"

S-0-0022 - attributes

ID number:	S-0-0022
Name in German :	IDN-Liste ungültige Betriebsdaten Phase 3
Name in English :	IDN List of Invalid Op. Data for Comm. Ph.3
Function :	Parameter
Data length :	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0024, Configuration list of master data telegram

Description:

If the configured telegram has been set in **S-0-0015, Telegram type parameter** then the configurable data block in the MDT is configured application-specific in this list.

It may only contain such operating data as listed in parameter **S-0-0188, List of configurable data in the MDT.**

See Function Description: "Configuration of telegram contents"

S-0-0024 - attributes

ID number:	S-0-0024
Name in German :	Konfig.-Liste Masterdaten-Telegramm
Name in English :	Config. List of the Master Data Telegram
Function :	Parameter
Data length :	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0028, Error Count MST

Description:

The „Error count MST“ counts all invalid MSTs in communications phases 3 and 4.

If two MSTs failed sequentially, then error **F401, Double MST failure shutdown** is generated and there is a return to phase 0.

The „Error count MST“ has a stop at (2^16) - 1. This means that „Error count MST“ has a value of 65535 after a transmission with extreme interference after an extended period of time.

See Function Description: "Error count for telegram failure"

S-0-0028 - attributes

ID number:	S-0-0028
Name in German :	Fehlerzähler MST
Name in English :	MST Error Count
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0029, Error count MDT

Description:

This parameter counts all invalid MDTs in communications phases 3 and 4.

If two sequential MDTs fail, then error **F402, Double MDT failure shutdown** is generated and there is a return to phase 0.

The "Error count MDT" has a stop at (2^16) - 1. This means that "Error count MDT" has a value of 65535 after a transmission with extreme interference after an extended period of time.

See Function Description: "Error count for telegram failure"

S-0-0029 - attributes

ID number:	S-0-0029
Name in German :	Fehlerzähler MDT
Name in English :	MDT Error Count
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0030, Manufacturer Version

Description:
The drive software version can be read in this parameter.

Example:

DSM2.3-ELS-03V25

See Function Description: "Firmware overview"

S-0-0030 - attributes

ID number:	S-0-0030
Name in German :	Hersteller-Version
Name in English :	Manufacturer Version
Function :	Parameter
Data length :	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0032, Main Operating Mode

Description:

The operating modes set in this parameter are activated in the drive if:

- the main operating mode is selected in the master control word (bits 8 and 9 = "00").
- control and power sections are ready to operate
- the drive enable RF signal has been set

The operating mode is selected by inputting a bit list. In this list, specific positions have been permanently defined.

Thus, in bit 3 the selection must be made whether there is to be lagless or with lag position control.

It applies :

Bit 3 = 0	position control with lag
Bit 3 = 1	lagless position control

Bit list:	Definition:
0000,0000,0000,0001	torque control
0000,0000,0000,0010	velocity control
0000,0000,0000,x011	position control with encoder 1
0000,0000,0000,x100	position control with encoder 2
0000,0000,0001,x011	drive-internal interpolation, encoder 1
0000,0000,0001,x100	drive-internal interpolation, encoder 2

Tab. 2-2: Bit list S-0-0032

See Function Description: "Setting operating parameters"

S-0-0032 - attributes

ID number:	S-0-0032
Name in German :	Hauptbetriebsart
Name in English :	Primary Mode of Operation
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0033, Secondary operating modes 1

Description:

The operating modes set in this parameter are activated in the drive if:

- the primary operating mode has been set in the master control word (bits 8 and 9 = "01").
- control and power sections are ready to operate
- the drive enable signal RF has been set

The operating mode is selected by inputting a bit list. In this list, specific positions have been permanently defined.

Thus, in bit 3 the selection must be made whether there is to be lagless or with lag position control.

It applies :

Bit 3 = 0	position control with lag
Bit 3 = 1	lagless position control

Bit list:	Definition:
0000,0000,0000,0001	torque control
0000,0000,0000,0010	velocity control
0000,0000,0000,x011	position control with encoder 1
0000,0000,0000,x100	position control with encoder 2
0000,0000,0001,x011	drive-internal interpolation, encoder 1
0000,0000,0001,x100	drive-internal interpolation, encoder 2

Tab. 2-3: Bit list S-0-0033

See Function Description: "Setting operating parameters"

S-0-0033 - attributes

ID number:	S-0-0033
Name in German :	Nebenbetriebsart-1
Name in English :	Secondary Operation Mode 1
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0034, Secondary operating mode 2

Description:

The operating modes set in this parameter are activated in the drive if:

- secondary operating mode 2 has been set in the master control word (bits 8 and 9 = "01").
- control and power sections are ready to operate
- the drive enable signal RF has been set

The operating mode is selected by inputting a bit list. In this list, specific positions have been permanently defined.

Thus, in bit 3 the selection must be made whether there is to be lagless or with lag position control.

It applies :

Bit 3 = 0	position control with lag
Bit 3 = 1	lagless position control

Bit list:	**Definition:**
0000,0000,0000,0001	torque control
0000,0000,0000,0010	velocity control
0000,0000,0000,x011	position control with encoder 1
0000,0000,0000,x100	position control with encoder 2
0000,0000,0001,x011	drive-internal interpolation, encoder 1
0000,0000,0001,x100	drive-internal interpolation, encoder 2

Tab. 2-4: Bit list S-0-0034

See Function Description: "Setting operating parameters"

S-0-0034 - attributes

ID number:	S-0-0034
Name in German :	Nebenbetriebsart-2
Name in English :	Secondary Operation Mode 2
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0035, Secondary operating mode 3

Description:

The operating modes set in this parameter are activated in the drive if:

- secondary operating mode 3 has been set in the master control word (bits 8 and 9 = "01").
- control and power sections are ready to operate
- the drive enable signal RF has been set

The operating mode is selected by inputting a bit list. In this list, specific positions have been permanently defined.

Thus, in bit 3 the selection must be made whether there is to be lagless or with lag position control.

It applies :

Bit 3 = 0	position control with lag
Bit 3 = 1	lagless position control

Bit list:	Definition:
0000,0000,0000,0001	torque control
0000,0000,0000,0010	velocity control
0000,0000,0000,x011	position control with encoder 1
0000,0000,0000,x100	position control with encoder 2
0000,0000,0001,x011	drive-internal interpolation, encoder 1
0000,0000,0001,x100	drive-internal interpolation, encoder 2

Tab. 2-5: Bit list S-0-0035

See Function Description: "Setting operating parameters"

S-0-0035 - attributes

ID number:	S-0-0035
Name in German :	Nebenbetriebsart-3
Name in English :	Secondary Operation Mode 3
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0036, Velocity Command Value

Description:

The velocity command value is specified in this parameter.

In position control mode this parameter shows the output variables of the position controller.

See Function Description: "Velocity control"

S-0-0036 - attributes

ID number:	S-0-0036
Name in German :	Geschwindigkeits-Sollwert
Name in English :	Velocity Command Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points :	S-0-0044
Minimum input value:	S-0-0044
Maximum input value:	S-0-0044
Editability:	P234
Storage:	no
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	MDT

S-0-0040, Actual Velocity Value

Description:

The velocity actual value can be transmitted by the drive controller to the control either cyclically or via the service channel.

See Function Description: "Prepare to set speed controller"

S-0-0040 - attributes

ID number:	S-0-0040
Name in German :	Geschwindigkeits-Istwert
Name in English :	Velocity Feedback Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points :	S-0-0044
Minimum input value:	S-0-0044
Maximum input value:	S-0-0044
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

S-0-0043, Velocity Polarity Parameter

Description:

In this parameter the polarity of the velocity data can be matched to the application.

The polarities are not matched inside but rather outside (at the input and output) of the control path.

With rotary motors it applies:
A clockwise rotation looking onto motor shaft applies to a positive velocity command value and positive polarity.

With linear motors it applies:
If the primary part of the linear motor moves in that directoin in which the connection cables are mounted on the front, then a positive direction is assumed.

Parameter Structure:

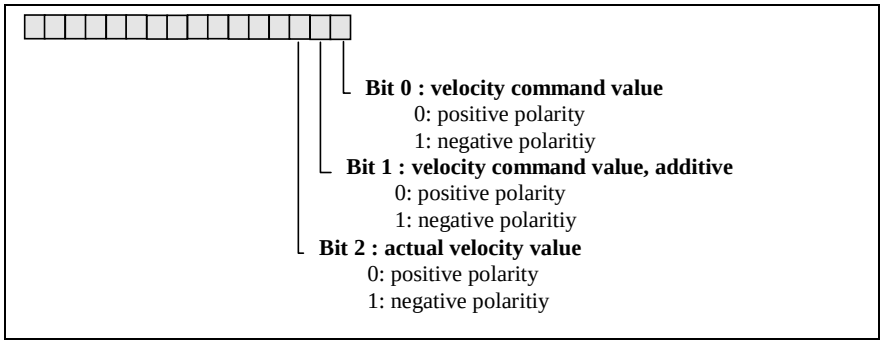


Fig. 2-6: S-0-0043, Velocity polarity parameter

See Function Description: "Command and actual value polarities"

S-0-0043 - attributes

ID number:	S-0-0043
Name in German :	Geschwindigkeits-Polaritäten-Parameter
Name in English :	Velocity polarity parameter
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0044, Scaling type for velocity data

Description:

Various scaling types for the velocity data in the drive can be defined.

Parameter Structure:

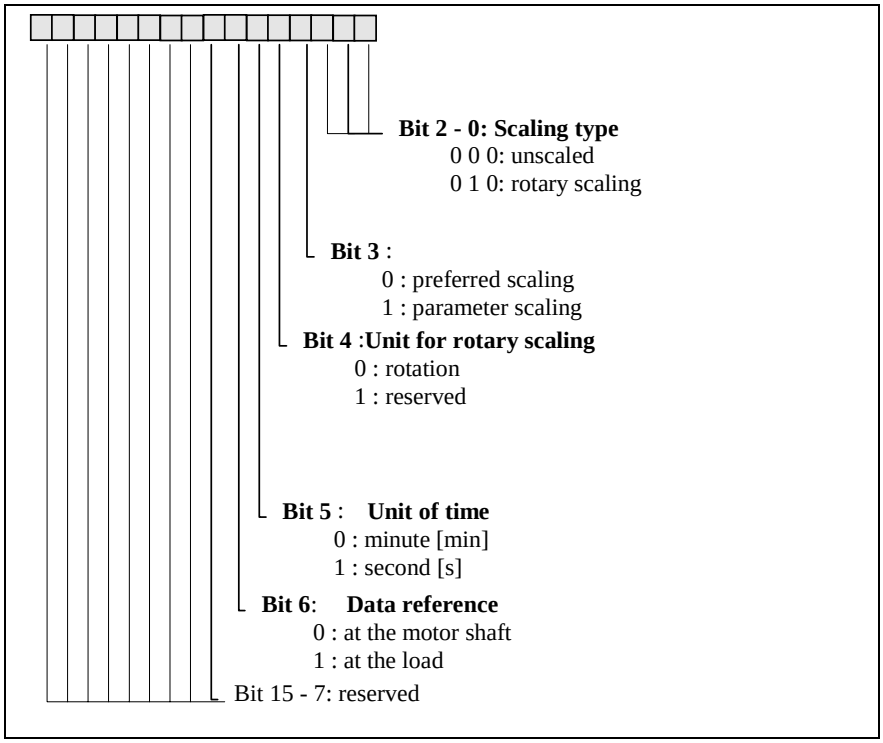


Fig. 2-7: S-0-0044, Scaling type for velocity data

See Function Description: "Display format for velocity data"

S-0-0044 - attributes

ID number:	S-0-0044
Name in German :	Wichtungsart für Geschwindigkeitsdaten
Name in English :	Velocity data scaling type
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Check_P3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0045, Velocity data scaling factor

Description:

The scaling factor for all velocity data in the drive can be set in this parameter.

If **S-0-0044, Velocity data scaling factor** is used for preferred scaling, then this parameter is set to 1.

See Function Description: "Display format for velocity data"

S-0-0045 - attributes

ID number:	S-0-0045
Name in German :	Wichtungs-Faktor für Geschwindigkeitsdaten
Name in English :	Velocity data scaling factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	1
Maximum input value:	65535
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0046, Velocity data scaling exponent

Description:

The scaling exponent for all velocity data in the drive is set in this parameter.

See Function Description: "Display format for velocity data"

S-0-0046 - attributes

ID number:	S-0-0046
Name in German :	Wichtungs-Exponent für Geschwindigkeitsdaten
Name in English :	Velocity data scaling exponent
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0047, Position command value

Description:

In position control mode, this parameter is transmitted at intervals within the NC cycle time by the control to the drive.

See Function Description: "Position control"

S-0-0047 - attributes

ID number:	S-0-0047
Name in German :	Lage-Sollwert
Name in English :	Position Command Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	S-0-0076
Maximum input value:	S-0-0076
Editability:	P234
Storage:	no
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	MDT

S-0-0051, Actual position value 1

Description:

The "Actual position value 1" represents the current motor encoder position.

It can be transmitted by the drive to the control.

See Function Description: "Setting the measuring systems"

S-0-0051 - attributes

ID number:	S-0-0051
Name in German :	Lage-Istwert-1
Name in English :	Position Feedback Value 1 (Motor Feedback)
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

S-0-0052, Reference distance 1

Description:

This parameter represents the distance between machine zero point and reference point for the motor measuring system (reference distance 1).

Upon completion of the command **S-0-0148, C6 Drive-controlled reference command,** the drive sets the **S-0-0047, Position command value** to this value if the motor encoder was referenced.

See Function Description: "Drive-controlled referencing"

S-0-0052 - attributes

ID number:	S-0-0052
Name in German :	Referenzmaß Lage-Istwert 1
Name in English :	Reference distance 1
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	S-0-0076
Maximum input value:	S-0-0076
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0053, Actual position value 2

Description:

Position feedback value 2 always references the external encoder.

See Function Description: "Setting the measuring systems"

S-0-0053 - attributes

ID number:	S-0-0053
Name in German :	Lage-Istwert-2
Name in English :	Position Feedback Value 2 (External feedback)
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

S-0-0054, Reference distance 2

Description:

This parameter represents the distance between machine zero point and reference point for the motor measuring system (reference distance 2).

Upon completion of the command **S-0-0148, C6 Drive-controlled reference command,** the drive sets the **S-0-0047, Position command value** to this value if the motor encoder was referenced.

See Function Description: "Drive-controlled referencing"

S-0-0054 - attributes

ID number:	S-0-0054
Name in German :	Referenzmaß Lage-Istwert 2
Name in English :	Reference distance 2
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	S-0-0076
Maximum input value:	S-0-0076
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0055, Position polarity parameter

Description:

This parameter can be used to invert the polarities of the specified position data. These polarities are switched outside of the control path, i.e., at the input and output of the control path.

With rotary motors it applies:
"Motor moving clockwise = motor turning clockwise (looking onto motor shaft) with a positive position command difference and positive polarity.

Software position limit values are activated or deactivated with bit 4.

Parameter Structure:

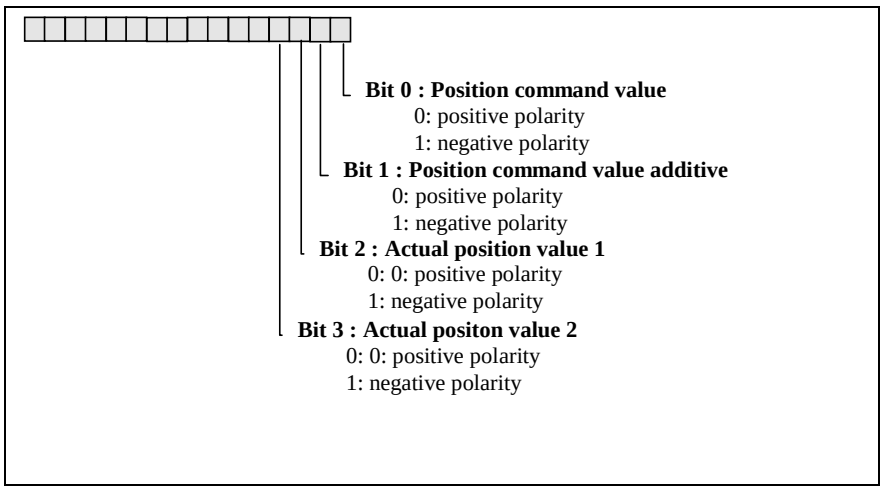


Fig. 2-8: S-0-0055, Position polarity parameter

Note:

-Only the bits specified here are software supported

-If the control changes bit 0, then the drive also sets bits 1 to 3 to the same value as bit 0.

See Function Description: "Command and actual value polarities"

S-0-0055 - attributes

ID number:	S-0-0055
Name in German :	Lage-Polaritäten-Parameter
Name in English :	Position Polarity Parameter
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	0
Maximum input value:	31
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-•-0057, Position window

Description:

The drive sets bit "In Position" in **S-0-0013, class 3 diagnostics** if the difference of position feedback value and position end value is smaller than the value in the position window.

During command **S-0-0148, C6 Command drive-controlled referencing** this parameter supports the signalling of the completion of the command if the actual positon value moves into reference point range ± **S-·-0057 Position window**.

See Function Description: **"S-0-0182, Manufacturer class 3 diagnostics"**

S-•-0057- attributes

ID number:	S-•-0057 (• ∈ {0,1,2,3})
Name in German :	Positionierfenster
Name in English :	Position window
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	0
Maximum input value:	S-0-0076
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0076, Position data scaling type

Description:

Various scaling types for position data in the drive can be set as shown below.

Parameter Structure:

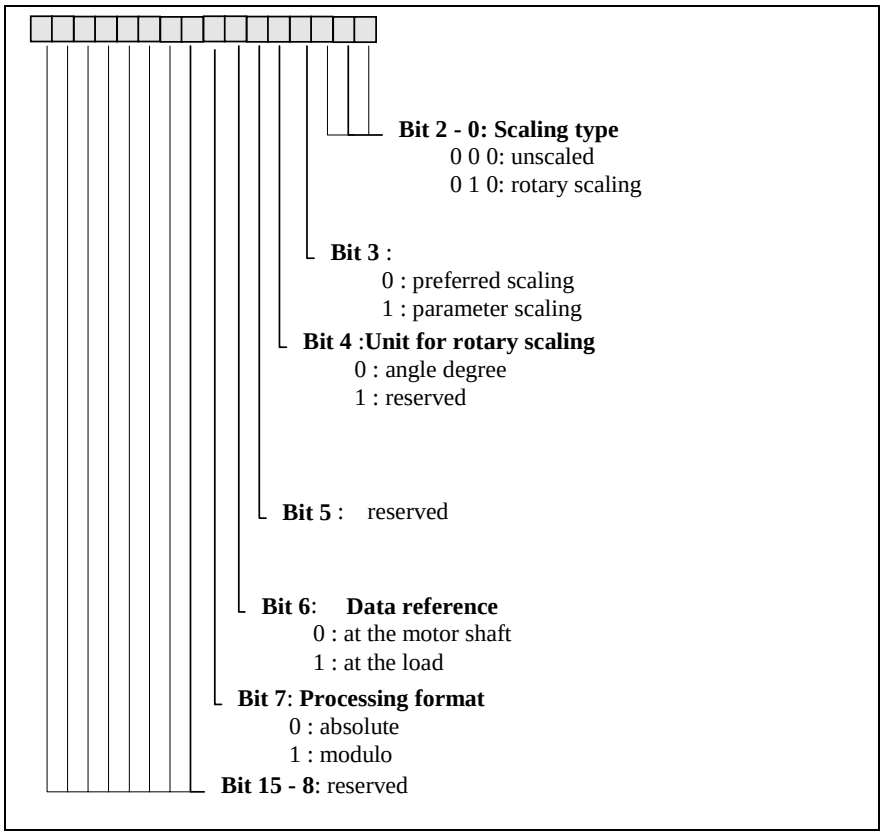


Fig. 2-9: S-0-0076, Position data scaling types

Note:

In DIAX04 main spindle drives, only "modulo" is possible as the processing format!

See Function Description: "Position data display formats"

S-0-0076 - attributes

ID number:	S-0-0076
Name in German :	Wichtungsart für Lagedaten
Name in English :	Position Data Scaling Type
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0077, Linear position data scaling factor

Description:

This ID number contains the scaling factor used to scale all position data within the drive.

The parameter is set to 1 if in **S-0-0076, Position data scaling type** translatory preferred scaling type is set.

See Function Description: "Position data display formats"

S-0-0077 - attributes

ID number:	S-0-0077
Name in German :	Wichtungs-Faktor transl. Lagedaten
Name in English :	Linear Position Data Scaling Factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0078 Linear position data scaling exponent

Description:

This ID number contains the scaling exponents needed to scale all position data in the drive if translatory scaling has been selected.

If translatory preferred scaling is selected, then the drive sets this parameter.

See Function Description: "Position data display formats"

S-0-0078 - attributes

ID number:	S-0-0078
Name in German :	Wichtungs-Exponent transl. Lagedaten
Name in English :	Linear Position Data Scaling Exponent
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0079, Rotational position resolution

Description:

If rotary position scaling is selected, then the LSB valence of all position data is set.

The LSB bit (least-significant bit) can be determined as follows:

Example:

If a resolution of 0.01 degrees is needed for the LSB, then a value of 36000 must be parametrized. The input value equals 8CA0H.

If preferred scaling has been set in parameterr **S-0-0076, Position data scaling type,** then the rotary position resolution is set to 3.600.000. This means a resolution of 0.0001degrees for the LSB.

See Function Description: "Position data display formats"

S-0-0079 - attributes

ID number:	S-0-0079
Name in German :	Rotations-Lageauflösung
Name in English :	Rotational position resolution
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	1
Maximum input value:	0xFFFFFFFF
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0080, Torque/force command value

Description:

In mode "torque control", the torque command values are transmitted to the drive from the control.

See Function Description: "Torque/force controller"

S-0-0080 - attributes

ID number:	S-0-0080
Name in German :	Drehmoment/Kraft-Sollwert
Name in English :	Torque/Force Command
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	S-0-0086
Unit in English :	S-0-0086
Decimal points :	S-0-0086
Minimum input value:	S-0-0086
Maximum input value:	S-0-0086
Editability:	P234
Storage:	no
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	MDT

S-0-0084, Torque/force actual value

Description:

This parameter represents the current torque feedback value of the motor.

S-0-0084 - attributes

ID number:	S-0-0084
Name in German :	Drehmoment/Kraft-Istwert
Name in English :	Torque/Force Feedback Value
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	S-0-0086
Unit in English :	S-0-0086
Decimal points :	S-0-0086
Minimum input value:	S-0-0086
Maximum input value:	S-0-0086
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

S-0-0085, Torque/force polarity parameter

Description:

The polarity of the torque data can be set to the application in this parameter.

Polarities are not matched inside but outside (at the input and ouputs) of the control path.

With rotary motors it applies:
With positive torque command value and positive polarity the motor shaft is accelerated clockwise, if $M_{Antrieb} > M_{Last}$

Parameter structure:

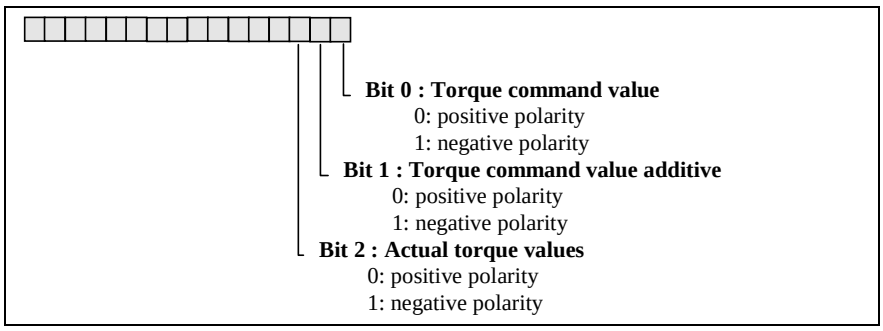


Fig. 2-10: S-0-0085, Torque/force polarity parameter

Note:

If the control changes bit 0, then the drive also changes bits 1 to 2 to the same value as is set in bit 0.

See Function Description: "Command and actual value polarities"

S-0-0085 - attributes

ID number:	S-0-0085
Name in German :	Drehmoment/Kraft-Polaritäten-Parameter
Name in English :	Torque/force polarity parameter
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	--
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0086 Torque/force data scaling type

Description:

At present, only the per cent scaling for torque/force data are supported.

It applies:

100 % = S-0-0111, motor standstill current

See Function Description: "Settable scaling for position, velocity and accel data"

S-0-0086 - attributes

ID number:	S-0-0086
Name in German :	Wichtungsart für Drehmoment-Kraftdaten
Name in English :	Torque/Force data scaling type
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

S-0-0088, TMTSY Receive to Receive Recovery Time

Description:

The time the slave needs to ready itself upon receipt of a master data telegram for the next master sycnhronization telegram is defined in this parameter.

The parameter is read by the control in phase 2 for calculation of the time slot parameter.

See Function Description: "Configuration of telegram end and receive times"

S-0-0088 - attributes

ID number:	S-0-0088
Name in German :	TMTSY Erholzeit Empfangen-Empfangen
Name in English :	Receive to Receive Recovery Time (TMTSY)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0089, T2 Transmit time MDT

Description:

Start time of master data telegram upon completion of master synchronization telegram. The value is transmitted by the master in phase 2 to the slave and activated in phase 3.

See Function Description: "Configuration of telegram end and receive times"

S-0-0089 - attributes

ID number:	S-0-0089
Name in German :	T2 Transmit timeMDT
Name in English :	MDT Transmit Starting Time (T2)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	0
Maximum input value:	65535
Editability:	P2
Storage:	parameter EEPROM
Validity check:	Phase 2
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0090, TMTSG Command value transmit time

Description:

Time needed in slave to make the command value ready for the drive after receipt of the master data telegram.

See Function Description: "Configuration of telegram end and receive times"

S-0-0090 - attributes

ID number:	S-0-0090
Name in German :	TMTSG Kopierzeit Sollwerte
Name in English :	Command Value Transmit Time (TMTSG)
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-•-0091, Bipolar velocity limit value

Description:

The "Bipolar velocity limit value" symmetrically sets the maximum allowable velocity in both directions. The maximum input value is fixed with **S-0-0113, Maximum motor speed**.

See Function Description: "Velocity limits"

S-•-0091- attributes

ID number:	S-•-0091 (• ∈ {0,1,2,3})
Name in German :	Geschwindigkeits-Grenzwert bipolar
Name in English :	Bipolar Velocity Limit Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points :	S-0-0044
Minimum input value:	0
Maximum input value:	S-0-0113
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	MDT

S-0-0092, Bipolar torque/force limit value

Description:

This parameter sets the maximum allowable torque, symmetrically in both directions - accel and decel.

See Function Description: "Torque/force limits"

S-0-0092 - attributes

ID number:	S-0-0092
Name in German :	Drehmoment/Kraft-Grenzwert bipolar
Name in English :	Bipolar Torque/Force Limit Value
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	S-0-0086
Unit in English :	S-0-0086
Decimal points :	S-0-0086
Minimum input value:	0
Maximum input value:	S-0-0086
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	MDT

S-0-0093, Torque/force data scaling factor

Description:

The scaling factor for all torque/force data in the drive is set in this parameter.

See Function Description: "Settable scaling for position, velocity and accel data"

S-0-0093 - attributes

ID number:	S-0-0093
Name in German :	Wichtungs-Faktor für Drehmoment-Kraftdaten
Name in English :	Torque/Force data scaling factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0094 Torque/force data scaling exponent

Description:

The scaling exponent for all torque/force data in the drive is set in this parameter.

See Function Description: "Settable scaling for position, velocity and accel data"

S-0-0094 - attributes

ID number:	S-0-0094
Name in German :	Wichtungs-Exponent für Drehmoment-Kraftdaten
Name in English :	Torque/Force data scaling exponent
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0095, Diagnoses

Description:

The presently relevant operating state of the drive is displayed in this parameter.

Before it appears, the relevant diagnostic number from **S-0-0390, Diagnosis number** appears**.**

Example:

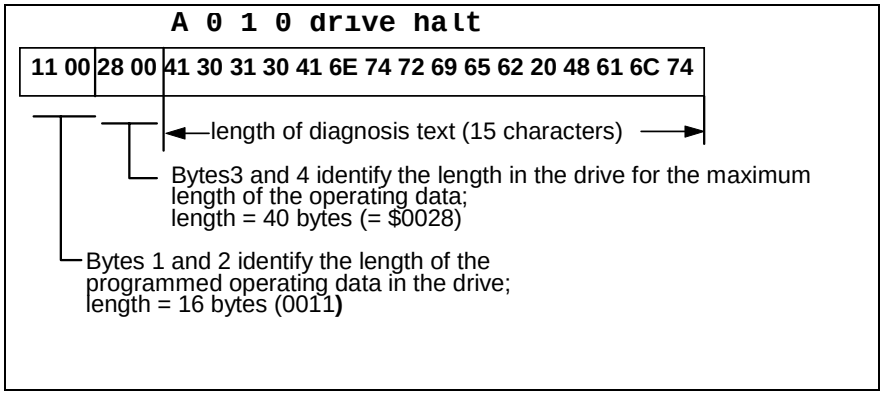


Fig. 2-11: S-0-0095, Diagnoses

See Function Description: "Clear text diagnoses"

S-0-0095 - attributes

ID number:	S-0-0095
Name in German :	Diagnose
Name in English :	Diagnostic Message
Function :	Parameter
Data length :	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0096, Slave arrangement (SLKN)

Description:

The master must know which drive is at which slave number during initialization in order to be able to conduct an optimum automatic time slot calculation.

The master receives this information from the drive during communications phase 2.

Valid address range: 01 .. 99

Example:

03	**03**

See Function Description: "Setting the SERCOS interface drive address"

S-0-0096 - attributes

ID number:	S-0-0096
Name in German :	Slavekennung (SLKN)
Name in English :	Slave arrangement (SLKN)
Function :	Parameter
Data length :	2Byte
Format :	HEX
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	no
Storage:	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0097, Mask class 2 diagnostics

Description:

Prewarnings can be masked in **S-0-0012, Class 2 diagnostics** in terms of their affect on the change bit in the drive status. When changing the masked prewarnings, the change bit of Class 2 diagnostics is set in the drive status.

The mask does not affect the operating data of Class 2 diagnostics.

See Function Description: "Change bits in class 2 and 3 diagnostics in the drive status word"

S-0-0097 - attributes

ID number:	S-0-0097
Name in German :	Maske Zustandsklasse 2
Name in English :	Mask class 2 diagnostic
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	yes
Cyclical transmission :	no

S-0-0098, Mask class 3 diagnostics

Description:

Prewarnings can be masked in **S-0-0013, Class 3 diagnostics** in terms of their affect on the change bit in the drive status. When changing the masked prewarnings, the change bit of Class 3 diagnostics is set in the drive status.

The mask does not affect the operating data of Class 3 diagnostics.

See Function Description: "Change bits in class 2 and 3 diagnostics in the drive status word"

S-0-0098 - attributes

ID number:	S-0-0098
Name in German :	Maske Zustandsklasse 3
Name in English :	Mask class 3 diagnostic
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	--
Maximum input value:	--
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

S-0-0099, Reset class 1 diagnostics

Description:

If the drive receives this command via the service channel, then, if no errors are pending, class 1 diagnostics, the interface status and the drive lock in drive stastus are cleared.

See Function Description: "Clearing errors"

S-0-0099 - attributes

ID number:	S-0-0099
Name in German :	Reset Zustandsklasse-1
Name in English :	Reset class 1 diagnostic
Function :	Command
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points :	0
Minimum input value:	0
Maximum input value:	3
Editability:	P234
Storage:	no
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-•-0100 , Velocity loop P-gain

Description:

This parameter contains the value for the P-gain of the velocity controller. The unit of the P-gain depends on the mounted motor.

Motor type	Unit:
Rotary motor:	A*sec/rad
Linear motor:	A*min/m

Tab. 2-6: Units for the motor types

When starting the drive, there is the option of loading base values for the parameter with the use of the command "Load base values". This applies if a motor with feedback storage has been mounted (**P-0-4014, Motor type:** 1 or 5).

See Function Description: "Setting the velocity controller"

S-•-0100 - attributes

ID number:	S-•-0100 (• ∈ {0,1,2,3})
Name in German :	Geschwindigkeitsregler-Proportionalverstaerkung
Name in English :	Velocity Loop Proportional Gain
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	As/rad
Unit in English :	As/rad
Decimal points :	1
Minimum input value:	0
Maximum input value:	65535
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-•-0101, Velocity integral action time

Description:

The velocity controller generates a current command using the difference between the velocity command and velocity feedback values (= velocity control deviation).

This current command is made up of a P-gain portion and an integral portion. The velocity loop integral action time is the time constant with which the integral portion of the current command at a constant velocity control deviation will increase.

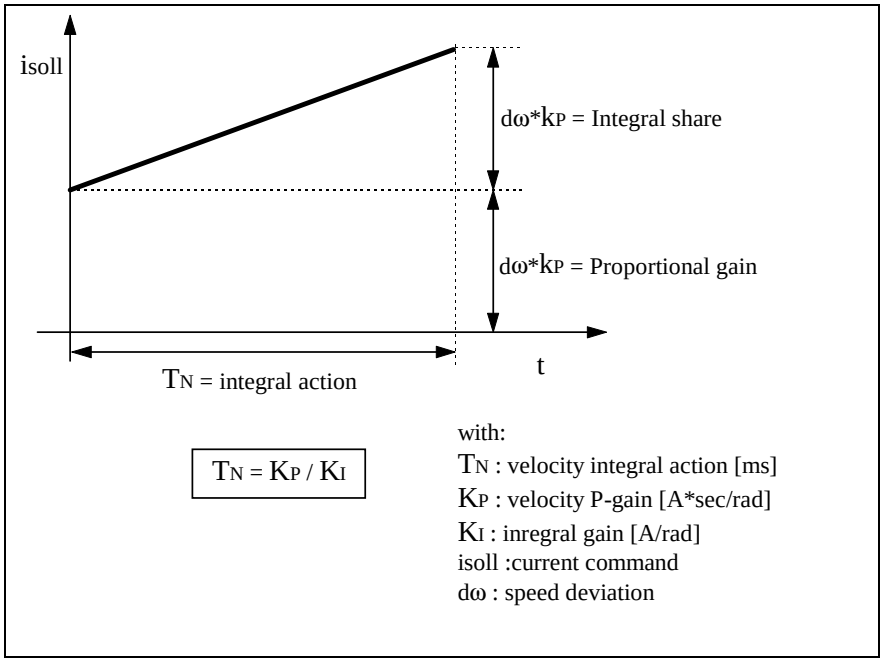


Fig. 2-12: Definition of integral action time

The value of the time axis is designated as the integral action time, whereby the integral gain is equal to the proportional gain.

An input value of 0 msec shuts the integral share off.

See Function Description: "Setting the velocity controller"

S-•-0101- attributes

ID number:	S-•-0101 (• ∈ {0,1,2,3})
Name in German :	Geschwindigkeitsregler-Nachstellzeit
Name in English :	Velocity Loop Integral Action Time
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal points :	1
Minimum input value:	0
Maximum input value:	65535
Editability:	P234
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-0-0103, Modulo value

Description:

If modulo format is set (parameter **S-0-0076, Scaling type for position data),** then it permanently specifies the numeric value at which modulo calculation in drive and control must be conducted.

See parameter **S-0-0393, Command value mode in modulo format**

See Function Description: "Modulo function"

S-0-0103 - attributes

ID number:	S-0-0103
Name in German :	Modulowert
Name in English :	Modulo Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points :	S-0-0076
Minimum input value:	1
Maximum input value:	360
Editability:	P23
Storage:	parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

S-•-0104, Position Loop KV Factor

Description:

This parameter contains the value for P-gain of the position controller.

When starting the drive, it is possible to load a default value for the parameter with the help of the "Load base values" command, if a motor with feedback storage is present (**P-0-4014, Motor type**: 1 or 5).

See Function Description: "Setting the position controller"

S-•-0104- attributes

ID number :	S-•-0104 (• ∈ {0,1,2,3})
Name in German :	Lageregler KV-Faktor
Name in English :	Position Loop KV-Factor (closed-loop control)
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	1000/min
Unit in English :	1000/min
Decimal points:	2
Minimum input value :	0
Maximum input value :	65535
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0106, P-gain 1 current regulator

Description:

This parameter shows the P-gain 1 of the current regulator.

