SIEMENS

SIMATIC

Process Control System PCS 7 Library of Driver Blocks for TELEPERM I/O Peripherals

Reference Manual

01/2007
C79000-G8076-C711-04

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well to protect the product and connected equipment. These notices are marked as follows to the level of danger. The notices to ensure your personal safety are additional highlighted in the manual by a warning triangle.

Danger

indicates an **imminently** hazardous situation which, if not avoided, **will** result in death or serious injury.

Warning

indicates a **potentially** hazardous situation which, if not avoided, **could** result in death or serious injury.

Caution

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Caution

used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Notice

Notice used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesireable result or state.

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Warnings

This device and its components may only be used for the applications described in the catalog or technical description, and only in connection with devices or components from other manufactorers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guaranteefull agreement. However, the data in the manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Preface

Description of the Manual

The driver block library offers a selection of programs (blocks) ready to use for common automation tasks.
They provide you with a basis for carrying out such tasks as:

- Measured–value and digital–value acquisition (with monitoring of the validity and message output, if appropriate)
- Analog–value processing
- Output of results via analog or digital output modules

This manual describes the components of this library. It explains the block concept in accordance with which the blocks are structured and applicable. The individual block description provides you with the necessary information to program, set up and maintain the automation software created with it. The information encompasses the brief description of the function (for rapid information), the method of operation and the interface description.

Readers

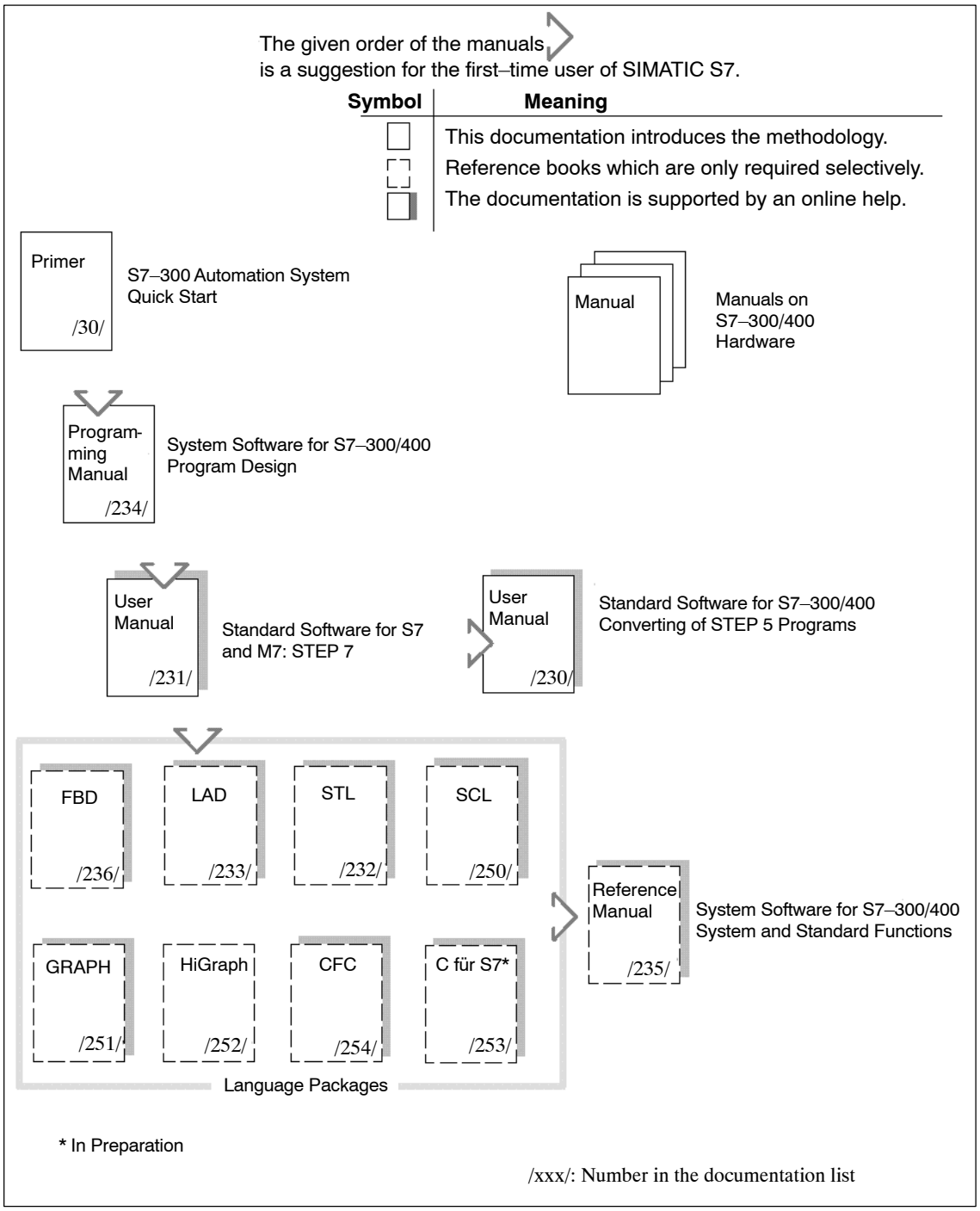
This manual is intended for persons working in the fields of project planning, setting up and service.

Validity of the Manual

This manual is valid for the “Driver blocks library” software, version 1.0.1.

Position in the Information Landscape (S7)

Extensive user documentation, which you should use selectively, is available to help you in configuring and programming a S7 programmable logic controller. The following explanations and the figure below should make it easier for you to use the user documentation.



Title	Contents
Quick Start	The “Quick Start” manual provides an easy introduction into the structure and the symbolic programming of an S7–300/400. It is particularly suitable for first–time users of a SIMATIC S7–300 programmable logic controller.
Programming Manual Program Design	The programming manual provides you with a basic knowledge of the structure of the operating system and of a user program of a S7–CPU. It should be used by the first–time user of an S7–300/400 to obtain an overview of the programming methodology and to base his or her design of the user program on it.
User Manual STEP 7	The STEP 7 user manual explains the theoretical utilization and the functions of the STEP 7 programming software package. The manual provides you, as a first–time user of STEP 7 as well as an experienced user of STEP 5, with an overview of the configuration, programming and starting up of an S7–300/400. When using the software you can access the on–line help, which offers direct support on detailed questions about using the software.
LAD, STL, FBD, SCL Manual[1]	The manuals of the STL, LAD and SCL language packages contain both the user’s guides and the language description. You only require one of the languages to program an S7–300/400, but you can also mix languages within a project, if you wish to. When you use a language for the first time Siemens recommends that you use the manual to familiarize yourself with the methodology of creating a program. When working with the software you can use the on–line help to obtain answers to all your detailed questions on using the corresponding editors/compilers.
GRAPH[1], HiGraph[1], CFC[1] Manuals	The GRAPH, HiGraph and CFC languages provide you with additional possibilities of implementing sequential control systems, state graphs or graphical interconnections of blocks. The GRAPH and HIGraph manuals contain both the user’s guide and the language description. When you use one of these languages for the first time Siemens recommends that you use the manual to familiarize yourself with the methodology of creating the program. When working with the software you can use the online help (exception HiGraph) to obtain answers to all your detailed questions on using the corresponding editors/ compilers.
Reference Manual System and Standard Functions	The S7 CPUs contain system and standard functions integrated in the operating system which you can use when programming. The manual provides you with an overview of the functions and organization blocks available for S7 as well as (for your reference) detailed descriptions of interfaces for use in your application.

1 Optional packages for S7–300/400 system software

Structure of this Manual

This manual is divided into the following groups of topics:

Chapters 1 and 2: Introductory section

- Chapter 1 provides you with information on installing the software.
- Chapter 2 describes the block concept on the basis of an application example. It explains the procedure for selecting the desired blocks as well as the generally valid properties of the blocks. This information is not repeated in the detailed information.
- Chapter 3 describes the driver blocks. These are used to read in process values present at the input modules, with accompanying information on whether the hardware or the process values read in are error–free.
- Chapter 4 describes the communication blocks. With these blocks the communication is realized between S7–CPU and FM456–4.

As a first–time user use the manual as follows:

1. Read the first two chapters before using the software in order to familiarize yourself with the terms used and the theoretical procedure.

2. Read the respective overview sections in the other chapters in order to get to know the tasks solved by the respective block group.

Conventions

References to further documentation are given by using the literature numbers in slashes /.../. The list of literature at the end of the manual provides you with the exact title of the documentation on the basis of these numbers.

Further Support

If you should have any questions on using the software which are not answered in the paper documentattion or in the on–line help, please contact your local Siemens partner.

If you have any questions or remarks on this manual please fill out the questionnaire at the end of the manual and send it to the address given there. Please also enter your personal evaluation of the manual there.

We offer corresponding courses in order to facilitate your familiarization with the SIMATIC PCS 7 process control system. Please contact your regional training center or the head training center in:

D–90327 Nürnberg, Tel. +49 911 / 895 3154.
D–76187 Karlsruhe, Tel. +49 721 / 595 2917.

Contents

Installation

1

Overview

This chapter describes how to install the block library by means of the SETUP program.

In this Chapter

This chapter deals with the following topics:

Section	Describes	Page
1.1	Installing and Deinstalling the Block Library	1–2

Installation Requirements

You require the following software and hardware in order to run the software:

- Windows NT operating system
- Programming device or PC with
  - Prozessor 80486 (or higher) and
  - RAM memory configuration $\geq$ 128 Mbytes
- Color monitor, keyboard and mouse, which are supported by Microsoft Windows NT.
- STEP 7 Standard software
- Hard disk with 4 Mbytes free memory
- At least 1 Mbyte of free memory on drive C: for the setup (setup files are deleted after completion of the installation).

1.1 Installing and Deinstalling the Block Library

Overview

The software supplied includes a SETUP program which installs the block library automatically.

The installation is menu-guided. The SETUP program is called up with the standard procedure under Windows NT for installing software.

The setup program installs the driver blocks for the PLC into the PCS 7_TM \ PCS 7 Driver Blocks library of the SIMATIC S7 catalog.

If a Software Version has already been installed ...

If the installation program notes that the program has already been installed on the target system, a corresponding message is displayed and the following alternatives are offered:

- Cancel installation (in order to deinstall the previous software version under Windows NT and then to restart the installation) or
- Continue installation and thus overwrite the old version with the new one.

In order to have a clear software structure, Siemens recommends that you deinstall any existing older versions before installing the new one. Simply overwriting an older version furthermore has the disadvantage that, when you deinstall at a later data, any parts of the older version which may still exist are not removed.

Installing and Deinstalling STEP 7 Software

For a detailed description on how to install and deinstall the STEP 7 software refer to Section 2.3 of the STEP 7 documentation /231/.

Utilization in CFC

The manual ”CFC for S7 and M7, Graphical Interconnection of Technological Functions” provides information on how to use the blocks in CFC.

Block Concept

2

Description of this Chapter

This chapter presents the block concept.
Here you learn what a block is and how you can use it to solve automation tasks.

In this Chapter

This chapter deals with the following subjects:

2.1 Overview

Purpose of Blocks

The PLC-specific part of configuring a system has an influence on both the hardware and the software. The latter can be programmed or structured using existing software. Structuring consists of combining individual elements into an overall structure which is to fulfil an automation function defined by you. The structural elements which can be used, called blocks afterwards, are supplied in a collection called ”Block library”.
When you use such blocks you can concentrate completely on the automation task by simply adapting ready-to-use typical partial solutions to your requirements. The blocks are supplied with a description which details the interfaces and the function of the individual blocks.
This description answers any questions you may have on:

- Function (which task does the respective block carry out?)
- Results supplied by the block
- Parameters required by it to this purpose
- Conditions and requirements for its use and error handling

The blocks do not require a special configuration tool. They can be used simply through the SIMATIC S 7 editors (CFC, SFC, STL, LAD, SCL).

What is a Block?

In order to understand the block concept the block can be regarded as an object having the following features:

- It has a data interface, called an I/O bar in the description. This is structured as follows:
  - Inputs (**I**n): Data which can on the one hand be configured (depending on the plant or function), and on the other hand can have the results of other blocks applied by interconnecting outputs.
    These input values are read by the block program and processed further. In graphical CFC display mode these are positioned on the left.
  - Controllable inputs (**InO**ut): Interacting inputs which be written (activated) by the OS or SFC and to which the block program can write back. They are displayed in CFC as inputs.
  - Outputs (**O**ut): Storage for data which are written by the block program as a result. In graphical CFC display mode these are positioned on the right.
  - Internal parameters which are used by the block program as the memory for interim results (are not displayed in CFC).
- The block has a **program**, which executes the parameters of the I/O bar mentioned above. Generally the values present at the inputs are read, compared, evaluated logically or arithmetically.
  The result is written to the outputs. The resulting output values can be fetched by other blocks.
  The results corresponds to the function which the block is to fulfil. It is provided in numerical form (for example in REAL or INTEGER data

type) or as Boolean information (1/0 or TRUE/FALSE). In addition Boolean indicators with respect to its validity are applied to the outputs. These can be scanned by other blocks in order to avoid an invalid end result in overall processing.

- The interface of the blocks consists of three information groups. Depending on the application it can be a PLC, ES and/or OS block. The information groups include, inter alia the I/O parameters of the blocks and their attributes, the operating and message texts as well as the references between the objects. As a rule the information of the three representations have a neutral predefinition. Adapting/changing is carried out in the context of the ES using the comfortable tools described there (graphical structuring with CFC or SFC, input with checking in block-specific configuration masks, etc.), or in the OS using its tools. When using the block under the standard STEP 7 project planning the blocks must be adapted by using its tools.

Block Diagram of a Block

The features described above can be summarized as a graphical representation (see Figure 2–1, CFC representation). The parameters of the I/O bar are provided with a name (in the example INP_1, INP_OP_1, etc.). In the actual block description the name indicates the function/meaning of the input/output. There are I/O parameters which are generally valid as well as program sections which, as a rule, occur in all the library blocks.

- **Block type:** Designation (or abbreviation) of the block function as, for example, the symbol table (for example ADD_P).
- **Block number:** Number of the instance DB. So-called instance DB's must be created in order to use the blocks. When CFC is used, this number is assigned by it. If you use standard STEP 7 tools for programming, you must stipulate this number yourself. The instance DB is used as the storage for the individual task-specific I/O bar.
- **Comment:** Block comment (for example, "addition")
- **Execution data:** In order to be executed the block must be called from an organization block (OB). In CFC project planning this call is also determined by the scan rate of the so-called runtime group (see CFC manual). The block is logged on together with others within a runtime group and this, in turn, in an OB. The runtime group is only executed at every n th OB start. In graphical CFC display mode the OB as well as the serial number of the call within the OB are displayed.
  When planning a project with standard STEP 7 tools, you must enter the block call in the relevant OB.

- **I/O bar:** Contains the inputs (with the abbreviated data type, for example BO for BOOL) on the left and the outputs on the right. The input/output points listed below always exist in CFC display (QERR, however, only in FBs).
  - **EN** (enable): Enable input. It only exists in graphical CFC display mode. This input allows you to activate/deactivate the execution of the block. This means that the block can be called up conditionally in the execution code of the PLC level if it has been enabled with EN=1. When planning a project with standard STEP 7 tools, this effect must be achieved by using conditional jump commands which depend on an enable memory bit.
  - **ENO:** corresponds to the binary result bit (see STEP 7 description). ENO=1 indicates a valid result conforming to the result. If errors occur which are recognized by the operating system and/or by the error-handling function in the block program, ENO=0 signals that the result is invalid. You can use this information to switch over to other values (for example standard values) and, if appropriate, to send a signal to the OS.
  - **QERR:** Corresponds to the inverted ENO value. QERR=1 indicates an invalid value. In contrast to ENO which (as a binary bit result) has to be scanned immediately after the block has been executed (since it is not stored), the QERR of the block can also be scanned later. The QERR output is stored in the block (instance DB).
  - **EN_MSG:** (Enable Messages). The default setting for this switch is 0, to avoid unnecessary messages during commissioning. EN_MSG has to be set to 1 absolutely for those drivers, which are monitored via display blocks (OCX). Otherwise no status transfer will happen.
- **Function:** The program section which acquires the normal function-specific inputs (EINx) and/or controllable inputs (BEDEINx), executes them in a form specific to the respective block and writes the result to the outputs (AUSGx). The inputs and outputs can be of differing data types (for example BOOL, REAL, etc.) depending on their meaning (for example switch, measured value, etc.). The function is described in the documentation. It is not displayed in CFC and can also not be viewed in the STL editor (protected block code).
- **Error handling:** The program section which has the task of verifying the validity of the input parameters and, in case of errors, ensuring that the outputs have a defined status. The existence of an error is generally indicated by the ENO or QERR outputs (see below). Their ability to be displayed is the same as that described in the “Function” section.

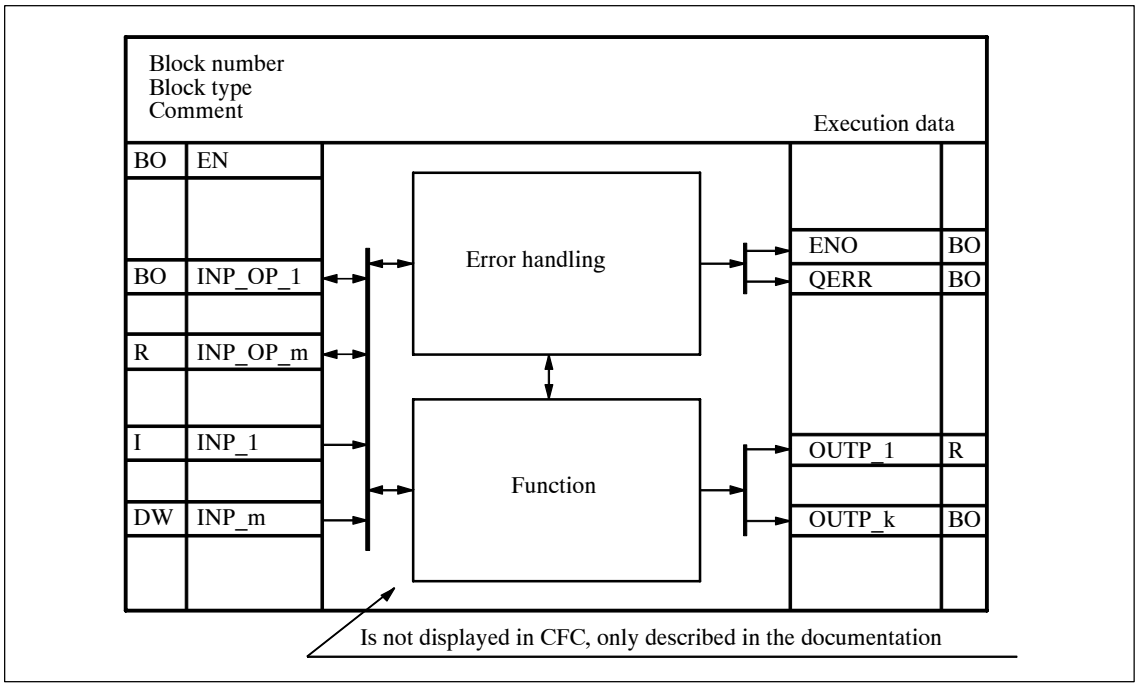


Figure 2-1 Block diagram of a block, similar to the CFC display.

How to Find the Suitable Block

The blocks of the present library are classified on the basis of their function features into the following groups:

- Operating blocks for operating and monitoring via OS. These blocks are required to transfer OS-end operations (via the OS block) to the PLC block and to receive the feedbacks from the operations accepted at the PLC end.
- Alarm blocks used to monitor digital signals and to transmit configured messages to the OS. The various process events, which are indicated by changes in Boolean variables, are monitored by alarm blocks and are signaled to the OS.
- Function blocks for general arithmetic, open-loop and closed-loop control tasks. These are used to solve the regular tasks of the PLC.
- Converter blocks which convert the various data types in order to allow the exchange of data. Values can only be transferred between outputs and inputs of different data types in CFC (for example, from a REAL value to an INTEGER value) after they have been converted.
- Driver blocks to exchange information between the process signals (via I/O modules) and the parameters of the I/O bar of other blocks. Through these blocks you can handle the process values in the physical unit desired by you or react in a defined manner to faults occurring in process-data processing.

Convention for Naming I/O Bars

This section lists the common abbreviations used as names for the inputs and outputs of the blocks listed above. These are intended to help you identify the meaning of the input/output parameters. As a rule the designation of a parameter consists of an abbreviation of the corresponding English term, limited to a maximum of 8 characters. The character "_" can also be used as a separator, provided the maximum length of 8 characters is not exceeded. An exception is formed by the designations of controllable inputs, which are represented differently (graphically) anyway in the OS block. The middle column of the table lists the preferred data type which is to be used for this abbreviation. No data type is stipulated for analog parameters here (they can be of data types REAL, INTEGER, etc.).
In the column Meaning the typical use of the block in/outputs is explained.

Table 2-1 Naming Convention for I/O Bars

Abbreviation	Parameter of Data Type	Meaning
Q	BOOL	Output Bool
Q_	BOOL	Output Bool; for example in order to differentiate between an input or a REAL value
_HLM		High Limit
_LLM		Low Limit
_ALM		Alarm
_WRN		Warning
_H_ALM		high alarm
_L_ALM		low alarm
_H_WRN		high warning
_H_TOL		high tolerance
_L_TOL		low tolerance
_ON	BOOL	Switch ON; default 0; activate function
_OFF	BOOL	Switch OFF; default 1; deactivate function
_SEL	BOOL	Selector; Switch function
I	BOOL	Input Bool; meaning cannot be specified more exactly
I_	BOOL	Input Bool; for example to differentiate between other inputs or REAL values
IN	ANY	Input ANY without Bool; meaning cannot be specified more exactly
OUT	ANY	Output ANY without Bool; meaning cannot be specified more exactly
_OP	IO	Operation; Extension for all operable I/O variables, even if the name is longer than 8 characters!
OP	BOOL	Operation
MON	BOOL	Monitoring

Table 2-1 Naming Convention for I/O Bars

Abbreviation	Parameter of Data Type	Meaning
_		Separator used to facilitate reading. If the name is too long, the underscore can be dropped
MAN		Manual value
AUT		Automatic value
INT		Internal value
EXT		External value
_RE_		Remote; when there is a choice between the computer and for example the I/O (for example on the case of controller variables)
SP_		Setpoint
PV_		Process variable; measured value or process variable
LMN_		(Loop) manipulated variable; manipulated variable or analog output signal to be output
DISV_		Disturbance variable
ER_		Error; error signal, fault
GAIN		Kp parameter of the closed-loop controller
TI		Integration value at an integrator or additive control algorithm
TD		Differentiation value at a differentiator or additive control algorithm
TN		Integral-action time at a multiplying control algorithm
TV		Derivative-action time at a multiplying control algorithm
TM_LAG		T1 Time lag

Convention for Naming I/O Bars of TM Blocks

The inputs and outputs of the TM I/O driver blocks are different to the convention described above. For the reason of compatibility, the old parameter names were retained as well as possible.

Solution Method Using Blocks

Solving a concrete automation problem requires that you are familiar with the process and the data interfaces/measuring points. This process can be illustrated in simplified form in Figure 2–2. As a rule the solution must answer the following questions:

- Which modules are suitable for reading or outputting the required process signals?
  - You can determine these by referring to the respective manual of the PLC used. The modules are configured by using the standard STEP 7 tools.
- Which driver blocks are used for these modules?
  - The ”Driver blocks” section of this description includes an assignment of the drivers to the modules. You can then read about the required structure of the selected drivers in the same section.

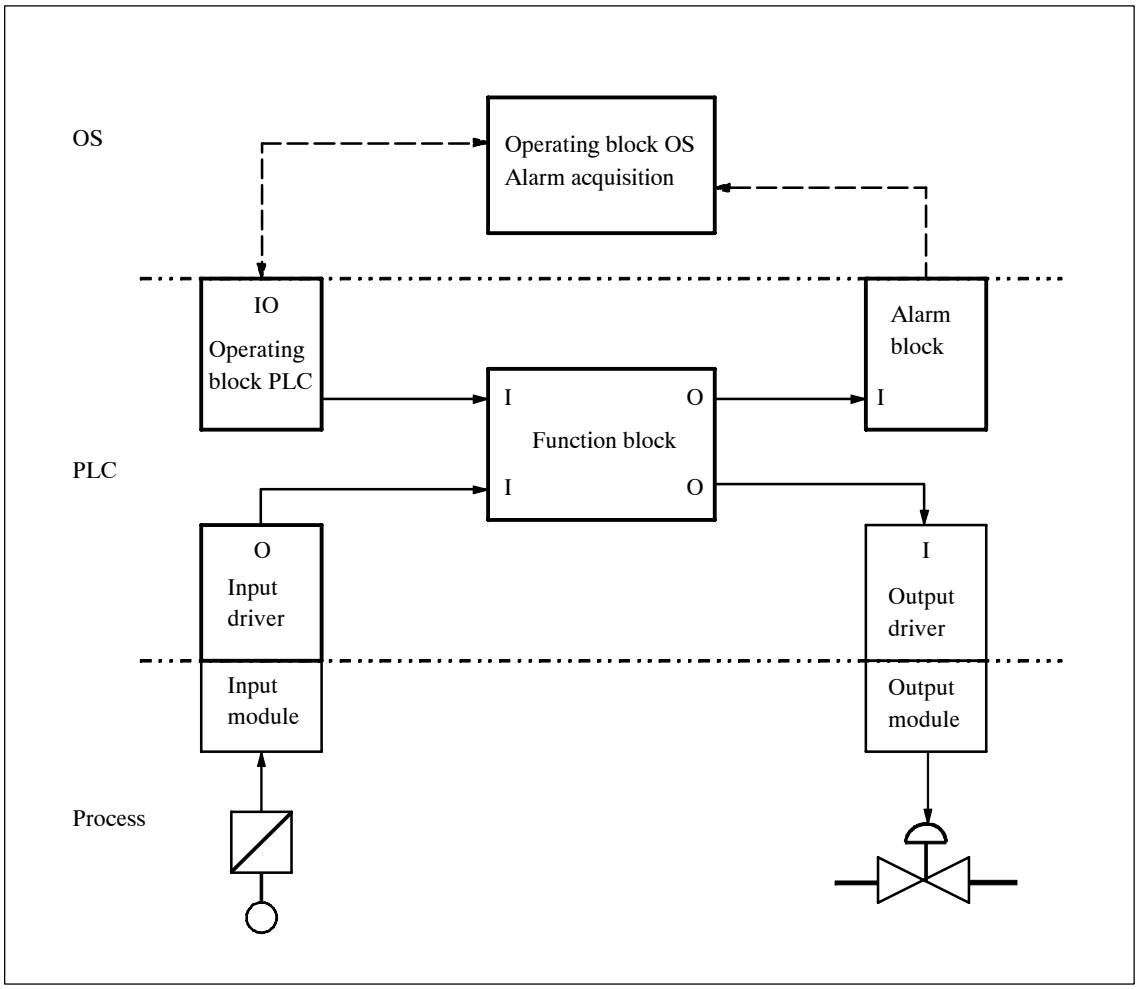


Figure 2-2 Solution with blocks, information path

2.2 Application Example

Task

The procedure described above is to be explained in more detail by means of a concrete task.
A simple temperature control unit is to be created. The temperature range is from 0 to 200 °C. The setpoint range of 140 to 160 °C, is to be set by the operator. The closed-loop controller is only operated in automatic mode.
If a temperature of 170 °C is exceeded, an alarm message is to be transmitted to the OS.