The portional gain of the current regulator is fixed for the respective motor/drive combinations. It depends on the type of motor and shoud not be changed once set. It is listed in the motor data sheets or can be determined using the command "load base values".

See Function Description: "Setting the current regulator"

S-0-0106 - attributes

ID number :	S-0-0106
Name in German :	Stromregler-Proportionalverstaerkung 1
Name in English :	Proportional Gain 1 Current Regulator
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	V/A
Unit in English :	V/A
Decimal points:	2
Minimum input value :	0
Maximum input value :	65535
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0107, Current regulator 1 integral action time

Description:

The value of the parameter depends on the motor and is lsited in the motor data sheet.

See Function Description: "Setting the current regulator"

S-0-0107 - attributes

ID number :	S-0-0107
Name in German :	Stromregler-Nachstellzeit-1
Name in English :	Current Regulator 1 Integral Action Time
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal points:	1
Minimum input value :	0
Maximum input value :	65535
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0108, Feedrate Override

Description:

The feedrate override is only activated with "drive-controlled travel commands" such as

- command "drive-controlled referencing"
- operating mode "drive-internal interpolation".

In this case, the drive computes the velocity command value itself. The feedrate override multiplies the velocity command value.

S-0-0108 - attributes

ID number :	S-0-0108
Name in German :	Feedrate-Override
Name in English :	Feedrate override
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	%
Unit in English :	%
Decimal points:	2
Minimum input value :	0
Maximum input value :	65535
Editability:	P4
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0109, Motor peak current

Description:

If the peak current of the motor is smaller than the peak current of the drive, then the latter is automatically limited to the peak current of the motor.

This value is stored in MDD and MKD motors in the motor feedback. It is loaded from there with the initial startup of the drive. The vaue for other motor types must first be entered.

See Function Description: "Setting the effective peak current"

S-0-0109 - attributes

ID number :	S-0-0109
Name in German :	Spitzenstrom Motor
Name in English :	Motor Peak Current
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal points:	3
Minimum input value :	1
Maximum input value :	500000
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0110, Amplifier peak current

Description:
Peak current of the drive controller. The drive sets this value itself.

See Function Description: "Current limitation"

S-0-0110 - attributes

ID number :	S-0-0110
Name in German :	Spitzenstrom Verstärker
Name in English :	Amplifier Peak Current
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal points:	3
Minimum input value :	1
Maximum input value :	500000
Editability:	no
Storage:	Amplifier EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0111, Motor current at standstill

Description:

The "motor current at standstill" is that current at which the motor constantly generates torque at standstill as est in the motor data sheet.

This value is stored in MHD and MKD motors in the motor feedback. It is loaded from there with the initial startup of the drive. The value for other motor types must first be entered.

S-0-0111 - attributes

ID number :	S-0-0111
Name in German :	Stillstandstrom Motor
Name in English :	Motor Current at Standstill
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal points:	3
Minimum input value :	1
Maximum input value :	500000
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0113, Maximum motor speed

Description:

The maximum speed of the motor cannot be exceeded. It also affects parameter **S-•-0091, Bipolar velocity limit value.**

This value is stored in MHD and MKD motors in the motor feedback. It is loaded from there with the initial startup of the drive. The value for other motor types must first be entered.

See Function Description: "Velocity limitations"

S-0-0113 - attributes

ID number :	S-0-0113
Name in German :	Maximalgeschwindigkeit des Motors
Name in English :	Maximum Motor Speed (nmax)
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0115, Position encoder 2 parameter

Description:

This parameter sets significant features of the external encoder (position encoder 2).

Parameter structure

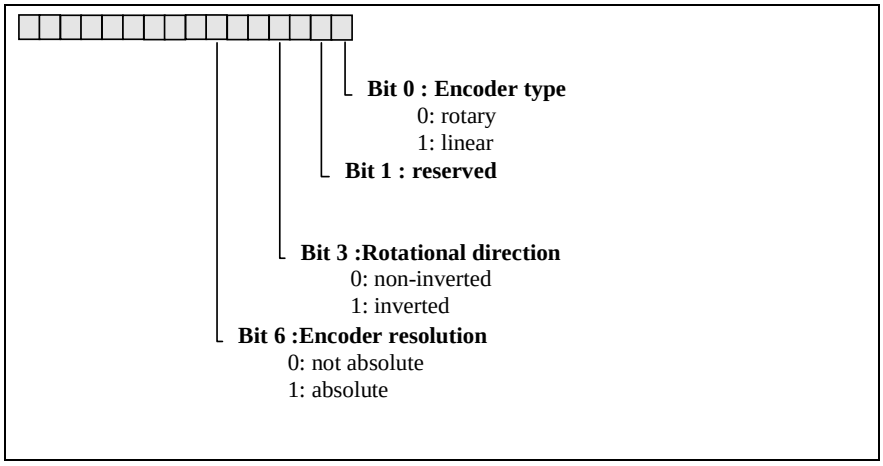


Fig. 2-0.1: S-0-0115, Position encoder 2 parameter

Comment:

Absolute measuring systems with memory automatically set bit 6.

Bits 0, 1 and 3 are set by the drive if MHD and MKD motors are mounted. They are also write protected.

Note:

Only the bits specified here are software supported.

See Function Description: "Other features of the external encoder"

S-0-0115 - attributes

ID number :	S-0-0115
Name in German :	Lagegeberart-Parameter 2
Name in English :	Position feedback 2 type parameter
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0116, Motor encoder resolution

Description:

Depending on parameter **P-0-4014, Motor type** (rotary or linear motors) **S-0-0116, Motor encoder resolution** specifies the resolution of the motor encoder.

With rotary motors, the value contains the number of cycles per motor revolution; with linear motors the number of lines per mm.

See Function Description: "Motor encoder resolution"

S-0-0116 - attributes

ID number :	S-0-0116
Name in German :	Rotationsgeber-1 Auflösung
Name in English :	Resolution of rotational feedback 1
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	Zykl/Umdr bzw. mm (von P-0-4014 abhängig)
Unit in English :	Cycl/Rev or inch (depends on P-0-4014)
Decimal points:	--
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0117, External encoder resolution

Description:

The resolution of the external encoder contains the number of cycles per external encoder rotation with rotary encoders; with translator external encoders, the number of lines is given in mm.

See Function Description: "Resolution of external encoder"

S-0-0117 - attributes

ID number :	S-0-0117
Name in German :	Rotationsgeber-2 Auflösung
Name in English :	Resolution of rotational feedback 2
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	Zykl/Umdr bzw mm (abhängig von S-0-0115, Bit 5)
Unit in English :	Cycl/Rev or inch (depends on S-0-0115, Bit 5)
Decimal points:	--
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-•-0121, Input revolutions of load gear

Description:

A mechanical gear is often used between motor and load.

The transmission ratio is defined:

$$\frac{\textbf{gear input (S-0-0121)}}{\textbf{gear output (S-0-0122)}}$$

Fig. 2-0.2: Transmission ratio

Example:

Five (5) motor revolutions equal two (2) gear output rotations

=> S-•-0121: 5
S-•-0122: 2

See Function Description: "Gear ratio"

S-•-0121- attributes

ID number :	S-•-0121 (• ∈ {0,1,2,3})
Name in German :	Lastgetriebe-Eingangsumdrehungen
Name in English :	Input revolutions of load gear
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	1
Maximum input value :	0xFFFFFFFF
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0122 Output revolutions load gear

Description:

A mechanical gear is often used between motor and load.

The transmission ratio is defined:

$$\frac{\textbf{gear input (S-0-0121)}}{\textbf{gear output (S-0-0122)}}$$

Fig. 2-0.3: Transmission ratio

Example:

Five (5) motor revolutions equal two (2) gear output rotations

=> S-•-0121 : 5
S-•-0122 : 2

See Function Description: "Gear ratio"

S-•-0122 - attributes

ID number :	S-•-0122 (• ∈ {0,1,2,3})
Name in German :	Lastgetriebe-Ausgangsumdrehungen
Name in English :	Output revolutions of load gear
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	1
Maximum input value :	0xFFFFFFFF
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0124, Stillstand window

Description:

Motor standstill is defined by the amount of **S-0-0040, Velocity actual value** situated below a parametrizable threshold (the "standstill window").

Bit 1 of **S-0-0013, Class 3 diagnostics** is set in standstill.

See Function Description: "S-0-0182, Manufacturer's class 3 diagnostics"

S-•-0124- attributes

ID number :	S-•-0124
Name in German :	Stillstandsfenster
Name in English :	Standstill window
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0126, Torque Threshold Mdx

Description:

If the torque generated by the drive exceeds torque threshold Mdx, then the drive signals this and sets bit 3 in **S-0-0013, Class 3 diagnostics**.

This message is suppressed in velocity control during accel and decel and with error reactions.

See Function Description: "S-0-0013, Class 3 diagnostics"

S-•-0126- attributes

ID number :	S-•-0126 (• ∈ {0,1,2,3})
Name in German :	Drehmoment-Schwelle Mdx
Name in English :	Torque Threshold Tx
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0086
Minimum input value :	S-0-0086
Maximum input value :	S-0-0086
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0127, C1 Communications phase 3 transition check

Description:

With this command, the master signals (control) to the slave (drive) that it has transmitted all communications parameters needed for phase 3. Upon receipt of this command, the slave checks whether, from it spoint of view, fault-free operations in communications phase 3 is probable.

The command is completed fault free if the slave is ready to follow input in the MST and maintain the telegram structure. Otherwise, the command is concluded with an error.

A positive command acknowledgement means that the control clears the command. Only now does the control enter communications phase 3 in MST.

See Function Description: "S-0-0127, C1 Communications phase 3 transition check"

S-0-0127 - attributes

ID number :	S-0-0127
Name in German :	C1 Umschaltvorbereitung auf Komm.-Phase 3
Name in English :	C1 Communication phase 3 transition check
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P2
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0128, C2 Communications phase 4 transition check

Description:

With this command, the master signals (control) to the slave (drive) that it has transmitted all communications parameters needed for phase 4. Upon receipt of this command, the slave checks whether, from it spoint of view, fault-free operations in communications phase 4 is probable.

The command is completed fault free if the slave is ready to follow input in the MST and maintain the telegram structure. Otherwise, the command is concluded with an error.

A positive command acknowledgement means that the control clears the command. Only now does the control enter communications phase 4 in MST.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check"

S-0-0128 - attributes

ID number :	S-0-0128
Name in German :	C2 Umschaltvorbereitung auf Komm.-Phase 4
Name in English :	C2 Communication phase 4 transition check
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P3
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0130, Probe value 1 positive value

Description:

With the positive edge of the input signal from **S-0-0013, Probe value 1** the drive stores the current value of the selected signal in this parameter.

The signal to be measured is set in parameters **P-0-200, Signal- select probe 1** and **S-0-0169, Probe control parameter**.

See Function Description: "Probe function"

S-0-0130 - attributes

ID number :	S-0-0130
Name in German :	Meßwert-1 positiv
Name in English :	Probe value 1 positive edge
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	AT

S-0-0131, Probe value 1 negative value

Description:

With the positive edge of the input signal from **S-0-0401, Probe 1** the drive stores the current value of the selected signal in this parameter.

The signal to be measured is set in parameters **P-0-200, Signal- select probe 1** and **S-0-0169, Probe control parameter**.

See Function Description: "Probe function"

S-0-0131 - attributes

ID number :	S-0-0131
Name in German :	Meßwert-1 negativ
Name in English :	Probe value 1 negative edge
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	AT

S-0-0132, Probe value 2 positive edge

Description:

With the positive edge of the input signal from **S-0-0402, Probe 2**. The drive stores the current value of the selected signal in this parameter.

The signal to be measured is set in parameters **P-0-201, Signal- select probe 2** and **S-0-0169, Probe control parameter**.

See Function Description: "Probe function"

S-0-0132 - attributes

ID number :	S-0-0132
Name in German :	Meßwert-2 positiv
Name in English :	Probe value 2 positive edge
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0133, Probe value 2 negative edge

Description:

With the negative edge of the input signal from **S-0-0402, Probe 2** the drive stores the current value of the selected signal in this parameter.

The signal to be measured is set in parameters **P-0-201, Signal- select probe 2** and **S-0-0169, Probe control parameter**.

See Function Description: "Probe function"

S-0-0133 - attributes

ID number :	S-0-0133
Name in German :	Meßwert-2 negativ
Name in English :	Probe value 2 negative edge
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	AT

S-0-0134, Master control word

Description:

This makes it possible to show the master control word via the service channel on the NC monitor.

The master control word also supports commissioning and fault finding.

See Function Description: "Master control word"

S-0-0134 - attributes

ID number :	S-0-0134
Name in German :	Master Steuerwort
Name in English :	Master control word
Function :	Parameter
Data length:	2Byte
Format :	Bin
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0135, Drive Status

Description:

This makes it possible to show the drive status via the service channel on the NC monitor. It supports commissioning and fault finding.

See Function Description: "Drive status word"

S-0-0135 - attributes

ID number :	S-0-0135
Name in German :	Antriebs-Status
Name in English :	Drive status word
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	Programming module
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0138, Bipolar acceleration value

Description:

"Bipolar accelerationi limit value" specifies the maximum allowable acceleration symmetrically in both directions (accel and decel).

When executing function "Drive Halt", the drive brakes with this acceleration to v = 0.

S-0-0138 - attributes

ID number :	S-0-0138
Name in German :	Beschleunigung bipolar
Name in English :	Bipolar acceleration limit value
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal points:	S-0-0160
Minimum input value :	0
Maximum input value :	S-0-0160
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	MDT

S-0-0140, Controller type

Description:

The machine type of the manufacturer is in the operating data of the controller.

Example:

HDS3.1-W075-...

See Function Description: "Drive controller"

S-0-0140 - attributes

ID number :	S-0-0140
Name in German :	Regelgerätetyp
Name in English :	Controller Type
Function :	Parameter
Data length:	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	Amplifier EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0141, Motor type

Description:

Firm name and manufacturer motor type are specified in the operating data of the motor.

This value is stored in MHD and MKD motors in the motor feedback and is loaded with initial startup of the drive.

Example:

MHD 071B-035-NG0-UN

See Function Description: "Motor configuration"

S-0-0141 - attributes

ID number :	S-0-0141
Name in German :	Motortyp
Name in English :	Motor Type
Function :	Parameter
Data length:	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0142, Application type

Description:

The name of the machine can be stored in this parameter, e.g., main spindle, etc. It has no functional significance.

S-0-0142 - attributes

ID number :	S-0-0142
Name in German :	Anwendungsart
Name in English :	Application type
Function :	Parameter
Data length:	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0143, SERCOS Interface Version

Description:
The SERCOS interface specification version is entered here.

Presently applicable types:

V	V 01.01:	V 01.02:
SERCOS-Spezifiaktion in German 01.00:	SERCOS-Spezifikation in English	SERCOS update in German/English
Status 5/90	Status 4/91	Status 9/91

Tab. 2-1: S-0-0143, Version - SERCOS interface specification

See Function Description: "Summary SERCOS communication"

S-0-0143 - attributes

ID number :	S-0-0143
Name in German :	SERCOS Interface Version
Name in English :	SERCOS interface version
Function :	Parameter
Data length:	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0144, Signal status word

Description:

With „Signal status word" the main spindle messsages can be collected and tansmitted in real time to the control if "Signal status word" is set as caclicaly data in the drive telegram.

See Function Description: "Section 8, Main spindle messages"

S-0-0144 - attributes

ID number :	S-0-0144
Name in German :	Signal-Statuswort
Name in English :	Signal status word
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0148, C6 Drive-controlled homing procedure command

Description:

It is necessary to establish the absolute dimension between measuring system and spindle before the spindle can be operated in position control mode,. The homing procedure must be conducted after each startup in the case of relative measuring systems as well as after each gearstage change!

- If direct measuring systems are used (motor or spindle feedbacks) then drive-controlled homing sets bit 0 of **S-0-0403, Status Actual position value** to „1“. The actual position value changes abruptly. It now relates to the zero position of the spindle. The established absolute reference is retained until the power supply is switched off or if these values fail (failure in the event of excessive spindle feedback speeds).
- If indirect measuring systems are used (motor feedback with spindle reference switch), then drive-controlled referencing bit 0 of **S-0-0403, Status actual position value,** is only set from „0“ to „1“ if bit 1 in **P-0-0300, Spindle positioning parameter 2**, is set to „1“.
  The established absolute reference is retained until the power supply is switched off.

See Function Description: "Drive-controlled referencing"

S-0-0148 - attributes

ID number :	S-0-0148
Name in German :	C6 Kommando Antriebsgeführtes Referenzieren
Name in English :	C6 Drive controlled homing procedure command
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P4
Storage:	no
Validity check:	no
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0150, Reference Offset 1

Description:

Distance between zero marker of the motor encoder (position via motor feedback) and the spindle referencing point.

See Function Description: "Drive-controlled referencing"

S-0-0150 - attributes

ID number :	S-0-0150
Name in German :	Referenzmaß Offset 1
Name in English :	Reference offset 1
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0151, Reference Offset 2

Description:

Distance between the zero marker of the external encoder (position via spindle feedback) and the reference point of the spindle.

See Function Description: "Drive-controlled referencing"

S-0-0151 - attributes

ID number :	S-0-0151
Name in German :	Referenzmaß Offset 2
Name in English :	Reference offset 2
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0152, C9 Position spindle command

Description:

This parameter starts the spindle positioning function. The command is processed via the drive-internal positoin control loop. The drive positions autonomously upon command from the control.

See Function Description: "Spindle positioning"

S-0-0152 - attributes

ID number :	S-0-0152
Name in German :	C9 00 Command Spindelpositionierien
Name in English :	C9 00 Position Spindle Command
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	Phase 4
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0153, Spindle angle position

Description:

This parameter contains the absolute position command for positioning the spindle (absolute positioning).

See Function Description: "Spindle positioning"

S-0-0153 - attributes

ID number :	S-0-0153
Name in German :	Spindel-Winkelposition
Name in English :	Spindle angle position
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0154, Spindle positioning parameter

Description:

The options of the "spindle positioning" function are set here.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X					S-0-0154
														0	0	clockwise
														0	1	counterclockwise
														1	0	shortest path
													0			absolute positioning
													1			relative positioning
												0				pos. via motorfeedb.
												1				pos. via spindle feedb.

Fig. 0.4: Parameter values for spindle positioning options

See Function Description: "Spindle positioning"

S-0-0154 - attributes

ID number :	S-0-0154
Name in German :	Spindelpositionier-Parameter
Name in English :	Spindle Position Parameter
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	
Unit in English :	
Decimal points:	0
Minimum input value :	
Maximum input value :	
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	no
Combination check:	yes
Cyclical transmission:	no

S-•-0157, Velocity window

Description:

The velocity window relates to the speed command. If the speed feedback value is within the velocity window around the speed command, then Class 3 diagnostics generates the message „$n_{ist} = n_{soll}$“.

S-•-0157- attributes

ID number :	S-•-0157 (• ∈ {0,1,2,3})
Name in German :	Actual velocity window
Name in English :	Velocity Window
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0158, Power threshold P_x

Description:
Threshold for drive power output.

S-•-0158 - attributes

ID number :	S-•-0158 (• ∈ {0,1,2,3})
Name in German :	Leistungs-Schwelle P_x
Name in English :	Power Threshold P_x
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	kW
Unit in English :	kW
Decimal points:	3
Minimum input value :	0
Maximum input value :	4294967.295
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0159, Monitoring window

Description:

The monitoring window helps to measure the maximum tolerated deviation and computes the position feedback value which can be set. If the position deviation exceeds the monitoring window, then the drive generates error **F228, Excessive control deviation** in C1D.

The maximum deviation is always stored in parameter **P-0-0098, Maximum model deviation.**

Procedure on setting a parameter:

See Function Description: "Position control loop monitor"

S-•-0159- attributes

ID number :	S-•-0159 (• ∈ {0,1,2,3})
Name in German :	Überwachungsfenster
Name in English :	Monitoring Window
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	0
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0160, Acceleration data scaling type

Description:

Various types of scaling for the acceleration data in the drive can be set as follows:

Parameter structure

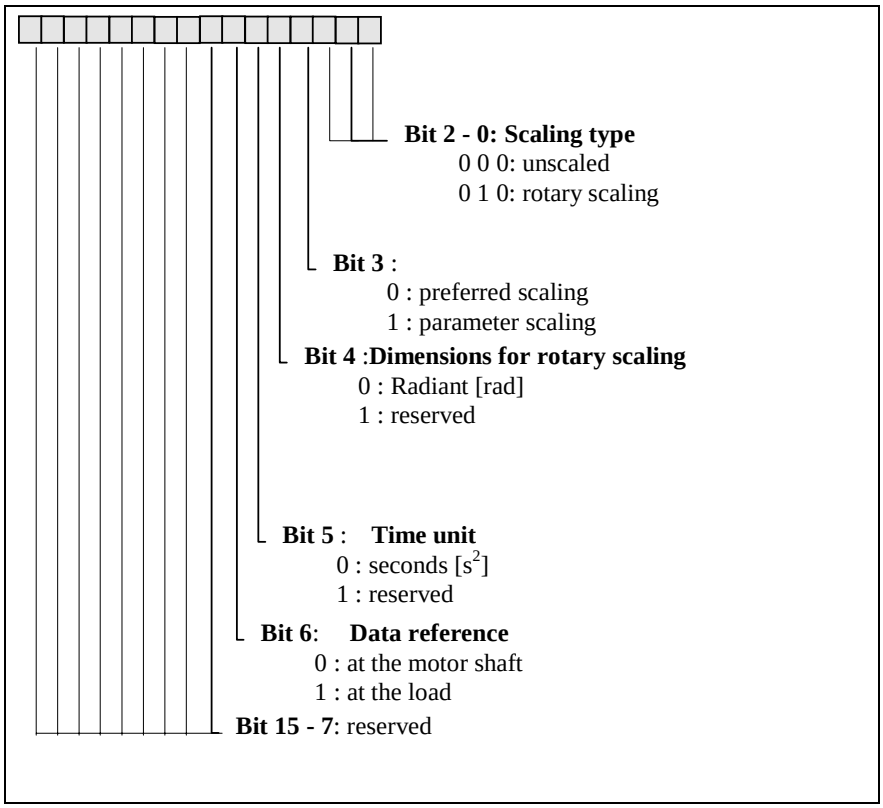


Fig. 2-0.5: S-0-0160, Scaling type for acceleration data

Note:

Only the bits specified here are software supported.

See Function Description: "Display format of the accel data"

S-0-0160 - attributes

ID number :	S-0-0160
Name in German :	Wichtungsart für Beschleunigungsdaten
Name in English :	Acceleration data scaling type
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	yes
Cyclical transmission:	no

S-0-0161, Scaling factor for acceleration data

Description:

In this parameter with parameter scaling set in **S-0-0160, Scaling type for acceleration data** the scaling factor for all accel data in the drive is set.

Parameter structure

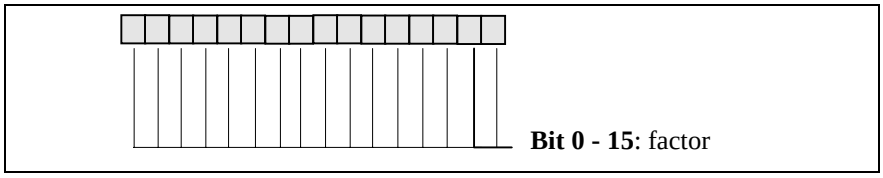


Fig. 2-0.6: S-0-0161, Scaling factor for accel data

See Function Description: "Display format of the accel data"

S-0-0161 - attributes

ID number :	S-0-0161
Name in German :	Wichtungs-Faktor für Beschleunigungsdaten
Name in English :	Acceleration data scaling factor
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0162, Scaling exponnent for accel data

Description:

In this parameter with parameter scaling set in **S-0-0160, Scaling type for acceleration data** the scaling exponent for all accel data in the drive is set.

Parameter structure

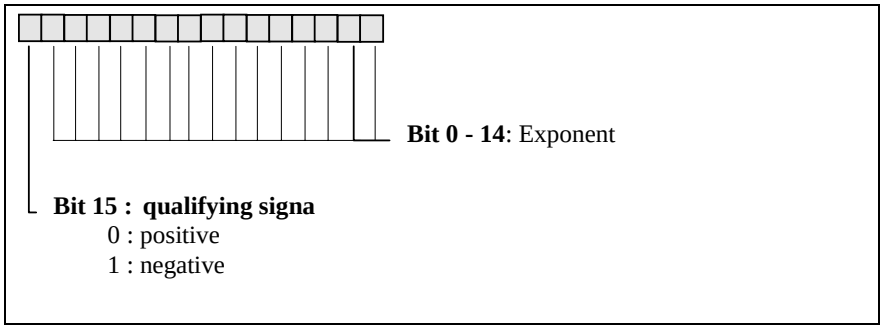


Fig. 2-0.7: S-0-0162, Scaling exponent for acceleration data

See Function Description: "Display format of the accel data"

S-0-0162 - attributes

ID number :	S-0-0162
Name in German :	Wichtungs-Exponent für Beschleunigungsdaten
Name in English :	Acceleration data scaling exponent
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0169, Probe control parameter

Description:

In this parameter it is set whether one or both of the probe inputs "Probe 1 1" (HDS: X12-E4) and "probe 2" (HDS: X12-E5) are activated and which edge (positive/negative) the probe data storage should trigger.

Parameter structure

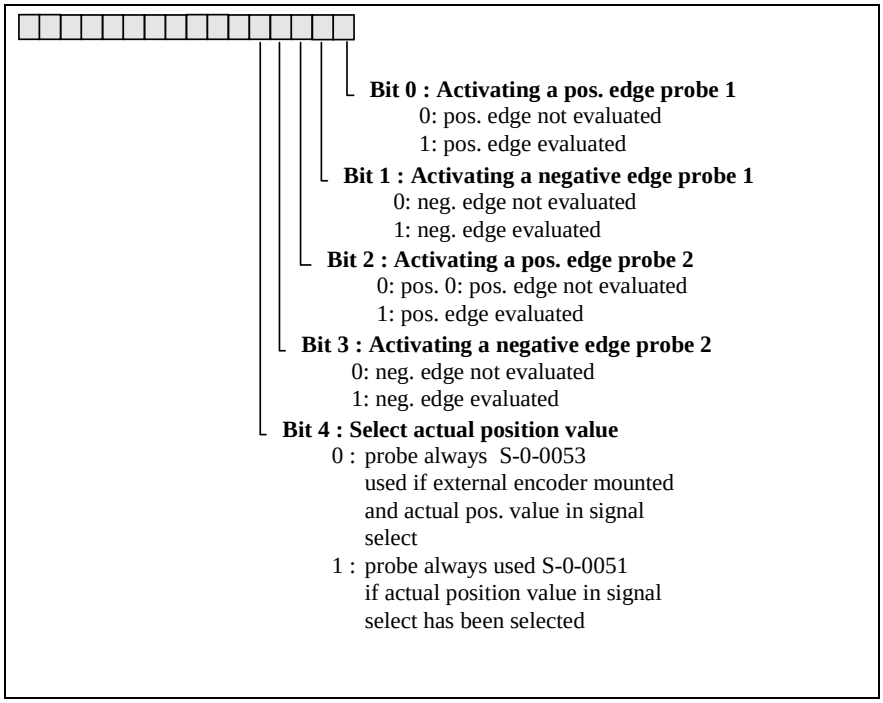


Fig. 2-0.8: S-0-0169, Probe control parameter

Note:

Only the bits specified here are software supported.

See Function Description: "Probe function"

S-0-0169 - attributes

ID number :	S-0-0169
Name in German :	Meßtaster-Steuerparameter
Name in English :	Probe control parameter
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	yes
Cyclical transmission:	no

S-0-0170, Probing cycle procedure command

Description:

The setting and enabling of command "Probe cycle" means that the drive will respond to:

- **S-0-0405, Probe 1 enable/ S-0-0406, Probe 2 enable and**
- **S-0-0401, Probe 1, /S-0-0402, Probe 2**

as programmed in **S-0-0169, Probe control parameter**.

While the command is active, the NC can undertake several measurements.

If the NC does not want to run this procedure, then it will clear the command.

Parameter structure

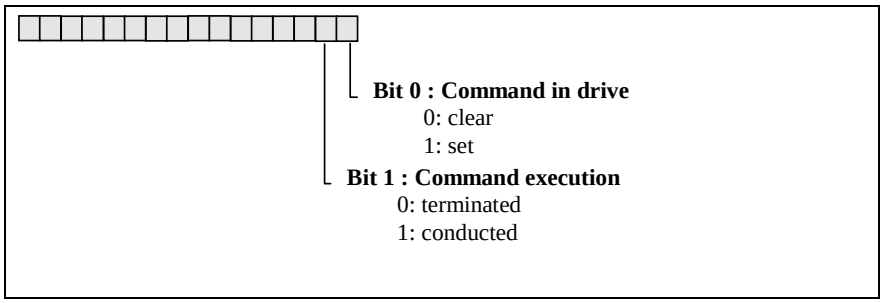


Fig. 2-0.9: S-0-0170, Command probe cycle

Note:

-Only the bits specified here are software supported.

-With Bit 0 =„1“ the external 24 volt monitor is simultaneously activated.

See Function Description: "Probe function"

S-0-0170 - attributes

ID number :	S-0-0170
Name in German :	Command Meßtasterzyklus
Name in English :	Probing cycle procedure command
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P4
Storage:	no
Validity check:	no
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0177, Absolute distance 1

Description:

The distance of the machine zero point to the zero point of the motor encoder with absolute measurement can be entered here.

S-0-0177 - attributes

ID number :	S-0-0177
Name in German :	Absolutmaß - Offset 1
Name in English :	Absolute distance 1
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0178, Absolute distance 2

Description:

The distance of the machine zero point to the zero point of the external encoder with absolute measurement can be entered here.

S-0-0178 - attributes

ID number :	S-0-0178
Name in German :	Absolutmaß - Offset 2
Name in English :	Absolute distance 2
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0180, Spindle angle position

Description:

This parameter contains the relative position command for positioning the spindle (relative positioning).

See Function Description: "Spindle positioning"

S-0-0180 - attributes

ID number :	S-0-0153
Name in German :	Spindel-Winkelposition
Name in English :	Spindle angle Position
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0182, Manufacturer class 3 diagnostics

Description:

Various messages from oeprating states are stored here every 8 ms. If the state of the message changes, then this is not signalled by a change bit.

Parameter structure

Bit 0	**=1,** if starting lockout is active, (24V/0V at clamps AS+(X3/8) and AS- (X3/9))
Bit 1	(does not apply to spindle drives)
Bit 2...6	(does not apply to spindle drives)
Bit 7	**=1**, if drive load exceeds 90% of maximum load, i.e., there is a control reserve of 10%
Bit 8...10	(does not apply to spindle drives)
Bit 11	=1, if „drive halt" is acknowledged i.e., motor speed within standstill window **(S-•-0124)**
Bit 12..15	(does not apply to spindle drives)

Fig. 2-0.10: S-0-0182, Manufacturer's class 3 diagnostics

Note:

Only the bits specified here are software supported.

See Function Description: "S-0-0182, Manufacturer’s class 3 diagnostics"

S-0-0182 - attributes

ID number :	S-0-0182
Name in German :	Hersteller-Zustatussklasse-3
Name in English :	Manufacturer Class 3 Diagnostics
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	AT

S-0-0185, Length of configurable data record in the AT

Description:

The drive specifies the maximum length ion bytes in the operating data of this ID number which it can process in the configured data record of the AT.

See Function Description: "Telegram contents configuration"

S-0-0185 - attributes

ID number :	S-0-0185
Name in German :	Länge des konfigurierbaren Datensatzes im AT
Name in English :	Length of the config. data record in the AT
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0186, Length of configurable data record in the MDT

Description:

The drive specifies maximum length in bytes in the operating data of this ID number which it can process in the configured MDT data record.

See Function Description: "Telegram contents configuration"

S-0-0186 - attributes

ID number :	S-0-0186
Name in German :	Länge des konfig. Datensatzes im MDT
Name in English :	Length of the config. data record in the MDT
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0187, List of configurable data in the AT

Description:

This list contains the ID numbers of the operating data which can be configured in the drive telegram.

See Function Description: "Telegram contents configuration"

S-0-0187 - attributes

ID number :	S-0-0187
Name in German :	Liste der konfigurierbaren Daten im AT
Name in English :	List of Configurable Data in the AT
Function :	Parameter
Data length:	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P2
Storage:	Parameter EEPROM
Validity check:	Phase 2
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0188, List of configurable data in the MDT

Description:

This list contains the ID numbers of the operating data which can be configured in the master data telegram.

See Function Description: "Telegram contents configuration"

S-0-0188 - attributes

ID number :	S-0-0188
Name in German :	Liste der konfigurierbaren Daten im MDT
Name in English :	List of Configurable Data in the MDT
Function :	Parameter
Data length:	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P2
Storage:	Parameter EEPROM
Validity check:	Phase 2
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0189, Following error

Description:

The drive stores in this operating data the current difference between the position command value and the relevant position feedback values (**S-0-0051, Actual position value 1** or **S-0-0053, Actual position value 2**).

See Function Description: "Permanentlegung der Lageregler-Einstellung"

S-0-0189 - attributes

ID number :	S-0-0189
Name in German :	Schleppabstatus
Name in English :	Following Error
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	AT

S-0-0190, d2 Drive-controlled oscillating command

Description:

This parameter starts the function "Drive-controlled oscillation". The command is processed via the drive-internal speed control. The drive autonomously generates the velocity command path for the oscillation motion upon receipt of the command from the control.

See Function Description: "Drive-controlled oscillation"

S-0-0190 - attributes

ID number :	S-0-0190
Name in German :	d2 Command Antriebsgef. Pendeln
Name in English :	d2 Drive-Contr. Oscillation Command
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	Phase 4
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0192, IDN list of back-up operating data

Description:

The ID numbers of all operating data are stored in the IDN list. These must also be loaded into the drive for a corect funtioning of the drive. Generally, these parameters are backed up in the programming module.

The control uses this IDN list to generate a back-up copy of the drive parameters.

See Function Description: "Parameter storage in the Programming module"

S-0-0192 - attributes

ID number :	S-0-0192
Name in German :	IDN-Liste der zu sichernden Betriebsdaten
Name in English :	IDN list of backup operation data
Function :	Parameter
Data length:	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	permanent
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0193, Positioning jerk

Description:

The positioning jerk limits the accel change in "Drive-internal interpolation" mode.

See Function Description: "Generator Function: Drive-internal Interpolation"

S-0-0193 - attributes

ID number :	S-0-0193
Name in German :	Positionier-Ruck
Name in English :	Positioning jerk
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal points:	S-0-0160
Minimum input value :	S-0-0160
Maximum input value :	S-0-0160
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0201, Motor warning temperature

Description:

If the motor temperature exceeds the motor warning temperature, then the drive sets the bit motor overtemperature warning in **S-0-0012, Class 2 diagnostics**.

In MHD and MKD motors the drive sets this parameter to 145°.

See Function Description: "Temperature monitoring"

S-0-0201 - attributes

ID number :	S-0-0201
Name in German :	Motor-Warntemperatur
Name in English :	Motor warning temperature
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	C
Unit in English :	C
Decimal points:	1
Minimum input value :	45
Maximum input value :	155
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0204, Motor shutdown temperature

Description:

If motor temperawture exceeds motor shutdown temperature, then the drive sets bit motor overtemperature shutdown in **S-0-0011, Class 1 diagnostics** and generates error **F219, Motor overtemperature shutdown**.

See Function Description: "Temperature monitoring"

S-0-0204 - attributes

ID number :	S-0-0204
Name in German :	Motor-Abschalttemperatur
Name in English :	Motor shutdown temperature
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	C
Unit in English :	C
Decimal points:	1
Minimum input value :	45
Maximum input value :	155
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0213, Oscillation speed

Description:

The oscillation speed is the amplitude of the speed oscillation in **Oscillation offset speed (S-0-0214)**.

See Function Description: "Drive-controlled oscillation"

S-0-0213- attributes

ID number :	S-0-0213
Name in German :	Pendel-Drehzahl
Name in English :	Oscillation Speed
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0214, Pendel-Offsetdrehzahl

Description:
The oscillation speed is the average speed oscillation value.

See Function Description: "Drive-controlled oscillation"

S-0-0214- attributes

ID number :	S-0-0214
Name in German :	Pendel-Offsetdrehzahl
Name in English :	Oscillation Offset Speed
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0215, Oscillation cycle time

Description:

The oscillation cycle time of the period of oscillation of the speed of oscillation.

See Function Description: "Drive-controlled oscillation"

S-0-0215- attributes

ID number :	S-0-0215
Name in German :	Pendel-Zykluszeit
Name in English :	Oscillation Cycle Time
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	msec
Unit in English :	msec
Decimal points:	1
Minimum input value :	0.5
Maximum input value :	6553.5
Editability:	P234
Storage:	Programming module
Validity check:	Phase 3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0216, d1 Switch parameter set command

Description:

This command switches the parameter set in **Parameter set preselect (S-0-0217)**.

See Function Description: "Parameter set switch"

S-0-0216- attributes

ID number :	S-0-0216
Name in German :	d1 Kommando Parametersatz umschalten
Name in English :	Switch Parameter Set Command
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	**--**
Unit in English :	**--**
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0217, Parameter set pre-select

Description:

The parameter set set here is switched into the command **d1 Parameter set switch (S-0-0216)**.

See Function Description: "Parameter set switch"

S-•-0217- attributes

ID number :	S-•-0217 (• ∈ {0,1,2,3})
Name in German :	Parametersatz-Vorwahl
Name in English :	Preselect Parameter Set Command
Function :	Parameter
Data length:	2Byte
Format :	DEC_0V
Unit in German :	**--**
Unit in English :	**--**
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-•-0218 Preselect gear ratio command

Description:

The gearstage set in parameter S-•-0218 of the activated parameter set (• ∈ {0,1,2,3}) is switched into command **d1 Parameter set switch (S-0-0216)**.

See Function Description: "Automatic gear switch"

S-•-0218- attributes

ID number :	S-•-0218 (• ∈ {0,1,2,3})
Name in German :	Getriebestufen-Vorwahl
Name in English :	Preselect Gear Ratio Command
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	**--**
Unit in English :	**--**
Decimal points:	1
Minimum input value :	0
Maximum input value :	2
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	yes
Cyclical transmission:	no

S-•-0219, IDN List of parameter sets

Description:

List of all parameters that can be switched in a parameter set. The list of an existing parameter which an be switched in a parameter set is called up if the relevant list parameter S- • -0219, (• ∈ {0;1;2;3}) is called up.

S-•-0219- attributes

ID number :	S-•-0219 (• ∈ {0,1,2,3})
Name in German :	IDN-Liste Parametersatz
Name in English :	IDN List for parameter set
Function :	Parameter
Data length:	2Byte variable
Format :	IDN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	
Maximum input value :	
Editability:	no
Storage:	permanent in EEPROM
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-•-0222, Spindle positioning speed

Description:
Maximum speed during the spindle positioning procedure.

S-•-0222- attributes

ID number :	S-•-0222 (• ∈ {0,1,2,3})
Name in German :	Spindel-Positionierdrehzahl
Name in English :	Spindle Positioning Speed
Function :	Parameter
Data length:	4Byte
Format :	DEC_0V
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	0
Minimum input value :	0
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Programming module
Validity check:	P3-4
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0254, Actual parameter set

Description:
The currently active actual parameter set is displayed here.
See Function Description: "Parameter set switch

S-0-0254 Attribute

ID number :	S-0-0254
Name in German :	Aktueller Parametersatz
Name in English :	Actual Parameter Set
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	**--**
Unit in English :	**--**
Decimal points:	1
Minimum input value :	0
Maximum input value :	3
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0255, Actual gearstage

Description:
The presently active gear ratio is displayed in this parameter.

See Function Description: "Automatic gear switch"

S-0-0255 Attribute

ID number :	S-0-0255
Name in German :	Aktuelle Getriebestufe
Name in English :	Actual Gear Ratio
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	**--**
Unit in English :	**--**
Decimal points:	1
Minimum input value :	0
Maximum input value :	2
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0258, Target position

Description:

The drive is given the target position by the drive in mode "Drive-intnernal interpolation" as a command value. The drive runs to "target position" taking into account **S-0-0259, Positioning velocity**, **S-0-0260, Positioning acceleration** and **S-0-0193, Positioning jerk**.

S-0-0258 - attributes

ID number :	S-0-0258
Name in German :	Zielposition
Name in English :	Target Position
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	yes
Combination check:	no
Cyclical transmission:	MDT

S-0-0259, Positioning velocity

Description:

S-0-0258, target position is approached with the positioning velocity in "Drive-internal interpolation" mode.

See Function Description: "Generator Function: Drive-internal interpolation"

S-0-0259 - attributes

ID number :	S-0-0259
Name in German :	Positionier-Geschwindigkeit
Name in English :	Positioning velocity
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	S-0-0044
Maximum input value :	S-0-0044
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	MDT

S-0-0260, Positioning acceleration

Description:

With "Positioning acceleration" and in "Drive-internal interpolation" the target position is approached **S-0-0259, Positioning acceleration**.

See Function Description: "Generator Function: Drive-internal interpolation"

S-0-0260 - attributes

ID number :	S-0-0260
Name in German :	Positionier-Beschleunigung
Name in English :	Positioning acceleration
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal points:	S-0-0160
Minimum input value :	S-0-0160
Maximum input value :	S-0-0160
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	MDT

S-0-0262, Command basic load

Description:

By setting and releasing this command, the basic parameters settings in the motor for current, velocity and position control are loaded and activated. the basic parameters are not optimized for the relevant application. They only make the interplay between amplifier and motor possible.

ATTENTION:

Executing this command could overwrite already optimized parameters.

See Function Description: "Basic load"

S-0-0262 - attributes

ID number :	S-0-0262
Name in German :	Command Urladen
Name in English :	Command Basic Load
Function :	Command
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	3
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0265, Language selection

Description:

All parameter names, units, diagnostics and fault messages are stored in the drive controller in several languages. this parameter can set the language in which the texts are to be generated.

- 0 : In German
- 1 : In English

Additional languages are presently in preparation.

See Function Description: "Language selection"

S-0-0265 - attributes

ID number :	S-0-0265
Name in German :	Sprachumschaltung
Name in English :	Language Selection
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	1
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0267, Password

Description:
This parameter is used to unlock customer functions.

ATTENTION:
The machine can be destroyed if incorrectly used!

S-0-0267 - attributes

ID number :	S-0-0267
Name in German :	Passwort
Name in English :	Password
Function :	Parameter
Data length:	1Byte variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0269, Parameter buffer mode

Description:

Using "Parameter buffer mode" it is permanently set whether the data transmitted via the service channel is stored temporarily in RAM or resident into EEPROM.

After the power supply is switched on, the drive sets bit 0 to "0".

See Function Description: "Parameter storage in the programming module"

S-0-0269 - attributes

ID number :	S-0-0269
Name in German :	Speicherungsmode
Name in English :	Parameter buffer mode
Function :	Parameter
Data length:	2Byte
Format :	DEC_0V
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	1
Editability:	P234
Storage:	no
Validity check:	no
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0277, Position encoder type 1 parameter

Description:

This parameter permanently sets the significant features of the motor encoder (position encoder 1).

Parameter structure

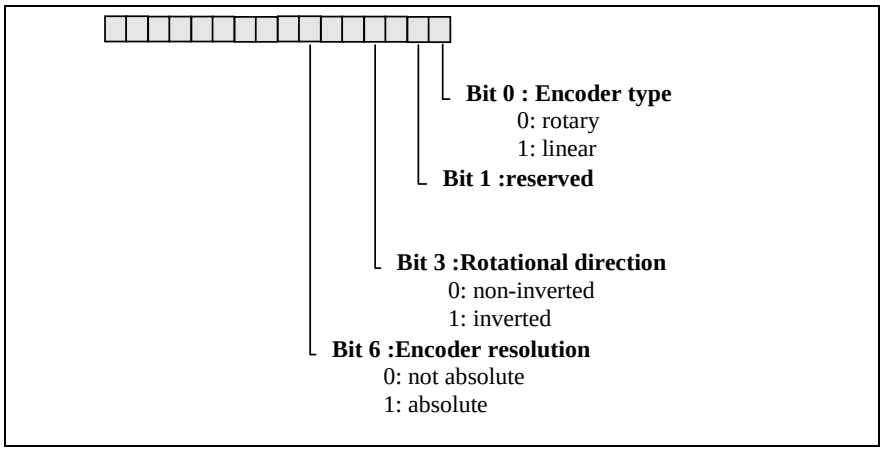


Fig. 2-0.11: S-0-0277, OPosition encoder type parameter 1

Comment:

In absolute measuring systems with data memory, bit 6 is automatically set.

Bits 0, 1, and 3 are set by the drive in MHD and MKD motors. They are also write protected.

Note:

Only the bits specified here are software supported.

See Function Description: "Other motor encoder features"

S-0-0277 - attributes

ID number :	S-0-0277
Name in German :	Lagegeberart-Parameter 1
Name in English :	Position feedback 1 type parameter
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P23
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	yes
Cyclical transmission:	no

S-0-0301, Allocation of real time control bit

Description:

To assign real time bit 1 a signal, the ID number of the signal is written into the operating mode of the assignment for real time bit 1.

If an assignment like this takes place, then the assigned signal (bit 0) is affected by real time control bit 1 (= a component of the master control word).

If the parametrized IDN is not available, then the drive responds with the service channel message "IDN not available".

If the programmed IDN is available, but has no write access in phase 4, then the drive responds with the error message "Data not correct".

See Function Description: "Real time control and stastus bits"

S-0-0301 - attributes

ID number :	S-0-0301
Name in German :	Zuweisung Echtzeitsteuerbit-1
Name in English :	Allocation of Real Time Control Bit 1
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0303 Allocation of real time control bit 2

Description:

To assign real time bit 2 a signal, the ID number of the signal is written into the operating mode of the assignment for real time bit 2.

If an assignment like this takes place, then the assigned signal (bit 0) is affected by real time control bit 2 (= a component of the master control word).

See Function Description: " Real time control and stastus bits "

S-0-0303 - attributes

ID number :	S-0-0303
Name in German :	Zuweisung Echtzeitsteuerbit-2
Name in English :	Allocation of Real Time Control Bit 2
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0305, Allocation of real time status bit 1

Description:

To assign real time bit 1 a signal, the ID number of the signal is written into the operating mode of the assignment for real time bit 1.

If an assignment like this takes place, then the assigned signal (bit 0) is affected by real time status bit 1 (= a component of the master control word).

If the parametrized IDN is not available, then the drive responds with the service channel message "IDN not available".

See Function Description: "Real time control and status bits"

S-0-0305 - attributes

ID number :	S-0-0305
Name in German :	Zuweisung Echtzeitstatusbit-1
Name in English :	Allocation of Real Time Status Bit 1
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0307, Allocation of real time status bit 2

Description:

To assign real time bit 2 a signal, the ID number of the signal is written into the operating mode of the assignment for real time bit 2.

If an assignment like this takes place, then the assigned signal (bit 0) is affected by real time status bit 2 (= a component of the master control word).

See Function Description: "Real time control and status bits"

S-0-0307 - attributes

ID number :	S-0-0307
Name in German :	Zuweisung Echtzeitstatusbit-2
Name in English :	Allocation of Real Time Status Bit 2
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0330, Message $n_{ist} = n_{soll}$

Description:

Bit 0 of the parameter goes to „1“, if **Actual velocity value (S-0-0040)** is within ± des **Actual velocity windows (S-•-0157)** around the **Velocity command value (S-0-0036)**.

Note: Message „$n_{ist} = n_{soll}$“ is only generated in velocity control mode!

S-0-0330 Attribute

ID number :	S-0-0330
Name in German :	Meldung $n_{ist} = n_{soll}$
Name in English :	Message $n_{actual} = n_{command}$
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0331, Message n_{ist} = 0

Description:

With velocity control mode:

Bit 0 of the parameter goes to „1“, if **Actual velocity value (S-0-0040)** and **command value (S-0-0036)** are smaller than the **Standstill window (S-•-0124)**.

With torque and position control modes:

Bit 0 of the parameter goes to „1“, if **Actual velocity value (S-0-0040)** is smaller than **Standstill window (S-•-0124)**.

S-0-0331 Attribute

ID number :	S-0-0331
Name in German :	Meldung n_{ist} = 0
Name in English :	Message n_{actual} = 0
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0333, Message $M_d > M_{dx}$

Description:

Bit 0 of parameter goes to „1“, if **Actual torque value M_d (S-0-0084)** is greater than **Torque threshold M_{dx} (S-•-0126)**.

S-0-0333 Attribute

ID number :	S-0-0333
Name in German :	Meldung $M_d > M_{dx}$
Name in English :	Message $T > T_x$
Function :	Parameter
Data length:	2 Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0335, Message $n_{soll} > n_{grenz}$

Description:

Bit 0 of the parameter goes to„1“, if the **Velocity command value (S-0-0036)** is outside of the velocity limits $\pm n_{grenz}$ **(S-•-0091)**.

S-0-0335 Attribute

ID number :	S-0-0335
Name in German :	Meldung $n_{soll} > n_{grenz}$
Name in English :	Message $n_{command} > n_{limit}$
Function :	Parameter
Data length:	2 Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0336, Message In Position

Description:

Bit 0 of the parameter goes to„1“, if the **Actual position value 1/-2 (S-0-0051/-0053)** is within the **Positioning window (S-0-0057)** around the **Spindle angle position (S-0-0153)**.

S-0-0336 Attribute

ID number :	S-0-0336
Name in German :	Meldung In-Position
Name in English :	Message In Position
Function :	Parameter
Data length:	2 Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0337, Message P = P_x

Description:

Bit 0 of the parameter goes to „1“, if the output power P **(S-0-0382)** exceeds the power threshold P_x **(S-•-0158)**.

S-0-0337 Attribute

ID number :	S-0-0337
Name in German :	Meldung P = P_x
Name in English :	Message P = P_x
Function :	Parameter
Data length:	2 Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal points:	0
Minimum input value :	-
Maximum input value :	-
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0347, Velocity control deviation

Description:

Der Parameter S-0-0347 gibt die Differenz zwischen Geschwindigkeitssollwert and Actual velocity value im Geschwindigkeitsregler an!

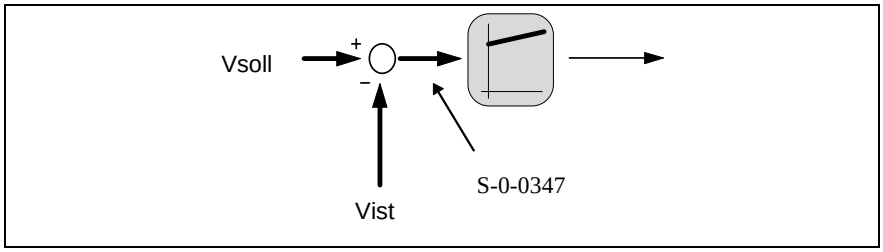


Fig. 3-0.12: S-0-0347, Velocity control difference

See Function Description: "Velocity controller"

S-0-0347 Attribute

ID number :	S-0-0347
Name in German :	Geschwindigkeitsregelabweichung
Name in English :	Velocity loop deviation
Function :	Parameter
Data length:	4Byte
Format :	DEC_MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal points:	S-0-0044
Minimum input value :	S-0-0044
Maximum input value :	S-0-0044
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0348, P-gain acceleration feed forward

Description:

Acceleration pre-control supports the reduction of the lag error during the acceleration phase with lagless operation. The current acceleration command value is multiplied with "P-gain acceleration pre-control" and added to the current command value of the speed controller.

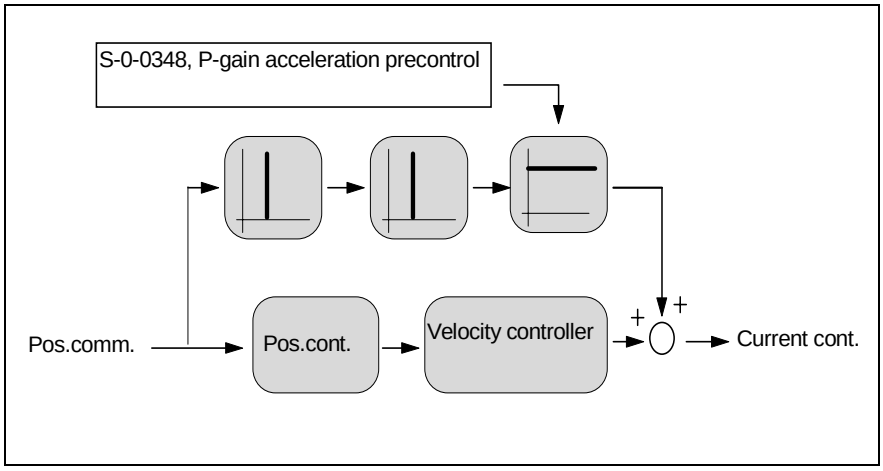


Fig. 0.13: Acceleration precontrol

Activating:

Writing a value greater than 0 into the parameter activates the acceleration pre-control!

Note:

Acceleration pre-control is only possible in lagless operation!

Input value:

$$K_R = (J_m + J_L) / K_m * 100$$

with: K_R = P-gain amplification acceleration pre-control

J_m = rotor moment of inertia

J_L = reduced extrinsic inert mass

K_m = torque constant

See Function Description: "Setting acceleratoin pre-control"

S-0-0348 - attributes

ID number :	S-0-0348
Name in German :	Proportionalverst. Beschleunigungsvorsteuerung
Name in English :	Proportional gain accelaration feed forward
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	mAsec²/rad
Unit in English :	mAsec²/rad
Decimal points:	1
Minimum input value :	0
Maximum input value :	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0349, Bipolar jerk limit

Description:
The bipolar jerk limits acceleration changes in "Drive halt".

See Function Description: "Functional principle drive halt"

S-0-0349 - attributes

ID number :	S-0-0349
Name in German :	Ruckgrenzwert bipolar
Name in English :	Jerk bipolar
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	1
Minimum input value :	0
Maximum input value :	0
Editability:	no
Storage:	Programming module
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0382, DC bus power

Description:
Displays DC bus power.

S-0-0382 - attributes

ID number :	S-0-0382
Name in German :	Zwischenkreisleistung
Name in English :	Circle Power
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	KW
Unit in English :	KW
Decimal points:	2
Minimum input value :	0
Maximum input value :	0
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0383, Motor Temperature

Description:

This parameter contains the measured motor temperature obtained over connector X6 of the connected motor temperature sensor.

Comment:

The PTC resistor is used as a temperature sensor in all motors except the asynchronous motors.

Because its temperature curve has a higher progression in high temperature ranges, the value of parameter S-0-0383 is very precise.

See Function Description: "Temperature monitoring"

S-0-0383 - attributes

ID number :	S-0-0383
Name in German :	Motor-Temperatur
Name in English :	Motor temperature
Function :	Parameter
Data length:	2Byte
Format :	DEC_MV
Unit in German :	C
Unit in English :	C
Decimal points:	1
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0390, Diagnostic message number

Description:

In parameter "Diagnostic Number" the number also seen in the 7-segment display is stored. This makes it possible for the control to generate its own diagnoses using the diagnosis numbers (e.g., in languages not stored as diagnoses in the drive).

Example:

Diagnoses:	„F8-22 motor encoder erro: signal too small“ in parameter S-0-0095
7-segment display:	alternately „F8“ <=> „22“
Diagnostic number:	„F822(hex)“ in parameter S-0-0390

See Function Description: "Diagnostic message number"

S-0-0390 - attributes

ID number :	S-0-0390
Name in German :	Diagnose Nummer
Name in English :	Diagnostic Message Number
Function :	Parameter
Data length:	2Byte
Format :	HEX
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0391, External encoder monitoring window

Description:

This parameter defines the maximum allowable deviation of **S-0-0051, Actual position value 1** and **S-0-0053, Actual position value 2**.

If this value is exceeded for more than 20 s, then error **F236, Excessive actual position value difference** is generated.

Monitoring can be switched off by writing 0 into this parameter.

See Function Description: "Actual position monitoring"

S-0-0391 - attributes

ID number :	S-0-0391
Name in German :	Überwachungsfenster externer Geber
Name in English :	External encoder monitoring window
Function :	Parameter
Data length:	4Byte
Format :	DEC_OV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal points:	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0392, Actual velocity value filter time constant

Description:

A VZ1 filter is used as a velocity feedback filter. Its filter timebase can be set with this parameter.

By inputting 250us, the filter is deactivated.

See Function Description: "Preparing the setting of the velocity controls"

S-0-0392 - attributes

ID number :	S-0-0392
Name in German :	Akutelle Geschwindigkeitswert Filterzeitkonstante
Name in English :	Velocity feedback value filtertimebase
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal points:	0
Minimum input value :	250
Maximum input value :	65500
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	no

S-0-0393, Command value mode in modulo format

Description:

The interpreation of the position command values such as **S-0-0047, Position command value** and **S-0-0258, Target position** with active modulo function depends on the mode which has been set.

To set the mode, use parameter **S-0-0393, Command value mode in modulo format.**

This parameter is only active if **S-0-0076, Scaling type position data of the modulo format** was activated.

S-0-0393:	Definition:
0	shortest path
1	positive direction
2	negative direction

Tab. 0-2: Parametrizable value

See Function Description: "Processing the command values in modulo format, short path direction selection"

S-0-0393 - attributes

ID number :	S-0-0393
Name in German :	Sollwertmodus im Moduloformat
Name in English :	Command value mode for modulo format
Function :	Parameter
Data length:	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	0
Maximum input value :	2
Editability:	P234
Storage:	Parameter EEPROM
Validity check:	Phase 3
Extreme check:	yes
Combination check:	no
Cyclical transmission:	MDT

S-0-0400, Reference point switch

Description:

This paramter assigns an IDN to the homing switch (external signal).

Possible applications:

The IDN (and thus the feedback status of the reference switch) can be asigned a real time status bit.

Parameter structure:

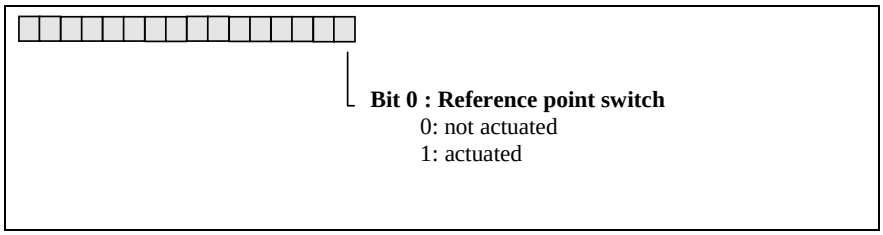


Fig. 2-0.14: S-0-0400, Reference point switch

See Function Description: "Project Planning Drive-Controlled Homing"

S-0-0400 - attributes

ID number :	S-0-0400
Name in German :	Referenzpunktschalter
Name in English :	Home switch
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0401, Probe 1

Description:

This parameter assigns an IDN to probe 1 (external signal). This means that probe 1 can be assigned a real-time stsatus bit, for example.

The drive only queries signal probe 1 if command **S-0-0170, Probe cycle** is active and **S-0-0405, Probe 1 enable** available.

Parameter structure

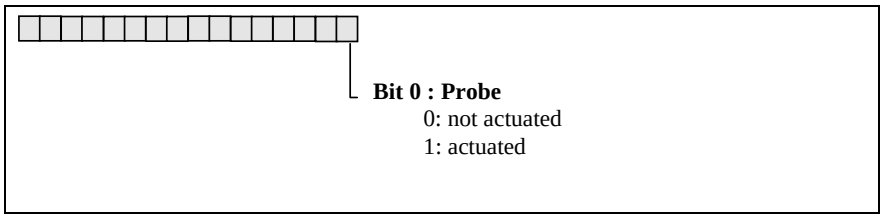


Fig. 2-0.15: S-0-0401, Probe

See Function Description: "Probe function"

S-0-0401 - attributes

ID number :	S-0-0401
Name in German :	Meßtaster-1
Name in English :	Probe 1
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0402, Probe 2

Description:

This parameter assigns an IDN to probe 2 (external signal). This means that probe 1 can be assigned a real-time stsatus bit, for example.

The drive only queries signal probe 2 if command **S-0-0170, Probe cycle** is active and **S-0-0405, Probe 2 enable** available.

Parameter structure

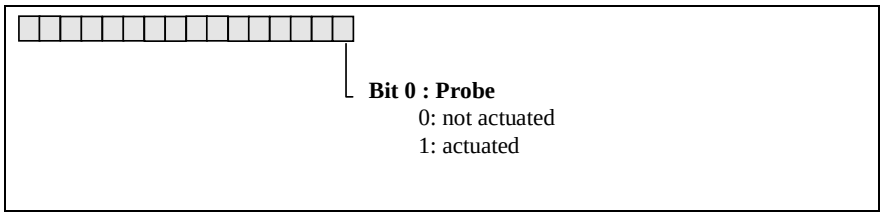


Fig. 2-0.16: S-0-0402, Probe

See Function Description: "Probe function"

S-0-0402 - attributes

ID number :	S-0-0402
Name in German :	Meßtaster-2
Name in English :	Probe 2
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0403, Status of actual position value

Description:

The drive sets bit 0 of the parameter to „1“ if the position feedback value has a permanent relationship to the zero position of the spindle.

If the commands **S-0-0148, C6 Command drive-controlled referencing** or **P-0-0012, Set absolute dimension** are performed in the drive, then the bit is reset at the start and upon successful completion of the command set again.

The status of actual position values can be assigned to a real time status bit. In this ecase, the NC is constantly informed of the drive status (see **S-0-0305, Assign real-time status bit 1**).

Parameter structure

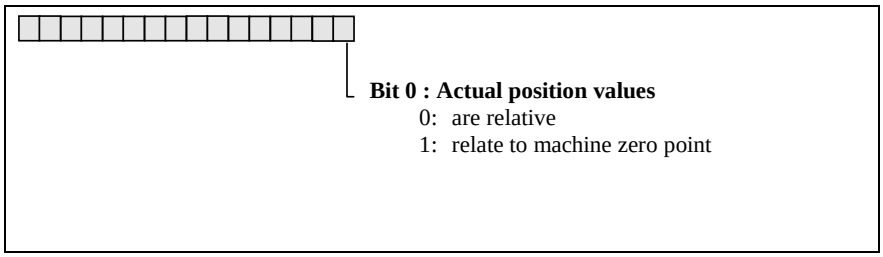


Fig. 2-0.17: S-0-0403, Status of actual position value

See Function Description: "Drive-controlled referencing"

S-0-0403 - attributes

ID number :	S-0-0403
Name in German :	Status Actual position value
Name in English :	Position feedback value status
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0405, Probe 1 Enable

Description:

This parameter is used to enable a probe input.

The 0 > 1 change of this signal activates the trigger mechanism to evaluate a positive and/or negative edge of the probe signal.

Probe 1 enable can be assigned to a real time control bit. The drive is informed in the master control word.

Parameter structure

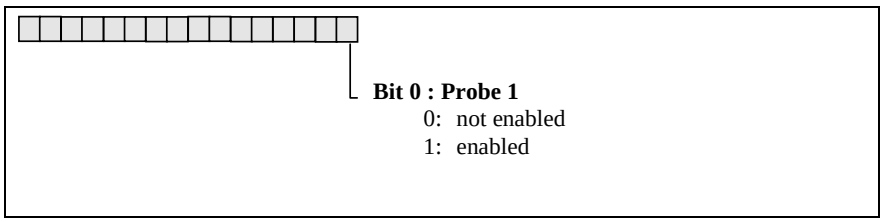


Fig. 2-0.18: S-0-0405, Probe 1 enable

See Function Description: "Probe function"

S-0-0405 - attributes

ID number :	S-0-0405
Name in German :	Meßtaster-1 Freigabe
Name in English :	Probe 1 enable
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P4
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0406, Probe 2 Enable

Description:

This parameter is used to enable a probe input.

The 0 > 1 change of this signal activates the trigger mechanism to evaluate a positive and/or negative edge of the probe signal.

Probe 1 enable can be assigned to a real time control bit. The drive is informed in the master control word.

Parameter structure

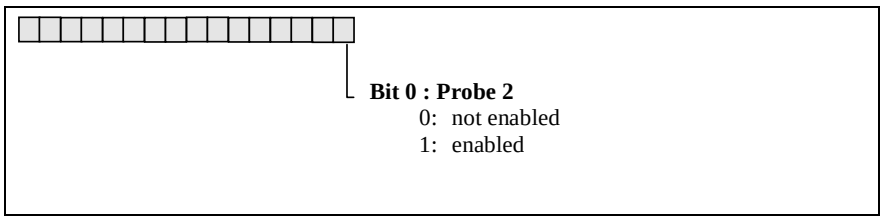


Fig. 2-0.19: S-0-0406, Probe 2 enabled

See Function Description: "Probe function"

S-0-0406 - attributes

ID number :	S-0-0406
Name in German :	Meßtaster-2 Freigabe
Name in English :	Probe 2 enable
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	P4
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0409, Probe 1 positive latched

Description:

The drive sets bit 0 of this parameter if:

- the command **S-0-0170, Probe cycle** is active,
- in **S-0-0169, Probe control parameter** bit 0 is set,
- **S-0-0405, Probe 1 enable** is available
- and the positive edge of **S-0-0401, Probe 1** is detected.

The drive simultaneously stores the value of teh seleted signal in **S-0-0130, Probe 1 positive**.

The drive clears the bit if the NC has cleared command **S-0-0170, Probe cycle** or **S-0-0405, Probe 1 enable** is set from "1" to "0".

Parameter "Probe 1 positive latched" can be allocated to a real time status bit and the NC is constantly informed of the drive status (see **S-0-0305, Assign real time status bit 1**).

Parameter structure

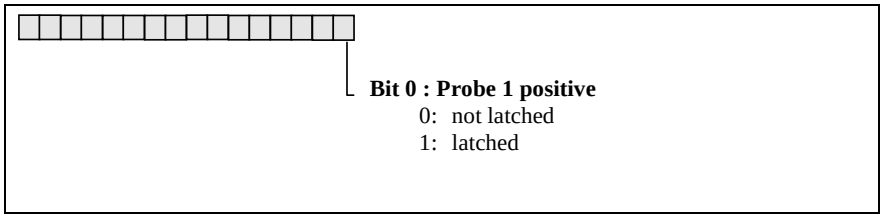


Fig. 2-0.20: S-0-0409, Probe 1 positive latched

See Function Description: "Probe function"

S-0-0409 - attributes

ID number :	S-0-0409
Name in German :	Meßtaster-1 positiv gelatcht
Name in English :	Probe 1 positive latched
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0410, Probe 1 negative latched

Description:

The drive sets bit 0 of this parameter if:

- the command **S-0-0170, Probe cycle** is active,
- in **S-0-0169, Probe control parameter** bit 0 is set,
- **S-0-0406, Probe 2 enable** is available
- and the positive edge of **S-0-0402, Probe** 2 is detected.

The drive simultaneously stores the value of the seleted signal in **S-0-0132, Probe 2 positive**.

The drive clears the bit if the NC has cleared command **S-0-0170, Probe cycle** or **S-0-0406, Probe 2 enable** is set from "1" to "0".

Parameter "Probe 1 positive latched" can be allocated to a real time status bit and the NC is constantly informed of the drive status (see **S-0-0305, Assign real time status bit 1**).

Parameter structure

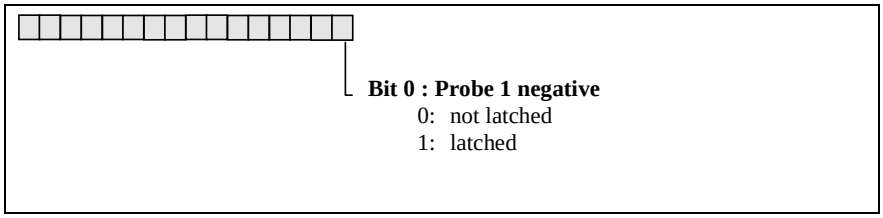


Fig. 2-0.21: S-0-0410, Probe 1 negative latched

See Function Description: "Probe function"

S-0-0410 - attributes

ID number :	S-0-0410
Name in German :	Meßtaster-1 negativ gelatcht
Name in English :	Probe 1 negative latched
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	nicht
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0411, Probe 2 positive latched

Description:

The drive sets bit 0 of this parameter if:

- the command **S-0-0170, Probe cycle** is active,
- in **S-0-0169, Probe control parameter** bit 0 is set,
- **S-0-0406, Probe 2 enable** is available
- and the positive edge of **S-0-0402, Probe** 2 is detected.

The drive simultaneously stores the value of teh seleted signal in **S-0-0132, Probe 2 positive**.

The drive clears the bit if the NC has cleared command **S-0-0170, Probe cycle** or **S-0-0405, Probe 2 enable** is set from "1" to "0".

Parameter "Probe 1 positive latched" can be allocated to a real time status bit and the NC is constantly informed of the drive status (see **S-0-0305, Assign real time status bit 1**).

Parameter structure

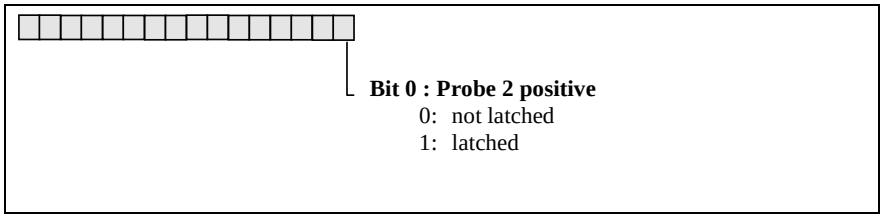


Fig. 2-0.22: S-0-0411, Probe 2 positive latched

See Function Description: "Probe function"

S-0-0411 - attributes

ID number :	S-0-0411
Name in German :	Meßtaster-2 positive gelatcht
Name in English :	Probe 2 positive latched
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

S-0-0412, Probe 2 negative latched

Description:

The drive sets bit 0 of this parameter if:

- the command **S-0-0170, Probe cycle** is active,
- in **S-0-0169, Probe control parameter** bit 0 is set,
- **S-0-0406, Probe 2 enable** is available
- and the positive edge of **S-0-0402, Probe** 2 is detected.

The drive simultaneously stores the value of teh seleted signal in **S-0-0133, Probe 2 positive**.

The drive clears the bit if the NC has cleared command **S-0-0170, Probe cycle** or **S-0-0406, Probe 2 enable** is set from "1" to "0".

Parameter "Probe 1 positive latched" can be allocated to a real time status bit and the NC is constantly informed of the drive status (see **S-0-0305, Assign real time status bit 1**).

Parameter structure

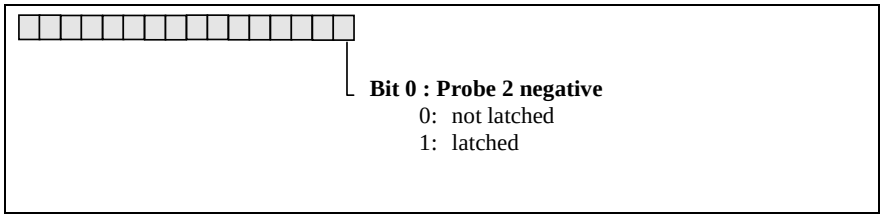


Fig. 2-0.23: S-0-0412, Probe 2 negative

See Function Description: "Probe function"

S-0-0412 - attributes

ID number :	S-0-0412
Name in German :	Meßtaster-2 negativ gelatched
Name in English :	Probe 2 negative latched
Function :	Parameter
Data length:	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal points:	0
Minimum input value :	--
Maximum input value :	--
Editability:	no
Storage:	no
Validity check:	no
Extreme check:	no
Combination check:	no
Cyclical transmission:	no

3 Product-Specific Parameters

P-0-0004, Smoothing time constant

Description:

The time constant that can be activated in this parameter effects the output of the speed controller and is suited to suppress quantizing effects and to limit the bandwidth of the speed controller.

See Function Description: "Setting the Speed Controller"

P-0-0004 - attributes

ID number :	P-0-0004
Name in German :	Glättungszeitkonstante
Name in English :	Smoothing Time Constant
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	us
Unit in English :	us
Decimal places :	0
Minimum input value :	250
Maximum input value :	65500
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0008, Activating E-Stop Function

Description:

The controllers are equipped with a control input (E-Stop) with which the spindle drive can be brought to a standstill with a voltage signal (not part of SERCOS communication).

Activating the E-Stop input and selecting a reaction to brake the drive is set in parameter P-0-0008.