Block Selection

Let us assume that the PLC hardware has already been configured by means of STEP 7 tools, meaning that it is already known which analog input or output modules are to be used, in which rack and in which slot they are installed and to which module channel the respective temperature sensor or actuator (control valve) is connected.
Under this assumption the software can be structured under CFC.
If, however, you deploy the blocks under simple STEP 7 tools (STL), you must program the interconnections, parameter assignments, assignments of various memory bit as well as calls of the blocks in the corresponding OBs.
In both cases you do not have to program and debug the various functions used.

- **Driver use**
  - Block TM_AE is selected from the ”Driver block” section to read the temperature (the assumed analog input module is supported by it).
  - Block TM_AA is selected from the ”Driver block” section to output the manipulated variable of the closed-loop controller (the assumed analog output module is supported by it).
  - Note module number of the modules used (these were defined when configuring the hardware with STEP 7 tools in DB1), the channel number and the measuring range of the connected process signals. These data must be used when structuring the individual drivers.

Configuring the Blocks

Although the description of the further procedure is the same for CFC configuring and STEP 7 programming, the concrete handling differs, depending on the configuring tool used.
The following sections describe the procedure when using CFC for this task (as the standard tool for planning projects on industrial processing plants).
For details on using CFC or on project management, please refer to the CFC manual.

- Create a CFC chart in the chart container of your project. Use a name which corresponds to the task (for example, TICA_123).
- Define one instance for each of the block types selected before (in our example one each of TM_AE, TM_AA, TM_KOM, TM_KST, REGLER, LIMITS_P, OP_A_LIM and MESSAGE block).

- Log all the instances on in a common watchdog interrupt OB for processing (CFC key word ”Runtime properties”. When defining the call sequence of the blocks from the OB, observe the general rule ”Retrieval –> Execution –> Output”.
  In order to define the sequence, you must first define for each block where it gets its parameters from. As a rule it must be installed after all other blocks from which it obtains interconnected values. bezieht.
  In our example this means:
  TM_KST, TM_AE, OP_A_LIM, REGLER, LIMITS_P, MESSAGE, TM_AA, TM_KOM.

Notice

Blocks which also have to be installed in other OBs (for example driver blocks), are installed automatically by CFC at those points. If you use simple STEP 7 programming tools (STL or SCL), you have to program the OBs required and call the respective same instance of the function block in each OB.
The required OBs can be found in the documentation at the respective block description as well as in the ”Technical Data” appendix.

- Interconnect the outputs of the blocks which supply values with the corresponding inputs of the blocks which process these values further.
- At each instance assign parameters to the inputs whose initial values have to be adapted to concrete process requirements. In our example this applies at least to the following parameters:
  - TM_AE: BGNR, KNR
  - OP_A_LIM: U_HL, U_LL
  - CONTROL: Adapt GAIN, TN, TV and TM_LAG to the controlled-system behavior
  - LIMITS_P: V_HL
  - MESSAGE: Message text for OS
  - TM_AA: BGNR, KNR
- Interconnect the outputs to the inputs in accordance with the diagram in Figure 2–3.
- Enable the I&C messages of the blocks TM_AE and TM_AA via EN_MSG.
- Generate the PLC code and load it into the PLC. Debug the structure using the online debugging tools.

Notice

Our simple example did not provide for a reaction to error messages from the individual blocks. Our example could be extended by inserting SEL_REAL blocks at various points in the structure. These can be interconnected to the error outputs of the blocks (ENO or QERR) in order to provide a safety/substitute value for further processing.

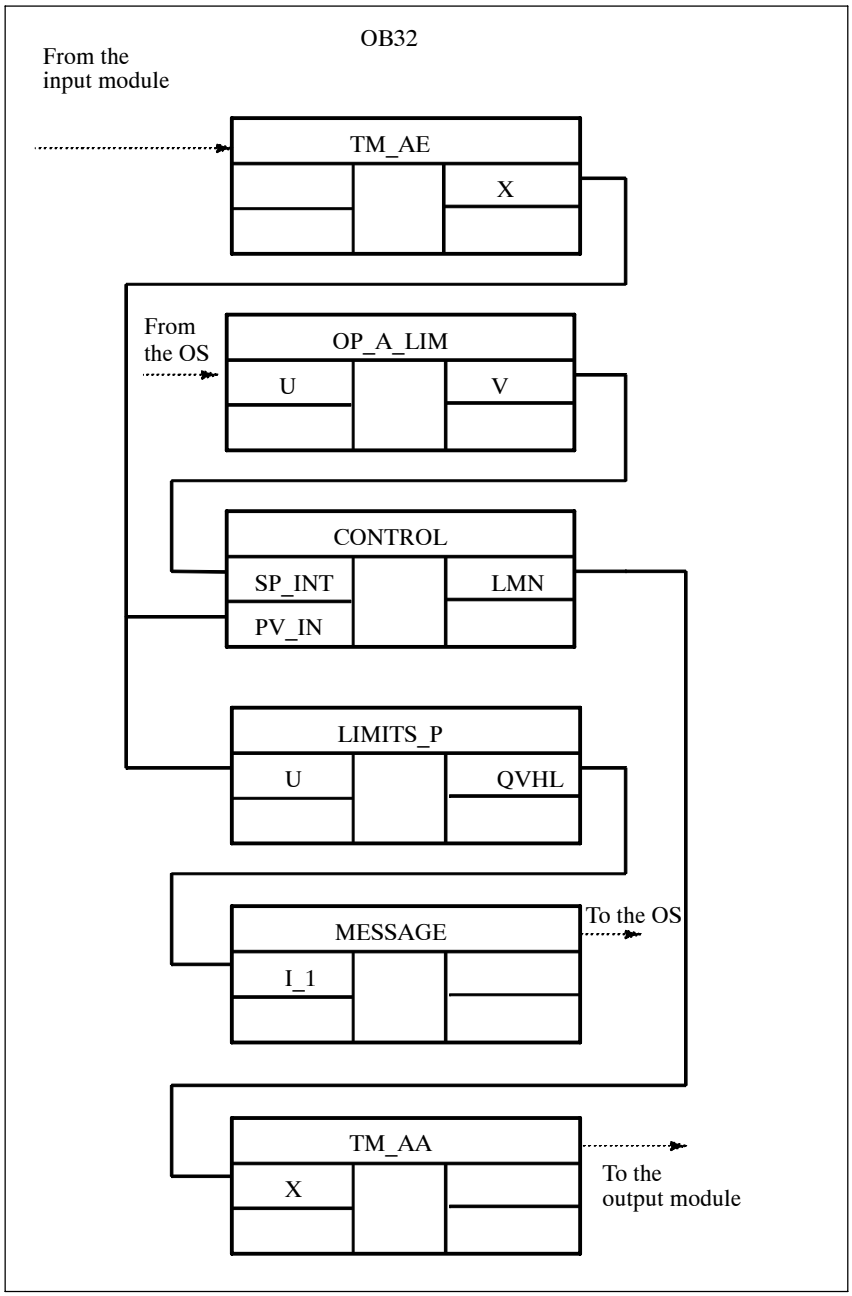


Figure 2-3 Interconnection example

2.3 SAMPLE: Template

Introduction

The following example explains the general form of the description of a block. This will help you to find the information desired rapidly when reading the descriptions of the individual blocks.

Title

SAMPLE is the type name of the block and must be unique within the project. **Template** is the brief description of the task/function of the block.

Type/Number

FB x

The abbreviation for the block type (in our example **FB**) can be:

- FB Function block
- FC Function
- ES block which is handled as such in the ES (CFC chart). When transferred to the PLC only the corresponding inline code is inserted into the calling OB. STEP 7 tools do not identify it as a block.

x Block type number

Calling OBs

This provides details on the organization blocks into which the written block is to be installed. When using CFC you only have to install it in the normal OB for the actual task (while observing the principle ”Read–>Process–> Output”). Installation in the remaining OBs is carried out by CFC, which creates the required OBs while compiling.
Check this while commissioning, since you could by mistake remove the block while installing/removing it in the execution sequence (while changing the sequence, etc.).
If you use the blocks under STL or SCL, you have to program these OBs and call the instance of the block in them.

Function

This describes the function of the block briefly.
In the case of complex blocks further information is provided in the Method of operation section.

Method of Operation

Further information on the function of the individual inputs, operating modes, time sequences, etc. You should know the contexts described here in order to use the block effectively.

Error Handling

Errors are indicated in the CFC chart at the Boolean block output **ENO**. The value corresponds to the **binary result bit** (binary result in STEP 7 STL after the block has been terminated) or to the **OK** bit (in SCL format) and has the following meaning:

- ENO = binary result bit = OK = 1 (TRUE) –> The block result is OK.
- ENO = binary result bit = OK = 0 (FALSE) –> The result or the required conditions for its calculation (for example, input values, operating mode, etc.) are invalid.

In the case of FBs the inverted binary input bit is additionally stored in the **QERR** output of the instance DB.

- QERR = NOT ENO

Notice

The following applies when programming in STL:
– ENO / The binary result bit can only be evaluated immediately after the block has been executed, since it can be influenced by the subsequent STEP 7 instructions. It is the typical error indicator of the FCs or ES blocks.
– QERR is stored in the instance DB of an FB and can also be scanned later.

Error indication arises by two independent means:

- The operating system recognizes a processing error (for example: value overflow, called system functions supply an error code with binary input bit = 0).
  This is a function of the system and is not mentioned expressly in the individual block descriptions.
- The block algorithm checks values and operating modes for their functional legality. These error cases are documented in the description of the block.

The evaluation of the error indication can be used, for example, to generate messages (refer to the section on alarm blocks) or to utilize substitute values for invalid results.

The error output QPARF indicates a parameterization error (permissible range of values exceeded). If TRUE, no processing of the block function is done.
The output BGF indicates a hardware fault (module not plugged, module faulty, etc.). The detailed cause is displayed via I&C alarm messages.

Start Characteristics

A difference is made between:

- Initial start
  The block is called for the first time from the OB in which it has been installed. As a rule this is the OB in which normal, process-specific processing occurs (for example: the watchdog interrupt OB).
  The block enters the state corresponding to the input parameters. These can be initial value (refer also to the I/O bar) or values which you have already configured, for example in CFC. The initial-start behavior is not described separately unless the block deviates from this rule.

- Startup
  The block is executed once during a CPU startup. This ensures that the block is called up from a start-up OB (where it is installed automatically by the ES or has to be installed manually by using STEP 7).
  In this case the start-up characteristics are described.

Time Characteristics

A block with these characteristics must be installed into a watchdog interrupt OB. It calculates its time constants/parameters on the basis of its sampling time (the interval between two consecutive cyclic processing steps).
When configuring in CFC on an ES the sampling time is also defined through the scan rate of the so-called runtime group. This ensures that the block is not executed during every OB run.

The time characteristics are only mentioned if the block indicates them.

Message Characteristics

A block having these characteristics signals events to the primary OS. If they exist, the parameters required to generate messages are documented.
Block not having message characteristics can be complemented by additional alarm blocks. A reference to the message characteristics in contained in the description of the individual blocks capable of signaling.

Operating and Monitoring via OS

If the block has operating and monitoring possibilities on OS, the corresponding OS components and their structuring are described.
Other block types can be complemented by these, thus enabling them also to be operated.

Starting Up

The individual blocks only contains deviations from or supplements to the general rules. These general rules are explained below.
The following points must be checked or set by using ES debugging means in order to ensure that the block can fulfil its assigned function:

- PLC is in RUN mode.
- The block is called in the correct OB:
  - With time characteristics, in a watchdog interrupt OB (for example OB32).
  - With start-up characteristics, additionally in the start-up OB (OB100).
  - Driver block, additionally in the interrupt OBs specified there.
- The enable input is set (EN=1, only for CFC configuration).
- The primary runtime group of the block is enabled (only CFC).
- The block does not indicate an error (ENO=1 or QERR=0). If this is not the case, eliminate the cause of the error indication (this is described in the error-handling section).
- The results/output values correspond to the input values and the set operating modes (the block functions correctly).

I/O Bar

The I/O bar provides the data interface of the block. In addition you can transfer data to the block and fetch results from the block.

Table 2-2 I/O bar of the SAMPLE block

Element	Meaning	Type	Default	Kind	Attr.	O&M	Valid values
EN	Enable	BOOL	1	I	Q		
U1	Addend 1	REAL	0	I	Q	+	> 0
etc.							
ENO	Test output 1: Processing o.k.	BOOL	0	O			

Table 2–2 lists all the input and output parameters of the block type, which the user can access with the configuration tools. Elements which can only be accessed from the algorithm of the block are not listed (so-called internal variables).
The columns have the following meaning:

- **Element** = Symbolic name of the parameter as it is shown in the chart display of the CFC. Due to the SCL syntax it can deviate from the name usual for its function.
- **Meaning** = Function (possibly brief description)
- **Type** = Data type: The following data types occur in the I/O bar:

Table 2-3 Data types in the I/O bar

Data Type	Bit length	Range	Application
BOOL	1	0/1 or FALSE/TRUE	Switches and displays
BYTE	8	16#00 to 16#FF	Drivers, subnet IDs
WORD	16	16#0000 to 16#FFFF	Drivers, rack numbers
DWORD	32	16#00000000 to 16#FFFFFFFF	Batch blocks, Batch IDs
INT	16	–32738 to 32767	Selection parameters
DINT	32	–2147483648 to 2147483647	Counter parameters
REAL	32	–3.402822E+38 to –1.175495E–38 or 1.175495E–38 to 3.402822E+38	Process values and their calculated results
STRING[n	8 x (n+1)	Characters (texts)	BATCH flexible blocks with dynamically-assigned texts
ANY	320	Interconnection information (pointers)	Alarm blocks, interconnection input for any secondary values

- **Default value** = Value of the parameter, if it is not changed by configuration or by the algorithm.
- **Type** = Kind of access of the block algorithm to the parameter:
  - I = Input; the algorithm reads the parameter.
  - O = Output; the algorithm writes the parameter.
  - IO = Input and output; the algorithm reads the parameter and, if appropriate writes a different value back (typical for OS-operable parameters).
- **Attributes** = Additional features of the parameter.
  Input parameters can, as a rule, be configured.
  Output parameters cannot be configured and can be transferred via an interconnection to an input of the same data type.
  Additional properties (attributes) are indicated as follows:
  - Q = The parameter can also be interconnected in CFC.
  - B = The parameter can be operated via the OS.
  - U = The parameter is invisible in CFC display and is configured automatically by the ES. It must be configured manually by the STEP 7 user, if no ES is used.
- **Valid values** = Additional limitation within the data-type range.
- **Operating and Monitoring** = The parameters marked with a ”+” can be operated and monitored from the corresponding display block of the OS.

Note

The input EN (1: Enable processing of the block) as well as the output ENO (0: Error in the block processing or block not enabled) only exist in the CFC display (applies to all the blocks in the library). They are therefore no longer displayed in the I/O bar.

Notice

An input parameter which has the attribute Q can be interconnected.
If it must be possible to operate it with OS means, then a corresponding operating block must be interconnected. It can then obtain values either by operation or through the interconnection and transfer it to the input mentioned. If an interconnected parameter is nevertheless operated directly, it is overwritten by the interconnection when the block is processed the next time.

2.4 Display Blocks (Overview)

Prerequisites

In order to use the display blocks, you require a system with WinCC and the "Basis Process Control" control system package.

The display blocks are designed for graphics boards with a resolution of 1280 x 1024 pixels.

Purpose of Display Blocks

For the operator the display blocks form the window to the PLC blocks with which a system is automated. Every display block has exactly one PLC block assigned to it.

The display blocks offer the user the following functions:

- Operation of the process / Configurations
- Monitoring of the process

Advantages of Display Blocks

The display blocks offer the user the following advantages:

- Easy to learn
- Simple project planning through defined interface between display block and PLC block
- Simple handling thanks to few operating rules
- Structured display of the process
- Conforms to WinCC and Windows

Display Forms of the Display Blocks

The display blocks can be displayed in two different formats. You can choose between the following views:

- Group display (Control field)
- Loop display

Group Display

The group display offers a detailed view of the respective PLC block.

Loop Display

The loop display shows an overall view of all the bodies of a display block.

2.5 Planning and Programming Display Blocks

Overview

This section shows you how to plan display blocks. The display blocks are realized as OLE Control units and are installed under WinCC by means of the object palette.

Planning the Display Blocks

The display blocks are planned in a Graphics Designer window. Proceed as follows:

- Select and position the display block
- Assign general properties

Selecting and Positioning Display Blocks

Proceed as follows:

- Select the ”OLE Control” object from the ”Smart Objects” object menu.

  Result: The cursor has the extension ”OCX”.

- Position the cursor and press the left-hand mouse button at the desired position on the screen and drag the mouse diagonally while holding the left-hand mouse button. Release the mouse button.

  Result: A rectangular window is displayed and an “Ole Control Insert” dialog box is opened.

- From the dialog box select the desired display block and confirm your choice by clicking on the OK button.

  Result: The selected display block is inserted into the rectangular window.

- Use the left-hand mouse button to position the block window at the desired location in the work area.

Assigning General Properties

Double-click in the block window to open the properties box of the display block.

Configuration field. This consists of:

- Tag name (measuring point name, can be masked or unmasked)
- Operating authorization: Here you give the operating authorization for parameter groups as described at the block.
- Language: Here you select the language, in which the static texts are displayed.

Adapting the Size of the Graphics

You can adapt the size of the graphic in the graphics display box.

The size of the graphics preview box can be changed by entering values in the ”Width” and ”Height” boxes. The values are entered as pixels. Confirm the values entered by clicking on the ”Apply” button.

You can change the size of the graphics within the graphics preview box by grabbing the rectangular graphics at the edges or corners and dragging the mouse horizontally, vertically or diagonally while keeping the left-hand mouse button pressed.

If several graphics overlap in the graphics preview box, the graphic is displayed completely whose assigned parameter is uppermost in the parameter list in the configuration box. Covered graphics can therefore be displayed completely by moving the assigned parameter to the top of the parameter list. The parameters can be moved by dragging with the mouse.

Removing the Assignment of Graphics

Proceed as follows to remove the assignment of a graphic to a parameter:

Point on the corresponding graphic in the configuration box and open a dialog box by clicking on the right-hand mouse button. Click on ”OK”. The graphic is removed from the configuration box and assignment deleted.

2.6 Operating and Monitoring with Display Blocks

Overview

This section shows you how to use the display blocks to change process values and parameters and monitor the process.

Where is Operating Carried Out?

The operating boxes (input boxes) are displayed as boxes with a white background. The boxes with a gray background are purely information boxes and cannot be operated.

How to Operate

In order to exclude wrong operation as far as possible, process operation controls and parameter changes always need to be confirmed by the operator (two-stage operation). The entered value is not written to the corresponding input of the PLC block until it has been confirmed (exception: stepping mode).

Proceed as follows for operation/configuration:

- Open the dialog box for entering the value by
  - Selecting the corresponding panel in the control field.
- Enter the new value in the operable box or click on the % buttons.
- Click on the OK button.

  Result: The software checks whether the value is permitted. If the upper or lower limit is exceeded, a warning box is displayed. If the value lies within the limits, it is written to the PLC block. If a bar is displayed, it adapts itself to the new value.

The dialog box is closed and the value is not written to the PLC block if the ”Cancel” button is activated or if the operation monitoring time of 15 s is exceeded.

In stepping mode click on the buttons provided in the dialog box. The value which has been changed by the corresponding percentages is written into the PLC block without confirmation. After the stepping buttons have beenactivated, you can close the dialog box by clicking on the ”Cancel” or ”OK” button.

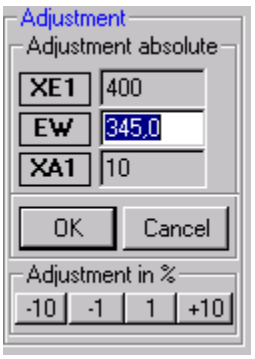


Figure 2-4 Display example of a dialog box

Assignment to the Block Parameters

The operable and monitorable boxes in the various bodies of the display blocks have a unique assignment to the input and in/out parameters of the PLC blocks. This interdependence is represented in the sections on the individual PLC blocks.

Authorization to Operate

Operator intervention in process values and the changing of parameters is only possible with a certain user authorization. The authorization levels are contained in the login of the respective user and are assigned in WinCC.

The display blocks use up to three authorizations levels controlled by parameters.
They are defined at configuring the display blocks.

The assignment of the authorization levels is described at the individual display blocks.

Monitoring

The values in the PLC block which are relevant for operating and monitoring are shown in the display block in the various bodies. Various forms, such as analog values, bars, curves, etc., are available for displayed values.

The upper and lower limit can be set. The ”Limit” body only represents the limits graphically and cannot be operated. The upper and lower limits of the objects can only be set by entering values in the corresponding windows, not however by dragging with the mouse.

Analog Value Display

The analog values are displayed as floating-point values as follows:

- Positive values: Max. of five digits and decimal point
- Negative values: Negative sign, max. of four digits and decimal point
- Overflow: grey
- Leading zeroes: are suppressed
- Invalid values: ”*****” (for example PLC failure)

Authorization to Monitor

If an operator has the authorization to operate a unit, this automatically entails the right to monitor all the display blocks belonging to this unit.

Logging of Operator Interventions

Every process operation control/configuration is logged by the WinCC signaling system. The following values are transferred to the signaling system:

- Time of the operator intervention (date, time)
- Alarm type
- Incoming signal
- Parameter name
- Previous value
- New value
- Batch designation
- Measuring point identifier
- Area
- Batch name
- Operating text
- Name of the logged operator
- Unit

Driver Blocks

3

Description of this Chapter

This chapter describes the driver blocks.
It tells you how they can be used with corresponding hardware to read process signals into the PLC or output them from the PLC.

The driver blocks

- Transfer process data between the I/O peripherals and the arithmetic blocks
- Supply diagnostic data on the addressed I/O

In this Chapter

This chapter deals with the following subjects:

3.1 Overview

Purpose of Driver Blocks

The S7 CPU conceals the hardware dependence of access to the I/O peripheral and allows direct access to the I/O peripheral.
Process instrumentation and control systems place other requirements on signal processing. This also includes test information for every hardware signal such as module/channel errors.
In order to fulfil these requirements, the library offers driver blocks which implement the interface to the hardware including the test functionality.

Module Assignment

The table provides an overview of the drivers with the corresponding modules.

Table 3-1 Overview of the driver blocks with the corresponding modules

FB block No.	Block type name	Module designation (MLFB Number)	Corresponding module
301	TM_BEI	6DS1 601/602/615	Binary input modules
302	TM_BAU	6DS1 603/604/605	Binary output modules
303	TM_BU8	6DS1 620/621	Binary input modules, 8 binary values
304	TM_BU16	6DS1 600	Binary input module, 16 binary values
305	TM_AE	6DS1 700/701/703/713/ 730/731/321	Analog input modules
306	TM_AA	6DS1 702/321	Analog output modules
307	TM_E110	6DS1 310/601/602	Binary input modules for S5–110A linking
308	TM_A110	6DS1 310/321/603/604/ 605	Binary output modules for S5–110A linking
309	TM_DZ	6DS1 613	Proportioning counter module
310	TM_ZE	6DS1 607	Metering pulse input module
311	TM_EG	6DS1 504/505	Open-loop control module
312	TM_EK	6DS1 501/503	Open-loop control module for actuator (valve)
313	TM_EU	6DS1 500/502	Open-loop control module for motor
314	TM_BRBK	6DS1 717	Binary arithmetic module, coordination
315	TM_ABR	6DS1 717/720	Binary arithmetic module, analog input/output
316	TM_TVB	6DS1 717	Binary arithmetic module, partial subgroup control and preselector control
317	TM_MSB	6DS1 717	Binary arithmetic module, open-loop control functions
318	TM_RK	6DS1 400/401	Closed-loop controller module, single-channel
319	TM_RZ	6DS1 402/403	Closed-loop controller module, two-channel, input
320	TM_RZA	6DS1 402/403	Closed-loop controller module, two-channel, output
321	TM_S5KE	6DS1 333	Interface module for S5–PLCs, receiver
322	TM_S5KS	6DS1 333	Interface module for S5–PLCs, Transmitter
323	TM_MELD	6ES7961-1AA00-0AC0	Cabin I&C messages

The driver block requires the following information from its corresponding module:

- **Module number**
- **Channel number**. It corresponds to the channel number in the module. Numbering begins with ”0”, both for the module and for the driver. This is configured at the **KNR** input of the driver.

The driver tests the validity of the configured module and channel number. This test is carried out during the startup and when the configuration is changed.
If the test is negative, the output QPARF (parameter assignment error) is set and no further I/O access is carried out until this state is corrected.

Module Test / Startup

The following utilities are offered by SIMATIC S7 for module testing:

Table 3-2 SIMATIC S7 utilities for module testing

OB	Event	Remark
OB40	Hardware interrupt	Is accessed when a module capable of interrupting triggers an interrupt (only relevant for common interrupt module 6DS16..).
:		
OB47	Hardware interrupt	as for OB40 (see above)
OB100	Cold restart	Is accessed when a cold restart is required.