- **P-0-0008 Activating E-Stop Function**

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X	X	X			P-0-0008
															0	inactive
															1	active
														0		as in P-0-0119, best possible standstill agreed
														1		speed command value goes to zero (quick stop)

Tab. 3-1: Parameter values E-Stop Function

See Function Description: "E-Stop Function"

P-0-0008 - attributes

ID number :	P-0-0008
Name in German :	Aktivierung E-Stop Funktion
Name in English :	Activating E-Stop Function
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P23
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0009, Error Number

Description:

If an error occurs during cyclilcal operation, then the drive diagnosis such and displays it on the 7-segment display.

Simultaneously, a bit is set in **S-0-0011, Class 1 diagnostics** and the change bit for this status class is set in the drive status word. The control can now read the error code on the display in the form of a decimal number (201..899) and conducts a relevant error reaction.

If no error is pending, then the value of the parameter is "0".

Example:

Pending error:	F822, "Motor encoder error signal amplitude faulty"
P-0-0009:	822

See Function Description: "Error number"

P-0-0009 - attributes

ID number :	P-0-0009
Name in German :	Fehler Number
Name in English :	Error Message Number
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German	**--**
Unit in English:	**--**
Decimal places:	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0010, Excessive Position Command

Description:

The position command monitor has triggered error **F2-37, Excessive position command difference** and the drive has been brought to a standstill as defined in parameter **P-0-0119, Best possible standstill**.

The excessive position command which triggered the error is stored in parameter **P-0-0010**, the last valid position command in parameter **P-0-0011, Last valid position command**.

Only those commands specified by the NC are monitored.

See Function Description: "Position command monitoring"

P-0-0010 - attributes

ID number :	P-0-0010
Name in German :	Exzessiver Lagesollwert
Name in English :	Excessive Position Command
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0011, Last valid position command

Description:

If error **F237, Excessive position command difference** occurs, then the last valid position command is stored in this parameter.

See Function Description: "Position command monitoring"

P-0-0011 - attributes

ID number :	P-0-0011
Name in German :	Letzter gueltiger Lagesollwert
Name in English :	Last Valid Position Command Value
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0012, Command set absolute measurement

Description:

When starting up an absolute measuring system, the position feedback value is a random and not machine zero point related value. The value of parameters **S-0-0403, Position feedback status** is 0.

The command "Set absolute measurement" can bring the feedback position value of this measuring system to the desired value. At the end of the command, the position feedback value of the encoder will have a defined reference to the machine zero point.

By backing up all required data of the absolute measuring system in the feedback or parameter memories all information is retained each time the machine is switched on. The position feedback value maintains its reference to machine zero point.

To execute the function, use parameter P-0-012.

See Function Description: "Set absolute dimension"

P-0-0012 - attributes

ID number :	P-0-0012
Name in German :	Kommando Absolutmaß setzen
Name in English :	Command 'Set Absolute Measurement'
Function :	Command
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	3
Editability :	P4
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0015, Memory address

Description:

This parameter can be used for factory test purposes to select a memory address in the drive the contents of which are then displayed in **P-0-0016, Contents of memory address.**

P-0-0015 - attributes

ID number :	P-0-0015
Name in German :	Speicheradresse
Name in English :	Memory Address
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0016, Contents of Memory Address

Description:

The contents of the memory address specified in parameter **P-0-0015, Memory address** are displayed here (only for factory test purposes!).

P-0-0016 - attributes

ID number :	P-0-0016
Name in German :	Inhalt der Speicheradresse
Name in English :	Contents of Memory Address
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0018, Numbers of pairs of poles/Pole pair distance

Description:

The numbers of pairs of poles per motor revolution are specified with rotary motors.

This value is stored in motors with a motor feedback memory precisely there and does not have to be displayed.

The distance of the pole pairs must be specified in linear motors.

P-0-0018 - attributes

ID number :	P-0-0018
Name in German :	Polpaarzahl/Polpaarweite
Name in English :	Numbers of pair of poles/ Pole pair distance
Function :	Parameter
Data length :	2Byte
Format :	DEC-OV
Unit in German :	Polpaare bzw. mm (abhängig von P-0-4014, Motorart)
Unit in English :	Pair of poles or mm (depends on P-0-4014, Motor type)
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P23
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0021, List of service data 1

Description:

The recorded signals are stored in parameter **P-0-0021 List of service data 1.**

See Function Description: "Oscilloscope Function"

P-0-0021 - attributes

ID number :	P-0-0021
Name in German :	Meßwertliste 1V
Name in English :	List of Service Data 1
Function :	Parameter
Data length :	4Byte
Format :	P-0-0023
Unit in German :	P-0-0023
Unit in English :	P-0-0023
Decimal places :	P-0-0076
Minimum input value :	**--**
Maximum input value :	**--**
Editability :	no
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0022, List of service data 2

Description:

The recorded signals are stored in parameter **P-0-0022 List of service data 2**.

See Function Description: "Oscilloscope Function"

P-0-0022 - attributes

ID number :	P-0-0022
Name in German :	Meßwertliste 2
Name in English :	List of Service Data 2
Function :	Parameter
Data length :	4Byte
Format :	P-0-0023
Unit in German :	P-0-0023
Unit in English :	P-0-0023
Decimal places :	P-0-0076
Minimum input value :	**--**
Maximum input value :	**--**
Editability :	no
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0023, Signal select channel 1

Description:

Parameter P-0-0023 specifies the signal to be recorded. The following signals are available.

Number	Signal selecton	Unit of measured values
0 x 00	channel not activated	---
0 x 01	actual position value operating mode dependent S-0-0051 or S-0-0053	position scaling dependent
0 x 02	speed value parameter (S-0-0040)	speed scaling dependent
0 x 03	speed control deviation (S-0-0347)	speed scaling dependent
0 x 04	lag distance parameter (S-0-0189)	position-scaling dependent
0 x 05	torque/force command parameter S-0-0080	per cent
0 x 06	available	---

Tab. 3-2: P-0-0023, Signal numbers

Expanded oscilloscope function:

In addition to the permanently defined signal select, it is also possible to record any memory address of the drive. To do so, bit 12 = 1 must be set. Bit 13 defines the data length of any memory signal.

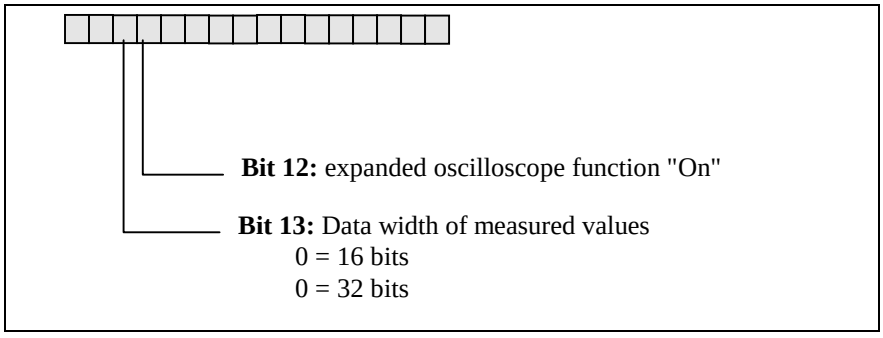


Fig. 3-1: P-0-0023, & P-0-0024, Oscilloscope function signal selection

See Function Description: "Oscilloscope Function"

P-0-0023 - attributes

ID number :	P-0-0023
Name in German :	Signalauswahl 1 Oszilloskop-Funktion
Name in English :	Signal Select Channel 1
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	1
Maximum input value :	0x3FFFFFFF
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0024, Signal select channel 2

Description:

Parameter P-0-0024 specifies the signal to be recorded. The following signals are available.

Number	Signal selecton	Unit of measured values
0 x 00	channel not activated	---
0 x 01	actual position value operating mode dependent S-0-0051 or S-0-0053	position scaling dependent
0 x 02	speed value parameter (S-0-0040)	speed scaling dependent
0 x 03	speed control offset (S-0-0347)	speed scaling dependent
0 x 04	lag distance parameter (S-0-0189)	lagescaling dependent
0 x 05	torque/force command parameter S-0-0080	Per cent
0 x 06	available	---

Tab. 3-3: P-0-0024, Signal numbers

Expanded oscilloscope function:

In addition to the permanently defined signal select, it is also possible to record any memory address of the drive. To do so, bit 12 = 1 must be set. Bit 13 defines the data length of any memory signal.

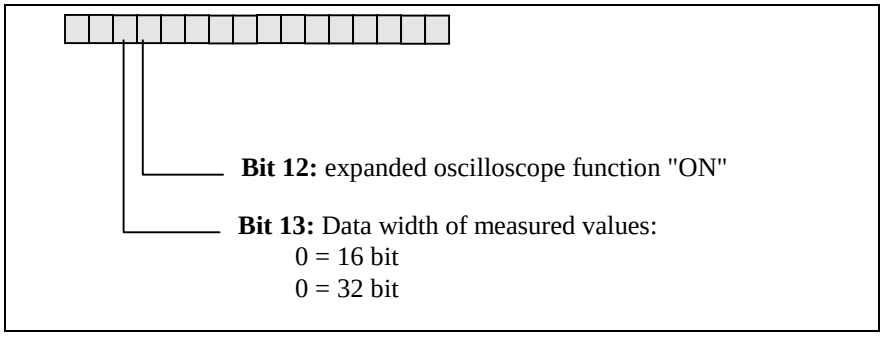


Fig. 3-2: P-0-0023, & P-0-0024, Oscilloscope function - signal selection

See Function Description: "Oscilloscope Function"

P-0-0024 - attributes

ID number :	P-0-0024
Name in German :	Signalauswahl 2 Oszilloskop Funktion
Name in English :	Signal Select Cannel 2
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	1
Maximum input value :	0x3FFFFFFF
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0025, Trigger Source Oscilloscope Function

Description:

Parameter P-0-0025 defines the source that actuates the trigger signal. There is a choice between:

- external trigger
- internal trigger

External trigger (P-0-0025 = 0x01)

If an external trigger is selected, then the tirgger is actuated via bit 0 of the trigger control word.

Internal trigger (P-0-0025 = 0x02)

If an internal trigger is selected, then the parametrized trigger signal is monitored for triggering conditions and the trigger actuated as soon as these are met.

See Function Description: "Oscilloscope Function"

P-0-0025 - attributes

ID number :	P-0-0025
Name in German :	Triggerquelle Oszilloskop-Funktion
Name in English :	Trigger Source
Function :	Parameter
Data length :	2Byte
Format :	DEC-0v
Unit in German :	--
Unit in English :	**--**
Decimal places :	0
Minimum input value :	1
Maximum input value :	2
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0026, Trigger Signal Select Oscilloscope Function

Description:

The signal for an internal trigger source is defined in parameter P-0-0026. It is monitored for the parametrized trigger conditions. The following permanently defined signals are available.

Trigger signal numbers :	Trigger signal:	Relevant tigger level
0 x 00	not defined	not defined
0 x 01	actual position value depending on activated mode	position data (P-0-0027)
0 x 02	actual speed value parameter S-0-0040	speed data (P-0-0028)
0 x 03	speed offset parameter	speed data P-0-0028)
0 x 04	lag distance parameter P-0-0189	position data (P-0-0027)
0 x 05	torque command value parameter S-0-0080	torque data (P-0-0029)

Tab. 3-4: P-00026, Signal numbers

It is also possible to set bit 12 of the expanded trigger signals.

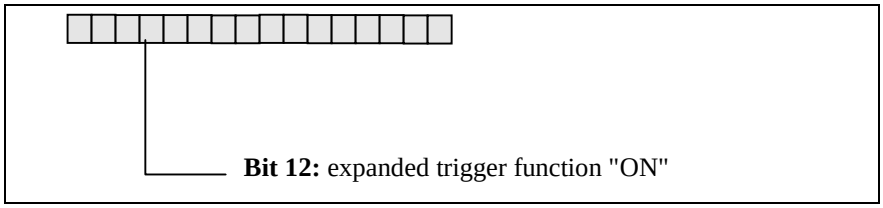


Fig. 3-3: P-0-0026, Trigger signal selection

See Function Description: "Oscilloscope Function"

P-0-0026 - attributes

ID number :	P-0-0026
Name in German :	Trigger Signalauswahl Oszilloskop-Funktion
Name in English :	Trigger Signal Select
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	**--**
Decimal places :	0
Minimum input value :	1
Maximum input value :	0x3FFFFFFF
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0027, Triggerlevel for Position Data

Description:

Parameter P-0-0027 specifies the value which actuates the trigger when the correct edge has been detected.

See Function Description: "Oscilloscope Function"

P-0-0027 - attributes

ID number :	P-0-0027
Name in German :	Triggerschwelle für Positionsdaten
Name in English :	Triggerlevel for Position Data
Function :	Parameter
Data length :	4Byte
Format :	DEC-MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0028, Triggerlevel for Velocity Data

Parameter P-0-0028 specifies the value which actuates the trigger when the correct edge has been detected.

See Function Description: "Oscilloscope Function"

P-0-0028 - attributes

ID number :	P-0-0028
Name in German :	Triggerschwelle für Geschwindigkeits Daten
Name in English :	Triggerlevel for Velocity Data
Function :	Parameter
Data length :	4Byte
Format :	DEC-MV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal places :	S-0-0044
Minimum input value :	S-0-0044
Maximum input value :	S-0-0044
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0029, Triggerlevel for Torque/Force Data

Description:

Parameter P-0-0029 specifies the value which actuates the trigger when the correct edge has been detected.

See Function Description: "Oscilloscope Function"

P-0-0029 - attributes

ID number :	P-0-0029
Name in German :	Triggerschwelle für Drehmomenten/Kraftdaten
Name in English :	Triggerlevel for Torque/Force Data
Function :	Parameter
Data length :	4Byte
Format :	DEC-MV
Unit in German :	%
Unit in English :	%
Decimal places :	S-0-0086
Minimum input value :	S-0-0086
Maximum input value :	S-0-0086
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0030, Trigger Edge

Description:

Parameter P-0-0030 defines the signal exchange which actuates a trigger event.

Number:	Trigger edge:
0x01	Trigger on a positive edge of the trigger signal
0x02	Trigger on a negative edge of the trigger signal
0x03	Trigger on both positive and negative edge of trigger signal
0x04	Trigger if trigger edge same as triggerlevel

Tab. 3-5: Selecting the trigger edge

See Function Description: "Oscilloscope Function"

P-0-0030 - attributes

ID number :	P-0-0030
Name in German :	Triggerflanke
Name in English :	Trigger Edge
Function :	Parameter
Data length :	2Byte
Format :	DEC-0V
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	1
Maximum input value :	4
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0031, Time Source

Description:

Time source defines the time intervals at which the samples of the selected signals are recorded. Intervals of 250 us to 100 ms are possible.

It generally applies.

Recording interval = time source X memory [us]

See Function Description: "Oscilloscope Function"

P-0-0031 - attributes

ID number :	P-0-0031
Name in German :	Zeitfunktion
Name in English :	Time Source
Function :	Parameter
Data length :	4Byte
Format :	DEC-0V
Unit in German :	uS
Unit in English :	uS
Decimal places :	0
Minimum input value :	250
Maximum input value :	100000
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0032, Size of Memory

Description:

Memory size determines the number of the samples recorded per measuring procedure. Up to 512 samples per channel can be recorded.

Using the size of the memory and the time source it is possible to set the recording interval. Minimum recording time equals 128 ms, maximum 51.2s.

It generally applies:

Recording interval = time source X memory [us]

See Function Description: "Oscilloscope Function"

P-0-0032 - attributes

ID number :	P-0-0032
Name in German :	Speichertiefe
Name in English :	Size of Memory
Function :	Parameter
Data length :	2Byte
Format :	DEC-OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	2
Maximum input value :	512
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0033, Number of Samples After Trigger

Description:

Using parameter P-0-0033 the number of samples can be defined which are entered into the sample list after the trigger. A trigger delay can thus be parametrized, defined via parameter P-0-0033.

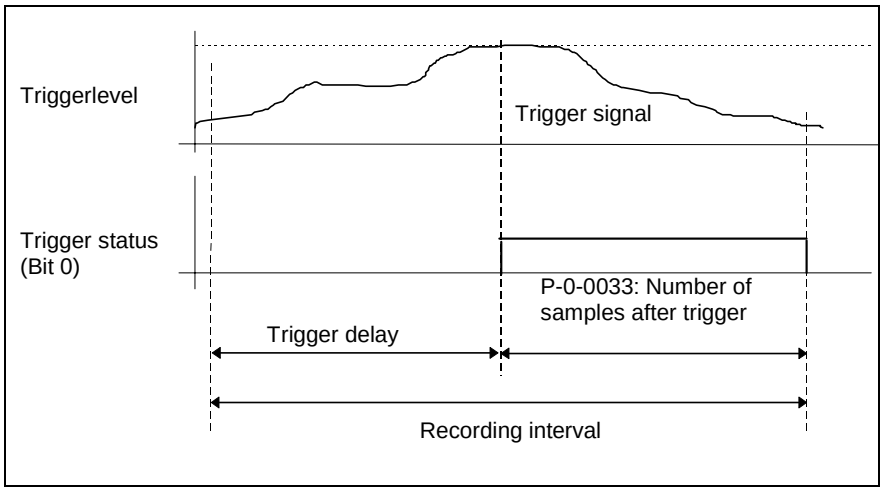


Fig. 3-4: Trigger

See Function Description: "Oscilloscope Function"

P-0-0033 - attributes

ID number :	P-0-0033
Name in German :	Anzahl der Meßwerte nach dem Triggerereignis
Name in English :	Number of Samples after Trigger
Function :	Parameter
Data length :	2Byte
Format :	DEC-0V
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	512
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0035, Delay from trigger to start

Description:

Parameter P-0-0035 sets the number of cycles between the trigger (internal) and the actuating of the trigger (bit 0 of delay from trigger to start) with an external trigger.

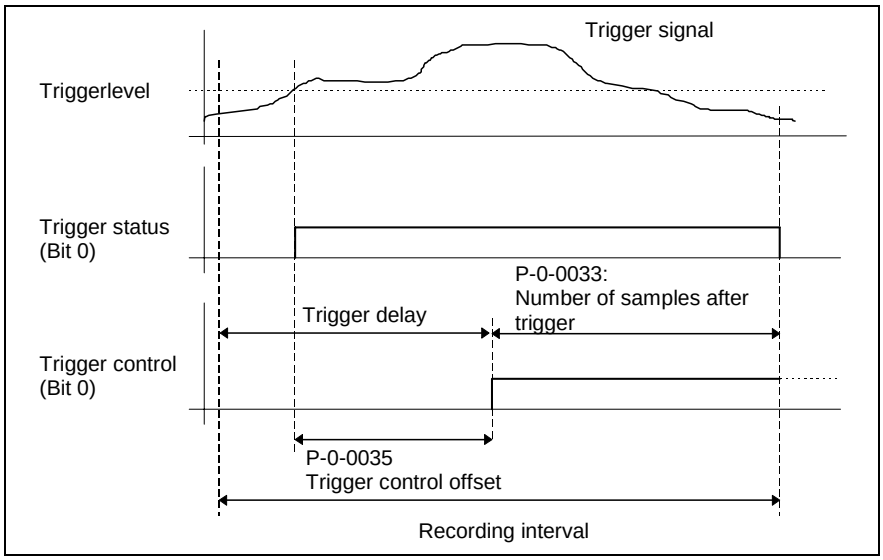


Fig. 3-5: Trigger

As there is a delay with the transmission of the trigger via the control between the detection of the signal and the actuation of the trigger, the drive measures this shift and stores it in parameter **P-0-0035, Delay from trigger to start**. By taking this parameter into account when visualizing the samples, a temporally correct ilustration of the signals is guaranteed.

See Function Description: "Oscilloscope Function"

P-0-0035 Attribute

ID number :	P-0-0035
Name in German :	Triggersteuerversatz
Name in English :	Delay from Trigger to Start
Function :	Parameter
Data length :	2Byte
Format :	DEC_0V
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0036, Trigger Control Word

Description:

Parameter P-0-0036 controls the oscilloscope function.

- Bit 2 activates the function, i.e., the list of samples is put together with the selected data.
- Bit 1 activates trigger monitoring.
- Bit 0 can actuate a trigger. If a valid edge is detected, then the sample memory as parametrized in parameter **P-0-0033, Number of samples after trigger** is completed and the oscilloscope function reset with bits 1 and 2 in the trigger control word deactivated.

Parameter structure

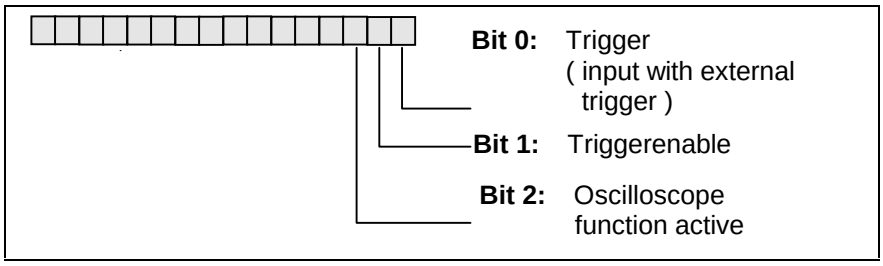


Fig. 3-6: P-0-0036, Activating the oscilloscope function

See Function Description: "Oscilloscope Function"

P-0-0036Attribute

ID number :	P-0-0036
Name in German :	Triggersteuerwort
Name in English :	Trigger Control Word
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	P234
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0037, Trigger Status Word

Status message of the oscilloscope function

Description:

Parameter P-0-0037 supplies information about the current state of the oscilloscope function.

Parameter structure

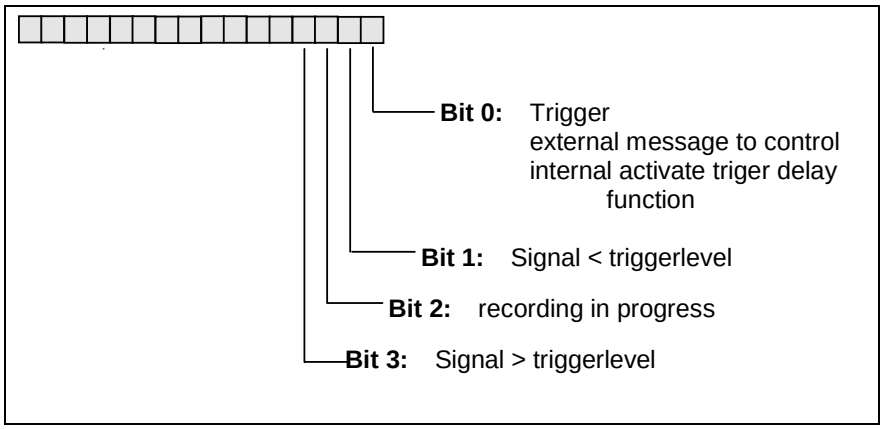


Fig. 3-7: P-0-0037, Status of the oscilloscope function

See Function Description: "Oscilloscope Function"

P-0-0037Attribute

ID number :	P-0-0037
Name in German :	Triggerstatuswort
Name in English :	Trigger Status Word
Function :	Parameter
Data length :	2Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0038, Signal Select Analog Channel 1

Description:

DIAX04 makes the function "Analog output" available. Using two outputs it is possible to output drive-internal signals and statuses as analog voltage signals.

By connecting an oscilloscope to the analog outputs it is possible to examine these. Maximum output voltage equals +/-10 volt with a resolution of 8 bits.

Channel select numbers are available to select specific signals.

Input the channel select number to select analog channel 1 (hexadecimalidecimal format) into parameter P-0-0038.

The following pre-defined signals are available:

Input value (Format hexadecimal.)	Signal select	Standard
0	--	--
1	Torque generating Command current	not settable, 10V = S-0-0110, Controller peak current
2	Actual speed value after mixing and filtering	settable, 10V = P-0-0040/P-0-0041
3	S-0-0036, Speed command value	settable, 10V = P-0-0040/P-0-0041
4	Position command value difference	settable, 10V = P-0-0040/P-0-0041
5	S-0-0051, Actual position value 1	settable, 10V = P-0-0042/P-0-0043
6	S-0-0053, Actual position value 2	settable, 10V = P-0-0042/P-0-0043
7	S-0-0189, Lag distance	settable, 10V = P-0-0042/P-0-0043
8	Sine signal of motor encoder	
9	Cosine signal of motor encoder	
10	Sine signal of external encoder	
11	Cosine signal of external encoder	
12	Torque generating Actual current	not settable, 10V = S-0-0110, Controller peak current
13	Magnetizing actual current	not settable, 10V = S-0-0110, Controller peak current
14	Actual speed value of the motor encoder	settable, 10V = P-0-0040/P-0-0041
15	thermal load of controller	10V = 100%
17	Speed command input of speed command value ramp	settable, 10V = P-0-0040/P-0-0041
18	Motor temperature	10V = 150°C

24	Per cent load of controller in terms of current possible thermal maixmum load	not settable, 10V=P-0-4046, effective peak current that the controller can supply for thermal reason
25	Effective magnetizing current command	not settable, 10V = S-0-0110, Controller peak current
26	Motor voltage	10V = U_{DC} (DC bus voltage)
27	Motor acceleration	settable, 10V = P-0-0600
28	Acceleration power	settable, 10V = P-0-0601
c	Speed command value input speed command value smoothing	settable, 10V = P-0-0040/P-0-0041
d	speed command input of speed control loop	settable, 10V = P-0-0040/P-0-0041
e	DC bus power	settable, 10V = P-0-0044
f	Amount of the DC bus power	settable, 10V = P-0-0044

Tab. 3-6: Signal select with analog output

When standardizing, note the following parameters:

- **P-0-0040, Scaling of speed analog channel 1**
- **P-0-0042, Scaling of position data analog channel 1**
- **P-0-0044, Scaling of power for analog output**
- **P-0-0600, Scaling of acceleration for analog output**
- **P-0-0601, Scaling of acceleration power for analog output**

See Function Description: "Analog output "

P-0-0038 - attributes

ID number :	P-0-0038
Name in German :	Signal select for analog channel1
Name in English :	Signal Select Analog Output Channel 1
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no

Combination check: no

Cyclical transmission : no

P-0-0039, Signal Select Analog Channel 2

Description:

DIAX04 makes the function "Analog output" available. Using two outputs it is possible to output drive-internal signals and statuses as analog voltage signals.

By connecting an oscilloscope to the analog outputs it is possible to examine these. Maximum output voltage equals +/-10 volt with a resolution of 8 bits.

Channel select numbers are available to select specific signals.

Input the channel select number to select analog channel 1 (hexadecimal format) into parameter P-0-0039.

The following pre-defined signals are available:

Input value (format hexadecimal)	Signal select	Standard
0	--	--
1	Torque generating Command current	not settable, 10V = S-0-0110, Controller peak current
2	Actual speed value after mixing and filtering	settable, 10V = P-0-0040/P-0-0041
3	S-0-0036, Speed command value	settable, 10V = P-0-0040/P-0-0041
4	Position command value difference	settable, 10V = P-0-0040/P-0-0041
5	S-0-0051, Actual position value 1	settable, 10V = P-0-0042/P-0-0043
6	S-0-0053, Actual position value 2	settable, 10V = P-0-0042/P-0-0043
7	S-0-0189, Lag distance	settable, 10V = P-0-0042/P-0-0043
8	Sine signal of motor encoder	
9	Cosine signal of motor encoder	
10	Sine signal of external encoder	
11	Cosine signal of external encoder	
12	Torque generating Actual current	not settable, 10V = S-0-0110, Controller peak current
13	Magnetizing actual current	not settable, 10V = S-0-0110, Controller peak current
14	Actual speed value of the motor encoder	settable, 10V = P-0-0040/P-0-0041
15	thermal load of controller	10V = 100%
17	Speed command input of speed command value ramp	settable, 10V = P-0-0040/P-0-0041
18	Motor temperature	10V = 150°C

24	Per cent load of controller in terms of current possible thermal maixmum load	not settable, 10V=P-0-4046, effective peak current that the controller can supply for thermal reason
25	Effective magnetizing current command	not settable, 10V = S-0-0110, Controller peak current
26	Motor voltage	10V = U_{DC} (DC bus voltage)
27	Motor acceleration	settable, 10V = P-0-0600
28	Acceleration power	settable, 10V = P-0-0601
c	Speed command value input speed command value smoothing	settable, 10V = P-0-0040/P-0-0041
d	speed command input of speed control loop	settable, 10V = P-0-0040/P-0-0041
e	DC bus power	settable, 10V = P-0-0044
f	Amount of the DC bus power	settable, 10V = P-0-0044

Tab. 3-7: Signal select with analog output

When standardizing, note the following parameters**:**

- **P-0-0041, Scaling of speed analog channel 2**
- **P-0-0043, Scaling of position data analog channel 2**
- **P-0-0044, Scaling of power for analog output**
- **P-0-0600, Scaling of acceleration for analog output**
- **P-0-0601, Scaling of acceleration power for analog output**

See Function Description: "Analog output"

P-0-0039 - attributes

ID number :	P-0-0039
Name in German :	Signalauswahl für Analog-Kanal 2
Name in English :	Signal Select Analog Output Channel 2
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	no
Extreme value check:	no

Combination check: no

Cyclical transmission : no

P-0-0040, Scaling factor for velocity data channel 1

Description:

If velocity data is selected via parameter **P-0-038, Signal select for analog channel 1,** then these are set with parameter **P-0-0040, Scaling of speed data analog channel 1**.

The unit rpm/10V thus always references the motor. Any gear ratio that might be given is not taken into account.

See Function Description: "Analog output"

P-0-0040 - attributes

ID number :	P-0-0040
Name in German :	Wichtg. von Geschwindigk. Analogausgang-Kanal 1
Name in English :	Scaling Factor for Velocity Data Channel 1
Function :	Parameter
Data length :	2Byte
Format :	DEC-OV
Unit in German :	Upm/10V bzw. mm/min/10V (abhängig von P-0-4014, Motorart)
Unit in English :	Rpm/10V or mm/min/10V (depends on P-0-4014, Motor type)
Decimal places :	0
Minimum input value :	0
Maximum input value :	65535
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0041, Scaling factor for velocity data channel 2

Description:

If velocity data is selected via parameter **P-0-039, Signal select for analog channel 2,** then these are set with parameter **P-0-0040, Scaling of speed data analog channel 2**.

The unit rpm/10V thus always references the motor. Any gear ratio that might be given is not taken into account.

See Function Description: "Analog output"

P-0-0041 - attributes

ID number :	P-0-0041
Name in German :	Wichtg. von Geschwindigk. Analogausgabe-Kanal 2
Name in English :	Scaling Factor for Velocity Data Channel 2
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	Upm/10V bzw. mm/min/10V (abhängig von P-0-4014, Motorart)
Unit in English :	Rpm/10V or mm/min/10V (depends on P-0-4014, Motor type)
Decimal places :	1
Minimum input value :	0
Maximum input value :	65535
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0042, Scaling factor for position data analog output channel 1

Description:

If position data were selected via parameter **P-0-038, Signal select for analog channel 1,** then these are set with parameter **P-0-0042, Scaling of position data analog channel 1**.

The unit degrees thus relates to the motor.

See Function Description: "Analog output "

P-0-0042 - attributes

ID number :	P-0-0042
Name in German :	Wichtg. von Positionsdaten Analogausgabe-Kanal 1
Name in English :	Scaling Factor for Position Data Channel 1
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	Grad/10V bzw. mm/10V (abhängig von P-0-4014, Motorart)
Unit in English :	Deg/10V or mm/10V (depends on P-0-4014, Motor type)
Decimal places :	2
Minimum input value :	0
Maximum input value :	0x7FFFFFFF
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0043, Scaling factor for position data analog output channel 2

Description:

If position data were selected via parameter **P-0-039, Signal select for analog channel 2,** then these are set with parameter **P-0-0043, Scaling of position data analog channel 2**.

The unit degrees thus relates to the motor.

See Function Description: "Analog output"

P-0-0043 - attributes

ID number :	P-0-0043
Name in German :	Wichtg. von Positionsdaten Analogausgabe-Kanal 2
Name in English :	Scaling Factor for Position Data Channel 2
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	Grad/10V bzw. mm/10V (abhängig von P-0-4014, Motorart)
Unit in English :	Deg/10V or mm/10V (depends on P-0-4014, motor type)
Decimal places :	2
Minimum input value :	0
Maximum input value :	0x7FFFFFFF
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0044, Scaling factor for power for analog output

Description:

The DC bus power can be output at analog channels (**P-0-0038, Signal select for analog channel 1**; **P-0-0039, Signal select for analog channel 2**). Using parameter P-0-0044, Scaling of power for analog output it is possible to make it meet the demands.

See Function Description: "Analog output"

P-0-0044 - attributes

ID number :	P-0-0044
Name in German :	Wichtung der Leistung für Analogausgabe
Name in English :	Scaling Factor for Power for Analog Channel
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	W/10V
Unit in English :	KW/10V
Decimal places :	0
Minimum input value :	0
Maximum input value :	0x7FFFFFFF
Editability :	P234
Storage :	Prog. Module
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0051, Torque/Force Constant

Description:

The torque/force constant specifies which drive torque or force of the motor will be generated with a specified effective current.

The value solely depends on the construction of the motor when delaing with synchronous motors.

This value only applies to asynchronous motors if the motor is not oeprated in the field weakening range.

With MKD and MHD motors, this parameter is stored in the feedback memory.

It applies:

M_A[Nm, N] = P-0-0051 * S-0-0080

with:	M_A	drive torque
	P-0-0051	torque/force constant [N/A]
	S-0-0080	torque/force command [A]

P-0-0051 - attributes

ID number :	P-0-0051
Name in German :	Drehmoment/Kraft-Konstante
Name in English :	Torque-Constant
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	Nm/A
Unit in English :	Nm/A
Decimal places :	2
Minimum input value :	1
Maximum input value :	65535
Editability :	P3
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0074, Interface feedback 1

Description:

Specifies the interface where the motor encoder is connected with this parameter. Enter the relevant interface module number here.

Modulee :	P-0-0074:	Measuring system:
Standard	1	dig. servo feedback made by Heidenhain or Stegmann or a resolver
DLF	2	incremental encoder with sine signals from Heidenhain, select uA or 1V signals
DZF	3	gearwheel encoder
DEF 1	5	incremental encoder with square-wave signals from Heidenhain
DAG 2	8	encoder with ENDAT interface
DZF03.M	9	gearwheel encoder from Lenord & Bauer, Woelke, VS-Sensorik, Siemens

Tab. 3-8: Values for P-0-0074, Motor encoder interface

Restrictions:

Modules DLF, DZF, DRF and DEF 1 may not be used at the same time in the same controller.=> **Danger of damage!**

It is not possible to combine DLF and DZF.
To operate an incremental encoder with the DLF or DZF module DEF2 should be used.

See Function Description: "Determining encoder interface of feedback interface 1"

P-0-0074 - attributes

ID number :	P-0-0074
Name in German :	Motorgeberinterface
Name in English :	Interface Feedback 1
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	1
Maximum input value :	3
Editability :	P23
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no

Cyclical transmission : no

P-0-0075, External encoder interface

Description:

Use this parameter to fix the encoder interface to which the external encoder is connected. Enter the number of the interface modules here.

Module:	P-0-0075:	Measuring System:
	0	no external encoder interface
Standard	1	digital servo feedback or resolver
DLF	2	incremental encoder with sine signals from Heidenhain, either uA or 1V signals
DZF	3	gearwheel encoder
DFF	4	digital servo feedback
DEF 1	5	incremental encoder with square-wave signals from Heidenhain
DEF 2	6	incremental encoder with square-wave signals from Heidenhain
DAG 1	7	encoder with SSI interface
DAG 2	8	encoder with ENDAT interface
DZF03.M	9	gearwheel encoder from Lenord & Bauer, Woelke, VS-Sensorik, Siemens

Tab. 3-9: Values for P-0-0075, external encoder interface

Restrictions:

Modules DLF, DZF, DRF and DEF 1 may not be used at the same time in the same controller.=> **Danger of damage!**

It is not possible to combine DLF and DZF. To operate an incremental encoder with the DLF or DZF module DEF2 should be used.

See Function Description: "Determining encoder interface of feedback interface".

P-0-0075 - attributes

ID number : P-0-0075
Name in German : Externes Geberinterface
Name in English : Interface Feedback 2
Function : Parameter
Data length : 2Byte
Format : DEC_OV
Unit in German : --
Unit in English : --
Decimal places : 0
Minimum input value : 0
Maximum input value : 8
Editability : P23
Storage : Parameter EEPROM
Validity check: Phase 3
Extreme value check: yes
Combination check: no
Cyclical transmission : no

P-0-0081, Parallel Output 1

Description:

The control can address the outputs of the I/O card DEA 4.1 with this parameter.