Notice

The OBs listed in Table 3–2 must be loaded in the PLC. Otherwise it will call the respective OB when one of the triggering events occurs. If the OB is not available, the PLC changes to STOP mode. When configuring with CFC this is carried out automatically, if you use driver blocks. If you use simple STEP 7 tools, you must program these OBs, so that they call the respective driver instances (see also the note below).

Notice

The driver blocks all have the properties ”Start-up characteristics” and ”Test behavior”. The latter is necessary in order to be able to react with defined results to the various error responses to the hardware used as well as to possible incorrect configurations. The driver blocks (with the same instance) must therefore be installed not only on the normal processing level but also in the OBs mentioned above. When configuring with CFC you only have to install the driver in the normal OB. The additional installation in the other OBs is carried out by CFC. Different code parts in the block are accessed depending on whether the calling OB is the start-up OB, the diagnostic OB or an other OB.
When programming with STL or SCL you have to program the required OBs and call them the respective driver instance in them.

Alarm Behavior

The PCS 7 block ALARM_8P is used to generate control-system messages. The block must be provided with an alarm number. When configuring with CFC the respective input EV_ID is assigned automatically. When configuring with STEP 7 on the other hand, you have to use the PMC-PRO message package to carry this out yourself.

The signal is sent with the event class S (control-system error) to the OS (if enabled by EN_MSG = 1).

3.2 Deployment of the Driver Blocks

Deployment of the Input Drivers

Figure 3–1 shows the deployment of the drivers for reading process data. This solves the following task:
”The signal of sensor X is to be transferred to input X of block XY”.

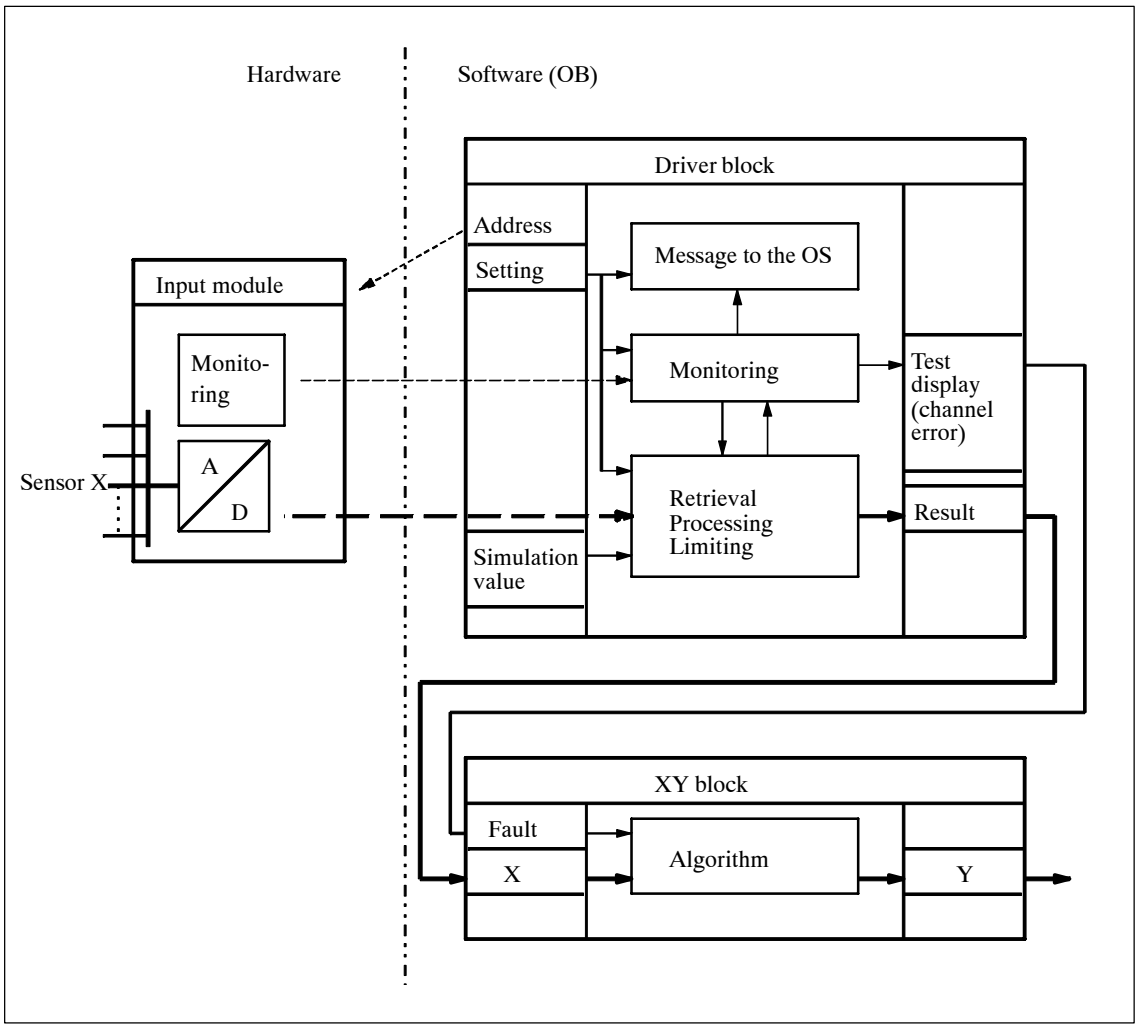


Figure 3-1 Deployment of the driver blocks for input modules

Proceed as follows:

- Determine the module and channel numbers as well as the module designation of the module to which the sensor is connected.
- Select the suitable type of driver for this module (see Table 3–1).
- Define an instance of this driver block (instance DB) and call this in the OB before the block which processes the driver results further.
- Assign parameters to the inputs of the driver with the required data.
  At least the following parameters of the input driver must be adapted (changing the initial setting) in order to access the signals connected to input module:
  - BGNR and possibly KNR (depending on the modules plugged into the rack)

All other parameters must be adapted in accordance with the individual signals.

- As a test function you must also install the driver in other OBs (see Table 3–2, with the corresponding information).

Figure 3–1 summarizes the various input/output parameters under:

- Input parameters
  - Address: BGNR and KNR. The driver uses these to define the I/O address in order to read the module information.
  - Setting: Diverse parameters with which the transfer of information is influenced (for example EV_ID as the message number (is configured automatically when using CFC), EN_MSG for disabling control-system messages of this driver, etc.).
  - Simulation value: A value generated by the software which is passed on by the driver in place of a value from a sensor which may not be connected yet.
- Output parameters
  - Test displays: Output parameter with information on the state of the addressed hardware or on the validity of the driver configuration (for example QPARF parameter assignment error, meaning that the addressed module does not correspond to the driver).
    The invalidity of the read value is indicated by the ”channel-error” output (KF).
  - Result: Outputs for the the values belonging to the respective sensors.

Deployment of the Output Drivers

Figure 3–2 illustrates the output of values calculated by the software to the actuators. This solves the following task:
”The output value Y of block XY is to be made available as a signal to actuator Y”.

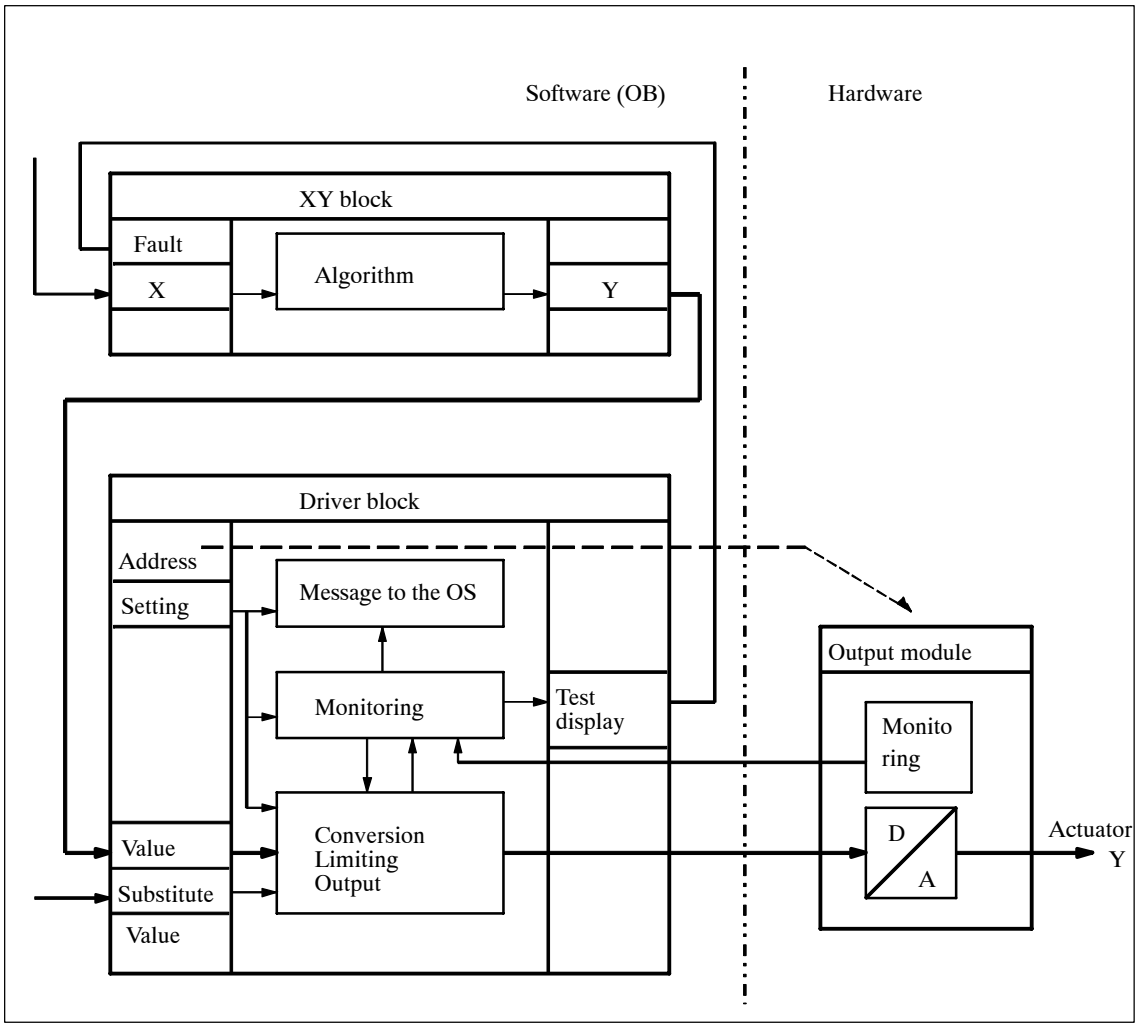


Figure 3-2 Deployment of the driver blocks for output modules

Proceed as follows:

- Determine the module and channel numbers as well as the designation of the module to which the actuators are connected.
- Select the suitable type of driver for this module (see Table 3–1).
- Define an instance of this driver block (instance DB) and install it in the OB after the blocks whose values are to be output by the driver to the I/Os.
- Assign parameters to the inputs of the driver with the required data. At least the following parameters of the output driver must be adapted (changing the initial values), in order to effect output to the actuators connected to the output module:
  - BGNR and possibly KNR (depending on the modules plugged into the rack).

All other parameters must be adapted in accordance with the individual signals.

- For test purposes you must also install the driver in other OBs (see Table 3–2 with the corresponding information).

Figure 3–2 summarizes the various input/output parameters:

- Input parameters
  - Address: BGNR and KNR. The driver uses these to define the logical I/O address in order to access the module.
  - Options: Diverse parameters with which the transfer of information is influenced (for example EV_ID as the message number (is configured automatically in CFC), EN_MSG to disable the control-system messages of this driver).
  - Value: The value calculated during normal operation by the blocks. It is passed by the output driver to the output module.
- Output parameters
  - Test displays: Output parameters with information on the state of the addressed hardware or on the validity of the parameter assignment of the driver (for example QPARF parameter assignment error, meaning that the addressed module does not correspond to the driver).

3.3 TM_BEI Binary Input Block

Type/Number

FB 301

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for acquiring from 8 up to 48 binary signals via a TELEPERM M binary input module 6DS1 601-8AA/-8AC/-8BA, 6DS1602-8AA/-8BA or 6DS1 615-8AA.

Working Method

The binary signals are stored into the outputs Q1 to Q48.
Output ”BGF=1” is set, and the binary values retain their old values if a fault is detected during acquisition.

Module type ”BTYP”	= 1:	8-bit input
”	= 2:	16-bit input
”	= 3:	32-bit input
”	= 4:	48-bit input
”	= 0:	No input

Notice

The module 6DS1 601-8BA must be used if binary value acquisition with common interrupt is performed.

Simulation

You have the possibility for every hardware input of outputting a simulated value (SIM_Q_x) to the corresponding output Qx. Selection is carried out by means of the respective input SIMONx.
The module fault message can be disabled via the input EN_MSG = 0.

Error Handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior

The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-3 Control-system messages of the TM_BEI block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-4 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS.

Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-5 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
SIMON1	Enable simulation value for channel 1	BOOL	0	Q		
...	...					
SIMON48	Enable simulation value for channel 48	BOOL	0	Q		
SIM_Q_1	Simulation value channel 1	BOOL	0	Q		
...	...					
SIM_Q_48	Simulation value channel 48	BOOL	0	Q		
BGNR	Module number	INT	–1			0...61, 100...160
BTYP	Module type	INT	0			0...4
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Special case:
With BGNR = 61 one byte can be read from the common interrupt module 6DS1601-8AC/-8BA or 6DS1 615-8AA without clearing the interrupt state (function of the former BRA block).
BGNR = 61 and BTYP <> 1 will cause a parameter assignment error.

Table 3-6 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
Q1	Binary input channel 1	BOOL	0			
...	...					
Q48	Binary input channel 48	BOOL	0			
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.4 TM_BAU Binary Output Block

Type/Number

FB 302

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for the output of up to 32 binary signals via a TELEPERM M binary output module 6DS1 603-8AA/-8BA/-8RR, 6DS1 604-8AA or 6DS1 605-8AA/-8BA.

Working Method

The TM_BAU block outputs a type-dependent number of binary signals via a binary output module. The binary signals are to be made available at the inputs I1 to I32.
Output “BGF = 1” is set if hardware faults are detected during the output process.

Module type ”BTYP”= 1: 8-bit output
= 2: 16-bit output
= 3: 32-bit output
= 0: No output

Error Handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior

The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-7 Control-system messages of the TM_BAU block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-8 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-9 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
I1	Binary output 1	BOOL	0	Q		
...	...					
I32	Binary output 32	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
BTYP	Module type	INT	0			0...3
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-10 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module fault (QCOM v QVZ v EANK)	BOOL	1			
QPARF	Parameter assignment error 1)	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.5 TM_BU8 Binary Encoder Monitoring Block for 8 Binary Values

Type/Number

FB 305

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for acquiring and monitoring up to 8 binary signals via a TELEPERM M binary input module 6DS1 620-8AA or 6DS1 621-8AA.

Working Method

The states of the binary signals applied to the binary input module are scanned and made available at the corresponding outputs (BU1 to BU8).

In addition to the binary value there are two binary qualifiers which indicate if the associated binary value BWn

- is simulated (outputs: SI1 to SI8) or
- disturbed (outputs: BU1 to BU8).

If binary values (one or several) are simulated or disturbed, a common alarm is issued via the outputs SASI or SAST respectively.
Input BGNR is used to parameterize the number of the binary input module.

If a hardware fault has occured (time-out, EANK), BGF is set = true and the old values retained.

Error Handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-11 Control-system messages of the TM_BU8 block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-12 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-13 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGNR	Module number	INT	–1			0...60, 100...160
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-14 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BW1	Binary value 1	BOOL	0			
SI1	Binary value 1 simulated	BOOL	0			
BU1	Binary value 1 signal monitor has responded	BOOL	0			
...	...					
BW8	Binary value 8	BOOL	0			
SI8	Binary value 8 simulated	BOOL	0			
BU8	Binary value 8 signal monitor has responded	BOOL	0			
SASI	Common alarm simulation	BOOL	0			
SAST	Common alarm fault	BOOL	0			
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1, no processing of the block is done.

3.6 TM_BU16 Binary Encoder Monitoring Block for 16 Binary Values

Type/Number

FB 306

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for acquiring and monitoring up to 16 binary signals via a TELEPERM M binary input module 6DS1 600-8AA/-8BA.

Working Method

The states of the binary signals applied to the binary input module are scanned and made available at the corresponding outputs (BU1 to BU16).

In addition to the binary value there are two binary qualifiers which indicate if the associated binary value BWn is

- simulated (outputs: SI1 to SI16) or
- disturbed (outputs: BU1 to BU16).

If binary values (one or several) are simulated or disturbed, a common alarm is issued via the outputs SASI or SAST respectively.
Input BGNR is used to parameterize the number of the binary input module.

If a hardware fault has occured (time-out, EANK), BGF is set = true and the old values retained.

Error Handling

During processing the driver monitors both the hardware and the value.
This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-15 Control-system messages of the TM_BU16 block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-16 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-17 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGNR	Module number	INT	–1			0...60, 100...160
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-18 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BW1	binary value 1	BOOL	0			
SI1	binary value 1 simulated	BOOL	0			
BU1	binary value 1 signal monitor has responded	BOOL	0			
...	...					
BW16	binary value 16	BOOL	0			
SI16	binary value 16 simulated	BOOL	0			
BU16	binary value 16 signal monitor has responded	BOOL	0			
SASI	common alarm simulation	BOOL	0			
SAST	common alarm fault	BOOL	0			
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1, no processing of the block is done.

3.7 TM_AE Analog Input Block

Type/Number

FB 303

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used to measure an external analog signal via a channel of one of the following TELEPERM M analog input modules:
6DS1 700-8AA/-8BA, 6DS1 701-8AA/-8AB (NAMUR),
6DS1 703-8AA/-8RR, 6DS1 713-8AB, 6DS1 730-8AA, 6DS1 731-8xx,
or a SIMATIC S5 analog input module connected via one of the TELEPERM M modules: 6DS1 321-8AA or 6DS1 327-8AA.

Working Method

The block converts a normalized input signal from an analog input module into an analog value of internal floating point representation.

The output value is made available at output 1 (X) as a physical quantity within the parameterized range (XA, XE). If the analog value is outside this range, a message is sent to output 2 (XF). Output 3 (BGF) is used to signal a malfunction of the associated analog input module.

If a fault indication occurs during measurement, the old value of X is retained. A faulty input signal (overrange, open-circuit) initiates output XF = 1 and the error number S320, a faulty channel initiates output of the error number S321. “BGF” is set and the error number S305 issued if the module is defective.

Analog values from SIMATIC modules are monitored for violation of limit values. Permissible values are 3 to 22 mA for unipolar signals and –55 to +55 mA for bipolar signals. The fault indication XF is only set if the measured value is higher or lower than these limits. The last permissible value is then indicated.

The module number (input 3) and the number of the channel on the module (input 4) are parameterized separately.

If either of the parameters BGNR or KNR is changed, the effects on the subsequent process section must be taken into account.

- **Parameterization:**

  (1st analog value): KNR = 0 or 32 or KNR = 100 or KNR = 200

KNR = 0 – 31	:	TELEPERM M-standard 6DS1700,6DS1731
KNR = 32 – 63	:	TELEPERM M-standard 6DS1701 with NAMUR limits; Even in case of overflow the actual value of the module is indicated at output X.
KNR = 100 – 131	:	SIMATIC S5 0 ... 20 mA or –50 ... +50 mA SIMATIC module must transfer 2’th complement.
KNR = 200 – 231	:	SIMATIC S5 4 ... 20 mA (live zero)

Simulation

The analog signal kann be simulated, e.g. if the associated module or sensor is not yet present during commissioning. If SIMON is set = 1 the simulated value SIM_V is output to X.
The module fault message can be suppressed by EN_MSG = 0.

Error Handling

During processing the driver monitors both the hardware and the value.
This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-19 Control-system messages of the TM_AE driver block

Message No.	Block parameter	Initial start message text		Message class
1	QPARF	Parameter assignment error	(F410)	S
2	QCOM	Communication error FM		S
3	QVZ	Module time-out	(S305)	S
4	EANK	Multiple addressing	(S313)	S
5	XF	Analog signal disturbed	(S320)	S
6	KF	Channel fault	(S321)	S

Table 3-20 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-21 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
XE	Upper range limit	REAL	100,0	Q		
XA	Lower range limit	REAL	0,0	Q		
SIMON	Simulation ON	BOOL	0	Q		
SIM_V	Simulation value	REAL	0,0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number on module (with mode)	INT	0			0...31, 32...63, 100...131, 200...231
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-22 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X	Analog value	REAL	0,0			
XF	Analog signal disturbed [1)]	BOOL	1			
BGF	Module defective (QCOM v QVZ v EANK v KF)	BOOL	1			
QPARF	Parameter assignment error [2)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) XF = 0 if SIMON = 1
2) If QPARF = 1 no processing of the block is done.

3.8 TM_AA Analog Output Block

Type/Number

FB 304

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used to output an analog signal via a channel of one of the following TELEPERM M analog output modules: 6DS1 702-8AA, 6DS1702-8RR
or a SIMATIC S5 analog output module connected via one of the TM modules: 6DS1 321-8AA oder 6DS1 327-8AA.

Working Method

This block converts an analog value from the internal floating point representation into an output signal which is adapted to the respective TELEPERM M or S5 analog output module. The analog value entered via input (X) is first normalized and limited according to the measuring range (XA, XE). Then it is fed to a channel of an analog output module which has been parameterized via BGNR (module number) and KNR (channel number).

Always use the numbers 0 to 31 to select and address the channels of all TELEPERM M modules. If numbers between 100 and 131 or 200 and 231 are used the program will be set to SIMATIC modules which will then be addressed with channel numbers between 0 and 31 (without offset 100 or 200).

- **Parameterization:**

channel number	0 ... 31	TELEPERM M-Standard
channel number	100 ... 131	SIMATIC S5-bipolar
channel number	200 ... 231	SIMATIC S5-unipolar (4 ... 20 mA)

Error Handling

During processing the driver monitors both the hardware and the value. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-23 Control-system messages of the TM_AA driver block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-24 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-25 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X	analog value	REAL	0,0	Q		
XE	Upper range limit	REAL	100,0	Q		
XA	Lower range limit	REAL	0,0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number on module (with mode)	INT	0			0...31, 100...131, 200...231
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-26 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.9 TM_E110 Binary Input Block for S5 and TELEPERM M Modules

Type/Number

FB 307

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used as a driver block for reading 8 to 16 binary values from one of the following TELEPERM M binary input modules:
6DS1 601-8AA/-8AC/-8BA or 6DS1 602-8AA/-8BA, 6DS1 615-8AA
or from an interface module to the SIMATIC S5 binary input modules:
6DS1 310-8AA/8AB or 6DS1 321-8AA or 6DS1 327-8AA.

Working Method

The number of binary values to be read depends on the BA1 and BA2 parameters:

BA1 = 0	BA2 = any value	:	The whole block is switched off.
BA1 ≠ 0	BA2 = 0	:	8 binary values (E1 to E8). Odd channel numbers are permitted
BA1 ≠ 0	BA2 ≠ 0	:	16 binary values (E1 to E16). Only even channel numbers are permitted.

Up to four S5–110A controllers can be connected to one S5–110A interface module (6DS1310-...). Each S5–110A controller can be equipped with:

– 7 modules with 8 binary values each (= 56 binary values) with 1-tier structure

– 15 modules with 8 binary values each (=120 binary values) with 2-tier structure

If 16 binary values are to be transferred, the channel number (KNR, = even module number in the S5–110A controller) and BA2 ≠ 0 are used to address two adjacent modules in the S5–110A controller.

- **Channel number (KNR) for S5–110A (1-tier)**

1. S5–110A:	channel number	0 :	binary value 1 – 16	module 0+1
		2 :	binary value 17 – 32	module 2+3
		4 :	binary value 33 – 48	module 4+5
		6 :	binary value 49 – 64	module 6+a
2. S5–110A:	channel number	8 :	binary value 65 – 80	module 0+1
		10 :	binary value 81 – 96	module 2+3
		12 :	binary value 97 – 113	module 4+5
		14 :	binary value 113 – 128	module 6+a
3. S5–110A:	channel number	16 :	binary value 129 – 144	module 0+1
		18 :	binary value 145 – 160	module 2+3
		20 :	binary value 161 – 176	module 4+5
		22 :	binary value 177 – 192	module 6+a

4. S5–110A:	channel number	24 :	binary value	193 – 208	module 0+1
		26 :	binary value	209 – 224	module 2+3
		28 :	binary value	225 – 240	module 4+5
		30 :	binary value	242 – 256	module 6+a

a = flags

The last eight binary values of each S5–110A contain flags and may not be interconnected with a module.

- **Channel number (KNR) for S5–110A (2-tier)**

1. S5–110A:	channel number	0 :	binary value	1 – 16	module 0+ 1
		2 :	binary value	17 – 32	module 2+ 3
		4 :	binary value	33 – 48	module 4+ 5
		6 :	binary value	49 – 64	module 6+ 7
		8 :	binary value	65 – 80	module 8+ 9
		10 :	binary value	81 – 96	module 10+11
		12 :	binary value	97 – 113	module 12+13
		14 :	binary value	113 – 128	module 14+a
2. S5–110A:	channel number	16 :	binary value	129 – 144	module 0+ 1
		18 :	binary value	145 – 160	module 2+ 3
		20 :	binary value	161 – 176	module 4+ 5
		22 :	binary value	177 – 192	module 6+ 7
		24 :	binary value	193 – 208	module 8+ 9
		26 :	binary value	209 – 224	module 10+11
		28 :	binary value	225 – 240	module 12+13
		30 :	binary value	242 – 256	module 14+a
3. S5–110A:	channel number	32 :	binary value	257 – 275	module 0+ 1
		34 :	binary value	276 – 291	module 2+ 3

etc. to

4. S5–110A:	channel number	62 :	binary value	496 – 512	module 14+ a

The last eight binary values of each S5–110A contain flags and may not be interconnected with a module.

- **Flag assignments**

Binary value	E9	=	Incorrect number of lines (jumper)
	E10	=	Rapid shutdown, since cyclic monitoring has failed (binary outputs reset)
	E11	=	Message frame fault
	E12	=	No time specified
	E13	=	Module fault
	E14	=	not applicable
	E15	=	not applicable
	E16	=	not applicable

The number of bytes read and the associated channel address depend on the parameters BA1, BA2, and KNR.

BA1 = 0 , BA2 any value	:	Whole block de-activated
BA1 ≠ 0 , BA2 = 0	:	1 byte from address = KNR is transferred to the first group. KNR may be even or odd.
BA1 ≠ 0 , BA2 ≠ 0	:	2 bytes are read from the addresses KNR and KNR + 1, if KNR is even. If KNR is odd, the next smaller even address is used instead of KNR.

Old and new value of each group (E1 - E8, E9 – E16) are compared with each other. New values are only stored if there is a difference in these values. Output BGF will be set if the module number has been set incorrectly on the module or in the TM_E110 (etc.) or if several modules use the same module number. Then the old binary values are retained.

- **Parameter Description**

BA1	:	= 0; block disabled (no processing)
	:	= 1; E1 to E8 enabled
	:	= 2; E1 to E8 enabled
E1	:	binary value 1
E2	:	binary value 2
E3	:	binary value 3
E4	:	binary value 4
E5	:	binary value 5
E6	:	binary value 6
E7	:	binary value 7
E8	:	binary value 8
BA2	:	= 0; 2nd group OFF
	:	= 1; E9 to E16 activated (if BA1 nonzero)
	:	= 2; E9 to E16 activated (if BA1 nonzero)
E9	:	binary value 9
E10	:	binary value 10
E11	:	binary value 11
E12	:	binary value 12
E13	:	binary value 13
E14	:	binary value 14
E15	:	binary value 15
E16	:	binary value 16

The modes BAx = 1 and 2 are identical (compatible with TELEPERM M).

Error Handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-27 Control-system messages of the TM_E110 driver block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-28 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Parameters BA1 and BA2 are limited (< 0 → 0, > 2 → 2), but no message is generated.

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-29 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BA1 [1)]	Mode 1	INT	0			0...2
BA2 [1)]	Mode 2	INT	0			0...2
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...63
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

1) Modes BAx = 1 and BAx = 2 are identical (compatible with TELEPERM M).

Table 3-30 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
E1	Binary value 1	BOOL	0			
...	...					
E16	Binary value 16	BOOL	0			
AE1	Change binary value E1–E8	BOOL	0			
AE2	Change binary value E9–E16	BOOL	0			
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.10 TM_A110 Binary Output Block for S5 and TELEPERM M Modules

Type/Number

FB 308

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used as a driver block for the output of 8 to 16 binary values to one of the following TELEPERM M binary output modules:
6DS1 603-8BA/-8RR, 6DS1 604-8AA or 6DS1 605-8BA.
or to an interface module for the SIMATIC S5 binary output modules:
6DS1 310-8AA/8AB S5-110A or 6DS1 321-8AA or 6DS1 327-8AA.

Working Method

The number of binary values to be output depends on the BA1 and BA2 parameters:

BA1 = 0,	BA 2	any value	:	The whole block is switched off.
BA1 ≠ 0,	BA 2	= 0	:	8 binary values (A1 – A8). Odd channel numbers are permitted.
BA1 ≠ 0,	BA 2	≠ 0	:	16 binary values (A1 – A16). Only even channel numbers are permitted.

The module number BGNR can be selected in the range from 0 to 60 or 100 to 160. Up to four S5–110A controllers can be connected to one S5–110A interface module (6DS1310-..). Each S5–100A controller can be equipped with:

- 7 modules with 8 binary values each (= 56 binary values) in a 1-tier-structure
- 15 modules with 8 binary values each (=120 binary values) in a 2-tier structure.

If 16 binary values are to be transferred, the channel number (KNR = even module number in the S5–110A controller) and BA2 ≠ 0 are used to address two adjacent modules in the S5–110A controller.

- **Channel number (KNR) for S5–110A (1-tier)**

1. S5–110A: channel number	0	:	binary value 1 – 16	module	0 + 1
	2	:	binary value 17 – 32	module	2 + 3
	4	:	binary value 33 – 48	module	4 + 5
	6	:	binary value 49 – 64	module	6 + m
2. S5–110A: channel number	8	:	binary value 65 – 80	module	0 + 1
	10	:	binary value 81 – 96	module	2 + 3
	12	:	binary value 97 – 112	module	4 + 5
	14	:	binary value 113 – 128	module	6 + m
3. S5–110A: channel number	16	:	binary value 129 – 144	module	0 + 1
	18	:	binary value 145 – 160	module	2 + 3
	20	:	binary value 161 – 176	module	4 + 5
	22	:	binary value 177 – 192	module	6 + m

4. S5–110A: channel number	24 :	binary value	193 – 208	module	0 + 1
	26 :	binary value	209 – 224	module	2 + 3
	28 :	binary value	225 – 240	module	4 + 5
	30 :	binary value	241 – 256	module	6 + m

m = monitoring time

The last eight binary values of each S5–110A controller are reserved for the specification of a monitoring time.

- **Channel number (KNR) for S5–110A (2–tier)**

1. S5–110A: channel number	0:	binary value	1 – 16	module	0 + 1
	2:	binary value	17 – 32	module	2 + 3
	4:	binary value	33 – 48	module	4 + 5
	6:	binary value	49 – 64	module	6 + 7
	8:	binary value	65 – 80	module	8 + 9
	10:	binary value	81 – 96	module	10 + 11
	12:	binary value	97 – 113	module	12 + 13
	14:	binary value	113 – 128	module	14 + m
2. S5–110A: channel number	16:	binary value	129 – 144	module	0 + 1
	18:	binary value	145 – 160	module	2 + 3
	20:	binary value	161 – 176	module	4 + 5
	22:	binary value	177 – 192	module	6 + 7
	24:	binary value	193 – 208	module	8 + 9
	26:	binary value	209 – 224	module	10 + 11
	28:	binary value	225 – 240	module	12 + 13
	30:	binary value	257 – 275	module	14 + m
3. S5–110A: channel number	32:	binary value	257 – 275	module	0 + 1
	34:	binary value	276 – 291	module	2 + 3
	.				
	.				
	.				
	etc. to				
	.				
	.				
	.				
4. S5–110A: channel number	62 :	binary value	496 – 512	module	14 + m

m = monitoring time

The last eight binary values of each S5–110A controller are reserved for the specification of a monitoring time.

Output BGF will be set if the module number has been set incorrectly on the module or in the TM_A110 (etc.) or if several modules use the same module number.

The number of bytes (= groups of 8 bits each) output and the associated channel address depend on parameters BA1, BA2 and KNR.

BA1 = 0 , BA2 any value:	Whole block de-activated
BA1 ≠ 0 , BA2 = 0:	1 byte is transferred to the address = KNR. KNR may be even or odd.
BA1 ≠ 0 , BA2 ≠ 0:	2 bytes are transferred to the addresses KNR and KNR + 1, if KNR is even. If KNR is odd, the next smaller even address is used instead of KNR.

- **Parameter Description**

BA1 : = 0; block disabled (no processing)
: = 1; 1st group (A1 to A8) enabled
: = 2; 1st group (A1 to A8) enabled
A1 : binary value 1
A2 : binary value 2
A3 : binary value 3
A4 : binary value 4
A5 : binary value 5
A6 : binary value 6
A7 : binary value 7
A8 : binary value 8

BA2 : = 0; 2nd group OFF
: = 1; A9 to A16 activated (if BA1 nonzero)
: = 2; A9 to A16 activated (if BA1 nonzero)
: = 3; specification monitoring time (if BA1 nonzero)
A9 : binary value 9
A10 : binary value 10
A11 : binary value 11
A12 : binary value 12
A13 : binary value 13
A14 : binary value 14
A15 : binary value 15
A16 : binary value 16

The modes BAx = 1 and 2 are identical (compatible with TELEPERM M).

Error Handling

During processing the driver monitors both the hardware and the value. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-31 Control-system messages of the TM_A110 block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-32 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Parameters BA1 and BA2 are limited (< 0 → 0, > 3 → 3), but no message is generated.

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-33 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
A1	Binary value 1	BOOL	0	Q		
...	...					
A16	Binary value 16	BOOL	0	Q		
BA1 [1)]	Mode 1	INT	0			0...2
BA2 [1)]	Mode 2	INT	0			0...3
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...63
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

1) Modes BAx = 1 and BAx = 2 are identical (compatible with TELEPERM M)..

Table 3-34 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.11 TM_DZ Driver Block for Proportioning Counter Module (2/4 Channels)

Type/Number

FB 309

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for acquiring signals from the TELEPERM M proportioning counter module (2/4 channels) 6DS1 613-8.. and for sending commands and normalized analog values to the proportioning counter module.

Working Method

The proportioning counter module transfers various groups of binary and analog signals to the TM_DZ block. Here they are activated as output signals:

- Fault alarms (S4, S10, S16)
- Return data mode, interlocking (EXIN, VER)
- Configuration jumpers (DZDR, AVZ, TYP)
- Alarm signals, states (ESA, VSA, ZL)
- Analog values (X, ZSPW)

The following groups of binary and analog signals from the TM_DZ block are transferred to the proportional counter module:

- Analog counter parameters (EW, VW, KF, TM)
- Binary counter parameters (VR, OGUG)
- Operator input commands (ZS, ZR, SP, FR)

- **Modes**

Monitoring and control of the proportioning counter module by the CPU are enabled if mode “External”, EXIN = 0 (corresponds to the hardware signal FEI = 0) has been selected. The operator input command “Set counter” (ZS = 1) is used to transfer the analog values EW, VW, KF, TM and the binary values OGUG, VR to the proportioning counter module.

Im manual mode (HDAC = 0) the final value EW can be specified by the OS within the programmable range limits (XA1 and XE1). The intermediate value VW can also be modified within the programmable control limits (XA2 and XE2).

In automatic mode (HDAC = 1) ZS = 1 interconnects the inputs EWAC and VWAC with the proportioning counter module. New count parameters (EW, VW, KF, TM) may only be entered after the current count operation has completed, i.e. after the return message ES = 1 has been set by the module.

- **Effects of the operator input commands (ZS, ZR, SP, FR)**

  – ZS = 1: Acceptance of the counter parameters transferred by the TM_DZ block and start of counting. Return data: counter active (ZL = 1).

  – ZR = 1: Counting is interrupted; (the counter content (X) will be set to the appropriate start value with next start of counter). A counter inhibit is released. Depending on the ANL configuration jumper, the signal “Final value attained” is set (ES = 1).

  – SP = 1: The counter output is disabled, the signal “Final value attained” is set. (ES = 1). The counter continues running (X-display) and counts a possible overshoot.

  – FR = 1: If the counter is enabled (FR = 1) before the final value has been attained, “Final value attained” is reset to zero.

The mode “Internal” EXIN = 1 (corresponds to the hardware signal FEI = 1) only permits monitoring of the proportioning counter module via the TM_DZ block. The counter parameters and operator input commands can no longer be transferred to the proportioning counter module via the TM_DZ block.

The module continues using the counter parameters selected by the TM_DZ block until the hardware signal ”External setting” (H level) of the corresponding channel triggers acceptance of the final counter value into the buffer memory (ZSPW) of the module. This value has been set on a 4-digit BCD thumbwheel switch. Counting is then restartet.

The buffer value (ZSPW) is loaded into the intermediate and final value (VW = EW) when counting is restarted in this mode..

- **Bar representation X**

For bar representation X it is possible in counter functions to set the end of the display range to the final value if the input NORM = 1 is parameterized.

The measuring range (display range) can be specified by the range limits (XA1, XE1) as required (NORM = 0) if speed/ rotational speed measurement has been selected.

- **Mode selection**

The TM_DZ block modes (H, A) can either be selected via the process communication keyboard (operator controllable inputs H and A) or via the interconnectable binary input AC. Mode A is selected if “1” has been applied to the binary input AC. The mode then cannot be changed via the process communication keyboard

- **Parameterization**

  The module number is parameterized via input BGNR.

  The channel number is parameterized with the following values via input KNR:

Channel-no.	Module	Integer number
1	2 channel	0
	4 channel	10
2	2 channel	1
	4 channel	11
3	4 channel	12
4	4 channel	13

Error Handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-35 Control-system messages of the TM_DZ block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	QBGF	Module malfunction (S321)	S
6			
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-36 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Status Transfer

Description of the status word transfer

In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-37 Status (low) of the TM_DZ block

Message No.	Block parameter	Initial start message text	Message class
1	HDAC	Manual/Automatic mode	
2	ES	RM final signal ES	
3	VS	RM intermediate signal VS	
4	EXIN	Internal RM enabling	
5	SPM	Disabled/Enabled	
6	ZL	Counter active	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-38 Status (high) of the TM_DZ block

Message No.	Block parameter	Initial start message text	Message class
1	UMGF	External fault	
2		Common alarm UMGF v S80 v S4 v S10 v S16 v S31	ST
3			
4			
5		I/O fault S80 v S4 v S10 v S16 v S31	
6	S80	I/O fault S80	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the TM_DZ block

Operating and monitoring of the TM_DZ block via the corresponding "NORA" requires a corresponding proportioning counter module.
The modes "Enable/Disable Counter Output" (FR,SP) and "Set counter", "Reset Counter" (ZS, ZR) can only be changed when manual mode is active; else a Windows Message Box will appear.

Changing of parameters is only possible, if the adequate input privilege is active; else a Windows Message Box will appear.

Input privilege = 0 the privilege is not limited.
Input privilege = 1: Changing modes
Input privilege = 2: Changing OE/ UE, OV/ UV

The modes of the TM_DZ block (manual / automatic, enable/disable counter output, set/reset counter) can be changed by clicking on the highlighted area. A box will then appear, where the actual mode is accentuated. After acknowledgement (clicking on the desired mode) and then on the OK-button the box disappears and the command is transferred to the AS. After the AS has changed the mode, the new mode is shown. Klicking on the Cancel Button will close the box.

(name of OCX: S7.G_DZ resp. S7.K_DZ)

Name	Source / Input (AS)	Operator-Controllable ?
Technolog. name	ATN	no
Current count	X	no
Final value (automatic)	EWA	no
Intermediate value (automatic)	VWA	no
Fault alarm S4	S4	no
Fault alarm S10	S10	no
Fault alarm S16	S16	no
Fault alarm S31	S31	no
Fault alarm S80	S80	no
Module fault	BGF	no
Upper range limit	XE1	yes, in loop display
Setpoint final value	EW	yes
Lower range limit	XA1	yes, in loop display
Upper control limit	XE2	yes, in loop display
Setpoint intermediate value	VW	yes
Lower control limit	XA2	yes, in loop display
Set counter	ZS / state	yes, in manual mode
Reset counter	ZR	yes, in manual mode
Disable counter output	SP / state	yes, in manual mode
Enable counter output	FR / state	yes, in manual mode
Automatic mode	A / state	yes
Manual mode	H / state	yes
Mnemonic name EW	TEW	no
Mnemonic name VW	TVW	no
Mnemonic name X	TX	no
Mnemonic name ZS	TZS	no
Mnemonic name ZR	TZR	no
Mnemonic name A	TA	no
Mnemonic name H	TH	no
Mnemonic name SP	TSP	no
Mnemonic name FR	TFR	no
Quantity of measurement X	EHTX	no
PCS fault (External fault)	state	no

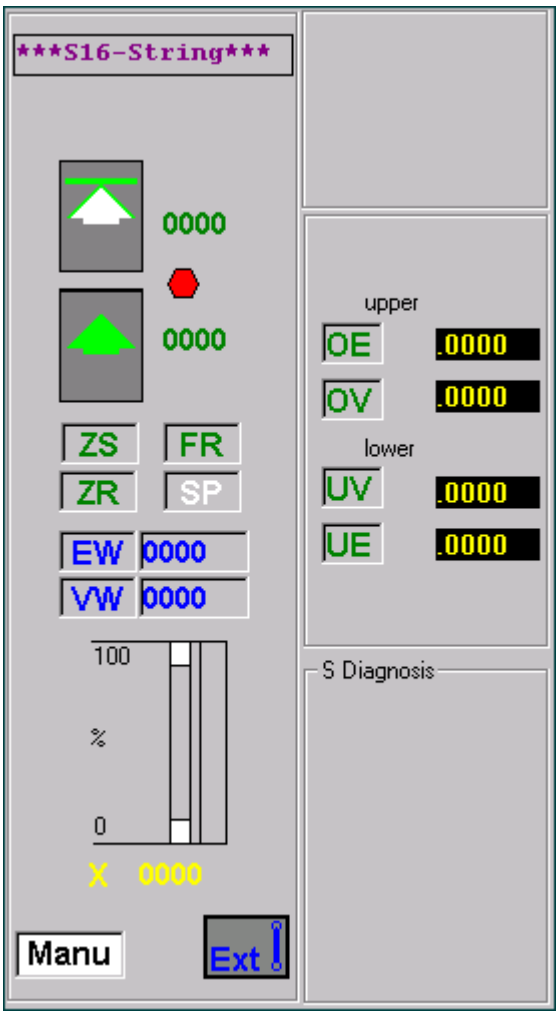


Figure 3-3 Display of the DZ block

On the right of the final signal indicator the final value EWA is displayed, on the right of the intermediate signal indicator the intermediate value VWA is displayed. The symbol situated between these is the counter's state: green / red = counter active/ not active.

The white bar on the left side of the actual value (X) bar represents the intermediate value VWA.

The modes Internal/ External are displayed only, but are not operator-controllable.

Operation boxes

After klicking on the button Manu/ Auto (manual / automatic) resp. ZS, ZR, SP or FR the corresponding operation boxes are opened. The actual mode is highlighted. After klicking on the wanted mode, this area is highlighted. The operator intervention is concluded by a click on the OK-button (transfer of the command to the PLC) or by the Cancel button.

The operation boxes are always opened inside the OCX and cannot be moved outside.

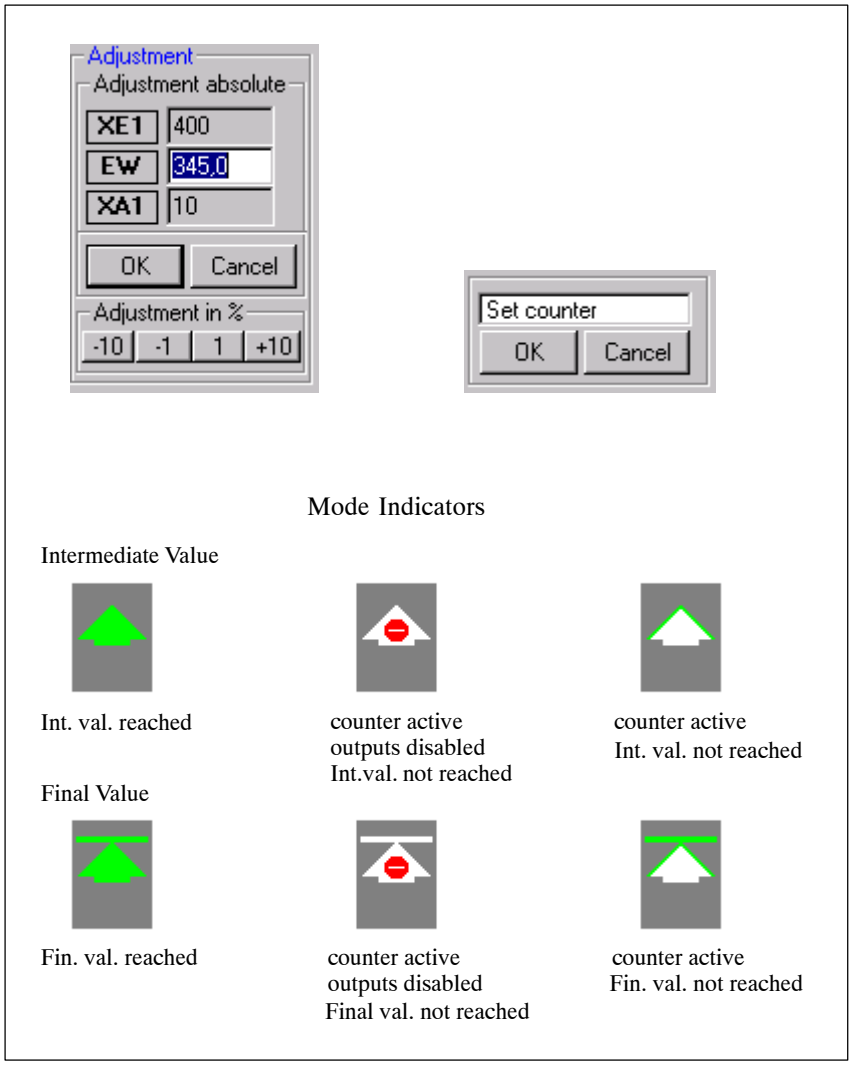


Figure 3-4 Operation boxes and indicators of the DZ block

I/O Bars

The following tables present the input and output bars of the block.

Table 3-39 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
XE1	Upper range limit	REAL	100,0	Q	B	
XA1	Lower range limit	REAL	0,0	Q	B	
XE2	Upper control limit	REAL	100,0	Q	B	
XA2	Lower control limit	REAL	0,0	Q	B	
EWAC	Setpoint final value (automatic)	REAL	0,0	Q		
VWAC	Setpoint intermediate value (automatic)	REAL	0,0	Q		
KF	Correcting factor	REAL	1,0	Q		
TM	Measuring time / overshoot time	REAL	0,0	Q		
ZSAC	Set counter (automatic)	BOOL	0	Q		
ZRAC	Reset counter (automatic)	BOOL	0	Q		
FRSP	Enable / Disable	BOOL	0	Q		
AC	Automatic	BOOL	0	Q		
OGUG	Selector UG/OG	BOOL	0	Q		
VR	Setpoint V/R, 0/1	BOOL	0	Q		
UMGF	External fault	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...63
TEW	Text for final value	STRING2	’EW’	U	B	
TVW	Text for intermediate value	STRING2	’VW’	U	B	
TX	Text for current value	STRING2	’X’	U	B	
TZS	Text for set counter	STRING2	’ZS’	U	B	
TZR	Text for reset counter	STRING2	’ZR’	U	B	
TA	Text for automatic mode	STRING2	’A’	U	B	
TH	Text for manual mode	STRING2	’H’	U	B	
TSP	Text for disable	STRING2	’SP’	U	B	
TFR	Text for enable	STRING2	’FR’	U	B	
EHTX	Physical quantity	STRING6	’*EHTX*’		B	
ATN	Technological name	STRING16	’*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-40 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
EW	Setpoint final value	REAL	0,0	U	B	XA1 ≤ EW ≤ XE1
VW	Setpoint intermediate value	REAL	0,0	U	B	XA2 ≤ VW ≤ XE2
H	Manual mode	BOOL	1	U	B	
A	Automatic mode	BOOL	0	U	B	
ZS	Set counter (manual)	BOOL	0	U	B	
ZR	Reset counter (manual)	BOOL	0	U	B	
SP	Disable (counter output)	BOOL	0	U	B	
FR	Enable (counter output)	BOOL	0	U	B	

Table 3-41 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X	Current count	REAL	0,0		B	
EWA	Final value (automatic)	REAL	0,0		B	
VWA	Intermediate value (automatic)	REAL	0,0		B	
ZSPW	Buffer value	REAL	0,0			
DZDR	Proport. counter / speed meter	BOOL	0			
AVZ	Interlocking	BOOL	0			
TYP	2/4 channel module, 0/1	BOOL	0			
VER	RM disable count pulses	BOOL	0			
VS	RM intermediate signal	BOOL	0			
ES	RM final signal resp. UG/OG	BOOL	0			
EXIN	RM enable internal	BOOL	0			
ZL	counter active	BOOL	0			
HDAC	Mode manual / automatic	BOOL	0			
S4	Fault alarm hardware	BOOL	0		B	
S10	Fault alarm binary signals	BOOL	0		B	
S16	Fault alarm command outputs	BOOL	0		B	
S31	Fault alarm interlocking	BOOL	0		B	
S80	Fault alarm module defect or parameterization	BOOL	0		B	
BGF	Module fault	BOOL	1		B	
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.12 TM_ZE Metering Pulse Input Block

Type/Number

FB 310

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for acquiring one channel of the TELEPERM M metering pulse input module 6DS1 607-8AB.

Working Method

As selected by the scan cycle defined via the CFC, the TM_ZE block processes one channel (16 bit counter) of the metering pulse input module and presents the counter value at output ZW. The associated counter is reset when the data is read.

Cyclic processing:
Output UEBL (overflow) is set to 1 and a system error message is issued if the maximum count (= 32.767) is exceeded. ZW is then set = 0.

Error handling

During processing the driver monitors both the hardware and the value. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-42 Control-system messages of the TM_ZE block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	UEBL	Overflow (S320)	S

Table 3-43 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-44 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...31
EN_MSG	Enable control system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-45 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
ZW	Counter value 1)	REAL	0,0			
UEBL	Overflow	BOOL	0			
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error 2)	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) The indicated value is the accumulated value at the time of the preceding block processing.

2) If QPARF = 1 no processing of the block is done.

3.13 TM_EG Driver Block for Open-Loop Control Module

Type/Number

FB 311

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

The TM_EG block is used for acquiring signals from a TELEPERM M open-loop control module 6DS1 504-8AA or 6DS1 505-8AA and to transfer commands to the module.

Working Method

- **Modes**

The commands AU, EI and ST entered via the operator-controllable inputs are routed to the open-loop control module if manual mode (H) has been selected. The commands AUAC and EIAC or AUBA and EIBA from an automatic control are routed to the open-loop control module if automatic mode (A) has been selected.

Manual mode can be selected via the operator controllable input H or the automatic input HAND. Automatic mode can be selected via the operator-controllable input A, the automatic input AUTO or the input ACBA.

- **Configuration instruction**

Manual or Automatic modes can only be selected identical for all channels of one open loop control module 6DS1504 or 6DS1505. Manual or Automatic mode selection must therefore be the same in all driver blocks if several EG drivers act upon different channels within a module

More information for configuring modules 6DS1 504/505 see chapter 4.7 in the manual /100/.

- **Parameterization**

The module number is parameterized via input BGNR, the channel number via input KNR. The module type is parameterized via input TYP.