See Function Description: "Digital Inputs/Outputs"

P-0-0081 - attributes

ID number :	P-0-0081
Name in German :	Paralleler Ausgang 1
Name in English :	Parallel I/O Output 1
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	MDT

P-0-0082, Parallel Input 1

Description:

The control can address the inputs of the I/O card DEA 4.1 with this parameter.

See Function Description: "Digital Inputs/Outputs"

P-0-0082 - attributes

ID number :	P-0-0082
Name in German :	Paralleler Eingang 1
Name in English :	Parallel I/O Input 1
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check:	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0097, Absolute Encoder Control Window

Description:

If an absolute control window monitor is used in the progression command 3 > 4, then the value stored is compared to the current feedback position of the axis.

If the difference exceeds the value in parameter P-0-0097, then error message **C224, Absolute encoder error** is generated.

As a standard value, 0.1 motor revolutions (= 36 degrees in terms of motor shaft) can be entered if the axis has a holding brake or is self-locking.

See Function Description: "Absolute encoder monitoring"

P-0-0097 - attributes

ID number :	P-0-0097
Name in German :	Absolutgeber-Überwachungsfenster
Name in English :	Absolute Encoder Control Window
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	0
Maximum input value :	S-0-0076
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0098, Maximum model deviation

Description:

Maximum model deviation means the maximum deviation between the real and model position feedback values computed by the drive.

The user can implement the parameter as an aid in parametrizing **S-0-0159, Monitoring window**.

When determining the model position feedback value, it is necessary to differentiate between:

1) Position control with lag error

In this mode, the control path is simulated with the help of a model.

The maximum deviation between the calculated model and real position feedback values is stored in parameter P-0-0098.

The model of the control path thus represents a delay element of the first order which only depends on the KV factor of the position controller.

2) Position control without lag

In this mode, the position command and the position feedback are compared. The maximum deviation is stored in P-0-0098.

A model for the control path is not needed.

See Function Description: "Position control loop monitoring"

P-0-0098 - attributes

ID number :	P-0-0098
Name in German :	max. Modellabweichung
Name in English :	Maximum Model Deviation
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	0
Maximum input value :	S-0-0076
Editability :	P234
Storage :	no
Validity check:	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0099, Position Command Smoothing Time Constant

Description:

The position command smoothing time constant determines the maximum jerk that is possible with cyclical position commands.

The maximum jerk is thus computed:

$$\text{max. jerk} = \frac{2^{nd} \text{ pos. command derivation}}{\textbf{P-0-0099 pos. com. value smoothing time constant}}$$

Fig. 3-8: Maximum jerk

If no filter is to be activated, then set P-0-0099 <= S-0-0001, NC cycle time.

P-0-0099 - attributes

ID number :	P-0-0099
Name in German :	Lagesollwert-Glättungssfilter-Zeitkonstante
Name in English :	Position Command Smoothing Time Constant
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal places :	2
Minimum input value :	0
Maximum input value :	65535
Editability :	P234
Storage :	Parameter EEPROM
Validity check:	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0109 Torque/force peak limitation

See Function Description: "Torque/force peak limitation"

P-0-0109 - attributes

ID number:	P-0-0109
Name in German :	Spitzendrehmoment/Kraft-Begrenzung
Name in English :	Torque/force peak limitation
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	S-0-0086
Unit in English :	S-0-0086
Decimal places :	S-0-0086
Minimum input value :	0
Maximum input value :	0X8000
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0110, Parallel Output 2

Description:

The control uses this parameter to address the outputs of I/O card DEA 5.1.

See Function Description: "Digital Input/Output"

P-0-0110 - attributes

ID number:	P-0-0110
Name in German :	Parallel output2
Name in English :	Parallel I/O Output 2
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	MDT

P-0-0111, Parallel Output 2

Description:

The control uses this parameter to address the inputs of I/O card DEA 5.1.

See Function Description: "Digital Input/Output"

P-0-0111 - attributes

ID number:	P-0-0111
Name in German :	Paralleler Eingang 2
Name in English :	Parallel I/O Input 2
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0112, Parallel Output 3

Description:

The control uses this parameter to address the outputs of I/O card DEA 6.1.

See Function Description: "Digital Input/Output"

P-0-0112 - attributes

ID number:	P-0-0112
Name in German :	Parallelerausgang 3
Name in English :	Parallel I/O Output 3
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	MDT

P-0-0113, Parallel Output 3

Description:

The control uses this parameter to address the inputs of I/O card DEA 6.1.

See Function Description: "Digital Input/Output"

P-0-0113 - attributes

ID number:	P-0-0113
Name in German :	Paralleler Eingang 3
Name in English :	Parallel I/O Input 3
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0115, Analog Input 1

Description:

To detect analog variables, drive contorllers equipped with additional input module "Analog signal interface" type DRF, have two differential inputs at their disposal.

The voltage applied to the differential input is converted with a resolution of 12 bits and made available in parameter **P-0-0115, Analog input 1** and **P-0-0116, Analog input 2**.

The following applies:

Input voltage:	Value:
>= 10 V	2047
0 V	0
<= -10 V	-2048

Tab. 3-11: Allocations

These values apply to input amplification 1.
With higher input amplifications (2, 4 or 10) the voltage values drop.

See Function Description: "Analog inputs"

P-0-0115 - attributes

ID number:	P-0-0115
Name in German :	Analogeingang 1
Name in English :	Analog Input 1
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0116, Analog input 2

To detect analog variables, drive contorllers equipped with additional input module "Analog signal interface" type DRF, hae two differential inputs at their disposal.

The voltage applied to the differential input is converted with a resolution of 12 bits and made available in parameter **P-0-0115, Analog input 1** and **P-0-0116, Analog input 2**.

The following applies:

Input voltage:	**Value:**
>= 10 V	2047
0 V	0
<= -10 V	-2048

Tab. 3-12: Allocations

These values apply to input amplification 1.
With higher input amplifications (2, 4 or 10) the voltage values drop.

See Function Description: "Analog inputs"

See Function Description: "Analog inputs"

P-0-0116 - attributes

ID number:	P-0-0116
Name in German :	Analogeingang 2
Name in English :	Analog Input 2
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0117, Activating an NC Reaction with Fault

Description:

This parameter ofers the NC the option of ring the drive to a coordinated standstill with a fault for 30 seconds. The drive responds with the set **P-0-0119, Best possible deceleration**.

The function is possible with non-fatal and interface errors!

Parameter Structure:

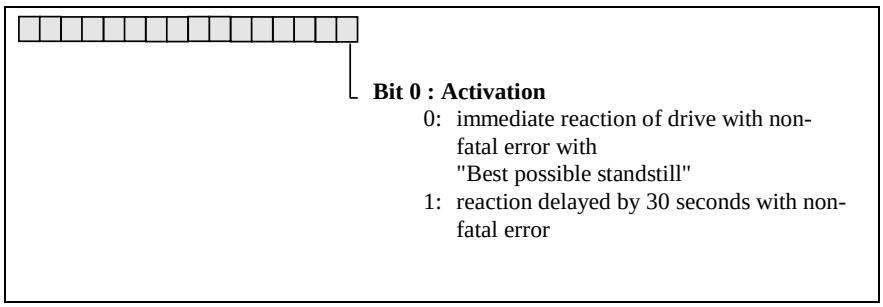


Fig. 3-19: P-0-0117, Activating an NC reaction with fault

See Function Description: "NC Reaction with Fault"

P-0-0117 - attributes

ID number:	P-0-0117
Name in German :	Aktivierung NC-Reaktion im Fehlerfall
Name in English :	NC Reaction in Error Situation
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0118, Power Off with Fault

Description:

This parameter is used in modular drive systems, e.g., DDS, to set whether an error is signalled to the power supply module or not. The module then responds by switching the power offa nd a DC bus short circuuit and then conducts an error reaction for all other drives.

Value of P-0-0118:	Function:
0	no signal to power supply module with fault
1	signal to power supply module with fault

Tab. 2-13: Signalling a drive error

In modular controllers, e.g., DDS, the signal is conducted via the bus connecting cable on the front (Connector X1, Pin 2).

See Function Description: "Power off with fault"

P-0-0118 - attributes

ID number:	P-0-0118
Name in German :	Leistungsabschaltung im Fehlerfall
Name in English :	Power Switch Off in Error Situation
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0119, Best possible deceleration

Description:

This parameter sets the way in which the drive is declerated with:

- a non-fatal error
- an interface error
- phase fallback
- removal of drive enable signal

P-0-0119:	Type of reaction:
0	speed command to zero (quick stop)
1	torque off
2	speed command value to zero with command value ramp and filter

Tab. 3-14: Types of drive decleration

See Function Description: "Error reaction with interface and non-fatal errors"

P-0-0119 - attributes

ID number:	P-0-0119
Name in German :	Bestmögliche Stillsetzung
Name in English :	Deceleration as best as possible
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0121, Velocity Mixfactor Encoder1& Encoder 2

Description:

Parameter "Velocity mixfactor" determines the ratio of velocity encoder values between motor and external encoder.

The value is input in per cent, whereby it applies:

0.0 %:	velocity controller works only with the velocity of the motor encoder (= encoder 1)
100.0 %:	velocity controller works only with the velocity of the external encoder (= encoder 2)

If there is no external encoder, then the parameter is set to 0 %.

See Function Description: "Setting the velocity mixfactor"

P-0-0121 - attributes

ID number:	P-0-0121
Name in German :	Geschwindigkeits-Mixfaktor Geber1&Geber2
Name in English :	Velocity-Mixfactor Feedback1&Feedback2
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	%
Unit in English :	%
Decimal places :	1
Minimum input value :	0
Maximum input value :	100,0
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0123, Absolute encoder buffer

Description:

All data are secured in this parameter that are needed by an absolute encoder for position initialization.

P-0-0123 - attributes

ID number:	P-0-0123
Name in German :	Absolutgeber-Buffer
Name in English :	Absolute encoder buffer
Function :	Parameter
Data length :	2Byte variable
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	parameter EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0124, Assignment ID number-> DEA output

Description:

The value of a parameter can be assigned to a DEA output with this parameter.
If the data width of the allocated parameter is greater than the DEA ports, then the bits of higher value are cut off.

Parameter Structure:

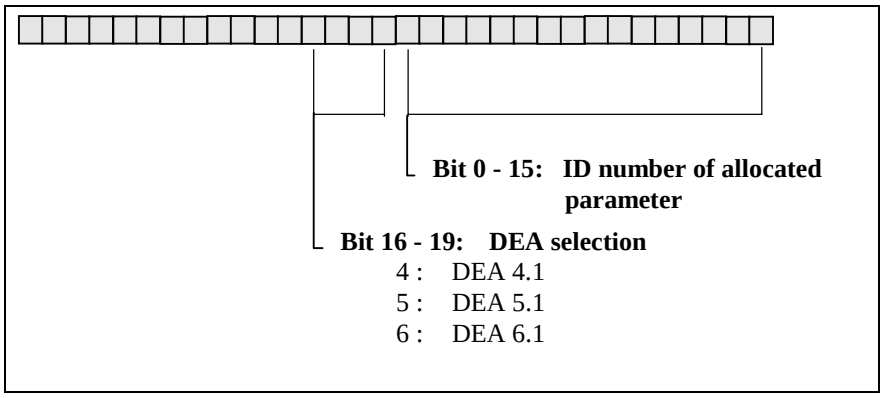


Fig. 3-20: P-0-0124, Allocating ID number > DEA output

The contents of the parmeter is written into the DEA output.

Note:

If the DEA 4.1 is assigned an ID number, then parameter **P-0-0081, Parallel output 1** can no longer be used.

The same restriction applies to:

- allocate DEA 5.1 <> **P-0-0110, Parallel output 2**
- allocate DEA 6.1 <> **P-0-0112, Parallel output 3**

See Function Description: "Digital Input/Output"

P-0-0124 - attributes

ID number:	P-0-0124
Name in German :	Zuweisung ID number-> DEA-Ausgang
Name in English :	Assignment IDN -> DEA-Output
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0125, Assigning DEA Input -> ID number

Description:

The DEA input can be set to the value of a parameter herewith.

The input state of DEA is written into the relevant parameter.

Parameter Structure:

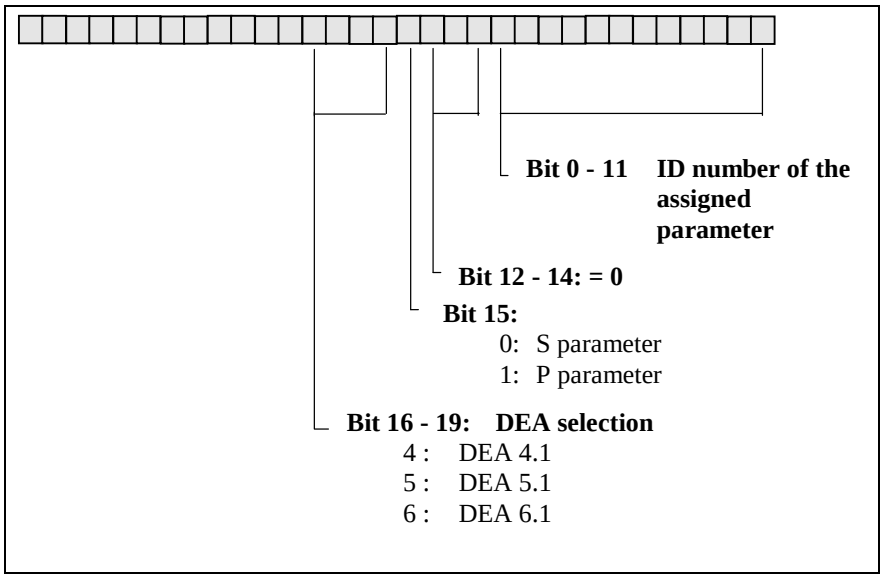


Fig. 3-21: P-0-0125, Assigning DEA inputs > ID number

Note:

If the DEA is assigned an ID number with the use parameter P-0-0125, then the operawting data of this allocated ID number is cyclically written into the input of the relevant DEA.

See Function Description: "Digital Input/Output"

P-0-0125 - attributes

ID number:	P-0-0125
Name in German :	Zuweisung DEA-Eingang -> Identnummer
Name in English :	Assignment DEA-Input -> IDN
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0126, Maximum braking time

Description:

The maxcimum braking time of the drive is set in this parameter.

The value should always be greater than the time needed to bring the axis to a standstill with velocity command value to zero while taking the maximum possible velocity into account.

See Function Description: "Velocity value to zero with filter and ramp"

P-0-0126 - attributes

ID number:	P-0-0126
Name in German :	Maximale Bremszeit
Name in English :	Maximum braking period
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal places :	0
Minimum input value :	500
Maximum input value :	100000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0127, Overload warning

Description:

To protect the end stage, a temperature module is used to compute the temperature of the transistor and stage. If the temperature exceeds 125°C, then the torque-generating command current is limited.

To keep the drive from unexpectedly not delivering the required torque, this parameter can be used to set a warning threshold.

If the thermal load exceeds this value, then the warning **E2-58, Continuous current limit prewarning** is generated.

Inputting 100% deactivates this warning and **E2-57, Continuous current limit active** is generated.

See Function Description: "Monitoring the thermal load"

P-0-0127 - attributes

ID number:	P-0-0127
Name in German :	Überlastwarnung
Name in English :	Overload warning
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	%
Unit in English :	%
Decimal places :	0
Minimum input value :	0
Maximum input value :	100
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0141, Thermal Drive Overload

See Function Description: "Checking thermal load"

P-0-0141 - attributes

ID number:	P-0-0141
Name in German :	Thermische Regelgeräte-Auslastung
Name in English :	Thermal drive load
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	Prozent
Unit in English :	per cent
Decimal places :	0
Minimum input value :	0
Maximum input value :	100.0
Editability :	P234
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0145, Expand trigger level

(For servicing only)

Description:

If bit 12 expand trigger edge is selected via parameter **P-0-0026, Trigger signal select,** then via parameter P-0-0145 an address in the drive can be selected that is monitored for exceeding the threshold.

Parameter Structure:

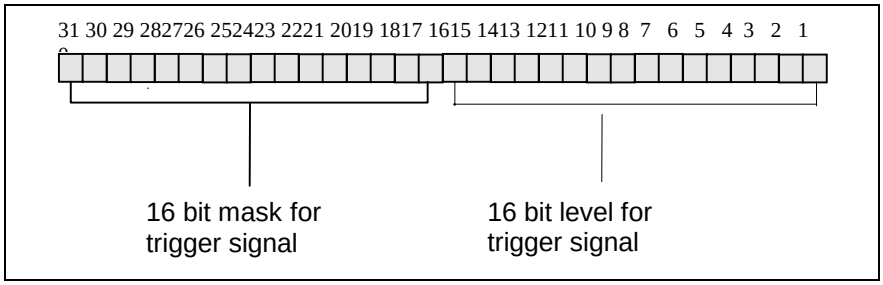


Fig. 3-22: P-0-0145, Expand trigger edge

See Function Description: "Oscilloscope function"

P-0-0145 - attributes

ID number:	P-0-0145
Name in German :	Triggerschwelle erw. Oszilloskop Funktion
Name in English :	Expand Trigger Edge
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0146, Expand trigger address

(For servicing only)

Description:

If bit 12 expand trigger edge is selected via parameter **P-0-0026, Trigger signal select,** then via parameter P-0-0146 an address in the drive can be selected that is monitored for exceeding the threshold.

Parameter Structure:

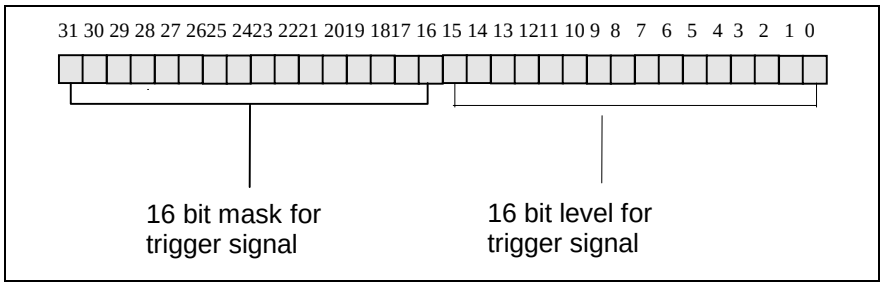


Fig. 3-23: P-0-0146, Expand trigger address

The 16 bit value of the trigger edge is monitored. The trigger signal hereby is first linked via the mask for trigger signals AND-.

See Function Description: "Oscilloscope function"

P-0-00146 - attributes

ID number:	P-0-0146
Name in German :	Triggersinaladresse erw. Oszilloskop Funktion
Name in English :	Expand Trigger Address
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0147, Expanded signal K1 address

Description:

If via parameters **P-0-0023 Signal select scope channel 1**and **P-0-0024 Signal select scope channel 2** expanded signal select is seleted, then parameter P-0-0147 can be used to select an address in the drive which is to be recorded.

See Function Description: "Oscilloscope function"

P-0-00147 - attributes

ID number:	P-0-0147
Name in German :	Signaladresse K1 erw. Oszilloskop Function
Name in English :	Expanded Signal K1 Adresse
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0148, Expanded signal K2 address

Description:

If via parameters **P-0-0023 Signal select scope channel 1**and **P-0-0024 Signal select scope channel 2** expanded signal select is selected, then parameter P-0-0148 can be used to select an address in the drive which is to be recorded.

See Function Description: "Oscilloscope function"

P-0-00148 - attributes

ID number:	P-0-0148
Name in German :	Signaladresse K2 erw. Oszilloskop Function
Name in English :	Expanded Signal K2 address
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0149, List of valid samples for oscilloscope function

Description:

The control can read the permanently defined signals of the drive via parameter P-0-0149.

List entry:	ID number:
1	S-0-0051 or S-0-0053
2	S-0-0040
3	S-0-0347
4	S-0-0189
5	S-0-0080
6	P-0-0147
7	P-0-0148

Tab. 3-15: P-0-0149, List of valid samples for oscilloscope function

See Function Description: "Oscilloscope function"

P-0-0149 - attributes

ID number:	P-0-0149
Name in German :	Signalauswahlliste für Oszilloskopfunktion
Name in English :	List of valid Samples for Oscilloscope function
Function :	Parameter
Data length :	2Byte - variable
Format :	IDN
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	**--**
Maximum input value :	--
Editability :	no
Storage :	permanent
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0150, Number of valid samples for oscilloscope function

Description:

Parameter P-0-0150 sets the number of valid samples in the sample list.

See Function Description: "Oscilloscope function"

P-0-0150 - attributes

ID number:	P-0-0150
Name in German :	Anzahl gültiger Meßwerte für Oszilloskop Funktion
Name in English :	Number of valid samples for Oscilloscope function
Function :	Parameter
Data length :	2Byte - variable
Format :	DEC_0V
Unit in German :	**--**
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	512
Editability :	no
Storage :	permanent
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-•-0180, Rejection frequency velocity loop

Description:

The frequency which the rejection filter in the velocity control loop most strongle attenuates.

See Function Description: "Filtering mechanical resonance oscillations"

P-•-0180 - attributes

ID number:	P-•-0180 { switchable, • ∈ 0;1;2;3}
Name in German :	Sperrfrequenz Geschwindigkeitsregler
Name in English :	Rejection frequency velocity loop
Function :	Parameter
Data length :	2Byte
Format :	DEC_0V
Unit in German :	Hz
Unit in English :	Hz
Decimal places :	0
Minimum input value :	150
Maximum input value :	1950
Editability :	P234
Storage :	EEPROM
Validity check :	P3-4
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-•-0181, Rejection bandwidth velocity loop

Description:

The frequency range which the rejection filter in the velocity loop most strong attenuates. The range is symmetric to **P-•-0180, rejection bandwidth velocity loop**. Setting „0“ deactivates the filter!

See Function Description: "Filtering mechanical resonance oscillations"

P-•-0181, Bandbreite Sperrfilter

ID number:	P-•-0181 { switchable, • ∈ 0;1;2;3}
Name in German :	Bandbreite Sperrfilter
Name in English :	Rejection bandwidth velocity loop
Function :	Parameter
Data length :	2Byte
Format :	DEC_0V
Unit in German :	Hz
Unit in English :	Hz
Decimal places :	0
Minimum input value :	0
Maximum input value :	3900
Editability :	P234
Storage :	EEPROM
Validity check :	P3-4
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0200, Signal select probe 1

Description:

This parameter is used to select the variable used for probe input 1.

The following signals can presently be selected:

P-0-0200:	Selected signal:
0	Actual positions values 1 or 2, depends on: **S-0-0169, Probe control parameter** bit 4
1	Time measurement in us

Tab. 3-16: P-0-0200, Variables for probe input 1

See Function Description: "Probe function"

P-0-0200 - attributes

ID number:	P-0-0200
Name in German :	Signal-Auswahl Messtaster-1
Name in English :	Signal select probe 1
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0201, Signal-Auswahl Messtaster-2

Description:

This parameter is used to select the variable used for probe input 2.

The following signals can presently be selected:

P-0-0201:	Selected signal:
0	Actual positions values 1 or 2, depends on: **S-0-0169, Probe control parameter** bit 4
1	Time measurement in us

Tab. 3-17: P-0-0201, Variables for probe input 2

See Function Description: "Probe function"

P-0-0201 - attributes

ID number:	P-0-0201
Name in German :	Signal-Auswahl Messtaster-2
Name in English :	Signal select probe 2
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0202, Difference probe value 1

Description:

The difference between the positive and negative measurands of probe 1 are stored here. The value is always recomputed if a new positive or negative measurand is latched.

See Function Description: "Probe function"

P-0-0202 - attributes

ID number:	P-0-0202
Name in German :	Differenz Meßwerte-1
Name in English :	Difference probe values 1
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0203, Difference probe value 2

Description:

The difference between the positive and negative measurands of probe 2 are stored here. The value is always recomputed if a new positive or negative measurand is latched.

See Function Description: "Probe function"

P-0-0203 - attributes

ID number:	P-0-0203
Name in German :	Differenz Meßwerte 2
Name in English :	Difference probe values 2
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	AT

P-0-0300, Spindle position parameter 2

Description:

This parameter determines the process with which the spindle drive is to be positioned, i.e., either

- directly via the spindle feedback

- or -

- via the motor feedback and an additional spindle reference switch.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Bit numbers)
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		P-0-0300
																Spindle positioning via
															0	-motor or spindle feedback
															1	-motor feedback via spindle reference switch
														0		status actual positions values not set in reference
														1		...set

Tab. 2-18: Parameter values for spindle positioning procedure

See Function Description: "Spindle positioning"

Note: Bit 0 =„1“ simultaneously sets external 24 volt power supply voltage for X12 (DSS plug-in module) monitoring.

P-0-0300 - attributes

ID number:	P-0-0300
Name in German :	Spindelpositionierparameter 2
Name in English :	Spindle Position Parameter 2
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P23
Storage :	programming module
Validity check :	P3-4
Extreme value check:	no
Combination check:	yes
Cyclical transmission :	no

P-0-0310 (For service only!)

P-0-0311 (For service only!)

P-0-0508, Commutator Offset

Description:

With synchronous motors, this parameter specifies the offset between the raw motor encoder value and the resulting absolute electrical angle between stator current and rotor flow vector.

The commutator offset is stored in motors with motor feedback data storage and therefore not specified.

With linear synchronous motors, this value must always be redetermined if:

- the measuring system of the motor is mechanically changed
- or there has been a mechanical change in primary or secondary parts.

See Function Description: "Synchronous/Asynchronous"

P-0-0508 - attributes

ID number:	P-0-0508
Name in German :	Kommutierungs-Offset
Name in English :	Commutator-Offset
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	65535
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0509, Slot angle

Description:
This parameter is not presently used.

P-0-0509 - attributes

ID number:	P-0-0509
Name in German :	Paßfedernutwinkel
Name in English :	Slot Angle
Function :	Parameter
Data length :	4Byte
Format :	DEC_MV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0510, Rotor moment of inertia

Description:

This parameter specifies the rotor's moment of inertia and is secured in the feedback in motors equipped with a feedback memory.

P-0-0510 - attributes

ID number:	P-0-0510
Name in German :	Rotorträgheitsmoment
Name in English :	Moments of inertia of the rotor
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	kgm²
Unit in English :	kgm²
Decimal places :	5
Minimum input value :	1
Maximum input value :	10000000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0511, Brake current

Description:

If a motor is equipped with a holding brake and a value not equal to 0 is entered in this parameter, then the drive controller monitors the braking current. If the current exceeds 0.7 ... 1.3 * P-0-0511 then error message **F268, Brake error** is triggered.

See Function Description: "Motor holding brake"

P-0-0511 - attributes

ID number:	P-0-0511
Name in German :	Haltebremsenstrom
Name in English :	Brake Current
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500.000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0513, Feedback type

Description:

This value is set in all measuring systems with feedback data memory and identifies, in addition to encoder resolution, important features of the system. The coding of the parameter is set by the encoder or the manufacturer.

the parameter cannot be write accessed and only supports informatoin about the connected feedback.

Measuring systems with feedback data memory are connected via the following encoder interfaces:

- 1 Standard
- 4 DFF 1
- 8 DAG 2

P-0-0513 - attributes

ID number:	P-0-0513
Name in German :	Feedbacktyp
Name in English :	Feedback type
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	feedback EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0514, Absolute encoder offset

Description:

This parameter supports the position initialization of absolute encoders equipepd with feedback memory and that have not been defined as a modulo axis.

P-0-0514 cannot be write accessed.

P-0-0514 - attributes

ID number:	P-0-0514
Name in German :	Absolutgeber-Offset
Name in English :	Absolute Encoder Offset
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	feedback EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0518, Amplifier nominal current 2

Description:

This parameter determines the maximum nominal current of the amplifier with reduced peak current.

Using parameters **S-0-0110, Amplifier peak current**, **S-0-0112, Amplifier nominal current** and **P-0-0519, Amplifier peak current 2** it sets the continuous peak current curve to limit the peak current of the amplifier.

The value does not have to be input as it is permanently programmed into the amplifier.

P-0-0518 - attributes

ID number:	P-0-0518
Name in German :	Verstärker Nennstrom-2
Name in English :	Amplifier Nominal Current 2
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500000
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0519, Amplifier peak current 2

Description:

The drive offers the option of defining a changed continuous peak current curve with derated amplifier peak current with an increased continuous amplifier current.

Parameter P-0-0519 defines the amplifier peak current.

The working point on the continuous peak current curve can be set with it.

The value of the parameter does not have to be entered as it is permanently programmed.

P-0-0519 - attributes

ID number:	P-0-0519
Name in German :	Verstärker Spitzenstrom-2
Name in English :	Amplifier Peak Current 2
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500000
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0523, Commutation probe value

Description:

If parameter **P-0-0524, Commutation setting command** is to be used to determine the commutation offset for linear synchronous motors, then the value must ber set in parameter **P-•-0532, Commutation setting probe value**.

The parameter can be write accessed if the function is unlocked with the appropriate password.

P-0-0523 - attributes

ID number:	P-0-0523
Name in German :	Kommutierungseinstellung - Meßwert
Name in English :	Commutation probe value
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0076
Unit in English :	S-0-0076
Decimal places :	S-0-0076
Minimum input value :	S-0-0076
Maximum input value :	S-0-0076
Editability :	P4
Storage :	no
Validity check :	no
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0524, Commutation Command

Description:

The command to generate the commutation offset can be activated via parameter P-0-0524. This command is only possible if:

- the relevant password is entered
- torque contol moe is active
- the drive enable is applied.

If these criteria have been met, then the drive autonomously detetermines the relevant commutation offset for synchronous motors.

P-0-0524 - attributes

ID number:	P-0-0524
Name in German :	Kommutierungseinstellung - Kommando
Name in English :	Commutation command
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	3
Editability :	P4
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0525, Type of Motor Brake

Description:

If a holding brake is used, then this parameter is used to set whether the brake is self-cooling or not. If an **MHD** or **MDK** motor is used, then the brake is self-holding. This automatically sets the parameter to 0. If other types of motor brakes are used, then this parameter must be entered at the time of startup.

See Function Description: "Motor holding brake"

P-0-0525- attributes

ID number:	P-0-0525
Name in German :	Motorbremsentyp
Name in English :	Type of motor brake
Function :	Parameter
Data length :	2Byte
Format :	Bin
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	0
Maximum input value :	1
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0526, Brake control delay

Description:

If a holding brake is used, then the delay time between control of the brake up to the point it becomes effective must be set in this parameter. If an **MHD** or **MKD** motor is used, then this value is automatically entered. If Indramat holding brakes are used with an asynchronous motor, then the standard value of 100 ms must be entered.

See Function Description: "Motor holding brake"

P-0-0526 - attributes

ID number:	P-0-0526
Name in German :	Motorbremsenverzugszeit
Name in English :	Brake control delay
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal places :	0
Minimum input value :	0
Maximum input value :	65000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0530 Increasing slip factor

Description:

Rotor resistance changes in asynchronous motors and therefore also the rotor time constant with the temperature. The slip factor increase compüensates this.

The factor which increases slip for 100K is motor-specific and fixed by Indramat for each motor.

See Function Description: "Asynchronous motors"

P-0-0530 - attributes

ID number:	P-0-0530
Name in German :	Schlupfanhebung
Name in English :	Increasing Slip Factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	1/100K
Unit in English :	1/100K
Decimal places :	2
Minimum input value :	1
Maximum input value :	3
Editability :	P23
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0531, Pull out limit

Description:

The pull out limit limits the peak current of the motor at high speeds to a sensible value. Higher currents do not mean higher shaft power but rather higher losses.

The pull out limit is fixed by Indramat. If zero is entered, then the limit is active.

See Function Description: "Asynchronous motors"

P-0-0531 - attributes

ID number:	P-0-0531
Name in German :	Kippstromgrenze
Name in English :	Pull Out Limit
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A/Vmin
Unit in English :	A/Vmin
Decimal places :	0
Minimum input value :	0
Maximum input value :	MaxULong
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-•-0532, Pre-magnetizing factor

Description:

The pre-magnetizing factor supports the application-dependent reduction of the servo magnetizing current. It determines, together with parameter **P-0-4004, Magnetizing current,** the magnetizing current of the motor.

effective magnetizing current = magnetizing currenrt X premagnetizing factor

With a pre-magnetizing factor of 100 % the servo magnetizing current flowers in the motor so that a torque proportional to the torque-generating current within the basic speed range is generated.

See Function Description: "Pre-magnetizing factor"

P-•-0532- attributes

ID number:	P-•-0532 (• ∈ {0,1,2,3})
Name in German :	Vormagnetisierungsfaktor
Name in English :	Pre-magnetizing factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	%
Unit in English :	%
Decimal places :	0
Minimum input value :	25
Maximum input value :	100
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0533, Flux loop proportional gain

Description:

The flux loop supports the control of the magnetizing current in the field weakening range.

The value of the parameter is set by Indramat.

See Function Description: "Asynchronous motors"

P-0-0533 - attributes

ID number:	P-0-0533
Name in German :	Feldregler Proportionalverstärkung
Name in English :	Flux Loop Proportional Gain
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	A/V
Unit in English :	A/V
Decimal places :	3
Minimum input value :	0
Maximum input value :	MaxUInt
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0534, Flux loop integral action time

Description:

The flux loop supports the control of the magnetizing current in the field weakening range.

The value of the parameter is set by Indramat.

See Function Description: "Asynchronous motors"

P-0-0534 - attributes

ID number:	P-0-0534
Name in German :	Feldregler Nachstellzeit
Name in English :	Flux Loop Intergral Action Time
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	ms
Unit in English :	ms
Decimal places :	1
Minimum input value :	0
Maximum input value :	MaxUInt
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0535, No load motor voltage

Description:

The motor voltage is set in the field weakening range to achieve a value smaller than the DC bus voltage.

Once loaded, the motor voltage climbs to motor maximum voltage.

See Function Description: "Asynchronous motors"

P-0-0535 - attributes

ID number:	P-0-0535
Name in German :	Motorleerlaufspannung
Name in English :	No Load Motor Voltage
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	%Uzwk
Unit in English :	%Uzwk
Decimal places :	1
Minimum input value :	50
Maximum input value :	100
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0536, Maximum motor voltage

Description:

the motor voltage is set in the field weakening range so that it achieves a value smaller or equalt o the DC bus voltage.

With full load, the motor voltage is brought up to maximum motor voltage. The output voltage retains a sinusoidal form up to 90%.

See Function Description: "Asynchronous motors"

P-0-0536 - attributes

ID number:	P-0-0536
Name in German :	Motormaximalspannung
Name in English :	Maximum Motor Voltage
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	%Uzwk
Unit in English :	% DC bus voltage
Decimal places :	1
Minimum input value :	50
Maximum input value :	100
Editability :	P234
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0537, S1 Kink Speed

Description:

Iron loss remains constant as of S1 kink speed. The magnetic field in the motor is weakened starting at S1 kink speed. The S1 kink speed must be smaller than the speed with which the operating curve of the drive starts in order to indicate the field weakening range of the drive.

See Function Description: "section 5.4 Asynchronous motors"

P-0-0537 - attributes

ID number:	P-0-0537
Name in German :	S1-Eckdrehzahl
Name in English :	S1 Kink Speed
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	1/min
Unit in English :	1/min
Decimal places :	4
Minimum input value :	0
Maximum input value :	MaxULong
Editability :	P2
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0538, Motor function parameter 1

Description:
Bit 0: 1 = function „S1 mode“ active

See Function Description: "Motor function parameter 1"

P-0-0538 - attributes

ID number:	P-0-0538
Name in German :	Motorfunktionsparameter 1
Name in English :	Motor Function Parameter 1
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P2
Storage :	Programming module
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-0600, Scaling factor acceleration analog output

Description:

If acceleration has been selected in parameters **P-0-038/P-0-0039, Signal select analog channels 1/2** then parameter **P-0-0600** sets the scaling factor.

The unit rad/s^2 hereby always relates to the motor. Any given gear ratio is not taken into account.