Parameterization of input TYP:

0 : module 6DS15 04-8AA (4 channels)
1 : module 6DS15 05-8AA (8 channels)
2 : module 6DS15 05-8AA (4 channels)

Parameterization of input KNR following input TYP:

– If input TYP = 0 or 1:
  KNR = 0..3 or 0...7 corresponds to channels 1...4 or 1...8 respectively

– If input TYP = 2:
  KNR = 0 : channel 1
  KNR = 2 : channel 2
  KNR = 4 : channel 3
  KNR = 6 : channel 4

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-46 Control system messages of the TM_EG block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5			
6			
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-47 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR
3	TYP

Status Transfer

Description of the status word transfer.
In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-48 Status (low) of the TM_EG block

Message No.	Block parameter	Initial start message text	Message class
1			
2			
3	RMEI	Open/On	
4	RMAU	Closed/Off	
5		Disable / enable	
6	AH	Automatic/Manual mode	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-49 Status (high) of the TM_EG block

Message No.	Block parameter	Initial start message text	Message class
1	UMGF	External fault	
2		Common alarm UMGF S18 v S20	ST
3			
4			
5	S18	Status discrepancy S18	
6	S20	Runtime error S20	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the TM_EG block

Representation as a Motor

(name of OCX: S7.G_EG1 resp. S7.K_EG1)

Name	Source / Input (AS)	Operator-controllable?
Technological name	ATN	no
Command ON (OPEN)	EI / state	yes, in manual Mode
Command OFF (CLOSE)	AU / state	yes, in manual Mode
automatic mode	A / state	yes
manual mode	H / state	yes
PCS fault (external fault)	state	no

Data for representation as a valve are identical.

(name of OCX: S7.G_EG2, S7.K_EG2)

The next picture shows the EG block in the two representations “switch” and “valve”, as a group and as a loop display each.

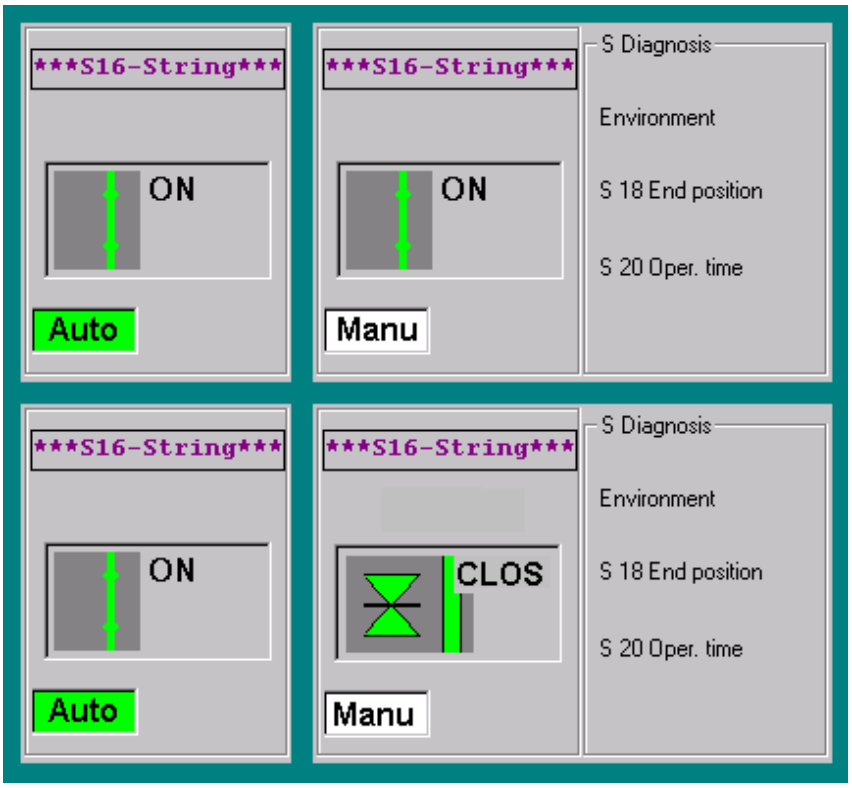


Figure 3-5 Bedienboxen des EG-Bausteins

Operation boxes

After klicking on the area Manu/Auto (manual / automatic resp.), On/Off or Close/Open the corresponding Operation boxes are opened. The actual mode is highlighted. When the desired mode has been klicked that mode becomes highlighted.
The operator intervention is concluded by a click on the OK button (transfer of the command to the PLC) or by the Cancel button.
In the “valve” representation the texts of the operation box are ”Close” and ”Open” instead of ”Off” and ”On”..

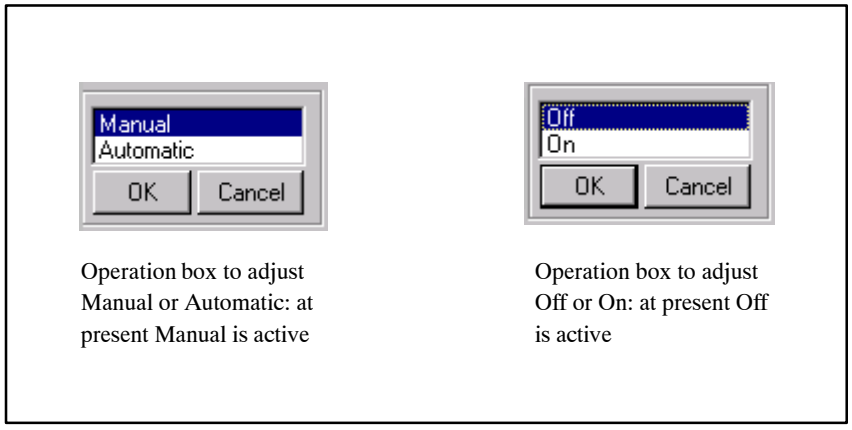


Figure 3-6 Bedienboxen des EG-Bausteins

I/O Bars

The following tables present the input and output bars of the block.

Table 3-50 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
HAND	Manual mode	BOOL	0	Q		
AUTO	Automatic mode	BOOL	0	Q		
AUAC	Automatic OFF	BOOL	0	Q		
EIAC	Automatic ON	BOOL	0	Q		
SAUS	Protection OFF	BOOL	0	Q		
LASP	Circuit breaker locked	BOOL	0	Q		
SPEI	Interlocking ON	BOOL	0	Q		
UMGF	External fault	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...7
TYP	Configuration definition	INT	0			0, 1, 2
AUBA	Command OFF (PAA)	BOOL	0	Q		
EIBA	Command ON(PAA)	BOOL	0	Q		
ACBA	Command automatic (PAA)	BOOL	0	Q		
TEI	Text for EI	STRING2	’EI’	U	B	
TAU	Text zu AU	STRING2	’AU’	U	B	

Table 3-50 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
TA	Text for A	STRING2	'A '	U	B	
TH	Text for H	STRING2	'H '	U	B	
ATN	Technological name	STRING16	*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-51 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
H	Manual mode	BOOL	0	U	B	
A	Automatic mode	BOOL	0	U	B	
AU	Command OFF	BOOL	0	U	B	
EI	Command ON	BOOL	0	U	B	
ST	Command STOP	BOOL	0	U	B	

Table 3-52 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
RMAU	Return data OFF	BOOL	0		B	
RMEI	Return data ON	BOOL	0		B	
S18	End position error	BOOL	0			
S20	Time-out	BOOL	0			
AH	Mode 0/1 (automatic/manual)	BOOL	0			
BGF	Module fault	BOOL	1		B	
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.14 TM_EK Driver Block for Open-Loop Control Module – Valve

Type/Number

FB 312

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

TM_EK is used for acquiring signals from one of the TELEPERM M open-loop control modules 6DS1 501-8AA/-8AB/-8BA/-8BB or of a channel of one of the TELEPERM M open loop control modules 6DS1 503-8AA/-8BA and to transfer commands to the module. The read signals are presented at the binary outputs and may be used, for example, by a subgroup controller.

Working Method

- **Modes**

In manual mode (Mode H) the commands AU (with OPEN acknowledgement), ZU (with CLOSED acknowledgement) and ST entered via the operator-controllable inputs are routed to the open-loop control module.

In automatic mode (Mode A) the commands OPEN (input AUAB), CLOSE (input ZUAB) and STOPP (input STAB) or the commands OPEN/STEP, CLOSE/STEP and STOP/STEP (inputs AUBA, ZUBA, STBA resp.) from an automatic controller are routed to the module. Priority is not given to automatic and automatic/STEP commands.

Simultaneous intervention (protective commands) is possible via the binary inputs AUSC and ZUSC. These commands have a higher priority; they are routed to the module as long as they are present. The commands OPEN/CLOSE acknowledgement are also valid during automatic operation.

The modes A/H (automatic/manual mode) can be selected via binary input AHBA.

- **Parameterization**

The module number is parameterized via input BGNR and the channel number via input KNR.

channel no. 0: 1-channel open-loop control module 6DS1501-8BA/-8BB
channel no.. 1, 2, 3: respective channel of the open-loop control module 6DS1503-8BA

- **Interlocking monitoring function**

The interlocking monitoring function informs the operator of a rejected OPEN or CLOSE command.

Rejection can be caused by
– missing process release or
– a protective command in the opposite direction

The interlocking monitoring function is shown during the monitoring time specified via input UZT (default = 10 seconds) in the loop display. After the monitoring time has elapsed, it is deleted from the loop display. A status message is generated if the interlocking monitoring function responds and after the monitoring time has elapsed.

In the OS subsystems, an operator notice (”B”), which need not be acknowledged, is derived at all levels from this function.If the monitoring time has been parameterized = 0, the display is shown for the duration of one cycle. This signal will not be processed in the message processing function MELD. The cabinet or cabinet row lamps are not triggered either when this monitoring function responds.

- **Elektronic position indication**

The electronic position indication of the one-channel open-loop control module 6DS1 501-8BB is issued via analog output 1 within the parameterized range limits (Lower range limit/Upper range limit) (input YANZ has been parameterized = 1). The electronic position indication of the three-channel open-loop control module can be connected to input YEXT. Input YANZ must then be parameterized = 2.

- **Continuous operation / inching operation (set on the module)**

Continuous operation is used to drive the actuators from end position to end position. The return data OPEN and CLOSED on the module is used for disconnection.

Inching mode allows an actuator to be adjusted to any intermediate position between the two end positions. An analog position indication must be present for inching operation (see picture 2.57). This ESR signal is connected to the module if the one-channel-open-loop control module 6DS1 501-8BB is used. The ESR signal must be connected to input YEXT of the driver block if the multi-channel open-loop control module 6DS1503-8BA is used.

A comparator is used to determine the difference between position indication and position setpoint. These values are used by a subsequent increment converter to generate OPEN, CLOSE and STOP commands which the EK block then transfers to the module. A follow-up circuit ensures that the actuator is held in its actual position if disturbances are present. In an OS subsystem, operation is performed by entering absolute values or by incremental adjustment.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-53 Control-system messages of the TM_EK block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	S4 v S80	Module malfunction (S321)	S
6			
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-54 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR
3	YANZ

The UZT parameter is limited to the range 1 to 1800 (without error message).

Status Transfer

Description of the status word transfer

In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-55 Status (low) of the TM_EK block

Message No.	Block parameter	Initial start message text	Message class
1	LAAU	Opening	
2	LAZU	Closing	
3	RAUF	Open	
4	RZU	Closed	
5	S31	Command inhibit	
6	AHBA	Automatic/Manual mode	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-56 Status (high) of the TM_EK block

Message No.	Block parameter	Initial start message text	Message class
1	UMGF	External fault	
2		Common alarm UMGF S80 v S31 v S4 v S25 v S10 v S16 v S17 v S18 v S21 v S22 v S19 v S20 v S9 v S6 v S26	ST
3			
4			
5			
6		I/O fault S80 v S31 v S4 v S25 v S10 v S16 v S17 v S18 v S21 v S22 v S19 v S20 v S9 v S6 v S26	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the TM_EK block

After the OCX has been placed by the WinCC-Grafics Designer the block specific properties box has to be called by a double click on the OCX. The block instance and other parameters can then be entered.

Changing of parameters is only possible, if the adequate input privilege is active; else a Windows Message Box will appear.

Input privilege = 0 the privilege is not limited.
Input privilege = 1: Changing modes

The modes of the TM_EK block (Open, Close, Stop) can be changed by clikking on the highlighted area. A box will then appear, where the actual mode is accentuated. After acknowledgemenet (clicking on the desired mode) and then on the OK-button the box disappears and the command is transferred to the AS. After the AS has changed the mode, the new mode is shown. Klikking on the Cancel Button will close the box.

Configuring the button text:

In continuous operation mode (DLBT = 0) the 2nd character of the TY string has to be set to '*'. The TZU, TST, and TAU strings must not include a '*', if they should be operated.

In inching operation mode (DLBT = 1) the 2nd character of the TZU, TST, and TAU strings has to be set to '*'. The TY string must not include a '*', if it should be operated.

A dynamic switchover of the continuous / inching operation mode during run–time must not be realized, as no automatic adjustment of the strings will be possible.

Display 1 (name of OCX: S7.G_EK resp. S7.K_EK)

Name	Source / Input (AS)	Operator-Controllable ?
Technological name	ATN	no
Electronic position indication	YESR	no
Fault alarm S25	S25	no
Fault alarm S10	S10	no
Fault alarm S16	S16	no
Fault alarm S31	S31	no
Fault alarm S17	S17	no
Fault alarm S18	S18	no
Fault alarm S21	S21	no
Fault alarm S22	S22	no
Fault alarm S19	S19	no
Fault alarm S20	S20	no
Fault alarm S9	S9	no
Fault alarm S26	S26	no
Fault alarm S6	S6	no
Fault alarm S4	S4	no
Fault alarm S80	S80	no
Module fault	BGF	no
Upper range limit Y	YME	no
Lower range limit Y	YMA	no

Manipulated value Y	Y	no
Open	AU / state	yes, in manual mode
Close	ZU / state	yes, in manual mode
Stop	ST / state	yes, in manual mode
mnemonic name CLOSED	TZU	no
mnemonic name STOP	TST	no
mnemonic name OPEN	TAU	no
mnemonic name Y	TY	no
Quantity Y	EHT	no
PCS fault (External fault)	state	no

Standardized Display for the TM_EK block

After the OCX has been placed by the WinCC-Grafics Designer the block specific properties box has to be called by a double click on the OCX. The block instance and other parameters can then be entered.

Changing of parameters is only possible, if the adequate input privilege is active; else a Windows Message Box will appear.

Input privilege = 0 the privilege is not limited.
Input privilege = 1: Changing modes

The modes of the TM_EK block (Open, Close, Stop) can be changed by clikking on the highlighted area. A box will then appear, where the actual mode is accentuated. After acknowledgemenet (clicking on the desired mode) and then on the OK-button the box disappears and the command is transferred to the AS. After the AS has changed the mode, the new mode is shown. Klikking on the Cancel Button will close the box.

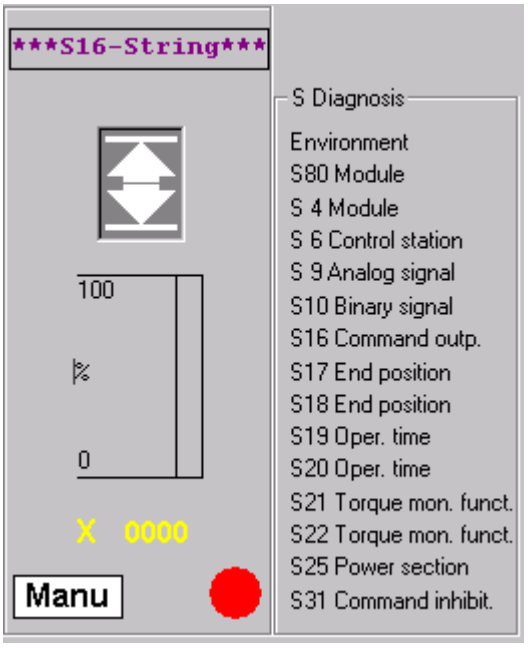


Figure 3-7 Display of the EK block

The modes Manu/Auto (manual/automatic) are displayed only, but are not operator-controllable.

Operation boxes

After klicking on the area “Open / Close / Stop / Opening / Closing” the corresponding operation boxes are opened. When the desired mode has been klicked it becomes highlighted.
The operator intervention is concluded by a click on the OK button (transfer of the command to the PLC) or by the Cancel button.

The operation boxes are always opened inside the OCX and cannot be moved outside.

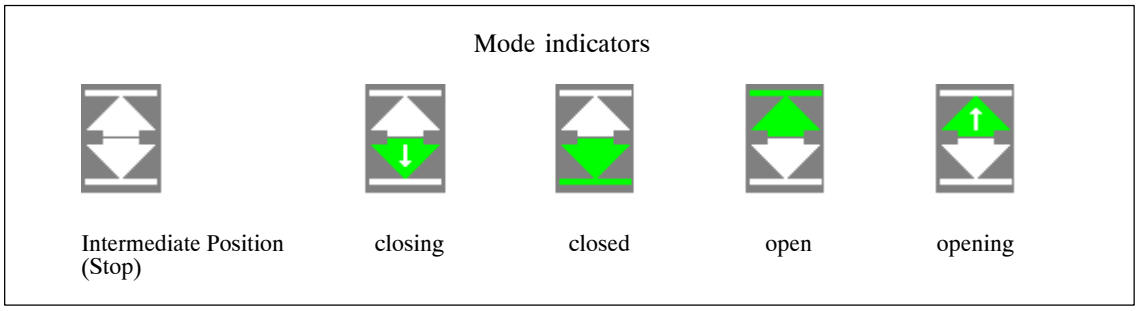


Figure 3-8 Mode indicators of the EK block

I/O Bars

The following tables present the input and output bars of the block.

Table 3-57 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
YME	Upper range limit für Y/YESR	REAL	100,0	Q	B	
YMA	Lower range limit für Y/YESR	REAL	0,0	Q	B	
UZT	Alarm duration for interlocking monitoring	INT	10	Q		1...1800
AUAB	Command OPEN – automatic	BOOL	0	Q		
ZUAB	Command CLOSE – automatic	BOOL	0	Q		
STAB	Command STOP – automatic	BOOL	0	Q		
AHBA	Automatic/manual mode	BOOL	0	Q		
OFFC	Protection – OPEN	BOOL	0	Q		
ZUSC	Protection – CLOSE	BOOL	0	Q		
AUFR	Enable – OPEN	BOOL	0	Q		
ZUFR	Enable – CLOSE	BOOL	0	Q		
DLBT	Continuous /inching operation 0/1	BOOL	0	Q		
SPEL	Disable end position monitoring	BOOL	0	Q		
USSC	Undervoltage protection	BOOL	0	Q		
ABA1	Binary output 1	BOOL	0	Q		
ABA2	Binary output 2	BOOL	0	Q		
UMGF	External fault	BOOL	0	Q		
US	Suppression STATUS	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...3
AUBA	Command OPEN – automatic/STEP	BOOL	0	Q		
ZUBA	Command CLOSE automatic/STEP	BOOL	0	Q		
STBA	Command STOP automatic/STEP	BOOL	0	Q		
YANZ	Y-display 0=OFF/ 1=Yint./ 2= Yext.	INT	0			0, 1, 2
TZU	Charcter string for CLOSED	STRING2	'ZU'	U	B	
TST	Character string for STOP	STRING2	'ST'	U	B	
TAU	Character string for OPEN	STRING2	'AU'	U	B	
TY	Character string for Y	STRING2	'Y'	U	B	
EHT	Quantity for Y	STRING6	'*EHT*'		B	
ATN	Technological name	STRING16	'*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-58 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
YEXT	Position indication Y from external device	REAL	0,0	Q		
Y	Manipulated value Y for inching operation	REAL	0,0		B	
AU	Command OPEN	BOOL	0	U	B	
ZU	Command CLOSE	BOOL	0	U	B	
ST	Command STOP	BOOL	0	U	B	

Table 3-59 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
YESR	Electronic position indication	REAL	0,0		B	
ZWST	Return data intermediate position	BOOL	0			
LAAU	Return data Opening	BOOL	0			
RAZU	Return data Closing	BOOL	0			
RNAU	Return data NOT OPEN	BOOL	0			
RAUF	Return data OPEN	BOOL	0		B	
RZU	Return data CLOSED	BOOL	0		B	
RNZU	Return data NOT CLOSED	BOOL	0			
TAUF	Key OPEN	BOOL	0			
TAZU	Key CLOSED	BOOL	0			
TSTP	Key STOP	BOOL	0			
ABE1	(Command CLOSE on module)	BOOL	0			
ABE2	(Command OPEN on module)	BOOL	0			
S25	Power section failure	BOOL	0		B	
S10	Binary signal monitoring has responded	BOOL	0		B	
S16	Command output failure	BOOL	0		B	
S31	Interlocking monitoring function has responded	BOOL	0		B	
S17	End position monitoring ‘OPEN’	BOOL	0		B	
S18	End position monitoring ‘CLOSED’	BOOL	0		B	
S21	Torque monitoring OPEN has responded	BOOL	0		B	
S22	Torque monitoring CLOSED has responded	BOOL	0		B	
S19	Run time monitoring OPEN	BOOL	0		B	
S20	Run time monitoring CLOSED	BOOL	0		B	
S9	Analog signal monitoring has responded	BOOL	0		B	
S26	Test position of switching device	BOOL	0		B	
S6	Control station defective	BOOL	0		B	
S4	Hardware fault detected on module	BOOL	0		B	
S80	Module failure detected	BOOL	0		B	
BGF	Module fault	BOOL	1		B	
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.15 TM_EU, Driver Block for Open-Loop Control Module – Motor

Type/Number

FB 313

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

TM_EU is used for acquiring signals from one of the TELEPERM M open-loop control modules 6DS1 500-8AA/-8BA or of a channel of one of the TELEPERM M open loop control modules 6DS1 502-8AA/-8BA and to transfer commands to the module. The read signals are presented at the binary outputs and may be used, for example, by a subgroup controller.

Working Method

- **Modes**

In manual mode (Mode H) the commands ON (EI, with acknowledgement) and OFF (AU, with acknowledgement) entered via the operator-controllable inputs are routed to the open-loop control module.

In automatic mode (Mode A) the commands ON (input EIAB) or OFF (input AUAB) or the commands ON/OFF-automatic/STEP (inputs BNEA and BNAA) from an automatic controller are routed to the module.

Priority is not given to automatic and automatic/STEP commands. Simultaneous operator interventions are possible via the binary inputs. These commands have a higher priority; they are routed to the module as long as they are present. The commands acknowledgement ON/OFF (EI,AU) are also valid during automatic operation.The modes A/H (automatic/manual mode) can be selected via binary input AHBA.

- **Parameterization**

The module number is parameterized via input BGNR and the channel number via input KNR.

channel-Nr. 0: 1-channel open-loop control module 6DS1500-8BA
channel-Nr. 1,2,3: respective channel of the open-loop control module 6DS1 502-8BA.

- **Interlocking monitoring function**

The interlocking monitoring function informs the operator of a rejected ON or OFF command.

Rejection can be caused by (output S31):
– missing process release or
– a protective command in the opposite direction

The interlocking monitoring function is shown during the monitoring time specified via input UZT (default = 10 seconds) in the loop display. After the monitoring time has elapsed, it is deleted from the loop display. A status message is generated if the interlocking monitoring function responds and after the monitoring time has elapsed.

In the OS subsystems, an operator notice (”B”), which need not be acknowledged, is derived at all levels from this function.If the monitoring time has been parameterized = 0, the display is shown for the duration of one cycle. This signal will not be processed in the message processing function MELD. The cabinet or cabinet row lamps are not triggered either when this monitoring function responds.

- **Motor current display**

The motor current is fed as an analog signal to input AW. Normalization parameters are entered via input AWME (Upper range limit) and input AWMA (Lower range limit).

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-60 Control-system messages of the TM_EU block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	QBGF	Module malfunction (S321)	S
6			
7	0	*Contro system message identifier*	
8	1	*Control system message identifier*	

Table 3-61 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

The UZT parameter is limited to the range 1 to 1800 (without error message).

Status Transfer

Description of the status word transfer.
In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-62 Status (low) of the TM_EU block

Message No.	Block parameter	Initial start message text	Message class
1	RMEI	On	
2	RMAU	Off	
3	S80	I/O fault S80	
4		I/O fault S80 v S31 v S4 v S25 v S10 v S16 v S17 v S18 v S19 v S20 v S6 v S26	
5	S31	Command inhibit	
6	AHBA	Automatic/Manual mode	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-63 Status (high) of the TM_EU block

Message No.	Block parameter	Initial start message text	Message class
1	UMGF	External fault	
2		Common alarm UMGF v S80 v S31 v S4 v S25 v S10 v S16 v S17 v S18 v S19 v S20 v S6 v S26	ST
3			
4			
5			
6			
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the EU block

After the OCX has been placed by the WinCC-Grafics Designer the block specific properties box has to be called by a double click on the OCX. The block instance and other parameters can then be entered.

Changing of parameters is only possible, if the adequate input privilege is active; else a Windows Message Box will appear.

Input privilege = 0 the privilege is not limited.
Input privilege = 1: Changing modes

The modes of the TM_EU block (On/Off) can be changed by clicking on the highlighted area. A box will then appear, where the actual mode is accentuated. After acknowledgement (clicking on the desired mode) and then on the OK-button the box disappears and the command is transferred to the AS. After the AS has changed the mode, the new mode is shown. Klicking on the Cancel Button will close the box.

Display 1 (name of OCX: S7.G_EU resp. S7.K_EU)

Name	Source / Input (AS)	Operator-Controllable?
Technological name	ATN	no
Fault alarm S25	S25	no
Fault alarm S10	S10	no
Fault alarm S16	S16	no
Fault alarm S31	S31	no
Fault alarm S18	S18	no
Fault alarm S17	S17	no
Fault alarm S26	S26	no
Fault alarm S20	S20	no
Fault alarm S19	S19	no
Fault alarm S6	S6	no
Fault alarm S4	S4	no
Fault alarm S80	S80	no
Module fault	BGF	no
Upper range limit (motor current)	AWME	no
Motor current	AW	no
Lower range limit (motor current)	AWMA	no
Command ON	EI / state	yes, in manual mode
Command OFF	AU / state	yes, in manual mode
Mnemonic name OFF	TAU	no
Mnemonic name ON	TEI	no
Quantity X	EHT	no
PCS fault (External fault)	state	no

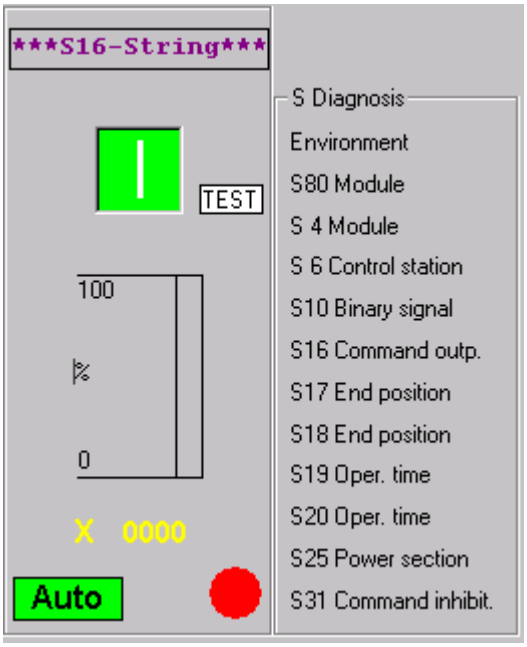


Figure 3-9 Display of the EU block

The modes Manu/Auto (manual/automatic) are displayed only, but are not operator-controllable.

Operation boxes

After klicking on the button ON / OFF the corresponding operation box is opened. When the desired mode has been klicked it becomes highlighted. The operator intervention is concluded by a click on the OK button (transfer of the command to the PLC) or by the Cancel button.

The operation boxes are always opened inside the OCX and cannot be moved outside.

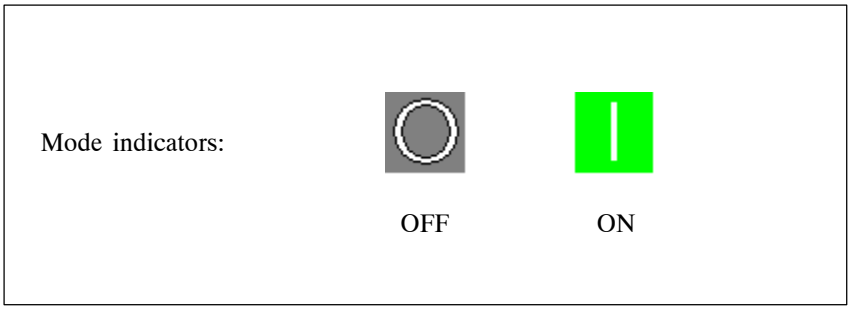


Figure 3-10 Mode indicators of the EU blocks

I/O Bars

The following tables present the input and output bars of the block.

Table 3-64 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
AWME	Upper range limit	REAL	100,0	Q	B	
AW	Allocated analog value / interconnectable	REAL	0,0	Q	B	
AWMA	Lower range limit	REAL	0,0	Q	B	
UZT	Alarm duration for interlocking	REAL	10	Q		1...1800
EIAB	Command ON – automatic	BOOL	0	Q		
AUAB	Command OFF – automatic	BOOL	0	Q		
AHBA	Automatic / manual mode	BOOL	0	Q		
EISC	Protection – ON	BOOL	0	Q		
OFFC	Protection – OFF	BOOL	0	Q		
EIFR	Enable – ON	BOOL	0	Q		
AUFR	Enable – OFF	BOOL	0	Q		
USSC	Undervoltage protection	BOOL	0	Q		
SPEL	Disable end position monitoring for protective command	BOOL	0	Q		
DLBT	Continuous operation	BOOL	0	Q		
ABA1 1)	Binary output 1	BOOL	0	Q		
ABA2 1)	Binary output 2	BOOL	0	Q		
UMGF	External fault	BOOL	0	Q		
US	Suppression STATUS	BOOL		Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...3
BNEA	Command ON automatic / STEP	BOOL	0	Q		
BNAA	Command OFF automatic / STEP	BOOL	0	Q		
TAU	Text for OFF	STRING2	'AU'	U	B	
TEI	Text for ON	STRING2	'EI'	U	B	
EHT	Quantity	STRING6	'*EHT*'		B	
ATN	Technological name	STRING16	'*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-65 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
EI	Command ON	BOOL	0	U	B	
AU	Command OFF	BOOL	0	U	B	

Table 3-66 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
RMAU	Return data OFF	BOOL	0		B	
RMEI	Return data ON	BOOL	0		B	
TAUS	Key OFF	BOOL	0			
TEIN	Key ON	BOOL	0			
ABE1 [1)]	Process Command ON	BOOL	0			
ABE2 [1)]	Process Command OFF	BOOL	0			
S25	Power section failure	BOOL	0		B	
S10	Binary signal monitoring has responded	BOOL	0		B	
S16	Command outputs have failed	BOOL	0		B	
S31	Interlocking monitoring function has responded	BOOL	0		B	
S18	End position monitoring ‘OFF’	BOOL	0		B	
S17	End position monitoring ‘ON’	BOOL	0		B	
S26	Test position switching device	BOOL	0		B	
S20	Run time monitoring ‘OFF’	BOOL	0		B	
S19	Run time monitoring ‘ON’	BOOL	0		B	
S6	Control station defective	BOOL	0		B	
S4	Hardware fault on module	BOOL	0		B	
S80	Module failure detected	BOOL	0		B	
BGF	Module fault/ Driver message	BOOL	1		B	
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

[1)] If QPARF = 1 no processing of the block is done.

3.16 TM_BRBK Driver Block for Binary Arithmetic Module (Coordination Block)

Type/Number

FB 314

Calling OBs

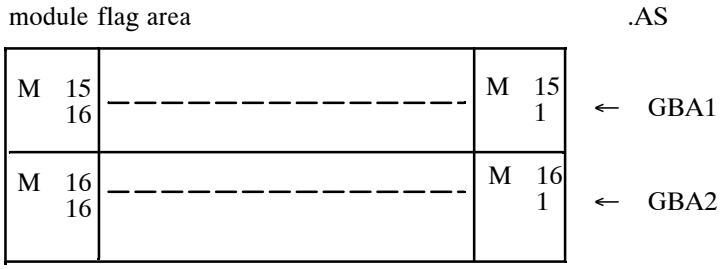
The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

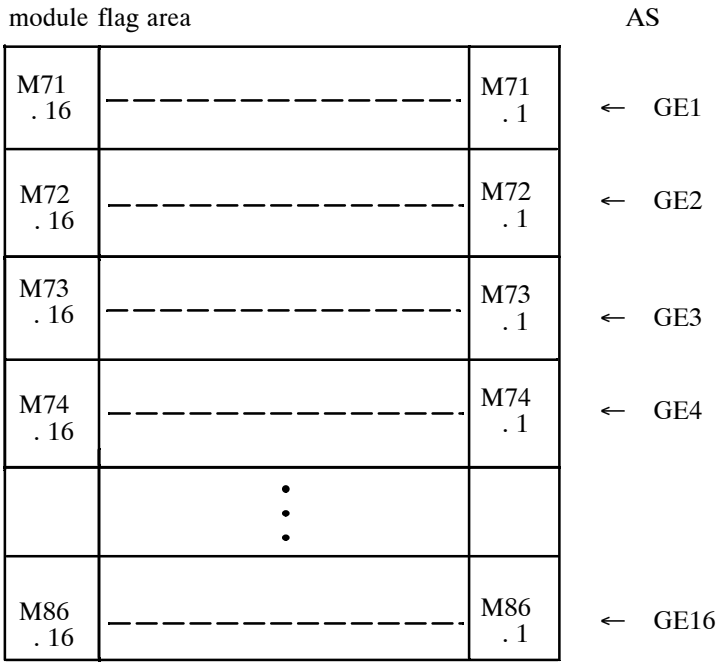
The BRBK block is used for acquiring signals from and transferring signals to the unassigned flag area of the TELEPERM M binary arithmetic modules 6DS1 717-8AA/-8RR. It is also used as a coordination block for subdriver blocks.

Working Method

Using the BRBK block, up to 32 binary values can be entered in the module's flag area (flags 15.1 to 15.16 or 16.1 to 16.16). The binary values must be provided in two fields with 16 values each (inputs GBA1 and GBA2).



In addition, max. 256 binary values are read from the module's flag area.(flags 71.1 to 71.16 ... 86.1 to 86.16). The binary values are stored in 16 fields of 16 values each (outputs GE1...GE16). All digital values will be set to 0 if a module malfunction has been detected.



The BRBK block coordinates and monitors the data transfer to the module. Subordinate blocks can only exchange data with the module after the BRBK block has internally enabled data transfer.

- **Block sequence**

All subdriver blocks (TM_ABR/TM_MSB/TM_TVB) pertaining to a TM_BRBK should be installed in the same processing cycle (before the BRBK) in order to avoid synchronization errors.

- **Parameterization / interconnection**

The module number is specified via input BGNR.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-67 Control-system messages of the TM_BRBK block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	TYP	Wrong module type (S311)	S
6	QBGF	Module malfunction/defective (S321)	S
7	BSP	Processing inhibit (S324)	S

Table 3-68 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-69 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
GBA1	Source 1st binary field to be output (Offset 0)	WORD	0	U		
GBA2	Source 2nd binary field to be output (Offset 2)	WORD	0	U		
BGNR	Module number	INT	–1			0...60, 100...160
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-70 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
GE1	Target read binary field 1 (Offset 12)	WORD	0	U		
GE2	Target read binary field 2 (Offset 14)	WORD	0	U		
GE3	Target read binary field 3 (Offset 16)	WORD	0	U		
GE4	Target read binary field 4 (Offset 18)	WORD	0	U		
GE5	Target read binary field 5 (Offset 20)	WORD	0	U		
GE6	Target read binary field 6 (Offset 22)	WORD	0	U		
GE7	Target read binary field 7 (Offset 24)	WORD	0	U		
GE8	Target read binary field 8 (Offset 26)	WORD	0	U		
GE9	Target read binary field 9 (Offset 28)	WORD	0	U		
GE10	Target read binary field 10 (Offset 30)	WORD	0	U		
GE11	Target read binary field 11 (Offset 32)	WORD	0	U		
GE12	Target read binary field 12 (Offset 34)	WORD	0	U		
GE13	Target read binary field 13 (Offset 36)	WORD	0	U		
GE14	Target read binary field 14 (Offset 38)	WORD	0	U		
GE15	Target read binary field 15 (Offset 40)	WORD	0	U		
GE16	Target read binary field 16 (Offset 42)	WORD	0	U		
BGF	Module fault	BOOL	1			
BGNA	Module cannot be addressed	BOOL	1			
BGA	Module failure	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
KOOR	Subdriver coordination	BYTE	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

Note

When an instance DB is opened, the parameter names, comments and byte offsets are visible, so that the user can access the I/O fields GBAx and GEx with his FB.

3.17 TM_ABR Analog Input/Output Block for Binary Arithmetic Module

Type/Number

FB 315

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

The block is used as a driver block to output one and to input up to six analog signals to the TELEPERM M analog extension module 6DS1 720-8AA via the binary arithmetic module 6DS1 717-8AA.

Note: The extension module 6DS1 720-8AA cannot be used with a 6DS1 717-8RR.

Working Method

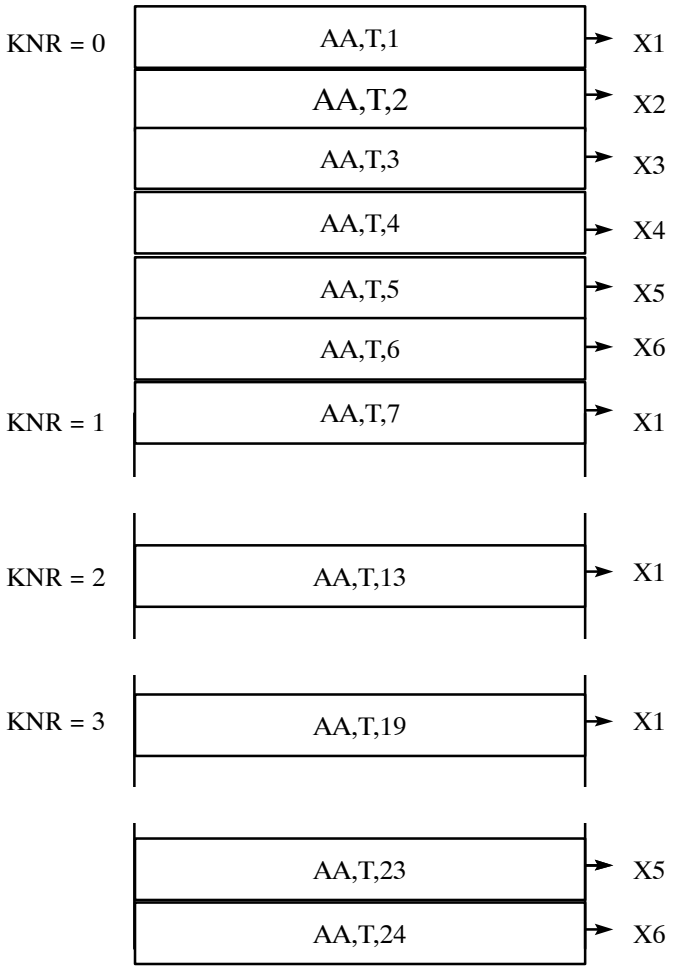
The TM_ABR block cannot be executed without a TM_BRBK block. The link to a TM_BRBK block is defined by parameterizing inputs BGNV and KOOR; else an error indication is output.

The number of analog values to be transferred is parameterized via input ANZ. ANZ = 0 means that no execution takes place, ANZ = 1 to 6 specifies the number of analog outputs. Input X7 is always transferred to the module if a value between 1 and 6 has been selected for ANZ. Selectable limits of the analog inputs are not monitored. Non-availabilty messages and channel related alarms are provided as output.

ANZ	X1	X2	X3	X4	X5	X6	X7
0	–	–	–	–	–	–	–
1	X	–	–	–	–	–	X
2	X	X	–	–	–	–	X
3	X	X	X	–	–	–	X
4	X	X	X	X	–	–	X
5	X	X	X	X	X	–	X
6	X	X	X	X	X	X	X

The channel number is selected at input KNR according to the table:

KNR = 0 = AA,T,1 to AA,T,6 and EA, T,1
1 = AA,T,7 to AA,T,12 and EA,T,2
2 = AA,T,13 to AA,T,18 and EA,T,3
3 = AA,T,19 to AA,T,24 and EA,T,4



The analog values 1 – 18 (KNR = 0 – 2) are defined as analog values via the hardware inputs or as arithmetic values by user configuration on the module. As the module features a maximum of 18 analog hardware inputs, only arithmetic values should be transferred for the analog values 19 – 24.

Selectable limits of the analog values are not monitored. Non-availabilty messages and channel related alarms are provided at the outputs X1 to X6. An status signal providing information regarding the fault-free states of the associated analog signals is issued via the outputs KF1 to KF6.

KFx is present if

- the analog value is not available
- the module cannot be addressed

Error handling

During processing the driver monitors both the hardware and the value. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-71 Control-system messages of the TM_ABR block

Message No.	Block parameter	Initial start message text		Message class
1	QPARF	Parameter assignment error	(F410)	S
2	QCOM	Communication error FM		S
3	QVZ	Module time-out	(S305)	S
4	EANK	Multiple addressing	(S313)	S
5	TYP	Wrong module type	(S311)	S
6	QBGF	BGNV / NV / read error	(S321)	S
7	BRBK_E	BRBK block not executed	(S324)	S

Table 3-72 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	ANZ
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-73 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X7	Analog input	REAL	0,0	Q		
ANZ	Number of analog values (0, 1–6)	INT	0			0...6
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...3
BGNV	Module not available (must be interconnected with the output BGF of the BRBK block to which it belongs)	BOOL		Q		
KOOR	Subdriver coordination (This input must be interconnected with the output KOOR of the BRBK block to which it belongs.)	BYTE		Q		
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-74 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X1	Analog output 1	REAL	0,0			
X2	Analog output 2	REAL	0,0			
X3	Analog output 3	REAL	0,0			
X4	Analog output 4	REAL	0,0			
X5	Analog output 5	REAL	0,0			
X6	Analog output 6	REAL	0,0			
BGF	Module fault	BOOL	1			
NV1	Non-availability of X1	BOOL	0			
NV2	Non-availability of X2	BOOL	0			
NV3	Non-availability of X3	BOOL	0			
NV4	Non-availability of X4	BOOL	0			
NV5	Non-availability of X5	BOOL	0			
NV6	Non-availability of X6	BOOL	0			
KF1	Channel fault X1	BOOL	0			
KF2	Channel fault X2	BOOL	0			
KF3	Channel fault X3	BOOL	0			
KF4	Channel fault X4	BOOL	0			
KF5	Channel fault X5	BOOL	0			
KF6	Channel fault X6	BOOL	0			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.18 TM_TVB Block for Partial Subgroup Control and Preselector Control of Binary Arithmetic Module

Type/Number

FB 316

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This block is used for signal acquisition from and transfer to the TELEPERM M binary arithmetic module 6DS1 717-8AA/-8RR.

Working Method

- **Common function**

The TM_TVB block can only be used together with a TM_BRBK block. The interconnections with the TM_BRBK block must be established via inputs BGNV and KOOR, else an error message is output.
Input TEVL defines whether a partial subgroup control (TEVL = 1) or a preselector control (TEVL = 2) has to be processed.
Block processing is inhibited if a control mode has not been selected (TEVL = 0). Block input KNR specifies the channel used for processing of the selected control mode.

Notice

The user must ensure that the required function has been implemented on the module. The system does not perform any check.

Impulse-type module signals (THBA, THBH and TBBL for partial subgroup control and HVW1, HVW2, HVW3 for preselector control) are extended by the TVB block for the purpose of better representation. The extension time, which is specified in seconds in the UZT element, is startet after each 0/1 transition.

- **Partial Subgroup Control Mode (element TEVL = 1)**

Signals from the TVB block to the module

The TVB block transfers the following input signals to the module:

A	:	Manual command “automatic” (only effective if FHD=1)
H	:	Manual command “manual” (only effective if FHD=1)
QB	:	Acknowledgement
FHD	:	Enable manual mode
BAA	:	Automatic command “automatic”
BAH	:	Automatic command “manual”
BABT	:	Automatic command “operation”
BAST	:	Automatic command “shutdown”
ZWH	:	Forced manual

The inputs A, H and QB are reset subsequently. The input QB is transferred to the module like as an A or H manual command without enabling signal (FHD = 0).

Signals from the module to the TVB block

Some of the signals coming from the module are stored in outputs, some in internal elements.

FUFE	:	Malfunction	
TH	:	Status “manual”	
TA	:	Status “automatic”	
THBH	:	Feedback manual command “manual”	(1)
THBA	:	Feedback manual command “automatic”	(1)
TST	:	Status “shutdown”	
TBT	:	Status “operation”	
TBAB	:	Feedback automatic command “operation”	
TBAS	:	Feedback automatic command “shutdown”	
TZWH	:	Feedback forced manual	
TBBL	:	Command blocked	
TBAA	:	Feedback automatic command “automatic mode”	
TBAH	:	Feedback automatic command “manual mode”	
TLAR	:	Lamp automatic steady light	
TLAB	:	Lamp automatic blinking	
TLHR	:	Lamp manual steady light	
TLHB	:	Lamp manual blinking	
TLSR	:	Lamp fault steady light	
TLSB	:	Lamp fault blinking	

(1) Signal is extended

- **Preselector control mode (element TEVL=2)**

Input BART defines the preselector control mode. Three modes are possible:

1 = Preselection 1-out-of-2 using 1 key
2 = Preselection 1-out-of-2 using 2 keys
3 = Preselection 1-out-of-3 using 3 keys

Notice

The user must ensure that the mode selected matches the mode configured on the module. A check is not performed.

Signals from the TVB block to the module

The TVB block transfers the following input signals to the module:

V1	:	Preselection 1
V2	:	Preselection 2 (mode 2 or 3 only)
V3	:	Preselection 3 (mode 3 only)

Signals from the module to the TVB block

Some of the signals from the module are stored in outputs, some in internal elements.

VW1	:	Feedback output command generating set 1
VW2	:	Feedback output command generating set 2
VW3	:	Feedback output command generating set 3
HVW1	:	Manual operator input preselection 1 (1)
HVW2	:	Manual operator input preselection 2 (1)
HVW3	:	Manual operator input preselection 3 (1)
LVW1	:	Lamp steady light Preselection 1
LVW2	:	Lamp steady light Preselection 2
LVW3	:	Lamp steady light Preselection 3

(1) signal is extended.

- **Parameterization**

At input TEVL, the user defines whether a partial subgroup control (TEVL = 1) or a preselector control (TEVL = 2) has to be processed. Block processing is disabled if a control mode has not been selected (TEVL = 0).

Input KNR is used for specifying the channel for the control mode selected.

Notice

The user must ensure that the required function has been implemented on the module. The system does not perform any check.

Status transfer via the bus is suppressed if input US has been set to 1. Status message frame will then no longer be transferred to the OS.
Input FHD is used for enabling (FHD = 1) or disabling (FHD = 0) the operator input function (A/H resp. V1/V2/V3).

Impulse-type module signals (THBA, THBH and TBBL for partial subgroup control and HVW1, HVW2, HVW3 for preselector control) are extended by the TVB block for the purpose of better representation. The extension time, which is specified in seconds in the UZT element, is startet after each 0/1 transition.

- **Block sequence**

In order to avoid synchronization errors, the TVB block should be installed before the BRBK block in the same processing cycle. Assignment must be performed in the BRBK block.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)

- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-75 Control-system messages of the TM_TVB block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF / TEVL = 0	Parameter assignment error / Control type missing (F410/S325)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	TYP	Wrong module type (S311)	S
6	QBGF / BRBK_E	Module malfunction / BRBK block has failed (S321/S324)	S
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-76 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	TEVL
2	KNR

Status Transfer

Description of the status word transfer.

In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-77 Status (low) of the TM_TVB block

Message No.	Block parameter	Initial start message text	Message class
1	TA	Manual/Automatic mode	
2	ST_BT	Shutdown/Operation	
3	LVW1	Steady light V1	
4	LVW2	Steady light V2	
5	LVW3	Steady light V3	
6	FUFE	Malfunction	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-78 Status (high) of the TM_TVB block

Message No.	Block parameter	Initial start message text	Message class
1	BGF	Module fault	
2		Common alarm FUFE v TZWH v BGF	ST
3			
4			
5	TZWH	Forced manual	
6	TBBL	Command inhibit	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the TVB block

– Display 1 for the TM_TVB block is for operating and monitoring a partial subgroup control, configured on a binary arithmetic module.

– Display 2 for the TM_TVB block is for operating and monitoring a preselector control 1-out-of-3 with 3 keys., configured on a binary arithmetic module.

Operating and monitoring of the TM_TVB block via the corresponding "NORA" requires a corresponding binary arithmetic module.

After the OCX has been placed by the WinCC-Grafics Designer the block specific properties box has to be called by a double click on the OCX. The block instance and other parameters can then be entered.

Changing of parameters is only possible, if the adequate input privilege is active; else a Windows Message Box will appear.

Input privilege = 0 the privilege is not limited.
Input privilege = 1: Changing modes

The modes of the TM_TVB block can be changed by clicking on the highlighted area. A box will then appear, where the actual mode is accentuated. After acknowledgement (clicking on the desired mode) and then on the OK-button the box disappears and the command is transferred to the AS. After the AS has changed the mode, the new mode is shown. Klicking on the Cancel Button will close the box.

(name of OCX: S7.TVB1 resp. S7.TVB2)

Name	Source / input	Operator-Controllable?
Feedback forced manual	TZWH	no
Command blocked	TBBL	no
Automatic mode	A / state	yes
Manual mode	H / state	yes
Acknowledgement	QB	yes
String automatic	TXA	
String manual	TXH	
String acknowledgement	TXQ	
Preselection 1	V1	
Preselection 2	V2	
Preselection 3	V3	
Mode	BART	no
String Preselection 1	TXV1	
String Preselection 2	TXV2	
String Preselection 3	TXV3	
Technological name	ATN	no
PCS fault (External fault)	state	no

The next 2 pictures show the EG block in the two representations 1 and 2, as a group display.

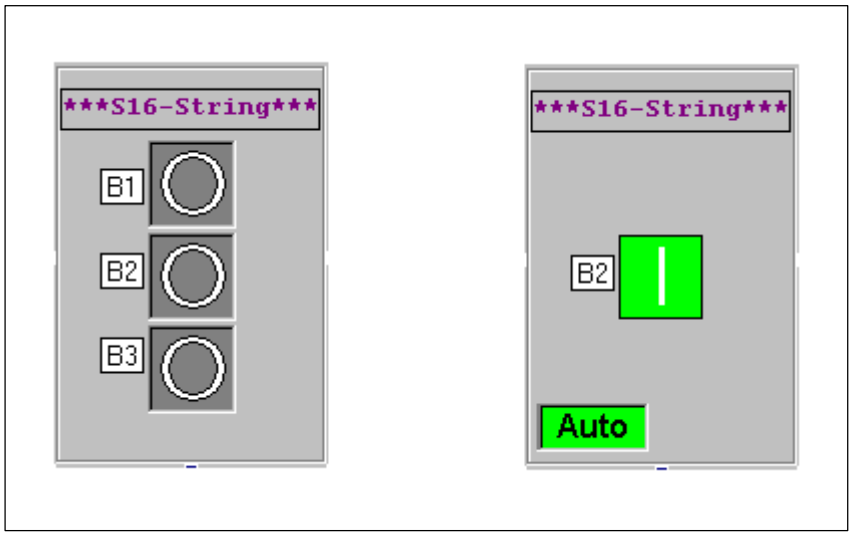


Figure 3-11 Display of the TVB block

Operation boxes

After klicking on the highlighted area manual/ automatic resp. operate the corresponding operation box is opened. The actual mode is highlighted. When the desired mode has been klicked, that mode becomes highlighted. The operator intervention is concluded by a click on the OK button (transfer of the command to the PLC) or by the Cancel button.