See Function Description: "Analog output"

P-0-0600 - attributes

ID number:	P-0-0600
Name in German :	Wichtg. Beschleunigung Analogausgang
Name in English :	Scaling Factor Acceleration Analog Output
Function :	Parameter
Data length :	4Byte
Format :	DEC-OV
Unit in German :	rad/s^2/10V
Unit in English :	rad/s^2/10V
Decimal places :	1
Minimum input value :	0
Maximum input value :	429496700.0
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-0601, Scaling factor acceleration power analog output

Description:

If acceleration power is set in parameter **P-0-0038/P-0-0039 , Signal select analog channels 1/2** then their scaling is set with parameter **P-0-0601**.

The unit rad^2/s^3 always refers to the motor. Any existing gear ratio is not taken into account.

Note: The signal „Acceleration power“ represents the acceleration power P_{acc} output to the motor shagt during accel or decel, if the measured value (rad^2/s^3) is multiplifed with the entire moment of inertia of spindle and motor!

See Function Description: "Analog output"

P-0-0601 - attributes

ID number:	P-0-0601
Name in German :	Wichtg. Beschleunigungsleistung Analog output
Name in English :	Scaling Factor Acceleration Power Analogausgang
Function :	Parameter
Data length :	4Byte
Format :	DEC-OV
Unit in German :	$rad^2/s^3/10V$ (= $(W/kgm^2)/10V$)
Unit in English :	$rad^2/s^3/10V$ (= $(W/kgm^2)/10V$)
Decimal places :	1
Minimum input value :	0
Maximum input value :	429496700,0
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P- •-1201, Ramp 1 pitch

Description:

The pitch of the drive-internal speed value ramp within the speed range of zero to „End speed of ramp 1“. „End speed ramp 1“ is set in parameter P-•-1202.

P-•-1201 - attributes

ID number:	P-•-1201 { switchable, • ∈ 0;1;2;3)
Name in German :	Steigung Rampe 1
Name in English :	Ramp 1 pitch
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal places :	S-0-0160
Minimum input value :	0
Maximum input value :	S-0-0160
Editability :	P234
Storage :	parameter EEPROM
Validity check :	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P- •-1202, Final speed of ramp 1

Description:

The pitch of the drive-internal speed value ramp in parameter „Final speed ramp 1“ changes from „Pitch ramp 1“ (P- •-1201) to „Pitch ramp 2“ (P- •-1203).

P-•-1202 - attributes

ID number:	P-•-1202 { switchable, • ∈ 0;1;2;3)
Name in German :	Enddrehzahl Rampe 1
Name in English :	Final speed of ramp 1
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal places :	S-0-0160
Minimum input value :	0
Maximum input value :	S-0-0160
Editability :	P234
Storage :	parameter EEPROM
Validity check :	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P- •-1203, Ramp 2 pitch

Description:

The pitch of the drive-internal speed value ramp in the speed range above „Final speed of ramp 1“. „Final speed ramp 1“ is set in parameter P-•-1202.

P-•-1203 - attributes

ID number:	P-•-1203 { switchable, • ∈ 0;1;2;3)
Name in German :	Steigung Rampe 2
Name in English :	Ramp 2 pitch
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0160
Unit in English :	S-0-0160
Decimal places :	S-0-0160
Minimum input value :	0
Maximum input value :	S-0-0160
Editability :	P234
Storage :	parameter EEPROM
Validity check :	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P- 0-1215, Cam search speed

Description:

The cam speed with which the cam is overtravelled in order to actuate the spindle reference switch ("searched") during spindle positioning via motor feedback with spindle reference switch.

P-0-1215 - attributes

ID number:	P-0-1215
Name in German :	Nockensuchdrehzahl
Name in English :	Cam search speed
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	S-0-0044
Unit in English :	S-0-0044
Decimal places :	S-0-0044
Minimum input value :	0
Maximum input value :	S-0-0044
Editability :	P234
Storage :	parameter EEPROM
Validity check :	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P- •-1222, Command value smoothing time constant

Description:

The time constant of the smoothing filter affecting speed or torque command values.

P-•-1222 - attributes

ID number:	P-•-1222 { switchable, • ∈ 0;1;2;3)
Name in German :	Sollwert-Glättungszeitkonstante
Name in English :	Setpoint smoothing time constant
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	msec
Unit in English :	msec
Decimal places :	0
Minimum input value :	0
Maximum input value :	999msec
Editability :	P234
Storage :	parameter EEPROM
Validity check :	Phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P- 0-1307, Message 90% Load

Description:

Bit 0 of parameter goes to „1“, if drive load exceeds 90% of maximum load, i.e., there is less than 10% reserve.

P- 0-1307- attributes

ID number:	P- 0-1307
Name in German :	Meldung 90% Load
Name in English :	Message „90% Load“
Function :	Parameter
Data length :	2Byte
Format :	BIN
Unit in German :	-
Unit in English :	-
Decimal places :	0
Minimum input value :	-
Maximum input value :	-
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4000, Current zero trim phase U

Description:

This parameter supports the display of the results of the zero trim procedure of the current feedback value sensor of phase U.

P-0-4000 - attributes

ID number:	P-0-4000
Name in German :	Strommeß-Nullabgleich Phase U
Name in English :	Current Zero Trim Phase U
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	%
Unit in English :	%
Decimal places :	2
Minimum input value :	0
Maximum input value :	10000
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4001, Current zero trim phase V

Description:

This parameter supports the display of the results of the zero trim procedure of the current feedback value sensor of phase V.

P-0-4001 - attributes

ID number:	P-0-4001
Name in German :	Strommeß-Nullabgleich Phase V
Name in English :	Current Zero Trim Phase V
Function :	Parameter
Data length :	2Byte
Format :	DEC_MV
Unit in German :	%
Unit in English :	%
Decimal places :	2
Minimum input value :	0
Maximum input value :	10000
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4002, Current amplify trim phase U

Description:

To compensate the current sensor in terms of the amplifier error, this parameter is set in the test field.

P-0-4002 - attributes

ID number:	P-0-4002
Name in German :	Strommeßverstärkungsabgl. Phase U
Name in English :	Current Amplify Trim Phase U
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	4
Minimum input value :	0
Maximum input value :	65535
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4003, Current amplify trim phase V

Description:

To trim the current sensor in terms of the amplifier error, this parameter is set in the test field.

P-0-4003 - attributes

ID number:	P-0-4003
Name in German :	Strommeßverstärkungsabgleich Phase V
Name in English :	Current Amplify Trim Phase V
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	4
Minimum input value :	0
Maximum input value :	65535
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4004, Magnetizing current

Description:

The nominal or servo magnetizing current for asynchronous motors is entered in this parameter. These are set by Indramat. The actually flowing magnetizing current is also dependent on the premagnetizing factor.

This parameter is automatically set to 0 in synchronous motors.

See Function Description: "Asynchronous motors"

P-0-4004 - attributes

ID number:	P-0-4004
Name in German :	Magnetisierungsstrom
Name in English :	Magnetizing current
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	4
Minimum input value :	0
Maximum input value :	400000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4011, Switch frequency

Description:

This parameter can be used to set the switch frequency of the pulse-controlled inverter to 4 and 8 kHz.

See Function Description: "Setting the effective continuous current"

P-0-4011 - attributes

ID number:	P-0-4011
Name in German :	Schaltfrequenz
Name in English :	Switch frequency
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	kHz
Unit in English :	kHz
Decimal places :	0
Minimum input value :	4
Maximum input value :	8
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4012, Slip factor

Description:

The slip factor is the most important parameter for asynchronous motors. It specifies rotor frequency in terms of the torque-generating current. The lower the rotor time constant, the higher the slip factor.

The parameter is set by Indramat motor-specifically.

See Function Description: "Asynchronous motors"

P-0-4012 - attributes

ID number:	P-0-4012
Name in German :	Schlupffaktor
Name in English :	Slip factor
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	Hz/100A
Unit in English :	Hz/100A
Decimal places :	2
Minimum input value :	1
Maximum input value :	5000
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4014, Motor type

Description:
This parameter is used to select the type of motor:

- 1: MHD
- 2: 2AD / 1MB
- 3: LSF
- 4: LAR / LAF
- 5: MKD
- 6: Asynchronous motors with PTC

See Function Description: "Setting motor type via P-0-4014, Motor type".

P-0-4014 - attributes

ID number:	P-0-4014
Name in German :	Motorart
Name in English :	Motor Type
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	1
Maximum input value :	5
Editability :	P23
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4015, DC bus voltage

Description:

The circle voltage is stored as a parameter in the amplifier.

The parameter cannot be write accessed and supports the display as well as internal computations.

P-0-4015 - attributes

ID number:	P-0-4015
Name in German :	Zwischenkreisspannung
Name in English :	DC bus voltage
Function :	Parameter
Data length :	2Byte
Format :	DEC_OV
Unit in German :	V
Unit in English :	V
Decimal places :	0
Minimum input value :	0
Maximum input value :	1000
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4028, Impulse wire feedback offset

Description:
The offset of the impulse wires to the resolver encoder are stored here.
It is specified at the factory and stored in the feedback memory.

P-0-4028 - attributes

ID number:	P-0-4028
Name in German :	Impulsdrahtgeber-Offset
Name in English :	Impulse wire feedback - offset
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	feedback EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4029, Impulse wire feedback PIC counter

Description:

This parameter contains the information on the absolute position of the encoder.

The value is updated with each position initialization. It cannot be write accessed.

P-0-4029 - attributes

ID number:	P-0-4029
Name in German :	Impulsdrahtgeber-Zählerstand
Name in English :	Impulse wire feedback - PIC counter value
Function :	Parameter
Data length :	4Byte
Format :	hexadecimal
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	no
Storage :	feedback EEPROM
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4035, Trim current

Description:

This parameter supports current amplification and cannot be write accessed.

P-0-4035 - attributes

ID number:	P-0-4035
Name in German :	Abgleichstrom
Name in English :	Trim Current
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500000
Editability :	no
Storage :	Amplifier EEPROM
Validity check :	phase 3
Extreme value check:	yes
Combination check:	no
Cyclical transmission :	no

P-0-4036, Type of motor connected

Description:

With each "load base value", the value of parameter **S-0-0141, Motor type** is stored here.

Each time the controller is switched on, the value of parameter **S-0-0141** from the motor feedback data memory is compared with P-0-4036. If the data are different, then a different motor has been connected. The message "UL" appears. By pressing the "S1" key, the default control parametrs of the new motor are activated.

The function is only relevant in connection with motors with motor feedback data memory such as MHD and MKD.

See Function Description: "Automatic execution of the load base values function"

P-0-4036 - attributes

ID number:	P-0-4036
Name in German :	Angeschlossener Motortyp
Name in English :	Contacted motor type
Function :	Parameter
Data length :	1Byte -variable
Format :	ASCII
Unit in German :	--
Unit in English :	--
Decimal places :	0
Minimum input value :	--
Maximum input value :	--
Editability :	P234
Storage :	parameter EEPROM
Validity check :	phase 3
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4045, Active duration current

Description:

This value supports the display of the set continuous current. With this current, there can be no overloading of the unit. It is simultaneously the current to which the current limit is reduced.

See Function Description: "Setting the effective continuous current"

P-0-4045 - attributes

ID number:	P-0-4045
Name in German :	Wirksamer Dauerstrom
Name in English :	Active duration current
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500000
Editability :	no
Storage :	no
Validity check :	nicht
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

P-0-4046, Active peak current

Description:

The active peak current P-0-4046 specifies which maximum active current the amplifier can presently deliver. The current limit reduces this value. Also flowing are:

- **S-0-0092, Bipolar torque limit value**
- **S-0-0109, Peak motor current**

See Function Description: "Setting the effective peak current".

P-0-4046 - attributes

ID number:	P-0-4046
Name in German :	Wirksamer Spitzenstrom
Name in English :	Active peak current
Function :	Parameter
Data length :	4Byte
Format :	DEC_OV
Unit in German :	A
Unit in English :	A
Decimal places :	3
Minimum input value :	0
Maximum input value :	500000
Editability :	no
Storage :	no
Validity check :	no
Extreme value check:	no
Combination check:	no
Cyclical transmission :	no

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DIAX04 Main Spindle Drives

Attachment B: Diagnostics

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

Title

DIAX04 Main Spindle Drives

Type of documentation

Function Description Attachmemt B: Diagnostic Description

Document code

DOK-DIAX04-SHS-02VRS**-FKB1-EN-P

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The purpose of this document

This document is Attachment B of the Function Description (DOK-DIAX04-SHS-02VRS**-FKB1-EN-P). It lists all errors, warnings, commands and status diagnoses belonging to firmware HSM01.1-SHS-02VRS.

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1 Diagnostics

1.1 Error Diagnostic Messages

Diagnostic types

Each operating mode of the drive controller is identified with a diagnosis.

A differentiation is made between:

- **error diagnoses**
- **warning diagnoses**
- **command diagnoses**
- **status diagnoses**
- **operating states**

Diagnosis Structure

A diagnosis is made up of:

- **a diagnosis number and a**
- **diagnosis text**

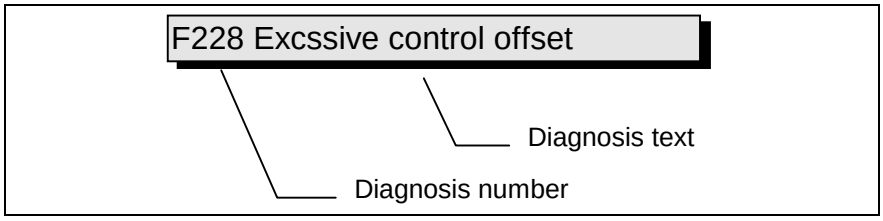


Fig. 1-1: Diagnosis structure made up of diagnosis number and text

The example depicted above would alternately generate "F2" or "28" on the H1 display.

The control uses parameter **S-0-0390, Diagnosis number** to read the diagnosis number in hexidecimal form.

The drive also makes available to the control in parameter **S-0-0095, Diagnosis** both diagnosis number and text in the form of string **F228, Excessive control offset.**

Display

Both the H1 and the H2 displays on the two-axes units (HDD) serve as optical diagnostics displays on the drive controller.

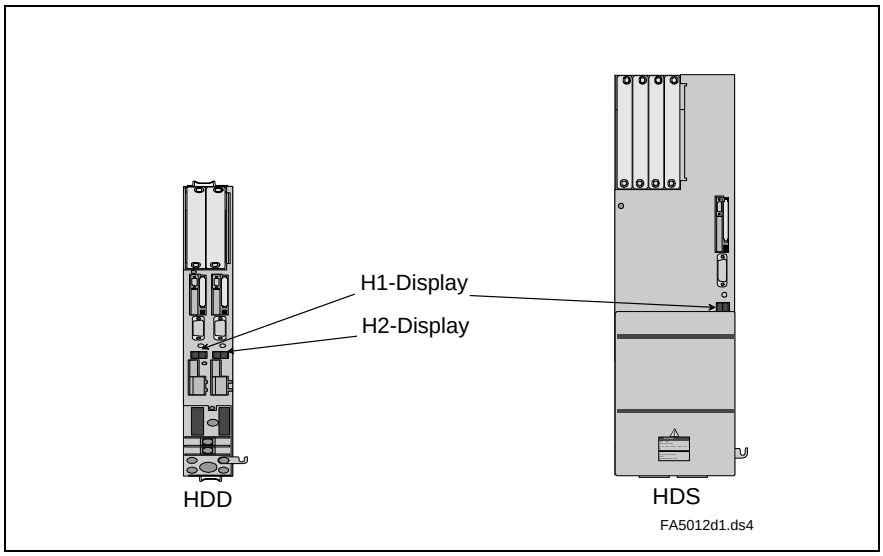


Fig. 1-2: H1 and H2 display on HDS and HDD controllers

The diagnosis number appears in the form of symbols on this two-place 7-segment display. The form in which it is illustrated is shown in picture "Priority-dependent diagnostic illustration".

With the help of the display it is possible to quickly and without the use of a communications interface, visually check the current operating state.

The operating mode is not shown on the H1 or H2 display. If the drive is complying with the mode, and if a command was activated, then "AF" appears on the display.

Priority of diagnostic output

If several diagnoses are simultaneously pending, then the message with the highest priority is shown.

The following graphics show the classification of the operating modes in terms of their priority.

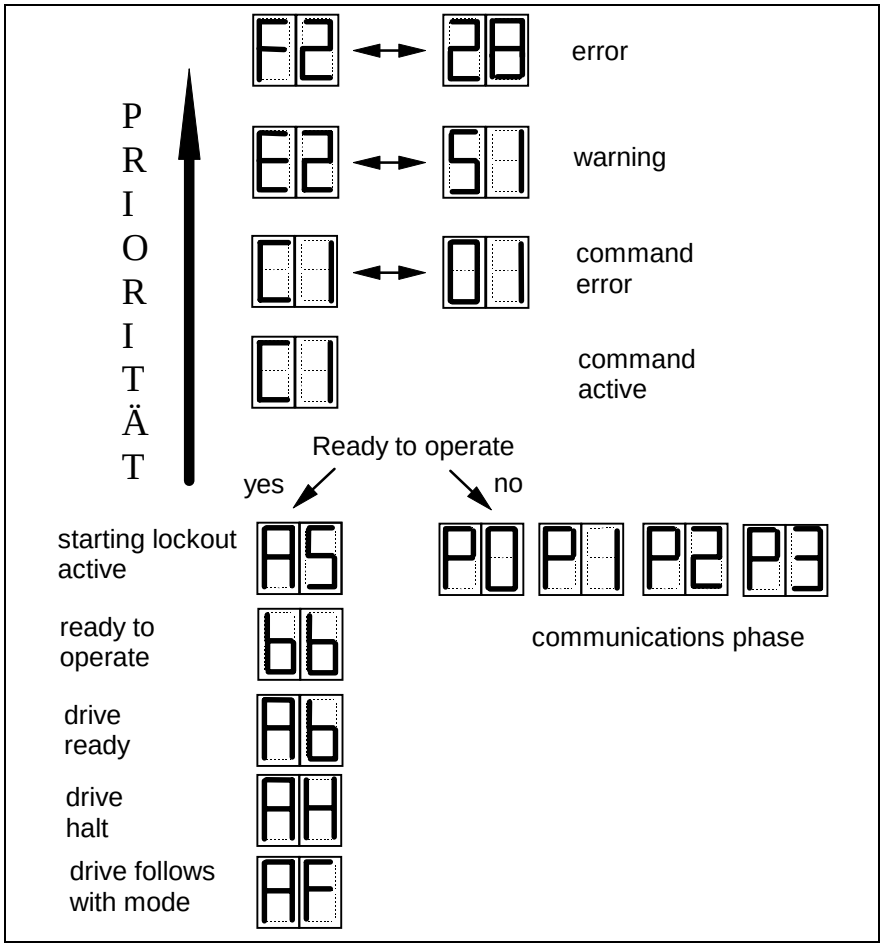


Fig. 1-3: Priority-dependent diagnostics illustration

Clear Text Diagnoses

The clear text diagnoses contain the number followed by the text, as can be seen in example "Excessive control offset" (Fig. 1-1). It can be read via parameter **S-0-0095, Diagnoses.** It supports the direct display of the drive state on a user interface.

The clear text diagnosis can be switched to the desired language.

1.2 Error Diagnoses

F207 Switching to Non-Initialized Operating Modes

Cause:

"0" has been parametrized in at least four of the operating mode parameters **S-0-0032..35**. This mode is selected, with an active drive, with bits 8 and 9 in the master control word.

Remedy:

Enter the mode wanted into the activated operating parameter.

Permissible operating modes are:

Definition:	**Bit list der operating modes parameter:**
Torque control	0000 0000 0000 0001
Velocity control	0000 0000 0000 0010
Position control with act. pos. value 1	0000 0000 0000 x011
Position control with act. pos. value 2	0000 0000 0000 x100
Drive-internal interpolation with actual position value 1	0000 0000 0001 x011
Drive-internal interpolation with actual position value 2	0000 0000 0001 x100

Tab. 1-1: Operating modes

Parameter:	main mode	S-0-0032
	auxilliary mode -1	S-0-0033
	auxilliary mode -2	S-0-0034
	auxilliary mode -3	S-0-0035

Check whether the allowable interpolation mode has been input.

See Function Description: "Setting operating mode parameters".

F207 attributes

SS display:	F2/07
Diagnosis:	F207 Umsch. auf nicht initial.Betriebsart
	F207 Switching to non-initialized oper. mode
Error number:	207
Diagnosis number:	F207
Error class:	Non-fatal

F208 Motor type has changed

Cause:

If the drive is operating with a motor equipped with feedback memory, then the drive recognizes the motor type automatically and stores it.

This occurs every time the drive is switched on. If the motor is exchanged for another one, then error message F208 is generated.

Remedy:

- use correct motor type
- If a new MHD or MKD motor is mounted, then the new motor type is accepted once the error is reset.

If a 2AD, ADF or 1MB motor is connected, then all motor-specific parameters must be checked and correct values entered.
See Function Description: "Automatic Execution of Base Load Function"

F208 attributes

SS display:	UL
Diagnosis:	F208 Motortyp verändert
	F208 Motor type has changed
Error number:	208
Diagnosis number:	F208
Error class:	Non-fatal

F219 Motor overtemperature off

If the motor temperature exceeds the value set in **S-0-0204, Motor shutdown temperature** then this error message is generated. In both MHD and MKD motors, this value is set permanently at 155°C in **S-0-0204**. With all other types of motors, this value, taken from the data sheet of the motor, must be entered.

In motors belonging to the 2AD, 1MB, LAF, LAR and MBW lines the current motor temperature can be called up via parameter **S-0-0383, Motor temperature**.

Cause:

1. The motor was overloaded. The rms torque requested by the motor exceeded the allowable continuous torque for too long a period.
2. Break in line or short-circuit in line to the motor temperature monitor.
3. Instability in the velocity control loop.

Remedy:

On 1. Check motor layout. In the case of installations which have been in use for extended periods, check whether drive conditions have changed (in terms of dirt, friction, moving masses, etc.).

On 2. Check line to motor temperature monitor X6/1 and X6/2 for line breaks or short-circuits.

On 3. Velocity control loop parametrization must (see Function Description) be checked.

See Function Description: "Temperature Monitor"

F219 attributes

SS display:	F2/19
Diagnosis:	F219 Motorübertemp.-Abschaltung
	F219 Motor Overtemperature Shutdown
Error number:	219
Diagnosis number:	F219
Error class:	Non-fatal

F221 Error Motor Temperature Control Defective

Cause:

Break in line to the motor temperature control.

Remedy:

Check line to motor temperature control X6/1 and X6/2 for breaks.

See Function Description: "Temperature Control"

F221 attributes

SS display:	F2/21
Diagnosis:	F221 Fehler Motortemperaturüberwachung defekt F221 Error Motor Temperature Control
Error number:	221
Diagnosis number:	F221
Error class:	Non-fatal

F222 Error Drive Overtemperature Watch Defect

The temperature watch checks whether the drive controller temperature which has been measured is realistic or not.

If it is less than -10°C, then it is assumed that the unit is defective.

After the relevant warning E219 has been issued for 30 seconds, the error message is generated.

Cause:

1. Sensor not connected to PCB DRP3.
2. Cable break in drive controller or sensor defect.

Remedy:

Replace/repair drive controller.

F222 attributes

SS display:	F2/22
Diagnosis:	F222 Fehler Verstärkertemperaturüber-wachung defekt F222 Error Drive Overtemperature Watch defect
Error number:	222
Diagnosis number:	F222
Error class:	Non-fatal

F226 Overvoltage Error

The DC bus voltage is monitored in the power supply module. The drive controller is informed via the control voltage bus whether the DC bus voltage exceeds the minimum allowable value of +680 V in an HVR and $0.7*1.14*U_{Netz}$ in an HVE. Exceeding the threshold brings about a braking of the drive in terms of the error reaction which was set.

Prerequisite: NCB bridge not used on power supply module.

Cause:

1. Power off withour previous deactivation of drive via drive enable (RF).
2. Activation of drive via drive enable (RF) without previous activation of power section.
3. Power supply unit failed.
4. Short-circuit/short to ground of motor.

Remedy:

1. Check logic which activates drive in the mounted control.
2. If the power supply unit has malfunctioned, then fix.
   See Application Description of the Power Supply Module.

See Function Description: "Drive Enable"

F226 attributes

SS display:	F2/26
Diagnosis:	F226 Unterspannungsfehler
	F226 Undervoltage Error
Error number:	226
Diagnosis number:	F226
Error class:	Non-fatal

F228 Excessive Control Offset

If the position control loop in the drive is closed, then the drive watches whether the preset command value is followed. A model position actual value is computed in the drive, in this case, and compared with the actual value. If the difference exceeds the theoretical and actual position value of parameter **S-0-0159, Monitoring Window,** then this error is generated.

Cause:

1. The acceleration capacity of the drive was exceeded.
2. The axis was blocked.
3. Incorrect parametrization in drive parameters.
4. **S-0-0159, Monitoring window** incorrectly parametrized.
5. The power supply was switched off with drive enable applied. Possible cause: error in an AC servo drive connected to same power supply unit.

Remedy:

On 1. Parameter **S-0-0092, bipolar torque limit value** must be checked and set to value for application. Acceleration value of control must be reduced (see Control Manual).

On 2. Check mechanics and eliminate axis jam.

On 3. Check drive parameters.

On 4. Parametrize **S-0-0159, Monitor window.**

On 5. Check AC servo drive with error message other than "28".

See Function Description: "Position control loop monitor"

F228 attributes

SS display:	F2/28
Diagnosis:	F228 Excessive Regelabweichung
	F228 Excessive Deviation
Error number:	228
Diagnosis number:	F228
Error class:	Non-fatal

F229 Motor Encoder Error: Quadrant Error

There has been a hardware error on motor encoder interface.

Cause:

1. Defective encoder cable.
2. Encoder cable subject to interference.
3. Motor encoder interface defective.
4. Drive controller defective.

Remedy:

On 1. Replace encoder cable.
On 2. Route encoder cable separate of power-conductive cables.
On 3. Motor encoder interface must be replaced.
On 4. Replace drive controller.

F229 attributes

SS display:	F2/29
Diagnosis:	F229 Motorgeberfehler: Quadrantenfehler F229 Motor Encoder Failure: Quadrant Error
Error number:	229
Diagnosis number:	F229
Error class:	Non-fatal

F233 External Power Supply Error

Cause:

Various optional plug-in cards are available via separate conductive inputs and outputs. Orderly operation of these requires that an external power supply be installed. If this supply exceeds the allowable range, this error message is generated.

The following functions need an external voltage supply:

1. Reference switch on module DSS2, activated via parameter **P-0-0300, Spindle position parameter 2**, bit 0.
2. Probe input activated via **S-0-0170, Command** probe cycle.
3. Emergency stop input on DSS2, activated via parameter **P-0-0008, Activating emergency stop function**, bit 0.
4. Use a DEA module.
5. Evaluate the measuring system using a DAG module.

Remedy:

Check external power voltage.

Designation:	Unit:	min.:	type:	max.:
External operating voltage $+U_L$	V	18	24	32
External current consumption I_L	mA			100

Tab. 1-2:External power supply voltage

F233 attributes

SS display: F2/33

Diagnosis: F233 Fehler Spannungsversorgung extern
F233 External Power Supply Error

Error number: 233

Diagnosis number: F233

Error class: Non-fatal

F234 Emergency-Stop Activated

Cause:

The emergency stop function was activated by turning off the +24V at input X12/6. The drive was braked by the selected error reaction.

Remedy:

1. Eliminate the problem which lead to the turning off of the +24V at input X12/6.
2. Activate "reset C1D" command via the control system (see Control System Manual).

See Function Description: "Emergency stop function"

F234 attributes

SS display:	F2/34
Diagnosis:	F234 Not-Stop aktiviert
	F234 Emergency stop activated
Error number:	234
Diagnosis number:	F234
Error class:	Non-fatal

F236 Excessive position feedback difference

Cause:

In preparation for transition check to communications phase 4, the command sets position feedback values 1 and 2 to the same value. The cyclical evaluation of both encoders will also begin (phase 4). The positon feedback value difference of both encoders is compared with **S-0-0391, External encoder monitoring window**. If the difference exceeds the window, then error F236 "Excessive position feedback difference" is diagnosed and the drive will react according to the selected error reaction.

1. Parameter for external encoder incorrect
   (**S-0-0115, Position encoder type parameter 2,**
   S-0-0117, External encoder resolution).
2. Mechanics between motor shaft and external encoder incorrectly parametrized.
   (**S-0-0121, Input revolutions of load gear,**
   S-0-0122, Output revolutions of load gear)
3. Mechanics between motor shaft and external encoder not rigid (e.g., gear backlash).
4. Encoder cable defect.
5. Module (DLF or DEF) for external measuring system evaluation defective.
6. Maximum input frequency of encoder interface exceeded.
7. External encoder not mounted to drive axis.

Remedy:

On 1. **S-0-0115, Position encoder type parameter 2** and **S-0-0117, External encoder resolution**

On 2. **S-0-0121, S-0-0122, Input and output revolutions of load gear** and **S-0-0123, Feed constant** must be checked.

On 3. Increase **S-0-0391, External encoder monitor window**.

On 4. Replace encoder cable.

On 5. Replace module to evaluate external measuring system.

On 6. Reduce speed.

On 7. Set **S-0-0391, External encoder monitor window** to 0 (switch monitor off).

See Function Description: "Actual position value monitor"

F236 attributes

SS display:	F2/36
Diagnosis:	F236 Exzessive Lageistwertdifferenz
	F236 Excessive Position Feedback Difference
Error number:	236
Diagnosis number:	F236
Error class:	Non-fatal

F237 Excessive position command value difference

Cause:

When the drive is operating in position control, the position command values coming over SERCOS are monitored. If the velocity required of the drive by two successive position command values exceeds or is equal to the value set in **S-•-0091, Bipolar velocity limit value**, then the position command value monitor is actuated. The **Excessive position command value** is stored in parameter **P-0-0010.** The **last valid position command value** is stored in parameter **P-0-0011**.

Remedy:

S-•-0091, Bipolar velocity limit value must be compared with programmed velocity and adapted, if necessary.

See Function Description: "Position command value monitor"

F237 attributes

SS display:	F2/37
Diagnosis:	F237 Exzessive Positionssollwertdifferenz
	F237 Excessive Position Command Difference
Error number:	237
Diagnosis number:	F237
Error class:	Non-fatal

F242 External encoder error: Signal amplitude faulty

Cause:

A high-resolution evaluation of an external measuring system uses the analog signals of that system. These are monitored in two ways:

1. The index length derived from sine and cosine signals equals > 1 V.

2. Maximum index length of sine and cosine signals may not exceed 11.8 V.

$$index\ length = \sqrt{\sin^2 + \cos^2}$$

Fig. 1-4: Index length

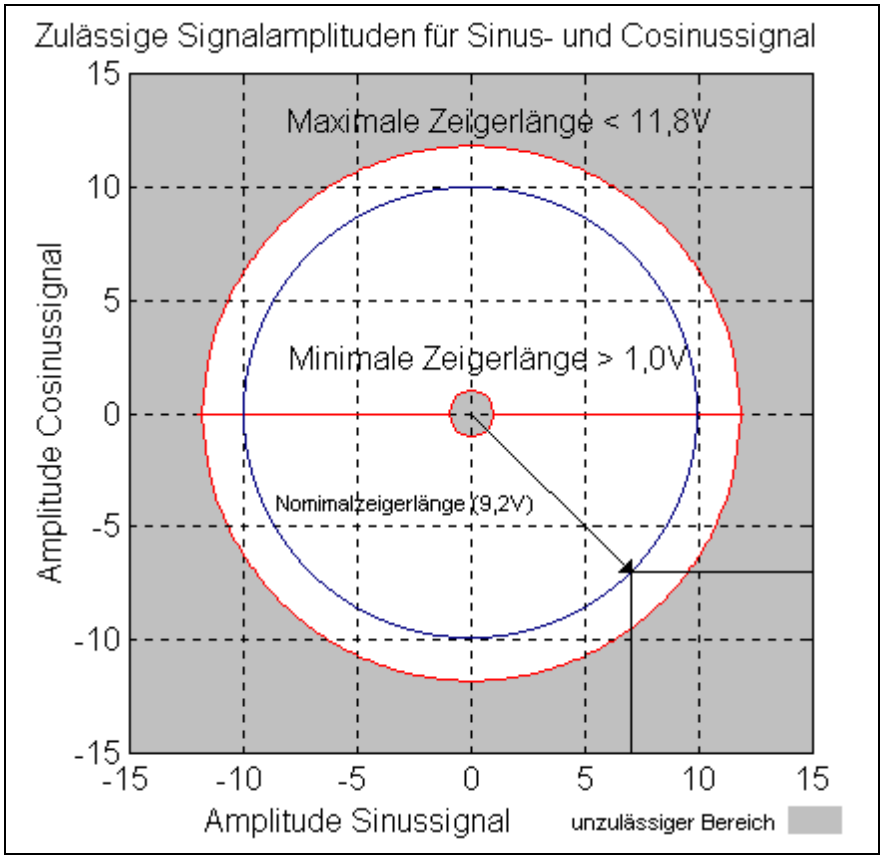


Fig. 1-5: Correct signal amplitudes

Example:

Ucos = -6.5V

Usin = 6.5V

$$Index\ length = \sqrt{(-6{,}5V)^2 + 6{,}5V} \approx 9{,}2V$$

Remedy:

1. Check cable to measuring system.
2. Check measuring system.

F242 attributes

SS display:	F2/42
Error number:	242
Diagnosis number:	F242
Error class:	Non-fatal

External encoder error: Quadrant error

A hardware error was detected on the high-resolution position interface for "DLF" sine signals of the external measuring system.

Cause:

1. Encoder cable defect.
2. Encoder cable interference.
3. DLF module defective.

Remedy:

On 1. Replace encoder cable

On 2. Route encoder cable separate of power-conductive cables.

On 3. Replace DLF module.

F245 attributes

SS display:	F2/45
Diagnosis:	F245 Fehler des ext. Gebers: Quadrantenfehler F245 External Encoder Failure: Quadrant Error
Error number:	245
Diagnosis number:	F245
Error class:	Non-fatal

F248 Battery Low

Cause:

The absolute position information in MKD motors is stored in battery backed electronics in the motor feedback. The battery has a service life of ten (10) years. If its voltage drops below 2.8 volts, then this message is generated. The absolute encoder function is secured thereafter for about two more weeks.

CAUTION

Danger source:	Fault in control of motor and moving parts.
Possible damage:	mechanical damage
Steps:	Replace battery soon.

How to replace battery

Have these tools and aids handy:

- Torx screwdriver size 10
- pointed pliers, torque key
- new standard battery (part no.: 257101)

CAUTION

Danger source:	Fault in control of motor and moving parts.
Possible damage:	Mechanical
Steps:	Switch power supply off. Secure against being switched back on. Replace battery with control voltage on.

If the battery is pulled out while the control voltage is off, then the absolute dimension will be lost.

The absolute dimension must be rehomed.

Removing the battery

- pull torx screws out using screwdriver size 10
- pull lid of resolver RSF feedback out manually
- pull out battery connector
- release clamping device of battery and pull it out
- insert battery (stock no. 257101) into housing and screw clamping device back on. **ATTENTION!** do not pinch battery cable!
- insert battery connector

Close resolver feedback lid. Tighten torx screws using torque key at 1.8 Nm!

F248 attributes

SS display:	F2/48
Diagnosis:	F248 Batterie-Unterspannung F248 Low-Battery Voltage
Error number:	248
Diagnosis number:	F248
Error class:	Non-fatal

Hardware Synchronization Faulty

Cause:

The drive control of all the drives within a given SERCOS ring are synchronized via the phase control loop. Synchronization is monitored for proper functioning. If the average value of a deviation exceeds 5 µsec, then this error is generated.

Remedy:

- Replace DDS module
- Replace drive controller

F267 attributes

SS display:	F2/67
Diagnosis:	F267 Hardware - Synchronisation fehlerhaft F267 Erroneous Internal Hardware Synchronization
Error number:	267
Diagnosis number:	F267
Error class:	Non-fatal

F268 Brake Error

The drive takes control of the brake on motors with internal brakes. The braking current is monitored. If the braking current exceeds allowable range between:

0.4 -1.6 * **P-0-0511, braking current**

then this error is generated.

Cause:

1. The power supply for the brake is not properly connected or exceeds (24 V +/- 10 %).
2. The motor cable is not completely or incorrectly connected (wiring error).
3. Defective brake.
4. Defective drive controller.

Note:

A conductive connection between 0V brake supply and 0V of the drive controller is necessary.

Remedy:

On 1. Check power supply.