The operation boxes are always opened inside the OCX and cannot be moved outside.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-79 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
TEVL	Control type	INT	0			0, 1, 2
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			1, 2
US	Status suppression	BOOL	0	Q		
FHD	Enable manual control	BOOL	1	Q	B	
UZT	Delay time for impulse-type module signals/ message duration interlocking monitoring	INT	10	Q		1...255
BAA	Automatic command “automatic”	BOOL	0	Q		
BAH	Automatic command “manual”	BOOL	0	Q		
BABT	Automatic command “operation”	BOOL	0	Q		
BAST	Automatic command “shutdown”	BOOL	0	Q		
ZWH	Forced manual	BOOL	0	Q		
BART	Mode	INT	3		B	1, 2, 3
BAV1	Automatic command Preselection 1	BOOL	0	Q		
BAV2	Automatic command Preselection 2	BOOL	0	Q		
BAV3	Automatic command Preselection 3	BOOL	0	Q		
BGNV	Module not available (must be interconnected with the output BGF of the BRBK block to which it belongs)	BOOL	1	Q		
KOOR	Subdriver coordination (This input must be interconnected with the output KOOR of the BRBK block to which it belongs.)	BYTE	0	Q		
TXA	Text for automatic	STRING2	’A’	U	B	
TXH	Text for manual	STRING2	’H’	U	B	
TXQ	Text for acknowledgement	STRING2	’QB’	U	B	
TVW1	Text for Preselection 1	STRING2	’V1’	U	B	
TVW2	Text for Preselection 2	STRING2	’V2’	U	B	
TVW3	Text for Preselection 3	STRING2	’V3’	U	B	
ATN	Technological name	STRING16	'*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-80 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
A	Manual command “automatic”	BOOL	0	U	B	
H	Manual command “manual”	BOOL	0	U	B	
QB	Acknowledgement	BOOL	0	U	B	
V1	Manual command Preselection 1	BOOL	0	U	B	
V2	Manual command Preselection 2	BOOL	0	U	B	
V3	Manual command Preselection 3	BOOL	0	U	B	

Table 3-81 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
TA	Status automatic	BOOL	0			
TH	Status manual	BOOL	0			
TBT	Status operation	BOOL	0			
TST	Status shutdown	BOOL	0			
TZWH	Feedbach forced manual	BOOL	0		B	
FUFE	Malfunction	BOOL	0			
TBBL	Command blocked	BOOL	0		B	
VW1	Output command Preselection generating set 1	BOOL	0		B	
VW2	Output command Preselection generating set 1	BOOL	0		B	
VW3	Output command Preselection generating set 1	BOOL	0		B	
THBH	Feedback manual command “manual”	BOOL	0	U		
THBA	Feedback manual command “automatic”	BOOL	0	U		
TBAH	Feedback automatic command “manual”	BOOL	0	U		
TBAA	Feedback automatic command “automatic”	BOOL	0	U		
TBAS	Feedback automatic command “shutdown”	BOOL	0	U		
TBAB	Feedback automatic command “operation”	BOOL	0	U		
TLHB	Lamp manual blinking	BOOL	0	U		
TLHR	Lamp manual steady light	BOOL	0	U		
TLAR	Lamp automatic steady light	BOOL	0	U		
TLAB	Lamp automatic blinking	BOOL	0	U		
TLSR	Lamp fault steady light	BOOL	0	U		
TLSB	Lamp fault blinking	BOOL	0	U		
HVW1	Manual operator input Preselection 1	BOOL	0	U		
LVW1	Lamp steady light Preselection 1	BOOL	0	U		
HVW2	Manual operator input Preselection 2	BOOL	0	U		
LVW2	Lamp steady light Preselection 2	BOOL	0	U		
HVW3	Manual operator input Preselection 3	BOOL	0	U		
LVW3	Lamp steady light Preselection 3	BOOL	0	U		
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

[1)] If QPARF = 1 no processing of the block is done.

3.19 TM_MSB Block for the ESG Functions “Motor, Valve and Actuator Control” on the Binary Arithmetic Module

Type/Number

FB 317

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This driver block is used for monitoring and controlling the ESG functions “motor, valve and actuator control” of a TELEPERM M binary arithmetic module 6DS1 717-8AA/-8RR.

Working Method

The TM_MSB block can only be used together with a TM_BRBK block. The interconnections with the TM_BRBK block must be established via inputs BGNV, BGAE and KOOR.
Input BART defines whether the block is to be executed as a motor/valve control (BART = 1) or as an actuator control (BART = 2).
Block processing is inhibited if a control mode has not been selected (BART = 0).
The ESG block input defines which ESG channel of the block is to be used.

Notice

The user must ensure that the required function has been implemented on the module. The system does not perform any check.

Impulse-type module signal BBL is extended by the MSB block for the purpose of better representation. The extension time, which is specified in seconds in the UZT element, is startet after each 0/1 transition.

- **Signals from the MSB block to the module**

The MSB block transfers the following input signals to the module:

AU	: Manual command	’OPEN’ (only effective if FHD = 1)
ZU	: Manual command	’CLOSE’ (only effective if FHD = 1)
ST	: Manual command	’STOP’ (only effective if FHD = 1 and BART = 2)
QB	: Acknowledgement	
FHD	: Manual enabling	
BAOE	: Automatic command	’OPEN’
BAS	: Automatic command	’CLOSE’
FPOE	: Process release	’OPEN’
FPS	: Process release	’CLOSE’
SS1	: Aggregate protection	’CLOSE’
SS2	: Plant protection	’CLOSE’
SOE	: Protection	’OPEN’

The inputs AU, ZU, ST and QB are reset subsequently.
Input QB is transferred to the module without enabling signal (FHD = 0) in the same manner as an AU or ZU manual command.

Signals from the module to the MSB block are transferred to outputs.

BGF	:	Module fault
ARAF	:	Plant return data 'OPEN/ ON'
ARZU	:	Plant return data 'CLOSED / OFF'
ALOE	:	Output command 'OPEN/ON, OPENING'
ALS	:	Outp. command 'CLOSE/OFF,CLOSING'
PFOE	:	Enabling process 'OPEN'
PFS	:	Enabling process 'CLOSE'
S1S	:	Aggregate protection 'CLOSE' / OFF
S2S	:	Plant protection 'CLOSE' / OFF
S2OE	:	Protection 'OPEN' / ON
WEZU	:	End-of-travel signal 'CLOSED'
WEAF	:	End-of-travel signal 'OPEN'
WENZ	:	End-of-travel signal 'not CLOSED'
WENA	:	End-of-travel signal 'not OPEN'
DEZS	:	Torque signal 'CLOSED'
DEAS	:	Torque signal 'OPEN'
M1	:	Individual open-loop controller alarm
M2	:	Time out alarm
M3	:	End position error alarm
M4	:	Branch error alarm
BBL	:	Command blocked (internal, signal is extended)

- **Parameterization**

The AU and ZU operator input function can be enabled/disabled via input FHD = 1/0.

An analog value can be interconnected with input ESR and used as a position feedback signal. This value is shown in bar and numeric representation in the loop display on the OS (only if BART = 2). Inputs OG and UG are used as (upper/lower) bar limits.

The physical quantity of the value is defined at input EHTY. The output is suppressed if an analog value has not been interconnected.

In order to provide improved representation, the impulse-type module signal "Command blocked" (BBL) is extended in the MSB block. The extension time is specified in seconds via input UZT. It is re-startet after each 0/1 transition.

A binary value interconnected with input FEXT is shown as an external fault in the loop display on the OS and accepted into the MSB block status word. Acceptance can be suppressed by input STU.

Status transfer via the bus is suppressed if input US has been set to 1. The OS does then not receive any status messages.

Input BART specifies whether a motor/valve control (BART = 1) or an actuator control function (BART = 2) is to be executed.
Input ESG specifies the ESG channel of the module which is to be used. Parameterization is only possible after the mode has been selected. Valid channel numbers are:

For BART = 1: 1 to 5
For BART = 2: 1 to 4

The modes “local operation” and “test position” are not actual I/O faults and therefore need not appear in the status word as I/O faults. To suppress the modes in the status word, the BART parameter is supplemented by the modes 11 and 12.

BART functions with:

=	1	“local” and “test” appear in the status word
=	2	“local” and “test” appear in the status word
=	11	“local” and “test” do not appear in the status word
=	12	“local” and “test” do not appear in the status word

Block execution remains disabled if mode (BART=0) and/or channel number (ESG = 0) have not been selected (→ S 325).

The user must ensure that the required function has been implemented on the module. The system does not perform any check.

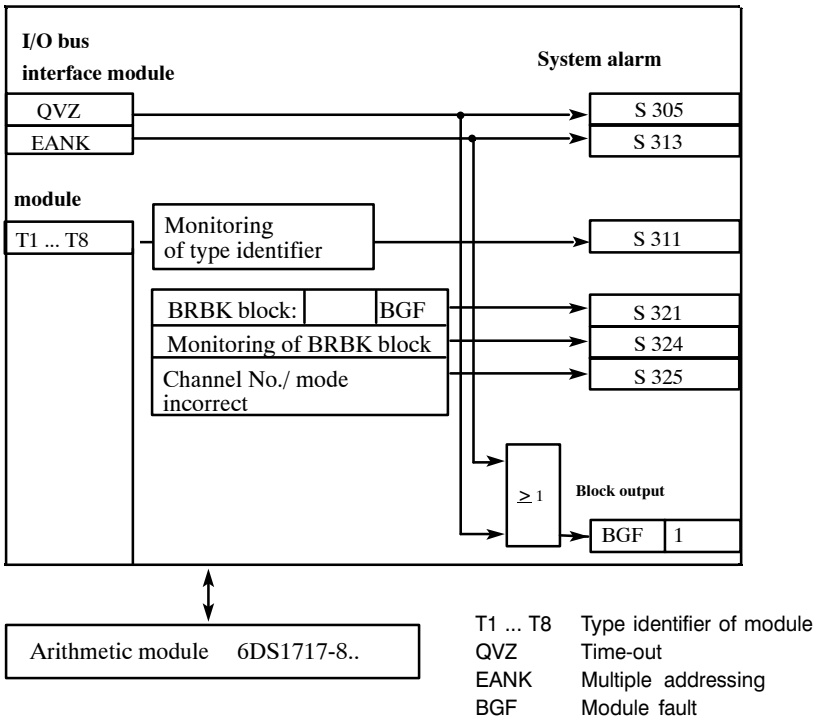


Figure 3-12 MSB block, alarm logic

- **I/O error messages**

  I/O error messages are shown in the loop display on the OS, and have the following meaning:

  Priority

  S 80 : Module failure/ module access failure
  S 4 : Hardware fault on module
  S 25 : Branch error
  S 27 : Low voltage, interconnected
  S 16 : Command output monitoring
  S 17 : End position monitoring CLOSED –> OPEN
  S 18 : End position monitoring OPEN –> CLOSED
  S 19 : Run time monitoring OPENING
  S 20 : Run time monitoring CLOSING
  S 21 : Torque monitoring function OPEN has responded
  S 22 : Torque monitoring funct. CLOSE has responded
  S 8 : Status signal fault 1
  S 9 : Status signal fault 2
  S 5 : Local operation
  S 26 : Test position

Allocation of I/O error numbers to module flags

I/O error messages	Driver		Module	
	Mnem. name	Input/output	Internal name	Flag No. ESG 1
S 80	BGA	I	BGA	M,0,9
S 4	BGF	0	—	—
S 25	AZS	I	AZS	M,26,9
S 27	UAV	I	UAV	M,26,11
S 16	UEBA	I	ÜBA	M,26,12
S 17	EFZA	I	EFZAV	M,26,8
S 18	EFAZ	I	EFAZM	M,26,7
S 19	LZAF	I	LZAFV	M,26,6
S 20	LZZU	I	LZZUV	M,26,5
S 21	DEAS	0	DEAFS	M,27,1
S 22	DEZS	0	DEZUS	M,26,16
S 8	RMF1	I	RMF1	M,26,14
S 9	RMF2	I	RMF2	M,26,15
S 5	VOV	I	VOV	M,26,13
S 26	TE	I	TE	M,26,10

Flag number allocation of the 5 ESG channels of the module

ESG channel 1 occupies the flags 26,1 to 34,16
ESG channel 2 occupies the flags 35,1 to 43,16
ESG channel 3 occupies the flags 44,1 to 52,16
ESG channel 4 occupies the flags 53,1 to 61,16
ESG channel 5 occuüies the flags 62,1 to 70,16

- **Block sequence**

The TM_MSB block should be inserted before the associated TM_BRBK in the same processing cycle in order to avoid synchronization errors.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block. The PCS 7 block ALARM_8P is used to generate control-system messages.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-82 Control-system messages of the TM_MSB block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF / BRBK_F	Parameter assignment error / Mode or channel no. missing (F410/S325)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	TYP	Wrong module type (S311)	S
6	QBGF / BRBK_E	Module malfunction / BRBK block has failed (S321/S324)	S
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-83 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BART
2	KNR

The UZT parameter is limited to the range 0 to 255 (without error message).

Status Transfer

Description of the status word transfer

In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-84 Status (low) of the TM_MSB block

Message No.	Block parameter	Initial start message text	Message class
1	ALOE	Opening	
2	ALS	Closing	
3	ARAF	Open / On	
4	ARZU	Closed / Off	
5	LZUB	Lamp Closed / Off	
6	LAFB	Lamp Open / On	
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-85 Status (high) of the TM_MSB block

Message No.	Block parameter	Initial start message text	Message class
1	FEXT	External fault	
2		Common alarm LZUB v LAFB v FEXT v BGF v DEZS v DEAS v LZZU v LZAF v EFAZ v EFZA v AZS v UAV v UEBA v RMF1 v RMF2 (v TE v VOV)	ST
3			
4			
5	BBL	Command inhibit	
6		I/O fault BGF v DEZS v DEAS v LZZU v LZAF v EFAZ v EFZA v AZS v UAV v UEBA v RMF1 v RMF2 (v TE v VOV)	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the MSB block

Operating and monitoring of the TM_MSB block via the corresponding “NORA” requires a corresponding binary arithmetic module. After the OCX has been placed by the WinCC-Grafics Designer the block specific properties box has to be called by a double click on the OCX. The block instance and other parameters can then be entered.

(name of OCX: S7.G_MSB resp. S7.K_MSB)

Name	Source / Input (AS)	Operator-Controllable?
Module fault	BGF	no
Enable ”process OPEN”	PFOE	no
Enable ”process CLOSE”	PFS	no
Aggregate protection “CLOSE”	S1S	no
Plant protection ”CLOSE/OFF”	S2S	no
Plant protection ”OPEN/ON”	S2OE	no
Manual command OPEN	AU	yes
Manual command CLOSE	ZU	yes
Manual command STOP	ST	yes
Acknowledgement	QB	yes
Manual enabling	FHD	
Mode	BART	no
String OPEN	TAU	no
String CLOSE	TZU	no
String STOP	TST	no
String acknowledgement	TQB	no
Technological name	ATN	no
PCS fault (External fault)	state	no

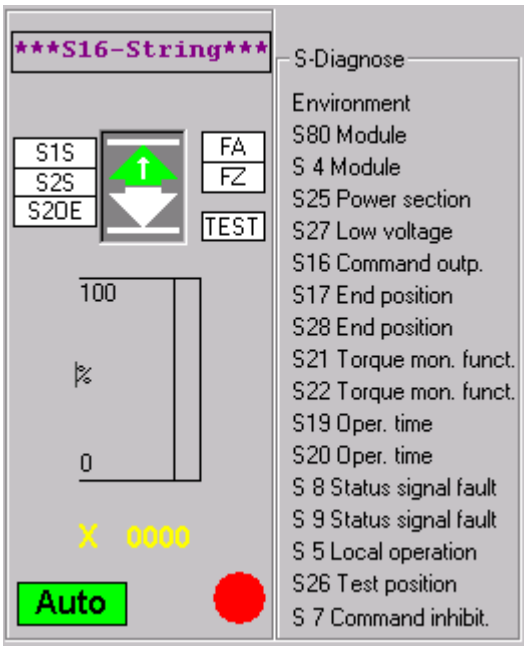


Figure 3-13 Display of the MSB block

I/O Bars

The following tables present the input and output bars of the block.

Table 3-86 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
FHD	Manual operator input enable	BOOL	1	Q	B	
BAOE	Automatic command “OPEN”	BOOL	0	Q		
BAS	Automatic command “CLOSE”	BOOL	0	Q		
FPOE	Process release “OPEN”	BOOL	0	Q		
FPS	Process release “CLOSE”	BOOL	0	Q		
SS1	Aggregate protection “CLOSE”	BOOL	0	Q		
SS2	Plant protection “CLOSE”	BOOL	0	Q		
SOE	Protection “OPEN”	BOOL	0	Q		
OG	Upper limit for position feedback	REAL	100,0	Q		
ESR	Position feedback	REAL	0,0	Q		
UG	Lower limit für position feedback	REAL	0,0	Q		
UZT	Delay time for BBL signal Message duration interlocking monitoring	INT	10	Q		1...255
FEXT	External fault	BOOL	0	Q		
US	Status output suppression	BOOL	0	Q		
STU	External interference suppression	BOOL	0	Q		
BART 1)	Mode	INT	0		B	0, 1, 2, 11, 12
BGNR	Module number	INT	–1			0...60, 100...160
ESG	ESG channel number	INT	0			0...4 resp. 0...5
BGNV	Module not available (must be interconnected with the output BGF of the BRBK block to which it belongs)	BOOL	1	Q		
BGAE	Module failure (must be interconnected with the output BGA of the BRBK block to which it belongs)	BOOL	1	Q		
KOOR	Subdriver coordination (must be interconnected with the output KOOR of the BRBK block to which it belongs.)	BYTE	0	Q		
TAU	Text for OPEN	STRING2	’AU’	U	B	
TZU	Text for CLOSE	STRING2	’ZU’	U	B	
TST	Text for STOP	STRING2	’ST’	U	B	
TQB	Text for Acknowledgement	STRING2	’QB’	U	B	
ATN	Technological name	STRING16	*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and state	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

1) BART = 11/12 is the same as BART = 1/2, but the signals TE and VOV do not appear in the status word as common fault.

Table 3-87 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
AU	Command OPEN	BOOL	0	U	B	
ZU	Command CLOSE	BOOL	0	U	B	
ST	Command STOP	BOOL	0	U	B	
QB	Acknowledgement	BOOL	0	U	B	

Table 3-88 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module fault	BOOL	1		B	
ARAF	Plant return data “OPEN/ON”	BOOL	0			
ARZU	Plant return data “CLOSED/OFF”	BOOL	0			
ALOE	Output command “OPEN/ON, OPENING”	BOOL	0			
ALS	Output command “CLOSE/OFF, CLOSING”	BOOL	0			
PFOE	Enabling process “OPEN”	BOOL	0		B	
PFS	Enabling process “CLOSE”	BOOL	0		B	
S1S	Aggregate protection “CLOSE/OFF”	BOOL	0		B	
S2S	Plant protection “CLOSE/OFF”	BOOL	0		B	
S2OE	Plant protection “OPEN/ON”	BOOL	0		B	
M1	Individual open-loop controller alarm	BOOL	0			
M2	Time-out alarm	BOOL	0			
M3	End position error alarm	BOOL	0			
M4	Branch error alarm	BOOL	0			
WEZU	End-of-travel signal ‘CLOSED’	BOOL	0			
WEAF	End-of-travel signal ‘OPEN’	BOOL	0			
WENZ	End-of-travel signal ‘not CLOSED’	BOOL	0			
WENA	End-of-travel signal ‘not OPEN’	BOOL	0			
DEZS	Torque signal ‘CLOSED’	BOOL	0			
DEAS	Torque signal ‘OPEN’	BOOL	0			
HBS	Manual command ’CLOSE/OFF’	BOOL	0	U		
HBOE	Manual command ’OPEN/ON’	BOOL	0	U		
ABSC	Automatic command ’CLOSE/OFF’	BOOL	0	U		
ABOE	Automatic command ’OPEN/ON’	BOOL	0	U		
LZZU	Time-out CLOSING	BOOL	0	U	B	
LZAF	Time-out OPENING	BOOL	0	U	B	
EFAZ	End position error OPEN–>CLOSED / ON –> OFF	BOOL	0	U	B	
EFZA	End position error CLOSED–>OPEN / OFF –> ON	BOOL	0	U	B	
AZS	Branch error	BOOL	0	U	B	
TE	Test position	BOOL	0	U	B	

Table 3-88 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BSP	Processing inhibit	BOOL	0	U		
UAV	Low voltage interconnected	BOOL	0	U	B	
UEBA	Monitoring command output	BOOL	0	U	B	
VOV	Local operation interconnected	BOOL	0	U	B	
RMF1	Status signal fault 1	BOOL	0	U	B	
RMF2	Status signal fault 2	BOOL	0	U	B	
BBL	Command blocked	BOOL	0	U	B	
UEFS	Disable end position monitoring (protection)	BOOL	0	U		
UEF	Disable end position monitoring	BOOL	0	U		
S1SV	Aggregate protection 'CLOSE'/OFF	BOOL	0	U		
LSB	Lamp fault blinking	BOOL	0	U		
LSR	Lamp fault steady light	BOOL	0	U		
LZUB	Lamp CLOSED/OFF blinking	BOOL	0	U		
LZUR	Lamp CLOSED/OFF steady light	BOOL	0	U		
LZUF	Lamp CLOSED/OFF flickering light	BOOL	0	U		
LAFB	Lamp OPEN/ON blinking	BOOL	0	U		
LAFR	Lamp OPEN/ON steady light	BOOL	0	U		
LAFF	Lamp OPEN/ON flickering light	BOOL	0	U		
BGA	Module failure	BOOL	0	U	B	
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.20 TM_RK Driver Block for Single-Channel Closed-Loop Controller Modules

Type/Number

FB 318

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This driver block is used for the acquisition of signals from the TELEPERM M single-channel controller modules 6DS1 400-8AA/-8BA (S-type controller) or 6DS1 401-8AA/-8BA (K-type controller) and for the transfer of commands and normalized increments to the controller module. The read signals are presented at the block output.

Working Method

The controller module transfers various groups of binary and analog signals to the TM_RK block where they are presented as output signals. These signals are:

– Fault alarms
– Return data protective interlocking
– Configuration jumpers
– Analog values
– Controller parameters
– Mode return data.

The following groups of binary and analog signals from the RK block are routed to the controller module:

– Mode selection
– Protective commands, interlocking
– Increments (Y, W, XD and V).

- **Modes**

In manual mode (H), the manipulated variable Y can be specified within the parameterized control limits (YHUG to YHOG) via the OS. The normalized actuating increment Y = YH – WY is then transferred to the controller module.

In automatic mode (A), either setpoint W or ratio V (for ratio control) can be specified within the parameterized control limits WUG/VUG and WOG/VOG, depending on the module input circuit (BAR1, EBR2, EBR3).

Ratio control: EBR1 = 0 and EBR2 = EBR3 = 1
Depending on the configuration jumper assignments, the appropriate normalized increment 0 to 100 is transferred to the controller module.

When controlling Y in manual mode or W and V in automatic mode via the OS, it should be noted that the respective value from the OS is only present and effective for increment generation during one cycle (TA). During program execution the difference between the value entered and the currently effective value is transferred as an increment to the module. The increment

will be 0 during the next cycle, as only the effective values WY, WXW, WW and WV, read from the module, will then be used for increment generation.

The analog value at input CE (= WC, VC or XDC (with SPC jumper) or YC (without SPC jumper)), related to the currently effective analog value WW, WV, WXW or WY, is used in C mode (compute) for increment generation.

If transition to C mode is possible, binary output BRBG = 1 (ready for C mode).

When in SPC mode, input CE is monitored and limited to the parameterized limits YCU to YCO, if necessary. Although the input value is not modified, the delimited value is used for increment generation.

In H mode and active correction of manipulated variable YNF , the actuator is corrected to the corrective manipulated variable YN. The actuator cannot be controlled manually as long as the correction value of the manipulated variable is 1. The signal YNF must be reset to make possible manual operation.

- **Mode selection**

The Modes H, A or C are selected either via the OS (binary inputs H, A and C) or via the unassigned binary inputs HBA, ABA and CBA. The unassigned inputs have a higher priority than the inputs from OS. The latter are only effective if all three unassigned inputs have been reset.

- **Parameterization**

The module number is parameterized via input BGNR.
The outputs DEA,DEZ,WEA,WEZ and S80,GO,GU of the K-type controller 6DS1 401-8BA are insignificant.
Outputs SPC, XDC, XDE, WE, WF and EBR1 to EBR3 (configuration jumper status) and the outputs KP, TN, K1TV, K2K1, K3K2, K4K3, K5K4, K6K5 (controller parameters and parameters of the adjusters K1 to K6) are updated either during initialization or after a transition to “manual mode”.

- **Cycle**

250 ms is the minimum processing cycle of the TM_RK block permitted for communication with the module.

- **Limit value generation**

The limits OG and UG of the effective system deviation WXW or the effective controlled variable WX are monitored. The monitoring value is selected by parameterizing input GWU. The result of the limit value check is fed to the outputs GO and GU.

* STU = 0

– GWU = 0
  The effective system deviation WXW is used for limit value monitoring. A hysteresis of 1 % (OG–UG) is used when monitoring the limits OG and UG.

– GWU = 1
  The effective controlled variable WX is used for limit value monitoring. A hysteresis parameterized via input HYWX is considered when monitoring the limits OG and UG

* STU = 1
– Monitoring is disabled and the outputs GO and GU are set = 0 gesetzt.

- **Interlocking monitoring**

The fault alarm „interlocking monitoring has responded" (S31) is not used for the error number generation. S31 is mapped at output S31 and displayed in the loop display on the OS during the monitoring time specified via input UZT. If UZT = 0, interlocking is displayed for the duration of one cycle.

- **Jumper assignments**

Mode	Mode indicator	SPC	XDC	VR { EBR 1 = 1 / EBR 2 = 1 / EBR 3 = 1 }	XD / XD E	WF	Δ	Measuring span of effective (W) – and central unit (C) – values
Manual	H = 1	X	X	X	X / X	X	Δ Y = Y – YW	YHUG to YHOG
Automatic	A = 1	X X	X X	0 1	0 / 0 0 / 0	0 0	Δ W = W – WW Δ V = W – VW (W = V)	VWUG to VWOG
Compute	C = 1	0	X	X	X / X	0	Δ Y = CE – WY	YCU to YCD
	C = 1 A = 1	1 1 1	0 0 1	0 1 X	X / X X / X X / X	0 0 0	Δ W = CE – WW Δ V = CE – VW Δ XD = CE – WXW	

1 = jumper inserted
0 = jumper not inserted
X = not significant

Jumper assignment for increment generation

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-89 Control-system messages of the TM_RK block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	S80 v S4	Module malfunction (S321)	S
6			
7	0	*Control system message identifier*	
8	1	*Control system message identifier*	

Table 3-90 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	WAF

The UZT parameter is limited to the range 0 to 255 (without error message).