On 2. Check motor cable.

On 3. Replace motor.

On 4. Replace drive controller.

See Function Description: "Current Limit".

F268 attributes

SS display:	F2/68
Diagnosis:	F268 Fehler Bremse
	F268 Brake Error
Error number:	268
Diagnosis number:	F268
Error class:	Non-fatal

F276 Absolute Encoder Error, Position Offset > P-0-0097

When switching off a drive with an absolute encoder motor (multiturn), the current actual position is saved. When it is turned back on, the position given by the absolute encoder is compared with the saved value. This error is output if the deviation is larger than the parametrized **P-0-0097, Absolute encoder monitor window**.

Cause:

1. Initial startup (stored position invalid).
2. The axis was moved while machine was off over a distance exceeding the one parametrized in **P-0-0097, Absolute encoder monitor window**.
3. Incorrect position initialization.

Remedy:

On 1. Clear error (establish home).

On 2. The axis was moved while on and now is in position outside of allowable position.
Check whether another travel command could cause damage.
Then clear error.

On 3**. Danger of accident from unwanted axis movement.**
Check home. Given wrong home, then feedback defect.
Replace it (in absolute motor encoders with MHD or MKD motors replace entire motor).

See Function Description: "Actual position value monitor".

F276 attributes

SS display:	F2/76
Diagnosis:	F276 Absolutgeberfehler, Lageabweichung > P-0-0097 F276 Absolute encoder error, deviation > P-0-0097
Diagnosis number:	F276
Error class:	Non-fatal

F316 Softstart Error Power Supply Module

The DC bus loop cannot be loaded.

Cause:

1. Short-circuit in power or drive controller.
2. Too many auxiliary capacitors connected.
3. DC bus choke break (only with HVE).

Remedy:

On 1: Connection to drive controllers must be loosened and power switched back on. Replace defective unit.

On 2: Number of auxiliary capacitors must be reduced or use separate loading unit.

On 3: Check or replace DC bus choke and lines.

F316 attributes

SS display:	F3/16
Error number:	316
Diagnosis number:	F316
Error class:	Non-fatal

F318 Heatsink Overtemperature Power Supply Module

Power off due to excessive heatsink temperature.

Cause:

The unit is overloaded or ambient temperature is too high.

Remedy:

Load and ambient temperatures must be checked. Temperature prewarning contact of unit must be checked.

F318 attributes

SS display:	F3/18
Error number:	318
Diagnosis number:	F318
Error class:	Non-fatal

F320 Bleeder Overload

Power shutdown due to excessive bleeder load.

Cause:

1. The drive energy fed back with power off is excessive.
2. In HVE either the continuous feedback power and/or rotary drive energy is too high.
3. Unit defective.

Remedy:

On 1: Reduce drive speed. Switch power OFF with emergency off in a delayed fashion.

On 2: Increase cycle time, reduce drive speed, install auxiliary bleeder.

On 3: Replace unit.

F320 attributes

SS display:	F3/20
Error number:	320
Diagnosis number:	F320
Error class:	Non-fatal

F324 Power Supply Module Auxiliary Component Error

Cause:

An error has been detected in an auxiliary component such as the auxiliary bleeder power section or a separate loading unit.

Remedy

Check auxiliary components.

F324 attributes

SS display:	F3/24
Error number:	324
Diagnosis number:	F324
Error class:	Non-fatal

F360 Power Supply Module Overcurrent

HVR only!

Cause:

Short circuit in power supply unit, drive controller, motor or cable.

Remedy:

Power connections to the drive controller must be gradually loosened. Replace defective unit.

F360 attributes

SS display:	F3/60
Error number:	360
Diagnosis number:	F360
Error class:	Non-fatal

F369 +24V / ±15V / +5V Power Supply Module Error

Control voltage interference.

Cause:

1. Maximum allowable load exceeded.
2. Short circuit in wiring if control voltage outside of drive system is used.
3. Unit defective.

Remedy

On 1: Bus connection to drive controller must be gradually released.

On 2: Release control voltage taps and check for short circuit.

On 3: Replace unit.

F369 attributes

SS display:	F3/69
Error number:	369
Diagnosis number:	F369
Error class:	Non-fatal

F380 Ground fault in power supply unit

Cause:

Ground fault in power supply unit, in drive controller, motor or motor cable.

Remedy:

Release connection to motor and power supply gradually. Replace defective drive components.

F380 attributes

SS display:	F3/80
Error number:	380
Diagnosis number:	F380
Error class:	Non-fatal

F381 Mains Failure

HVR only!

Cause:

At least one phase of the mains supply is missing.

Remedy:

Check mains fuses and replace, if necessary.

F381 attributes

SS display: F3/81
Error number: 381
Diagnosis number: F381
Error class: Non-fatal

F382 Phase Fault

HVE only!

Cause:

At least one phase of the mains supply is missing.

Remedy:

Check mains fuses and replace, if necessary.

F382 attributes

SS display: F3/82
Error number: 382
Diagnosis number: F382
Error class: Non-fatal

F383 Mains Voltage Error

HVR only!

Cause:

The mains voltage exceeds allowable tolerance (3x380 to 480V, ± 10 %).

Remedy:

Check mains voltage, use matching transformer, if necessary.

F383 attributes

SS display: F3/83
Error number: 383
Diagnosis number: F383
Error class: Non-fatal

F384 Power Supply Connection Error

HVR only!

Cause:

Power and control voltage connection out of phase.

Remedy:

Check connected voltage. The terminals X5/U and X8/1, X5/V and X8/2, X5/W and X8/3 must be checked so that they do not conduct voltage to each other.

F384 attributes

SS display:	F3/84
Error number:	384
Diagnosis number:	F384
Error class:	Non-fatal

F385 Mains Frequency Error

HVR only!

Cause:

The mains frequency exceeds allowable tolerances (± 2Hz).

F385 attributes

SS display:	F3/85
Error number:	385
Diagnosis number:	F385
Error class:	Non-fatal

F394 Checksum Error Power Supply Module

HVR only!

Cause:

Unit error.

Remedy:

Replace unit.

F394 attributes

SS display:	F3/94
Error number:	394
Diagnosis number:	F394
Error class:	Non-fatal

F401 Double MST Error Shutdown

The master-sync telegram was not received in the drive over two successive SERCOS cycles.

Cause:

1. Disruption in fiber optic cables.
2. Light signal reduced too much.
3. Malfunction in SERCOS interface (general).

Remedy:

On 1. All LWL connections in SERCOS ring must be checked.

On 2. Measure reduction in LWL (fiber optic cable).

Maximum reduction between TX and RX may not exceed 12.5 dB! Transmission power of SERCOS interface plug-in modules must be increased with S5 switch position! (see section 4).

On 3. Replace SERCOS interface module in drive.

See Function Description: "SERCOS interface error".

F401 attributes

SS display:	F4/01
Diagnosis:	F401 Abschaltung zweifacher MST-Ausfall F401 Double MST Error Shutdown
Error number:	401
Diagnosis number:	F401
Error class:	Interface

F402 Double MDT Error Shutdown

The master data telegram (MDT) was not received by the drive over two successive SERCOS cycles.

Cause:

1. Disruption in fiber optic cables.
2. Light signal reduced too much.
3. Malfunction in SERCOS interface (general).

Remedy:

On 1. All LWL connections in SERCOS ring must be checked.

On 2. Measure reduction in LWL.

Maximum reduction between TX and RX may not exceed 12.5 dB! Transmission power of SERCOS interface plug-in modules must be increased with S5 switch position! (see section 4).

On 3. Replace SERCOS interface module in drive.

See Function Description: "SERCOS interface error".

F402 attributes

SS display:	F4/02
Diagnosis:	F402 Abschaltung zweifacher MDT-Ausfall
	F402 Double MDT Error Shutdown
Error number:	402
Diagnosis number:	F402
Error class:	Interface

F403 Invalid Communications Phase Shutdown

An invalid communications phase was set by the SERCOS master module (phase > 4).

Cause:
Error in SERCOS master module of the control.

Remedy:
Consult with control manufacturer.

See Function Description: "SERCOS Interface error".

F403 attributes

SS display:	F4/03
Diagnosis:	F403 Abschaltung ungültige Komm.-Phase F403 Invalid Communication Phase Shutdown
Error number:	403
Diagnosis number:	F403
Error class:	Interface

F404 Error During Phase Progression

The prescribed order was not kept during phase progression.

Cause:
Error in SERCOS master module of control.

Remedy:
Consult with control manufacturer.

See Function Description: "SERCOS interface error"

F404 attributes

SS display:	F4/04
Diagnosis:	F404 Fehler bei Phasenhochschaltung F404 Error during Phase Progression
Error number:	404
Diagnosis number:	F404
Error class:	Interface

F405 Error During Phase Regression

Phase 0 was not actuated while switching back from a communications phase.

Cause :
Error in SERCOS master module of control.

Remedy:
Consult with control manufacturer.

See Function Description: "SERCOS interface error".

F405 attributes

SS display:	F4/05
Diagnosis:	F405 Fehler bei Phasenrückschaltung
	F405 Error during Phase Regression
Error number:	405
Diagnosis number:	F405
Error class:	Interface

F406 Phase Transition Without Ready Signal

A phase switch was attempted from the SERCOS master without waiting for the drive ready signal.

Cause:
Error in SERCOS master module of control.

Remedy:
Consult with control manufacturer.

See Function Description: "SERCOS interface error".

F406 attributes

SS display:	F4/06
Diagnosis:	F406 Phasenumschaltung ohne Bereitmeldung
	F406 Phase Switching without Ready Signal
Error number:	406
Diagnosis number:	F406
Error class:	Interface

F818 Drive Overtemperature Shutdown

The power amplifier of the drive has reached a temperature which is too high. In response, the drive generates "E250 amplifier overtemperature warning" for 30 seconds. The drive is brought to a standstill according to the error reaction which has been set.

Cause:

1. loss of drive internal blower
2. loss of control cabinet climate control
3. incorrect control cabinet dimensioning for heat dissipation

Remedy:

On 1. if blower fails, exchange the drive

On 2. install a control cabinet air conditioning device

On 3. check cabinet dimensions

F818 attributes

SS display:	F8/18
Diagnosis:	F818 Verstärker-übertemp.-Abschaltung F818 Drive Overtemperature Shutdown
Error number:	818
Diagnosis number:	F818
Error class:	Fatal

F819 Drive Overtemperature Monitor Defective

Cause:

An NTC resistor is used to measure drive temperature. If the resistor is defective or not connected, then the aforementioned error message is generated.

Remedy:

Connect NTC resistor or replace it, if necessary.

F819 attributes

SS display:	F8/19
Diagnosis:	F819 Verstärkertemperaturüberwachung defekt
	F819 Drive Overtemperature Watch defective
Error number:	819
Diagnosis number:	F819
Error class:	Fatal

F820 Bleeder Overload

Cause :

The energy of a braking motor cannot be converted quickly enough by the bleeeder resistor.

The energy converted by the internal bleeder is analyzed. When the maximum energy capacitor of a bleeder is exceeded, it is shut off. The bleeder overload error is generated.

Remedy:

The braking slope should be flatter or increase bleeder capacity by adding an additional bleeder. The drive can be used again after the bleeder has cooled down. Reset C1D is needed **(S-0-0099)**!

F820 attributes

SS display:	F8/20
Diagnosis:	F820 Bleeder-Überlast
	F820 bleeder overload
Error number:	820
Diagnosis number:	F820
Error class:	Fatal

F822 Motor Encoder Failure: Signals too Small

The analog signals of a measurement system are used for high resolution analysis of that external system. These are monitored along two lines:

1. index length made up of sine and cosine signals must equal at least 1 V
2. maximum index length of sine and cosine signals may not exceed 11.8 V

Note:

This error cannot be cleared in communications phase 4. Go to communications phase 2 to switch.

Remedy:

- Check cable to measuring system.
- Route cable separate of motor power cable. The shielding must be applied to drive controller (see Project Planning Manual of Drive Controller for instructions).
- Check measuring system, replace, if necessary.

F822 attributes

SS display:	F8/22
Diagnosis:	F822 Motorgeberfehler: Signalamplitude fehlerhaft
	F822 Motor Encoder Failure: Signals too small
Error number:	822
Diagnosis number:	F822
Error class:	Fatal

F827 Drive Interlock While Drive Activated

Cause:

The drive interlock was activated at the same time as the contol enable. The drive switches to torque free operation immediately.

Remedy:

The drive interlock should not be activated at the same time as the control enable. Check control of drive interlock input.

F827 attributes

SS display:	F8/27
Diagnosis:	F827 Anlaufsperre bei gesetzter Reglerfreigabe
	F827 Drive interlock while drive activated
Error number:	827
Diagnosis number:	F827
Error class:	Fatal

F860 Overcurrent: Short in Powerstage

The current in the power transistor bridge has exceeded the double value of the peak current of the drive. As a result, the drive will be switched to torque free operation. Any brake is immediately activated.

Cause:

1. Short circuit in motor cable.
2. Power section of drive controller defective.

Remedy:

On 1. Check motor cable for short circuit.

On 2. Replace drive controller.

F860 attributes

SS display:	F8/60
Diagnosis:	F860 Brückensicherung
	F860 Overcurrent : Short in Powerstage
Error number:	860
Diagnosis number:	F860
Error class:	Fatal

F861 Overcurrent: Short to Ground

The sum of the phase currents is monitored. Generally, the sum = 0. If the sum of the currents exceeds 0.5 x I_N, the ground fuse is activated.

Cause:

1. Motor cable defective.
2. Short to ground in motor.

Remedy:

Replace motor cable, check motor for ground short and replace, if necessary.

F861 attributes

SS display:	F8/61
Diagnosis:	F861 Erdschlußsicherung
	F861 Overcurrent : Short to Ground
Error number:	861
Diagnosis number:	F861
Error class:	Fatal

F862 No Acknowledge of Gearstage

When switching gears, the auxiliary contactors are directly controlled by the controller. The successful transition is signalled to the controller by means of control signals.

Cause:

The conducted gear transition was not acknowledged within ten (10) seconds after the transition procedure was initiated.

Remedy:

- check electrical wiring for layout as per section 8.6.3
- check mechanics of gear switching motor and its gears

F862 attributes

SS display:	F8/62
Diagnosis:	F862 Quittierung Getriebestufe fehlt F862 No aknowledge of gearstage
Error number:	862
Diagnosis number:	F862
Error class:	Fatal

F863 No Acknowledge of Windings Interconnection

When switching gears, the auxiliary contactors are directly controlled by the controller. The successful transition is signalled to controller by means of control signals.

Cause:

The conducted windings transition was not acknowledged within two seconds after the transition procedure was initiated.

Remedy:

- check electrical wiring for a layout as specified in section 8.6.3
- check mechanics of mains switch

F863Attribute

SS display:	F8/63
Diagnosis:	F863 Quittierung Wicklungsumschaltung fehlt F863 No aknowledge of windings interconnection
Error number:	863
Diagnosis number:	F863
Error class:	Fatal

F869 +/- 15 Volt Error

The drive found a malfunction in the ± 15 V supply.

Cause:

1. control voltage bus cable defect
2. power supply module defect

Remedy:

On 1. check control voltage bus cable or plug-in connector and replace, if necessary

On 2. check power supply module (see Application Description of Power Supply Module)

F869 attributes

SS display:	F8/69
Diagnosis:	F869 +/- 15 Volt - Fehler
	F869 +/-15 Volt Error
Error number:	869
Diagnosis number:	F869
Error class:	Fatal

F870 + 24 Volt Error

The drive found a malfunction in the ± 24 V supply.

Cause:

1. control voltage bus cable defect
2. overload of 24 V power source
3. power supply unit defect
4. short circuit in emergency stop loop

Remedy:

On 1. check control voltage bus cable or plug-in connector and replace, if necessary

On 2. 24 V power source at power module must be checked

On 3. check power supply module (see Application Description of Power Supply Module)

On 4. check emergency stop loop for short circuit

F870 attributes

SS display:	F8/70
Diagnosis:	F870 + 24 Volt - Fehler
	F870 + 24 Volt Error
Error number:	870
Diagnosis number:	F870
Error class:	Fatal

F871 + 10 Volt Error

The power source of the current sensor is disrupted.

Cause:

Defect in drive controller.

Remedy:

Replace drive controller.

F871 attributes

SS display:	F8/71
Diagnosis:	F871 + 10 Volt - Fehler
	F871 + 10 Volt Error
Error number:	871
Diagnosis number:	F871
Error class:	Fatal

F878 Velocity Loop Error

If the difference between velocity command value and actual value exceeds 10% of maximum motor velocity while the loop is active, then the actual value must move in the direction of the command value. This error is generated if the actual value does not come closer to the command value within 20 ms and the rms torque/force command is at its limit (=**P-0-4046, RMS peak current**).

Cause:

1. Motor cable wrongly connected.
2. Power section of drive controller defective.
3. Feedback defect.
4. Velocity control parametrized wrong.
5. RMS peak current too small.
6. Motor encoder or external encoder parameter values are wrong.

Remedy:

On 1. check motor cable connection

On 2. replace drive controller

On 3. replace motor

On 4. check velocity control layout as per application descrip. (see section on velocity control)

On 5. maximum accel in control must be reduced, or reduce **P-•-1201, Velocity ramp 1**

On 6. check parameter values of motor and external encoders

See Function Description: "Determining velocity control settings"

F878 attributes

SS display:	F8/79
Diagnosis:	F878 Fehler im Geschwindigkeitsregelkreis
	F878 Velocity Loop Error
Error number:	878
Diagnosis number:	F878
Error class:	Fatal

F879 S-0-0092, Crossing Velocity Limit Value

The actual velocity is monitored in torque regulation mode. This error is generated when the programming velocity in parameter **S-•-0091, bipolar velocity limit value** is exceeded 1.125 times or a minimum if 100 rpm (rotary motors) or 100 mm/min (linear motors).

Cause:

The load torque was less than the torque command value. This leads to an increase in the actual velocity of up to maximum possible motor velocity.

Remedy:

Allocate correct torque command value for relevant task. Reduce parameter **S-0-0092, Bipolar torque limit value**.

See Function Description: "Limiting velocity bipolar limit value".

F879 attributes

SS display:	F8/79
Diagnosis:	F879 S-0-0092, Geschwindigkeitsgrenzwert überschritten
	F879 Crossing velocity limit (S-•-0091) value
Error number:	879
Diagnosis number:	F879
Error class:	Fatal

1.3 Warning Diagnoses

E219 Warning Drive Overtemperature Monitor Defect

The temperature monitor checks to see if the measured control drive temperature is realistic. If it determines that is is less than -10°C, it will assess the measuring unit as malfunctioning. The warning E219 “Warning drive overtemperature monitor defect“ appears for thirty (30) seconds. The drive is braked with the error reaction set and message F220 “Error drive overtemperature monitor defect“ generated.

Cause:

1. Sensor not connected to PCB DRP3.
2. Cable break in drive controller or sensor is defect.

Remedy:

Repair/replace drive controller.

E219 attributes

SS display:	E2/19
Diagnosis:	E219 Warnung Verstärkertemperaturüber wachung defekt E219 Warning Drive Overtemperature Watch defect
Diagnosis number:	E219
Warning class :	Non-fatal

E221 Warning Motor Temperature Control Defect

The temperature monitor checks to see if the temperature measured is realistic. If it is less than -10°C, then the unit is defective. Warning E221 “Warning motor temperature control defect“ appears for thirty (30) seconds. The drive is braked with the error reaction set and message F221 “Error drive overtemperature monitor defect“ generated.

Cause:

1. Motor temperature sensor not connected.
2. Cable break.
3. Sensor defect.
4. Cable break in drive controller.

Remedy:

On 1. Sensor in drive controller and motor must be connected. See Project Planning Manual of Motor.

On 2. Replace line between controller and motor.

On 3. Replace motor.

On 4. Replace drive controller.

See Function Description: "Temperature monitor".

E221 attributes

SS display:	E2/21
Diagnosis:	E221 Warnung Motortemperaturüberwachung defekt
	E221 Warning Motor Temperature Control
Diagnosis number:	221
Warning class :	Non-fatal

E249 Positioning Velocity > maximum value

Cause:

In "drive-internal interpolation" a velocity is set in parameter **S-0-0259, Positioning velocity** with which the target position is approached.

If this exceeds the maximum value set in **S-•-0091, Bipolar velocity limit value** then message E249 is generated. At the same time, message bit 4 is set in **S-0-0013, C3D**.

Remedy:

Reduce **S-0-0259, Positioning velocity.**

See Function Description: "Drive-internal interpolating".

E249 attributes

SS display:	E2/49
Diagnosis:	E249 Positioniergeschw. (S-0-0259) größer S-•-0091
	E249 Positioning vel. (S-0-0259) greater than S-•-0091
Diagnosis number:	E249
Warning class :	Non-fatal

E250 Drive Overtemperature Warning

The temperature of the heatsink in the drive has reached maximum allowable temperature. The drive follows the command input for 30 seconds. This makes it possible to bring the shaft to a standstill with the control system while continuing to process (e.g., concluding the process, leaving collision area and so on). After 30 seconds, the reaction set in parameter **P-0-0119, Best possible standstill** is conducted.

Cause:

1. loss of drive internal blower
2. loss of control cabinet climate control
3. incorrect control cabinet dimensions for heat dissipation
4. air channel blocked

Remedy:

On 1. if the blower fails, exchange the drive
On 2. check control cabinet functions
On 3. check control cabinet dimensions
On 4. clean air channel

E250 attributes

SS display:	E2/50
Diagnosis:	E250 Verstärker Übertemp.-Warnung
	E250 Drive Overtemperature Warning
Diagnosis number:	E250
Warning class :	Non-fatal

E251 Motor Overtemperature Warning

The motor has heated up. The drive follows the command value for 30 seconds. This makes it possible to bring the motor to a standstill with the control system while keeping up with the process, e.g., concluding the process, leaving collision area and so on. After thirty (30) seconds, the reaction set in parameter **P-0-0119, Best possible standstill** follows.

Cause:

The motor was overloaded. The rms torque wanted by the motor exceeded allowable continuous standstill torque.

Remedy:

Check motor layout. With older installations, check whether drive conditions have changed in terms of drit, friction, moving masses and so on.

See Function Description: "Temperature Monitor".

E251 attributes

SS display:	E2/51
Diagnosis:	E251 Motor Übertemp.-Warnung
	E251 Motor Overtemperature Warning
Diagnosis number:	E251
Warning class :	Non-fatal

E255 Feedrate Override(S-0-0108) = 0

The travel velocity used in drive controlled travel commands can be changed with parameter **S-0-0108, Feedrate Override**.
This warning is given if the value of this parameter equals 0, since the drive cannot follow this command value.

Cause:

1. Feed potentiometer of the connected control at 0 or is wrong.
2. Parameter set to wrong value.

Remedy:

On 1. Check feed potentiometer.

On 2. Set parameter to correct value for the application.

E255 attributes

SS display:	E2/55
Diagnosis:	E255 Feedrate-Override(S-0-0108) = 0
	E255 Feedrate override(S-0-0108) = 0
Diagnosis number:	E255
Warning class :	Non-fatal

E257 Continuous Current Limit Active

The thermal controller load is monitored. If a rated current profile is demanded of the drive which would require a power transistor load over time which is too high (excessive power output warning), then the drive will react by dynamically reducing the rms peak current. This warning will be given at the same time. The **P-0-4046, rms peak current** parmeter will be reduced. The early warning **E261 Continuous current prewarning** is generated.

Cause:

The drive controller was overloaded.

Remedy:

1. Check drive layout.
2. Reduce acceleration.

   In older installations check whether drive conditions have changed in terms of friction, moving masses and so on.

See Function Description: "Monitoring Thermal Load"

E257 attributes

SS display:	E2/57
Diagnosis:	E257 DauerstrombegrenOnng aktiv
	E257 Continuous current limiting active
Diagnosis number:	E257
Warning class :	Non-fatal

E259 Command Velocity Limitation Active

In position control and velocity control modes, the effective velocity command value is limited to the value in **S-•-0091, Bipolar velocity limit value** parameter. The warning is given if the resulting velocity command value reaches this limit.

Cause:

Parameter **S-•-0091, Bipolar velocity limit value** parametrized too low.

Remedy:

Generally, parameter **S-•-0091, Bipolar velocity limit value** must be set 10% higher than the NC usable speed.

See Function Description: "Limiting bipolar velocity limit value".

E259 attributes

SS display:	E2/59
Diagnosis:	E259 Geschwindigkeitssollwertbegrenzung aktiv
	E259 Command velocity limitation active
Diagnosis number:	E259
Warning class :	Non-fatal

E261 Continuous Current Limiting Prewarning

Digital drives are monitored by a continuous running temperature model. If the thermal load reaches 100%, the continuous current limit is activated shortly thereafter.
Before torque is reduced, a continuous current limit early warning is given via a switching threshold, which is determined with parameter **P-0-0127, Overload warning.**
Entering **P-0-0127** = 100% deactivates this warning.

Cause:

The drive controller was overloaded.

Remedy:

1. Check drive layout.
2. Reduce acceleration.
3. Increase switching threshold in parameter **P-0-0127, Overload warning**.
4. In older installations check whether drive conditions have changed in terms of friction, moving masses and so on.

See Function Description: "Monitoring thermal load".

E261 attributes

SS display:	E2/61
Diagnosis:	E261 DauerstrombegrenOnng Vorwarnung
	E261 Continuous current limiting prewarning
Diagnosis number:	E261
Warning class :	Non-fatal

E263 Velocity Command S-0-0036 Greater than Bipolar Limit Value

Cause:

The **S-0-0036, velocity command value** was set higher than allowed.

Remedy:

It is limited to **S-•-0091, Bipolar Velocity Limit Value.**

See Function Description: "Velocity control"

E263 attributes

SS display:	E2/63
Diagnosis:	E263 Geschwindigkeitssollwert S-0-0036 größer als Grenzwert Bipolar E263 Velocity Command Value greater than Bipolar Limit
Diagnosis number:	E263
Warning class :	Non-fatal

E325 Regenerated Overload in the Supply Module

Cause:

The regenerated power of the drive is too big.

Remedy

Reduce allowable delay. Drive controller must be set with smaller peak currents.

E325 attributes

SS display:	E3/25
Diagnosis number:	E325
Warning class :	Non-fatal

E326 Infeed Overload of Power Module

Error only stored for 500ms !

Cause:

The infeed power demanded by drives is too big.

Remedy:

Reduce allowable acceleration. Drive controller must be set with smaller peak current.

E326 attributes

SS display: 26

Diagnosis number: E326

Warning class : Non-fatal

E350 Heatsink Overtemperature Warning of Power Supply Module

The allowable heatsink temperature has been reached. The temperature prewarning contact is open. Power off in 30 seconds.

Cause:

Load too high, overtemperature too high, heatsink clogged, blower defective.

Remedy:

Reduce load, reduce control cabinet temperature, clear heatsink air channel or replace unit.

E350 attributes

SS display: E3/50

Diagnosis number: E350

Warning class : Non-fatal

E352 Bleeder Overload Warning of Power Supply Module

Cause:

75% of allowable bleeder ON time has been reached due to high regenerated power.

Remedy:

- reduce allowable aceler (delay)
- reduce drive speed
- reduce peak current of drive

E352 attributes

SS display: E3/52

Diagnosis number: E352

Warning class : Non-fatal

E353 Diagnosis of Power Supply Module Faulty

Supply modules HVE or HVR cyclically transmit via a serial connection both status and error messages to connected controllers. If these do not receive valid messages over several sequences, then this warning is generated.

Cause:

1. serial interface of power supply module defect
2. serial connection lines disrupted
3. serial interface of controller defect

Remedy:

On 1. replace power supply module

On 2. check bus connecting cable and replace, if necessary

On 3. replace controller

E353 attributes

SS display: E3/53

Diagnosis number: E353

Warning class : Non-fatal

E387 Control Voltage Infeed Failure of Power Supply Module

HVE only!

Cause:

The control voltage supply in the HVE exceeds allowable tolerances (3x 380 ... 480V, ± 10 %).

Remedy:

Check mains fuse in control cabinet and replace, if necessary.

E387 attributes

SS display: E3/87

Diagnosis number: E387

Error class: Non-fatal

E410 Slave Not Scanned or Address 0

During the initialization of the SERCOS ring in communications phase 1, each slave to participate in the run-up, must be addressed by the SERCOS master. Those not addressed are set with drive address „0“ and diagnosed with warning E410. Communications with the slaves in higher communications phases is thus not possible. They only work in repeater mode.

Cause:

Slave not scanned in phase 1 or address „0“ set.

Remedy:

- set correct slave address
- check Sercos master configuration

See Function Description: "Commissioning the SERCOS interface"

E410 attributes

SS display:	E4/10
Diagnosis:	E410 Slave nicht gescannt or Adresse 0
	E410 Slave not scanned or address 0
Diagnosis number:	E410
Warning class :	Non-fatal

E825 Overvoltage Error

The DC bus voltage has reached an allowable value (Ud > 870 V). The drive was switched torque free so that the power stage of the controller would not be damaged.

Cause:

The regenerated energy of the braking drive (e.g., main spindle drive) cannot be sufficiently converted by the bleeder resistors in use.

Remedy:

Parametrize braking slope flatter or increase bleeder power with an auxiliary bleeder.

E825 attributes

SS display:	E8/25
Diagnosis:	E825 Überspannungsfehler
	E825 Overvoltage Error
Diagnosis number:	E825
Warning class :	Non-fatal

1.4 Command Diagnoses

C100 Communications phase 3 transition check

Cause:

The command **S-0-0127, C1 Communications phase 3 transition check** is activated.

See Function Description: "S-0-0127, C1 Communications phase 3 transition check".

C100 attributes

SS display:	C1/00
Diagnosis:	C100 Kommunikations Phase 2 nach 3 C100 Communication phase 3 transition check
Diagnosis number:	C100

C101 Invalid Communications Parameter (S-0-0021)

Cause:

Communications parameters needed to operate the drive in communications phase 3 are not valid.

Remedy:

The invalid parameters have been stored in parameter **S-0-0021, List of invalid operating data for phase 3**.
Make the invalid parameters valid by overwriting them.

See Function Description: "S-0-0127, C1 Communications phase 3 transition check".

C101 attributes

SS display:	C1/01
Diagnosis:	C101 Kommunikations-Parameter unvollständig (S-0-0021) C101 Invalid Communication Parameter (S-0-0021)
Diagnosis number:	C101

C102 Limit Error Communication Parameter (S-0-0021)

Cause:

Parameters needed to operate the drive in communications phase 3 exceeded either the minimum or maximum input values or the value as input cannot be processed.

Remedy:

The faulty parameters are listed in **S-0-0021, IDN list of invalid operating data phase 2**.
Overwrite parameters **S-0-0021** with valid values.

C102 attributes

SS display:	C1/02
Diagnosis:	C102 Kommunikations-Parameter Grenzwertfehler (S-0-0021)
	C102 Limit Error Communication Parameter (S-0-0021)
Diagnosis number:	C102

C104 Config. ident number for MDT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. In **S-0-0024**, **Configuration list for master data telegram** parameters have been entered that are not in **S-0-0188, List of configurable data in the MDT**.

Remedy:

Either set a preferred telegram (Telegram type = 0..6) or enter parameters in **S-0-0024, Configuration list for the MDT** that are also in **S-0-0188, List of configurable data**.

See Function Description: "Configuring telegram contents"

C104 attributes

SS display:	C1/04
Diagnosis:	C104 Configured ident number for MDT nicht konfigurierbar
	C104 config. IDN for MDT not configurable
Diagnosis number:	C104

C105 Maximum Length of MDT Exceeded

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter.** The length of the configured data record in the MDT, determined in **S-0-0024, Configuration list of master data telegram** exceeds maximum allowable **S-0-0186, Length of configurable data record in MDT.**

Remedy:

Either set a preferred telegram in **S-0-0015, Telegram type parameter** (Telegram type = 0 to 6) or decrease the number of configurable parameters in the MDT.

See Function Description: "Configuring telegram contents".

C105 attributes

SS display:	C1/05
Diagnosis:	C105 Maximallänge für MDT überschritten C105 Configured Length > Max.Length for MDT
Diagnosis number:	C105

C106 Configured ident number for AT not configurable

Cause:

Telegram type 7 was set in parameter **S-0-0015, Telegram type parameter**. In **S-0-0016, List of configurable data for the AT** parameters have been entered that are not in **S-0-0187, List of configurable data in the AT.**

Remedy:

Either set a preferred telegram in parameter **S-0-0015, Telegram type parameter** (Telegram type = 0..6) or enter parameters in **S-0-0016, List of configurable data for the AT** that are also in **S-0-0187, List of configurable parameters**.

See Function Description: "Configuring telegram contents".

C106 attributes

SS display:	C1/06
Diagnosis:	C106 Configured ident number for AT nicht konfigurierbar
	C106 config. IDN for AT not configurable
Diagnosis number:	C106

C107 Maximum AT Length Exceeded

Cause:

Telegram type 7 was set in **S-0-0015, Telegram type parameter**. The length of the configured data record in the AT set via **S-0-0016, Configuration drive telegram**, exceeds maximum allowable **S-0-0187, Length of configurable data record in the AT**.

Remedy:

Either set a prefered telegram via **S-0-0015, Telegram type parameter** (Telegram type = 0..6) or reduce the number of configurable parameters in the AT (**S-0-0016**).

See Function Description: "Configuring telegram contents".

C107 attributes

SS display:	C1/07
Diagnosis:	C107 Maximallänge für AT überschritten
	C107 Configured length > max.length for AT
Diagnosis number:	C107

C108 Time Slot Parameter > Sercos Cycle Time

Cause:

One of the following time slot parameters

- **S-0-0006, AT transmission starting time (T1)**
- **S-0-0089, Master data telegram transmission starting time (T2)**
- **S-0-0007, Feedback acquisition starting time (T4)**
- **S-0-0008, Command Valid time (T3)**

exceeds **S-0-0002, SERCOS cycle time.**

Remedy:

Correct the relevant parameter(s). These times are the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram and receive times".

C108 attributes

SS display:	C1/08
Diagnosis:	C108 Zeitschlitzparameter > SERCOS-Zykluszeit C108 Time Slot Parameter > SERCOS Cycle Time
Diagnosis number:	C108

C109 Position of Data Record in MDT (S-0-0009) even

Cause:

Parameter **S-0-0009, Position of data record in MDT** contains an even number. This is not allowed.

Remedy:

Parameter **S-0-0009, Position of data record in MDT** must be parametrized odd. This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C109 attributes

SS display:	C1/09
Diagnosis:	C109 Anfangsadresse MDT (S-0-0009) gerade C109 Position of Data Record in MDT (S-0-0009) even
Diagnosis number:	C109

C110 MDT Length (S-0-0010) odd

Cause:

Parameter **S-0-0010, Length of master data telegram** contains an even number. This is not allowed.

Remedy:

Parameter **S-0-0010, Length of master data telegram** must be parametrized with an odd number. This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C110 attributes

SS display:	C1/10
Diagnosis:	C110 Länge MDT (S-0-0010) ungerade C110 Length of MDT (S-0-0010) odd
Diagnosis number:	C110

C111 ID9 + Data record length - 1 > length of MDT (S-0-0010)

Cause:

The parametrization of **S-0-0009, Position of data record in master data telegram** and **S-0-0010, Length of master data telegram** is faulty. The length of the data record in the MDT for the drive plus the position of the data record in MDT exceeds entire length of the MDT.

Remedy:

Correct parametrization of **S-0-0009, Position of data record in Master-Datentelegramm** and **S-0-0010, Length of master data telegram.** This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times"

C111 attributes

SS display:	C1/11
Diagnosis:	C111 ID9 + Datensatzlänge - 1 > Länge MDT (S-0-0010)
	C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)
Diagnosis number:	C111

C112 TNcyc (S-0-0001) or TScyc (S-0-0002) error

Cause:

Allowable values for **S-0-0001, NC cycle time(s)** and **S-0-0002, SERCOS cycle time(s)** are only 500 µs or whole integer multiples of 1ms. This is not the case.

Remedy:

S-0-0001, NC cycle time(s) and **S-0-0002, SERCOS cycle time(s)** must be corrected**.** This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C112 attributes

SS display:	C1/12
Diagnosis:	C112 TNcyc (S-0-0001) or TScyc (S-0-0002) fehlerhaft
	C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error
Diagnosis number:	C112

C113 Compare TNcyc (S-0-0001) to TScyc (S-0-0002) Error

Cause:

The value of **S-0-0001, NC cycle time(s)** can only be equal to or a multiple integer of **S-0-0002, SERCOS cycle time(s)**. This is not the case.

Remedy:

S-0-0001, NC cycle time(s) and **S-0-0002, SERCOS cycle time(s)** must be corrected. These are the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C113 attributes

SS display:	C1/13
Diagnosis:	C113 Verhaelt. TNcyc (S-0-0001) zu Tscyc (S-0-0002) Fehler C113 Relation TNcyc (S-0-0001) to Tscyc (S-0-0002) Error
Diagnosis number:	C113

C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)

Cause:

The maximum allowable value for **S-0-0007, Feedback acquisition starting timeT4** equals:

> **S-0-0002, SERCOS cycle time(s) -**
> **S-0-0005, Minimum feedback acquisition starting time T4min**.

The value of **S-0-0007, Feedback acquisition starting timeT4** is wrong.

Remedy:

Correct **S-0-0007, Feedback acquisition starting timeT4**. This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C114 attributes

SS display:	C1/14
Diagnosis:	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
	C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
Diagnosis number:	C114

C115 T2 too small

Cause:

The value set for **S-0-0089, MDT transmit starting time** is wrong. The drive cannot work with this value.

Remedy:

Correct **S-0-0089, MDT transmit starting time**.

This is the responsibility of the control manufacturer and is fixed by the SERCOS interface.

See Function Description: "Configuration of telegram end and receive times".

C115 attributes

SS display:	C1/15
Diagnosis:	C115 T2 Zu klein
	C115 T2 too small
Diagnosis number:	C115

C200 Communications phase 4 transition check

Definition:

Command **S-0-0128, C2 Communications phase 4 transition check** has been activated.

See Function Description: "S-0-0127, C2 Communications phase 4 transition check".

C200 attributes

SS display:	C2/00
Diagnosis:	C200 Communications phase Phase 3 nach 4
	C200 Communication phase 4 transition check
Diagnosis number:	C200

C201 Parameter record incomplete (-> S-0-0022)

Cause:

Parameters needed to operate the drive in phase 4 are invalid. These are stored in **S-0-0022, IDN list of invalid operating data for phase 3**.

Remedy:

Overwrite the parameters in **S-0-0022, IDN list of invalid operating data for phase 3** therewith making them valid.

See Function Description: "S-0-0128, C2 Communications phase auf transition check".

C201 attributes

SS display:	C2/01
Diagnosis:	C201 Parametersatz unvollständig (-> S-0-0022)
	C201 Invalid Parameter (-> S-0-0022)
Diagnosis number:	C201

C202 Parameter Limit Value Error (->S-0-0022)

Cause:

Parameters needed to operate the drive in communications phase 4 exceed minimum or maximum input values or the value input cannot be used as is (in the case of bit strips). The faulty parameters are listed in **S-0-0022, IDN list of invalid operation data for phase 3**.

Remedy:

Overwrite parameters in **S-0-0022, IDN list of invalid operation data for phase 3** making them valid.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C202 attributes

SS display:	C2/02
Diagnosis:	C202 Parameter Grenzwertfehler (->S-0-0022)
	C202 Limit Error Parameter (-> S-0-0022)
Diagnosis number:	C202

C203 Parameter Calculation Error (->S-0-0022)

Cause:

Parameters needed for operation in phase 4 cannot be processed as they are. The faulty parameters are listed in **S-0-0022, IDN list of invalid operation data for phase 3**. For example, in parameter **P-0-0075, External encoder interface** the value of the DLF modules has been entered, but there is no module.

Remedy:

Overwrite the parameters in **S-0-0022, IDN list of invalid operation data for phase 3** with correct values.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C203 attributes

SS display:	C2/03
Diagnosis:	C203 Parameter Umrechnungsfehler (->S-0-0022) C203 Parameter Calculation Error (-> S-0-0022)
Diagnosis number:	C203

C204 Motor Type (P-0-4014) incorrect

In parameter **P-0-4014, Motor type** an MHD or MKD motor has been entered (value 1 or 5), but in the data memory of the motor feedback, parameter **S-0-0141, Motor type** neither "MHD" nor "MKD" could be found.

Cause:

1. Incorrect motor type parametrized.
2. The data memory of the motor feedback cannot be read.

Remedy:

On 1. Enter motor type in parameter **P-0-4014, Motor type.**

On 2. Check feedback line.
Feedback defect - replace motor.

See Function Description: "Automatic setting of motor type in motors with feedback memory""

C204 attributes

SS display:	C2/04
Diagnosis:	C204 Motorart (P-0-4014) fehlerhaft
	C204 Motor type (P-0-4014) incorrect
Diagnosis number:	C204

C210 External Encoder Required (-> S-0-0022)

Cause:

Values were entered in parameters **S-0-0154, Spindle positioning parameter** or in the operating mode parameters **S-0-0032..35** that necessitate the use of an external encoder. In parameter **P-0-0075, External encoder interface** "0" has, however, been entered, for not available.

Remedy:

S-0-0154, Spindle positioning parameter or **Operating mode parameter S-0-0032..35** must be changed to motor encoder.
External measuring system activated by inputting value of **P-0-0075, External encoder interface** not equal to "0".

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C210 attributes

SS display:	C2/10
Diagnosis:	C210 Externer Geber erforderlich (-> S-0-0022) C210 External Feedback required (-> S-0-0022)
Diagnosis number:	C210

C211 Invalid Feedback Data (-> S-0-0022)

With an MHD or MKD motor, there is a motor feedback with data memory. The attempt was made to read the parameters stored there. An error occurred during this attempt.

Causes:

1. Motor feedback cable defect
2. Motor feedback defect
3. Drive controller defect

Remedy:

On 1. Check motor feedback cable.

On 2. Replace motor.

On 3. Replace amplifier.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C211 attributes

SS display:	C2/11
Diagnosis:	C211 Ungültige Feedbackdaten (-> S-0-0022)
	C211 Invalid feedback data (-> S-0-0022)
Diagnosis number:	C211

C212 Invalid Amplifier Data (-> S-0-0022)

During drive initialization, the operating software retrieves data from the EEPROM in the drive controller. If this accessing goes wrong, then this error message is generated.

Cause:

Hardware defect in drive controller

Remedy:

Replace drive controller.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C212 attributes

SS display:	C2/12
Diagnosis:	C212 Ungültige Verstärkerdaten (-> S-0-0022)
	C212 Invalid amplifier data (-> S-0-0022)
Diagnosis number:	C212

C213 Position Data Scaling Error

Cause:

The display format of the position can be set with the scaling parameters for position data. The drive-internal format of the position data depends on the motor encoder used and its resolution. The factor for calculating the position data from drive-internal format to display format or vice versa exceeds processing range as either:

- the linear motor or rotary position scaling with motor reference or
- the rotary motor and linear position scaling with motor reference or
- the linear motor and modulo scaling have been set or
- the determined factor for computation of position data from display into internal format and vice versa cannot be depicted.

Remedy:

Check and correct such relevant parameters as:

- **S-0-0076, Position data scaling type**
- **S-0-0077, Position data scaling factor**
- **S-0-0078, Position data scaling exponent**
- **S-0-0079, Rotary position resolution**
- **S-0-0116, Motor encoder resolution**
- **S-•-0121, Load gear input revolutions**
- **S-•-0122, Load gear output revolutions**
- **S-0-0123, Feed constant**
- **P-0-0074, Motor encoder interface**
- **S-0-0277, Position feedback 1 type parameter**

See Function Description: "S-0-0128, C2 Communications check 4 transition check".

C213 attributes

SS display:	C2/13
Diagnosis:	C213 Wichtung der Lagedaten fehlerhaft
	C213 Position data scaling error
Diagnosis number:	C213

C214 Scaling Error in Speed Data

Cause:

The display format of the position can be set with the scaling parameters for position data. The drive-internal format of the position data depends on the motor encoder used and its resolution. The factor for calculation of the position data from drive-internal format to display format or vice versa exceeds processing range.

Remedy:

Check and correct such relevant parameters as:

- **S-0-0044, Speed data scaling mode**
- **S-0-0045, Speed data scaling factor**
- **S-0-0046, Speed data scaling exponent**
- **S-0-0116, Motor encoder resolution**
- **S-•-0121, Load gear input revolutions**
- **S-•-0122, Load gear output revolutions**
- **S-0-0123, Feed constant**
- **P-0-0074, Motor encoder interface**
- **S-0-0277, Position feedback 1 type parameter**
-

See Function Description: "S-0-0128, C2 Communications check 4 transition check".

C214 attributes

SS display:	C2/14
Diagnosis:	C214 Wichtung der Geschwindigkeitsdaten fehlerhaft
	C214 velocity data scaling error
Diagnosis number:	C214

C215 Acceleration Data Scaling Error

Cause:

The display format of the position can be set with the scaling parameters for position data. The drive-internal format of the position data depends on the motor encoder used and its resolution. The factor for calculation of the position data from drive-internal format to display format or vice versa exceeds processing range.

Remedy:

Check and correct such relevant parameters as:

- **S-0-0160, Acceleration data scaling mode**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**
- **S-0-0116, Motor encoder resolution**
- **S-•-0121, Load gear input revolutions**
- **S-•-0122, Load gear output revolutions**
- **S-0-0123, Feed constant**
- **P-0-0074, Motor encoder interface**
- **S-0-0277, Position feedback 1 type parameter**

See Function Description: "S-0-0128, C2 Communications check 4 transition check".

C215 attributes

SS display:	C2/15
Diagnosis:	C215 Wichtung der Beschleunigungsdaten fehlerhaft
	C215 Accelaration data scaling error
Diagnosis number:	C215

C216 Torque/force data scaling error

Cause:

The display format of the torque/force data can be set with the scaling parameters for the torque/force data. The factor for the calculation of the torque/force force from drive-internal format into display format or vice versa exceeds processable range.

Remedy:

Check and correct such relevant parameters as:

- **S-0-0086, Torque/force data scaling mode**
- **S-0-0093, Torque/force data scaling factor**
- **S-0-0094, Torque/force data scaling exponent**
- **S-0-0110, Peak current amplifier**
- **S-0-0111, Motor standstill current**

See Function Description: "S-0-0128, C2 C2 Communications check 4 transition check".

C216 attributes

SS display:	C2/16
Diagnosis:	C216 Wichtung der Drehmoment/Kraftdaten fehlerhaft
	C216 Torque/force data scaling error
Diagnosis number:	C216

C217 Error While Reading Motor Encoder Data

If for **P-0-0074, Motor encoder interface**

- "1" for standard interface or
- "4" for DFF module or
- "8" for DAG module (Endat)

has been parametrized, then the mounted encoder must have a feedback data memory. The values for the encoder resoluton and feedback type are read out of it. Whilst reading these values an error occurred.

Cause:

1. Motor feedback cable defect
2. Motor feedback defect

Remedy:

On 1. Check motor feedback cable.

On 2. Replace motor.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C217 attributes

SS display:	C2/17
Diagnosis:	C217 Fehler beim Lesen der Motorgeberdaten
	C217 Motor feedback data reading error
Diagnosis number:	C217

C218 Error While Reading External Encoder Data

If for **P-0-0075, External encoder interface**

- "1" for standard interface or
- "4" for DFF module or
- "8" for DAG module (Endat)

has been parametrized, then the mounted encoder must have a feedback data memory. The values for the encoder resoluton and feedback type are read out of it. Whilst reading these values an error occurred.

Cause:

1. Measuring system cable defective
2. Measuring system defective

Remedy:

On 1. Check measuring system cable.

On 2. Replace measuring system.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C218 attributes

SS display:	C2/18
Diagnosis:	C218 Fehler beim Lesen der Daten des ext. Gebers
	C218 External feedback data reading error
Diagnosis number:	C218

C220 Error During Motor Encoder Initialization

Several checks are run when the motor encoder is initialized. An error occurred during this procedure. This error can take the form of:

- error when reading angle correction data
- error when coping angle correction data
- communications with encoder disrupted
- error when constructing the position of an initialization track
- error when reading the analog signal of an initialization track
- faulty index length of the analog signal of an initializaton track
- invalid offset between high and low resolution tracks
- error in microcontroller of the measuring system

Cause:

1. Motor feedback cable defect
2. Motor feedback defect
3. Measuring system interface defect

Remedy:

On 1. Check motor feedback cable.

On 2. Replace motor.

On 3. Replace measuring system interface (module)

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C220 attributes

SS display:	C2/20
Diagnosis:	C220 Fehler bei Mot.Geber-Initialisierung
	C220 Motor feedback initializing error
Diagnosis number:	C220

C221 Error During External Encoder Initialization

Several checks are run when the motor encoder is initialized. An error occurred during this procedure. This error can take the form of:

- error when reading angle correction data
- error when coping angle correction data
- communications with encoder disrupted
- error when constructing the position of an initialization track
- error when reading the analog signal of an initialization track
- faulty index length of the analog signal of an initializaton track
- invalid offset between high and low resolution tracks
- error in microcontroller of the measuring system
- error external 24V in DAG 1.2 on SSI interface

Cause:

1. External feedback cable defect
2. Feedback defect
3. Measuring system interface defect

Remedy:

On 1. Check external feedback cable

On 2. Replace feedback

On 3. Replace measuring system interface (module)

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C221 attributes

SS display:	C2/21
Diagnosis:	C221 Fehler bei Ext.Geber-Initialisierung
	C221 Ext.Feedback Initializing Error
Diagnosis number:	C221

C225 Coprocessor not ready for initialization

The drive controller has a coprocessor. It is initialized during the changeover command. The coprocessor signals its readiness to initialize. If this is not the case, then this error is generated.

Cause:

Coprozessor failed.

Remedy:

The controller must be replaced.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C225 attributes

SS display:	C2/25
Diagnosis:	C225 Coprozessor nicht bereit zur Initialisierung
	C225 Coprocessor not ready for initialization
Diagnosis number:	C225

C226 No Acknowledge from Coprocessor

The drive controller has a coprocessor. It is initialized during the changeover command. If the coprocessor does not acknowledge the initialization via the master processor, then this error is generated.

Cause:

Coprocessor failed.

Remedy:

Replace drive controller.

See Function Description: "S-0-0128, C2 Communications phase 4 transition check".

C226 attributes

SS display:	C2/26
Diagnosis:	C226 Kein Acknowledge von Coprozessor
	C226 Coprocessor acknowledge failed
Diagnosis number:	C226

C227 Modulo Range Error

See Function Description: "Modulo processing marginal conditions".

C227 attributes

SS display:	C2/27
Diagnosis:	C227 Modulo-Bereichs-Fehler
	C227 Modulo range error
Diagnosis number:	C227

C228 Controller type (S-0-0140) wrong

With parameter **S-0-0140, Controller type,** various internal settings are performed in the software. If the contents of the parameters are not evaluated, then this error is generated.

Cause:

1. This software cannot process this controller type.
2. Amplifier EEPROM defect.

Remedy:

On 1. Consult Indramat.

On 2. Repair/replace controller.

See Function Description: "S-0-0127, C2 Communications phase 4 transition check".

C228 attributes

SS display:	C2/28
Diagnosis:	C228 Regelgerätetyp (S-0-0140) fehlerhaft
	C228 Controller type (S-0-0140) incorrect
Diagnosis number:	C228

C229 DEA4 missing for gearbox or windings changeover

During gearbox and windings changeovers, auxiliary contactors are controlled directly by the controller. The successful change is also signalled back to the controller with voltage signals.

Cause:

Plug-in module DEA4.2 is not mounted in the controller.

Remedy:

Mount plug-in module DEA4.2 into controller!

C229 attributes

SS display:	C2/29
Diagnosis:	C229 DEA4 fehlt zur Getriebe- bzw. Wicklungsumschaltung C229 DEA4 missing for gearbox or windings changeover
Diagnosis number:	C229

C230 Pre-Select Gearstage/Y-D Switch Incomplete

If gearbox or windings changeover is used then each of the four switchable parameter records must have either a gearbox or a windings type (Y or Δ) allocated to it.

Note: The gearbox changeover cannot be simultaneously used with the Y- Δ– switch!

Cause:

Allocation of windings switch not complete.

Remedy:

Specify windings switch for each of the four switchable parameter records!

C230 attributes

SS display:	C2/30
Diagnosis:	C230 Vorwahl Getriebestufen/Y-D-Schaltung unvollständig C230 Preselection of gearstages/Y-D-connection incomplete
Diagnosis number:	C230

C300 Set Absolute Measuring

Command **P-0-0012, Set absolute measuring** has been activated.

See Function Description: "Set absolute measuring".

C300 attributes

SS display:	C3/00
Diagnosis:	C300 Absolutmaß setzen
	C300 Set absolute measuring
Diagnosis number:	C300

C302 No Absolute Measuring System Installed

The command **P-0-0012, Command set absolute measuring** was started but no absolute measuring system was instaled.

The command cannot be executed if no absolute measuring system has been installed.

Cause:

1. The command was wrongly activated.
2. The mounted motor or external measuring system are not absolute encoders.

Remedy:

On 1. Terminate command actuation.

On 2. Equip motor or external measuring system with absolute encoder function.

See Function Description: "Possible error messages with set absolute measuring".

C302 attributes

SS display:	C3/02
Diagnosis:	C302 Kein absolutes Meßsystem vorhanden
	C302 Absolute Measuring System Not Installed
Diagnosis number:	C302

C500 Reset Class 1 Diagnostics

The control activated the command to reset an error **S-0-0099, Reset Class 1 diagnostics (C1D).**

See Function Description: "Reset error".

C500 attributes

SS display:	C5/00
Diagnosis:	C500 Reset Zustandsklasse-1
	C500 Reset class 1 diagnostic (error reset)
Diagnosis number:	C500

C501 Error delete only in Parameter Mode

Cause:

The attempt was made to clear error F8/22 motor encoder error, signal too small in communications phase 4. This is only possible in communications phase < 4.

Remedy:

1. Reset communications phase.
2. Reactivate command.

C501 attributes

SS display:	C5/01
Diagnosis:	C501 Fehler nur im Parametriermodus 1 löschbar
	C501 Error delete only in parameter mode
Diagnosis number:	C501

C600 Drive-Controlled Homing Procedure Command

The control activated the command **S-0-0148, Drive-controlled homing**.

See Function Description: "Drive-controlled homing".

C600 attributes

SS display:	C6/00
Diagnosis:	C600 Kommando Antriebsgeführtes Referenzieren
	C600 Drive controlled homing procedure command
Diagnosis number:	C600

C601 Homing Not Possible If Drive Is Not Enabled

Cause:

The command was started without drive enable applied. This is not permitted.

Remedy:

1. Switch drive enable on.
2. Restart command.

See Function Description: "Drive-controlled referencing".

C601 attributes

SS display:	C6/01
Diagnosis:	C601 Referenzieren ohne Antriebsfreigabe nicht möglich
	C601 Homing Not Possible If Drive Is Not Enabled
Diagnosis number:	C601

C602 Distance Homing-Switch Reference Mark Erroneous

Cause:

Homing switch evaluation is switched on. The distance between the positive homing edge and the reference marker to be evaluated exceeds allowable range.

Remedy:

Assume value in parameter **S-0-0298, Reference cam switch by ..** in parameter **S-0-0299, Home Switch Offset**.

See Function Description: "Connecting and Allocating the Homing Switch".

C602 attributes

SS display:	C6/02
Diagnosis:	C602 Abstand Nullschalter-Referenzmarke fehlerhaft C602 Distance homing switch-reference mark erroneous
Diagnosis number:	C602

C604 Homing of Absolute Encoder Not Possible

Command **S-0-0148, Drive-controlled homing** was started. An encoder was selected in **S-0-0154, Spindle positioning parameter** which has an absolute measuring system. The command can only be executed, however, if the command **P-0-0012, Set absolute dimension** is activated first.

Remedy:

Activate command **P-0-0012, Set absolute measuring** first and then the command **S-0-0148, Drive-controlled homing**. This action establishes the absolute dimension.

See Function Description: "Drive-controlled homing "

C604 attributes

SS display:	C6/04
Diagnosis:	C604 Referenzieren with Absolutmaßgeber nicht möglich
	C604 Homing of absolute encoder not possible
Diagnosis number:	C604

C700 Basic Load

The act of adjusting machine mechanics to the digital drive is performed in MHD and MKD motors by activating the speed control parameters stored in the motor feedback. Via message C7, the drive controller signals that command C700 basic load has been activated by command **S-0-0262, Basic load command.**

Cause:

Command C700 has been activated.

See Function Description: "Basic load".

C700 attributes

SS display:	C7/00
Diagnosis:	C700 Urladen
	C700 Basic load
Diagnosis number:	C700

C701 Basic Load with Drive Enable Set Not Possible

Cause:

The command **S-0-0262, Basic load command** cannot be executed if the drive enable is set.

Remedy:

1. Switch drive enable off.
2. Restart command.

See Function Description: "Executing basic load function as a command".

C701 attributes

SS display:	C7/01
Diagnosis:	C701 Urladen bei gesetzter Reglerfreigabe nicht möglich
	C701 Basic load not possible if drive is enabled
Diagnosis number:	C701

C702 Default Parameters Not Available

The act of adjusting machine mechanics to the digital drive is performed in MHD and MKD motors by activating the speed control parameters stored in the motor feedback. Via message C7, the drive controller signals that command C700 basic load has been activated by command **S-0-0262, Basic load command,** but the mounted motor has no data memory capabilities.

Remedy:

Obtain parameter sheet of motor used from INDRAMAT customer service and enter the parameters.

See Function Description: "Executing the basic load function as a command".

C702 attributes

SS display:	C7/02
Diagnosis:	C702 Keine Defaultparameter vorhanden
	C702 Default parameters not available
Diagnosis number:	C702

C703 Default Parameter Invalid

Cause:

The default parameters are read out of the motor feedback data memory. At least one of these parameters is not valid.

Remedy:

The connection to the motor feedback must be checked. Replace motor, if necessary.

See Function Description: "Executing the basic load function as a command".

C703 attributes

SS display:	C7/03
Diagnosis:	C703 Dafaultparameter ungültig
	C703 Default parameters invalid
Diagnosis number:	C703

C704 Parameter not copyable

Cause:

The existing default parameters are not compatible with the software version.

Remedy:

Consult Indramat.

See Function Description: "Executing the basic load function as a command".

C704 attributes

SS display:	C7/04
Diagnosis:	C704 Parameter nicht kopierbar
	C704 Parameters not copyable
Diagnosis number:	C704

C902 Spindle Positioning without Drive Enable Not Possible

Cause:

At the start of command **S-0-0152 Spindle Positioning** the drive enable had not been set.

Remedy:

Set drive enable before starting command.

C902 attributes

SS display:	C9/02
Diagnosis:	C902 Spindelpositionieren ohne Reglerfreigabe nicht möglich C902 No positioning spindle without drive enable signal
Diagnosis number:	C902

C904 No External Encoder Available

Spindle positioning with a slipless power train needs an external encoder mounted to the spindle.

Cause:

The direct measuring system (spindle feedback) needed as per **Spindle positioning parameter (S-0-0154)** is either missing or not mounted.

Remedy:

Spindle feedback (external encoder) must be checked for correct mounting.

C904 attributes

SS display:	C9/04
Diagnosis:	C904 Kein externer Geber vorhanden C904 No external encoder
Diagnosis number:	C904

C905 Spindle Positioning With Non-Initialized Absolute Encoder Not Possible

If an absolute encoder is used as motor or spindle feedback, then prior to drive-controlled spindle positioning, the command „Set absolute measuring" must be executed to establish reference between spindle and measuring system.

Cause:

The absolute encoder used as motor or spindle feedback is not in reference with the spindle. The command **Drive-controlled spindle positioning (S-0-0152)** cannot be executed as the measuring system has no reference.

Remedy:

- First check whether parameters **S-0-0277, Position encoder parameter 1** and **S-0-0115, Position encoder parameter 2** are set to „Encoder resolution absolute“.
- Execute command **C3 Set absolute measuring (P-0-0012)** (see section 7.3).

C905 attributes

SS display:	C9/05
Diagnosis:	C905 Spindelpositionieren with nicht initialisiertem Absolutwertgeber unmöglich C905 Positioning with non-initialized absolute encoder impossible
Diagnosis number:	C905

D101 Switch Parameter Set Only Possible in Phase 4

Cause:

The command **d1 Switch Parameter Set (S-0-0216)** was already activated in phase 2, but cannot be executed prior to phase 4. Only after phase 4 is reached, may a parameter set other than „0“l be activated.

Remedy:

Activate command **d1 Switch parameter set** only in phase 4!

D101 attributes

SS display:	D1/01
Diagnosis:	D101 Parametersatzumschaltung nur in Phase4 möglich
	D101 Switch parameter set only possible in Phase 4
Diagnosis number:	D101

D102 Offset Speed of Oscillation cannot be achieved

Cause:

The spindle turns after the gear has been switched by command **d1 Switch parameter set (S-0-0216)** has been triggered at **Offset oscillation speed, S-0-0214**, but does not reach the internal acknowledgement of the oscillation offset speed as the value in parameter **Velocity window, S-•-0157**, is equal to zero!

Remedy:

Enter a value in parameter **Velocity window, S-•-0157** that exceeds zero!

If the spindle does not turn with **S-0-0214, Offset oscillating speed:**

Check whether the gearstage being switched into is blocked or not!

D102 attributes

SS display:	D1/02
Diagnosis:	D102 Pendel-Offsetdrehzahl nicht erreichbar
	D102 Offset speed of oscillation cannot be achieved
Diagnosis number:	D102

D201 No Oscillating Drive Without Drive Enable Signal

Cause:

The drive enable had not been set at the start of command **d2 Drive-controlled oscillation** (**S-0-0190)**.

Remedy:

Set drive enable signal before starting command.

D201 attributes

SS display:	D2/01
Diagnosis:	D201 Pendeln ohne Reglerfreigabe nicht möglich D201 No oscillating drive without drive enable signal
Diagnosis number:	D201

D202 Offset Speed of Oscillation Cannot be Achieved

Cause:

The spindle is turning but with **Oscillation offset speed, S-0-0214**. It does not reach internal acknowledgement of oscillation offset speed as the value in parameter **Velocity window, S-•-0157**, is zero!

Remedy:

Enter a value in parameter **Velocity window, S-•-0157** that is greater than zero!

D202 attributes

SS display:	D2/02
Diagnosis:	D202 Pendel-Offsetdrehzahl nicht erreichbar D202 Offset speed of oscillation cannot be achieved
Diagnosis number:	D202

1.5 Status Diagnostics

A000 Communications Phase 0

The structure of communications is broken down into four phases. Phases 0 and 1 support the recognition of participant. In phase 2 time and data structure of the protocol for communications phases 3 and 4 are prepared.
Initialization is performed in rising order. Communications phases are specified by the control. Switching into phase 4 concludes initialization and makes powering up possible. If phase progression is terminated, then this is visible in the status display which retains the last communications phase reached and does not alter.
If diagnostics **A000 Communications Phase 0** is active**,** then the drive is in Phase 0 and is waiting for phase progression from the control from phase 0 to 1.

See Function Description: "Parametrization mode - operating mode".

A000 attributes

SS display:	P0
Diagnosis:	A000 Kommunikationsphase 0
	A000 Communication Phase 0
Diagnosis number:	A000

A001 Communications Phase 1

The structure of communications is broken down into four phases. Phases 0 and 1 support the recognition of participant. In phase 2 time and data structure of the protocol for communications phases 3 and 4 are prepared.
Initialization is performed in rising order. Communications phases are specified by the control. Switching into phase 4 concludes initialization and makes powering up possible. If phase progression is terminated, then this is visible in the status display which retains the last communications phase reached and does not alter.
If diagnostics **A001 Communications Phase 1** is active**,** then the drive is in Phase 1 and is waiting for phase progression from the control from phase 1 to 2.

See Function Description: "Parametrization mode - operating mode"

A001 attributes

SS display:	P1
Diagnosis:	A001 Kommunikationsphase 1
	A001 Communication Phase 1
Diagnosis number:	A001

A002 Communications Phase 2

The structure of communications is broken down into four phases. Phases 0 and 1 support the recognition of participant. In phase 2 time and data structure of the protocol for communications phases 3 and 4 are prepared.
Initialization is performed in rising order. Communications phases are specified by the control. Switching into phase 4 concludes initialization and makes powering up possible. If phase progression is terminated, then this is visible in the status display which retains the last communications phase reached and does not alter. If diagnostics **A002 Communications Phase 2** is active, then the drive is in phase 2. Before control switches to phase 3, the command **S-0-0127, C1 Communications phase 3 transition check** must be started**.** If this command is negatively acknowledged, then there is no progression to communications phase 3. The problems diagnosed by the drive must first be cleared.

Note: The parameters are not checked for accuracy!

See Function Description: "Parametrization mode - operating mode"

A002 attributes

SS display:	P2
Diagnosis:	A002 Kommunikationsphase 2
	A002 Communication Phase 2
Diagnosis number:	A002

A003 Communications Phase 3

The structure of communications is broken down into four phases. Phases 0 and 1 support the recognition of participant. In phase 2 time and data structure of the protocol for communications phases 3 and 4 are prepared.
Initialization is performed in rising order. Communications phases are specified by the control. Switching into phase 4 concludes initialization and makes powering up possible. If phase progression is terminated, then this is visible in the status display which retains the last communications phase reached and does not alter. If diagnostics **A003 Communications Phase 3** is active, then the drive is in phase 3. Before control switches to phase 4, the command **S-0-0128, C1 Communications phase 4 transition check** must be started. If this command is negatively acknowledged, then there is no progression to communications phase 4. The problems diagnosed by the drive must first be cleared.

Note: The parameters are not checked for accuracy!

See Function Description: "Parametrization mode - operating mode"

A003 attributes

SS display:	P3
Diagnosis:	A003 Kommunikationsphase 3
	A003 Communication Phase 3
Diagnosis number:	A003

A010 Drive Halt

The drive halt function has been activated. It supports the braking of an axis with defined accel and jerk.
The function is cleared by resetting drive halt bits (bit 13) in the master control word or terminated by activating the drive control command (e.g., drive-controlled homing).

See Function Description: "Drive halt principle"

A010 attributes

SS display:	AH
Diagnosis:	A010 Antrieb Halt
	A010 Halt Drive
Diagnosis number:	A010

A011 Starting Lockout Active

Digital drive controllers are equipped with starting lockouts. They prevent unwanted startups of a servo axis. By activating the drive lockout, the control electronics of the power end stage is separated via a relay contact. At terminals AS+; AS– connector X3, +24V were applied.

See Function Description: "Starting Lockout".

A011 attributes

SS display:	AS
Diagnosis:	A011 Anlaufsperre aktiv
	A011 Drive Interlock Open
Diagnosis number:	A011

A012 Control and Power Sections Ready to Operate

The drive is receiving control voltage. Power is on. The drive is ready to output.

See Function Description: "Drive Enable"

A012 attributes

SS display:	Ab
Diagnosis:	A012 Steuer- and Leistungsteil betriebsbereit
	A012 Control and Power Sections Ready for Operation
Diagnosis number:	A012

A013 Ready to Receive Power

The drive is receiving control voltage. There is no error in the drive. The drive is ready to receive power.

See Function Description: "Parametrization mode - operating mode".

A013 attributes

SS display: bb
Diagnosis: A013 Bereit zur Leistungszuschaltung
A013 Ready for Power ON
Diagnosis number: A013

A100 Drive in Torque Control

The drive is in torque control mode. It follows the torque command value path specified by the control.

See Function Description: "Torque/force control".

A100 attributes

SS display: AF
Diagnosis: A100 Antrieb in Momentenregelung
A100 Drive in Torque Mode
Diagnosis number: A100

A101 Drive in Velocity Mode

The drive is in velocity mode. It is following the velocity command value path set by the control. The velocity control loop is closed in the drive.

See Function Description: "Velocity Mode"

A101 attributes

SS display: AF
Diagnosis: A101 Antrieb in Geschwindigkeitsregelung
A101 Drive in Velocity Mode
Diagnosis number: A101

A102 Position Control / Encoder 1

The drive is in **position control**. The position control loop is closed in the drive via the position encoder. The control only sets the position command value path if the drive follows the command value with lag error.

Encoder 1 means that the position encoder is mounted on the motor shaft (indirect measurement of axis position).

See Function Description: "Position Mode".

A102 attributes

SS display:	AF
Diagnosis:	A102 Lageregelung/Geber 1
	A102 Position Mode Encoder 1
Diagnosis number:	A102

A103 Position Control / Encoder 2

The drive is in **position control**. The position control loop is closed in the drive via the position encoder. The control only sets the position command value path if the drive follows the command value with lag error.

Encoder 2 means that the position control is mounted to the machine axis (direct measurement of axis position).

See Function Description: "Position Mode".

A103 attributes

SS display:	AF
Diagnosis:	A103 Lageregelung/Geber 2
	A103 Position Mode Encoder 2
Diagnosis number:	A103

A104 Position Mode / Encoder 1 lagless positioning

The drive is in **position control**. The position control loop is closed in the drive via the position encoder. The control only sets the position command value path if the drive follows the command value without lag error.

Encoder 1 means that the position encoder is mounted on the motor shaft (indirect measurement of axis position).

See Function Description: "Position Mode".

A104 attributes

SS display:	AF
Diagnosis:	A104 Lageregelung/Geber 1 schleppfehlerfrei
	A104 Position Mode Encoder 1 / lagless positioning
Diagnosis number:	A104

A105 Position Mode / Encoder lagless positioning

The drive is in **position control**. The position control loop is closed in the drive via the position encoder. The control only sets the position command value path if the drive follows the command value without lag error.

Encoder 2 means that the position control is mounted to the machine axis (direct measurement of axis position).

See Function Description: "Position Mode".

A105 attributes

SS display:	AF
Diagnosis:	A105 Lageregelung/Geber 2 schleppfehlerfrei
	A105 Position Control / Feedback 2 / Lagless
Diagnosis number:	A105

A106 Drive-controlled Interpolation, Encoder 1

The drive receives a position command value from the control. It is identical with the target position of the travel path. The drive generates (**interpolates**) an internal positon command value path which maintains the maximum jerk, acceleration and velocity values determined by the control. The drive runs without lag to the target position of the travel path.

Encoder 1 means that the position encoder is mounted on the motor shaft (indirect measurement of axis position).

See Function Description: "Drive-controlled interpolation".

A106 attributes

SS display:	AF
Diagnosis:	A106 Antriebsinterne Interpolation, Geber 1
	A106 Drive controlled interpolation/Encoder 1
Diagnosis number:	A106

A107 Drive-controlled Interpolation, Encoder 2

The drive receives a position command value from the control. It is identical with the target position of the travel path. The drive generates (**interpolates**) an internal positon command value path which maintains the maximum jerk, acceleration and velocity values determined by the control. The drive runs with lag error to target position of the travel path.

Encoder 2 means that the position encoder is mounted to the machine axis (direct measurement of the axis position).

See Function Description: "Drive-controlled interpolation".

A107 attributes

Diagnosis:	A107 Antriebsinterne Interpolation, Geber 2
	A107 Drive controlled interpolation/Encoder 2
Diagnosis number:	A107

A108 Drive-controlled Interpolation Encoder 1, lagless

The drive receives a position command value from the control. It is identical with the target position of the travel path. The drive generates (**interpolates**) an internal positon command value path which maintains the maximum jerk, acceleration and velocity values detrmined by the control. The drive runs without lag error to target position of the travel path.

Encoder 1 means that the position encoder is mounted on the motor shaft (indirect measurement of axis position).

See Function Description: "Drive-controlled interpolation".

A108 attributes

SS display:	AF
Diagnosis:	A108 Antriebsinterne Interpol. Geber 1, schleppf.frei
	A108 Drive controlled interpolation/Encoder 1 /Lagless
Diagnosis number:	A108

A109 Drive-controlled interpolation, Encoder 2, lagless

The drive receives a position command value from the control. It is identical with the target position of the travel path. The drive generates (**interpolates**) an internal positon command value path which maintains the maximum jerk, acceleration and velocity values detrmined by the control. The drive runs with lag error to target position of the travel path.

Encoder 2 means that the position encoder is mounted to the machine axis (direct measurement of the axis position).

See Function Description: "Drive-controlled interpolation".

A109 attributes

SS display:	AF
Diagnosis:	A109 Antriebsinterne Interpol. Geber 2, schleppf.frei
	A109 Drive controlled interpolation/Encoder 2 /Lagless
Diagnosis number:	A109

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Indramat