Status Transfer

Description of the status word transfer.
In order to transfer the status word, two PCS7 ALARM_8 system blocks are called. The two highest order bits contain a code, which is processed e.g. by the associated OCX (display) block. This is necessary, because the assignment of the two status bytes to the WinCC variables EventRaw#x is not unequivocal.

Table 3-91 Status (low) of the TM_RK block

Message No.	Block parameter	Initial start message text	Message class
1	ARBG	Manual/Automatic mode	
2	CRBG	Compute mode	
3	S31	Command inhibit	
4		I/O fault S4 v S6 v S9 v S10 v S24 v S25 v S80	
5	GU	Lower limit value	AL
6	GO	Upper limit value	AH
7	0	*Status (low) identifier*	
8	0	*Status (low) identifier*	

Table 3-92 Status (high) of the TM_RK block

Message No.	Block parameter	Initial start message text	Message class
1	UMGF	External fault	
2		Common alarm UMGF v GO v GU v S4 v S6 v S9 v S10 v S24 v S25 v S80	ST
3			
4			
5	WAF	W/F/A	
6	WAF	W/F/A	
7	1	*Status (high) identifier*	
8	0	*Status (high) identifier*	

Operating and Monitoring via OS

For this driver block an allocated display block is realized in the OS.
See next section.

Standardized Display for the RK block

The mode of the RK block – Manual/Automatic/Compute – can be changed by clicking on the highlighted area.
The analog values W and Y can be changed by clicking on the mnemonic name or the allocated digital value.

(name of OCX: S7.G_RK resp. S7.K_RK)

Name	Source / Input	Operator-Controllable?[1)]
Technological name	ATN	no
Mnemonic name X	TX	no
Digital display X	WX	no
Analog display X (bar)	WX	no
mnemonic name W	TW	no
Digital display W	WW	yes, via W
Analog display W (bar)	WW	yes, via W
Quantity X, W	EHTX	no
Upper limit display range X, W	WXE	no
Lower limit display range X, W	WXA	no
Upper limit bar display	OG	no
Lower limit bar display	UG	no
Mnemonic name Y	TY	no
Digital display Y	WY	yes, via Y
Analog display Y (bar)	WY	yes, via Y
Quantity Y	static	no
Upper limit display range Y	YCO	no
Lower limit display range Y	YCU	no
Display range Y	static	no
Upper range limit	YCO	no
Lower range limit	YCU	no
Manual mode	H / state	yes
Automatic mode	A / state	yes
Compute mode	C / state	yes
PCS fault (external fault)	state	no
Upper limit digital display	OG	no
Lower limit digital display	UG	no
Upper operating limit setpoint	VWOG	no
Lower operating limit setpoint	VWUG	no
Upper operating limit manipulated variable	YHOG	yes
Lower operating limit manipulated variable	YHUG	yes
Proportional factor Kp	KP	no
Reset time	TN	no
Adjuster constant K1/TV	K1TV	no
Adjuster constant K2/K1	K2K1	no
Adjuster constant K3/K2	K3K2	no
Adjuster constant K4/K3	K4K3	no
Adjuster constant K5/K4	K5K4	no
Adjuster constant K6/K5	K6K5	no
Module fault display WAF /Status	Status	no

1) May be restricted by input privilege

The following two pictures show the RK block as a group and as a loop display. The mnemonic names for X, W and Y are read from the corresponding S2 string parameters in the AS and entered in the display.
The fault (tolerance) or warning / alarm representations are read from the WAF status and entered in the display.
The group display shows the WAF status = fault (tolerance), in the loop display the WAF status = Alarm is shown.

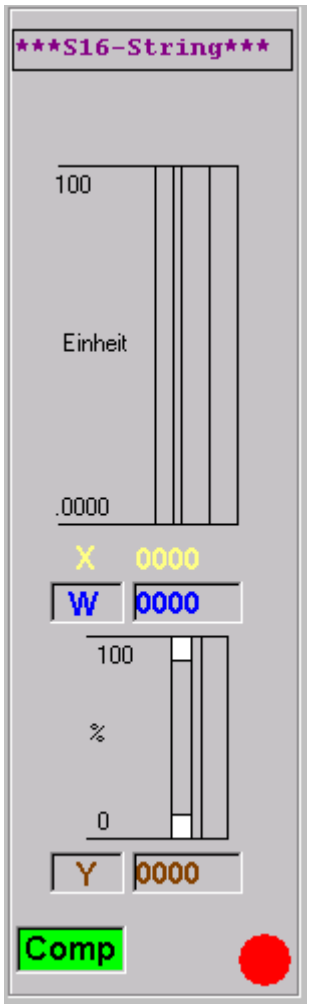


Figure 3-14 Group display of the TM_RK block

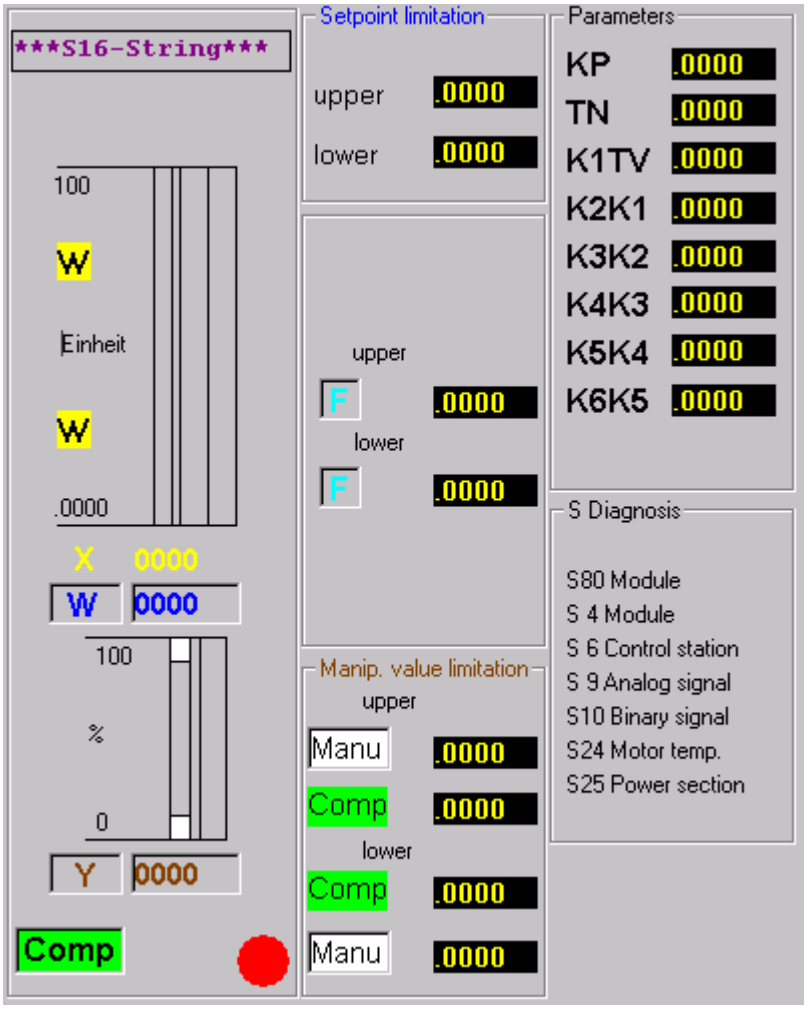


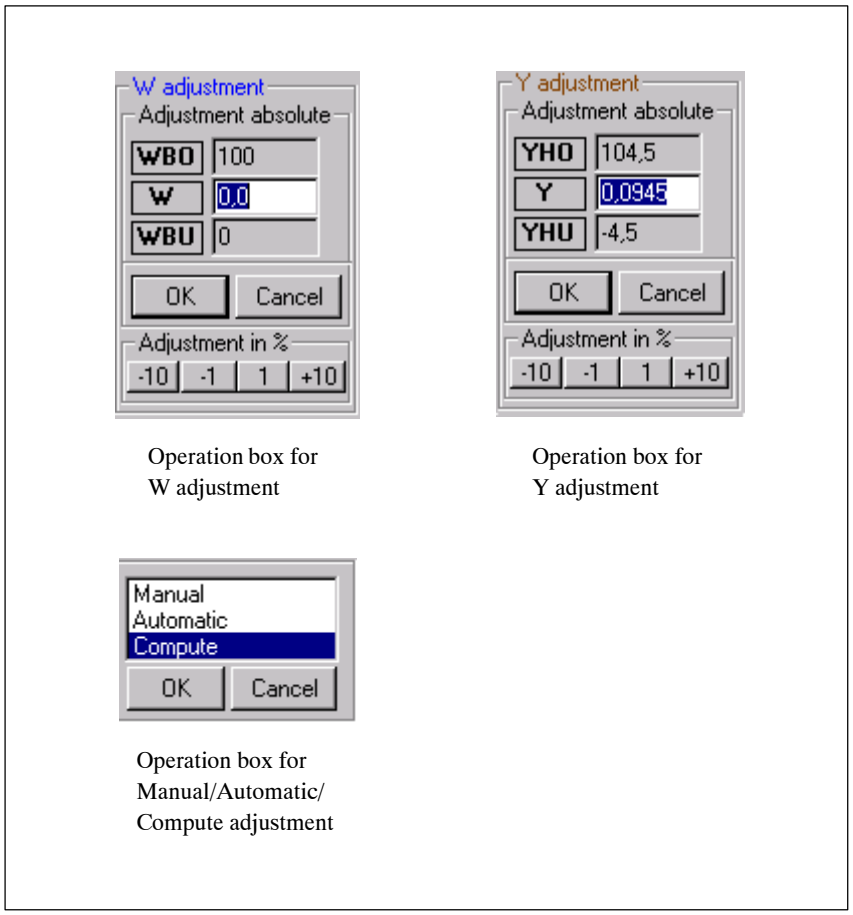
Figure 3-15 Loop display of the TM_RK block

Operation boxes

After klicking on the highlighted area W resp. Y the corresponding operation boxes are opened. They allow absolute or incremental adjustment of the value. With incremental adjustment, a klick on the % buttons causes the OS to transfer the adjusted value to the AS immediately.

When klicking on the highlighted area Manual / Automatic /Compute the corresponding operation box is opened. The actual mode is highlighted. When the desired mode has been klicked, that mode becomes highlighted. The operator intervention is concluded by a click on the OK button (transfer of the command to the PLC) or by the Cancel button.

The operation boxes are always opened inside the OCX and cannot be moved outside. For better clearness they are shown here without the OCX.



Operation box for W adjustment

Operation box for Y adjustment

Operation box for Manual/Automatic/ Compute adjustment

Figure 3-16 Operation boxes of the TM_RK block

I/O Bars

The following tables present the input and output bars of the block.

Table 3-93 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
CE	Computer presetting YC, WC, VC, XDC	REAL	0,0	Q		
YN	Correction input	REAL	0,0	Q		
YHOG	Y manual upper limit	REAL	105,0	Q	B	
YHUG	Y manual lower limit	REAL	–5,0	Q	B	
VWOG	Upper limit WH resp. VH	REAL	100,0	Q	B	
VWUG	Lower limit WH resp. VH	REAL	0,0	Q	B	
X1E	Upper range limit X1	REAL	100,0	Q		
X1A	Lower range limit X1	REAL	0,0	Q		
X2E	Upper range limit X2	REAL	100,0	Q		
X2A	Lower range limit X2	REAL	0,0	Q		
X3E	Upper range limit X3	REAL	100,0	Q		
X3A	Lower range limit X3	REAL	0,0	Q		
WXE	Upper range limit (WX,WW,WXW)	REAL	100,0	Q	B	
WXA	Lower range limit (WX,WW,WXW)	REAL	0,0	Q	B	
OG	Upper limit value for WX/WXW	REAL	100,0	Q	B	
UG	Lower limit value for WX/WXW	REAL	0,0	Q	B	
HYWX	Hysteresis f. XW lim.val.monitoring funct.	REAL	0,0	Q		
YCO	Upper Y–DDC limit	REAL	100,0	Q	B	
YCU	Lower Y–DDC limit	REAL	0,0	Q	B	
UZT	Monitoring time for S31 display	INT	10	Q		0...255
GWU	Limit value switchover WX/WXW	BOOL	0			
STU	Interference suppression GO/GU	BOOL	0	Q		
US	Status output suppression	BOOL	0	Q		
UMGF	S display environment fault external	BOOL	0	Q		
HBA	Manual mode from central unit	BOOL	0	Q		
ABA	Automatic mode from central unit	BOOL	0	Q		
CBA	Compute mode from central unit	BOOL	0	Q		
YNF	Y correction condition	BOOL	0	Q		
RSOF	Controller inhibit OPEN	BOOL	0	Q		
RSSL	Controller inhibit CLOSED	BOOL	0	Q		
SUOF	Protection OPEN SKA	BOOL	0	Q		
SUSL	Protection CLOSE SKZ	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
WAF	Modul fault display	INT	0			0, 1, 2
TY	Mnemonic for Y	STRING2	'Y '	U	B	
TW	Mnemonic for W	STRING2	'W '	U	B	
TX	Mnemonic for X	STRING2	'X '	U	B	
TH	Mnemonic for H	STRING2	'H '	U	B	

Table 3-93 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
TA	Mnemonic for A	STRING2	'A '	U	B	
TC	Mnemonic for C	STRING2	'C '	U	B	
EHTX	Physical quantity AW1	STRING6	'*EHTX*'		B	
ATN	Technological name	STRING16	*TECHNO-LOG.NAME*		B	
EN_MSG	Enable control-system messages and status	BOOL	0	Q		
EV_ID1	Message number (status low)	DWORD	0	U		
EV_ID2	Message number (status high)	DWORD	0	U		
EV_ID3	Message number (I&C)	DWORD	0	U		

Table 3-94 In/output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
Y	Y-manual	REAL	0,0	U	B	
W	WH resp. VH	REAL	0,0	U	B	
H	Manual command “manual”	BOOL	0	U	B	
A	Manual command “automatic”	BOOL	0	U	B	
C	Compute	BOOL	0	U	B	

Table 3-95 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X1	Analog value 1	REAL	0,0			
X2	Analog value 2	REAL	0,0			
X3	Analog value 3	REAL	0,0			
WY	Effective manipulated variable	REAL	0,0		B	
WW	Effective setpoint	REAL	0,0		B	
WXW	Effective system deviation	REAL	0,0			
WX	Effective controlled variable Xw	REAL	0,0		B	
WV	Effective ratio Vw	REAL	0,0			
KP	Proportional factor Kp	REAL	0,0		B	
TN	Reset time	REAL	0,0		B	
K1TV	Adjuster constant K1/TV	REAL	0,0		B	
K2K1	Adjuster constant K2/K1	REAL	0,0		B	
K3K2	Adjuster constant K3/K2	REAL	0,0		B	
K4K3	Adjuster constant K4/K3	REAL	0,0		B	
K5K4	Adjuster constant K5/K4	REAL	0,0		B	
K6K5	Adjuster constant K6/K5	REAL	0,0		B	

Table 3-95 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
HRBG	Mode: Manual (RBG)	BOOL	0			
ARBG	Mode: Automatic (RBG)	BOOL	0			
CRBG	Mode: Compute (RBG)	BOOL	0			
BRBG	Controller module ready	BOOL	0			
SPC	Configuration jumper Setpoint Control	BOOL	0			
XDC	Xd specification from central unit	BOOL	0			
XDE	External system deviation	BOOL	0			
WE	External setpoint W	BOOL	0			
WF	Setpoint W from panel	BOOL	0			
EBR1	Configuration jumper input circuit	BOOL	0			
EBR2	Configuration jumper input circuit	BOOL	0			
EBR3	Configuration jumper input circuit	BOOL	0			
RSPO	Controller inhibit OPEN	BOOL	0			
RSPS	Controller inhibit CLOSE	BOOL	0			
SUO	Protective command OPEN	BOOL	0			
SUS	Protective command CLOSE	BOOL	0			
DEA	Torque switch OPEN	BOOL	0			
DEZ	Torque switch CLOSED	BOOL	0			
WEA	Limit switch OPEN	BOOL	0			
WEZ	Limit switch CLOSE	BOOL	0			
S4	Module malfunction	BOOL	0		B	
S6	Control station malfunction	BOOL	0		B	
S9	Analog signal monitoring /Common S91–S95	BOOL	0		B	
S10	Binary signal monit. function has responded	BOOL	0		B	
S24	Motor temperature too high	BOOL	0		B	
S25	Power section malfunction	BOOL	0		B	
S31	Interlocking monitoring function has responded	BOOL	0		B	
S80	Module fault, read/cycle error	BOOL	0		B	
GO	Upper limit violation	BOOL	0			
GU	Lower limit violation	BOOL	0			
BGF	Module fault QVZ or EANK	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.21 TM_RZ Input Block for Two-Channel Closed-Loop Controller Module

Type/Number

FB 319

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This driver block is used for the acquisition of analog and binary signals via one channel of a two-channel TELEPERM M controller module 6DS1 402-8AA/-8BA or 6DS1 403-8AA/-8CA/-8CB. It is used together with the TM_RZA block.

Working Method

The block converts the analog and binary values into values of system-internal representation. The controlled variable is present at the outputs RX1 and X1 as a root-extracted or as a non-root-extracted physical quantity within the parameterized range (X1A, X1E).

The current actuator position (YR) and controller setpoint (W) are output as physical quantities via outputs YR (actuator position) and W (setpoint). YR is presented between 0 and 100 %, W within the range (X1A, X1E). The mode states are issued via outputs H, A, C, N, SPC. Two analog values from unassigned inputs (of the controller module) are present as physical quantities within the measuring ranges (X2A, X2E, X3A, X3E) at outputs X2 and X3.

An additional binary value BW from an unassigned input (of the controller module) is issued at output BW. If an analog signal is outside the range, an alarm is issued via output XF.
If a double reading error occurs during analog signal acquisition (S 321) the old values remain unchanged.
A malfunction of the controller module is signalled via the associated output BGF. A control station malfunction is signalled via the associated output LGF.
The module number is parameterized via input BGNR, the channel number on the module related to this TM_RZ block via input KNR.

- **Configuration instructions**

When implementing very fast DDC controls, the problem of systems oscillation after a change in the setpoint could arise.
To minimize the oscillations there are two alternatives for configuration:

1st alternative:
After the Delta value has been calculated it may be divided by 4. This division causes the P component to be reduced to 25% of the original value.

2nd alternative:
Insert the YR-jumper on the controller module.
Install the TM_RZ (together with the block, which calculates the Delta value), in an OB, which runs at double speed, compared to the OB containing the TM_RZA block. The latter OB must have a phase displacement against the TM_RZ OB (e.g. TM_RZ OB = 250 ms, TM_RZA OB = 500 ms, displacement = 250 ms). In this configuration, using the YR jumper, the internal

filter on the controller module is disabled, in order to bridge the dead times of the CPU / FM communication.

Reason:

The execution time between TM_RZ and TM_RZA block has the same effect on the closed-loop control circuit as a dead time.
In addition, the values read by the TM_RZ block will be declared invalid (S321), if the test word written by the TM_RZA block cannot be processed in the module before the TM_RZ block performs the next access. The execution time of the 6DS1 402 or 6DS1 403 module cannot exceed 130 ms. Execution of a RZ block located at the beginning of a cycle (watchdog interrupt) follows too quickly after the execution of the RZA block at the end of the watchdog interrupt, if the watchdog interrupt has been restarted immediately. Even if there is sufficient time beween the end of a watchdog interrupt and the start of the next watchdog interrupt in normal operation, this interval can be reduced to nearly zero (delayed cycle start) if additional computer time is required temporarily by the same watchdog interrupt or by higher priority watchdog interrupts.

Error handling

During processing the driver monitors both the hardware and the value. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-96 Control-system messages of the TM_RZ block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	QBGF	Module malfunction (S321)	S

Table 3-97 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-98 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
X1E	Upper range limit X1	REAL	100,0	Q		
X1A	Lower range limit X1	REAL	0,0	Q		
X2E	Upper range limit X2	REAL	100,0	Q		
X2A	Lower range limit X2	REAL	0,0	Q		
X3E	Upper range limit X3	REAL	100,0	Q		
X3A	Lower range limit X3	REAL	0,0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...63
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-99 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
RX1	Root extracted controlled variable	REAL	0,0			
X1	Controlled variable	REAL	0,0			
X2	Analog value 1	REAL	0,0			
X3	Analog value 2	REAL	0,0			
YR	Actuator position 2)	REAL	0,0			
W	Setpoint of module	REAL	0,0			
H	Manual	BOOL	0			
A	Automatic	BOOL	0			
C	Compute	BOOL	0			
N	Correction external controller	BOOL	0			
SPC	1=SPC / 0=DDC	BOOL	0			
BW	Binary value	BOOL	0			
XF	Channel fault	BOOL	1			
BGF	Module fault	BOOL	1			
LGF	Control station fault	BOOL	1			
QPARF	Parameter assignment error 1)	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.
2) The manipulated variable is fed back if a controller module with continious output (i.e. 6DS1403-8CA) is used.

3.22 TM_RZA Output Block for Two-Channel Closed-Loop Controller Module

Type/Number

FB 320

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

TM_RZA is used for transferring the setpoint increment W resp. the actuating increment Y, which normally comes from a controller block, to a channel of a TELEPERM M controller module 6DS1 402-8AA/-8BA or 6DS1 403-8AA/-8CA/-8CB. It is used together with the TM_RZ block.

Working Method

The block transfers a normalized increment present at input DC (= setpoint increment W for SPC mode, actuating increment Y for DDC mode) to the controller module. The highest resolution is 0.1 %.

Input SPDC has the following functions:

- DDC mode (without SPC jumper)
  SPDC = 0: Controller inhibit is effective, after analog signal monitoring has responded
  SPDC = 1: Controller inhibit is not effective, after analog signal monitoring has responded.
  Manual adjustment is possible.
- SPC mode (SPC jumper inserted)
  SPDC = 0: SPC mode
  SPDC = 1: Compute/manual mode. Controller inhibit is not effective after analog signal monitoring has responded.

An additional unassigned binary value (BW) is transferred to the controller module via input BW. The module number is parameterized via input BGNR. The channel number related to the TM_RZA block is set via input KNR.

BGF is set = 1 if a hardware failure occurs (QVZ, EANK, cycle time-out).

- **Cycle**

250 ms is the minimum processing cycle of the RZ/RZA blocks permitted for communication with the module.

- **Configuration instructions:** see TM_RZ block

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-100 Control-system messages of the TM_RZA block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S

Table 3-101 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-102 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
DC	Increment: W or Y	REAL	0,0	Q		
SPDC	Controller inhibit DDC; Manual-Compute/ SPC mode SPC	BOOL	0	Q		
BW	Binary value	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	0			0...63
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-103 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module fault	BOOL	1			
QPARF	Parameter assignment error [1)]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) If QPARF = 1 no processing of the block is done.

3.23 TM_S5KE, 3964(R) Linking Receiver Block

Type/Number

FB 321

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

TM_S5KE receives message frames from another automation system via a TELEPERM M Interface module and stores the data in a S7 data block. Usually it is used together with one ore more TM_S5KS blocks.

Working Method

This driver block is used to receive message frames from automation systems SIMATIC S5-135U, S5-155U and S5-155H, S7-300, S7-400 and other systems using RK512, 3964/ 3964R protocols via one of the TELEPERM M interface modules 6DS1 333-8AB, 6DS1 318-8AB. In addition, user programmable modules based on 6DS1328-8AA hardware allow linking to other protocols, if their transfer RAM drivers are compatible with S5KS/S5KE handshake.

Notice

One driver is normally sufficient for each interface module. If various driver blocks are specified, they must be installed in the same processing cycle. Proper monitoring and fault processing require the block to be embedded in a processing cycle of ≥ 1 s.

- **Parameters and their meaning**

The module's receive buffer length is 12 message frames (each with 128 bytes net data) for 2-channel operation.

The module number is parameterized via input BGNR.

It can be set to a value between 0 and 60 (base unit) or 100 to 160 (extension unit).

Driver output BGF is set if an incorrect module number is selected on the module or in the driver block or if more than one module respond to the same BGNR.

- **Monitoring of the interface unit in TELEPERM M**

The driver block monitors the interface module cyclically. An error message (STOE = 1) is issued if the module does not acknowledge. In addition, the module monitors the driver block for detecting a failure in the AS system.

- **Transmitter configuration in SIMATIC S5**

Five parameters are transferred from SIMATIC S5 to the receiver block in each message frame header. The length of the message frame header is 10 Bytes (Bytes 1 and 2 always contain 00H).

Note:

All blocks must be 256 words long.

Specification of the message frame header data from SIMATIC S5:

- Type of instruction (byte 3 and 4 of S5 message frame)
  The driver block only recognizes the identifier "AD" (= data out instruction).
- AS target address (byte 5 and 6 of S5 message frame)
  The data received is stored in a DB for further processing / interconnection. Byte 5 contains the DB no., Byte 6 the element number where the data is to be stored. [1)]
  Condition: Block length = 256 (mandatory)
- Number of data (bytes 7 and 8 of S5 message frame). This value is always specified in data words (1 word = 2 bytes = 16 bits).
- Code for data type / coordination flag (bytes 9 and 10 of S5 message frame).
- There is only one data type in each message frame. The code corresponds to the co-ordination flag bit in byte 10 (see table 3–90).
  Flag byte 9 is not interpreted, but must, however, differ from zero, as otherwise bytes 9 and 10 of the message frame from the CP525 will contain FFH.

Table 3-104 Data types

Data type (S5)	Code	Unit	Max. number/values per receive job
Binary value	0	16 values	1024
Fixed point value (16 bit)	1	1 value	64
Floating point value(32 bit)	2	1 value	32
Binary value swapped (same as Code 0, but bytes swapped two by two)	3	16 values	1024

- Data (follows immediately after the message frame header, byte 11 up to 138). Up to 128 bytes can be used in a receive job (message frame) for data transfer.

1) Target DB no. = (DB no. in GAGB parameter) + (No. in message frame).
The target DB must exist and must be long enough.

- **Fault processing**

The following outputs are set for fault detection:

BGF	Module fault (Hardware) Reaction: Execution is aborted, S 305
STOE	Module failure (Software) – Self-detection by interface module – Monitoring has responded Reaction: Execution is aborted
PAF1, PAF2	The partner connected to channel 1 or channel 2 respectively is defective (USART fault at interface 1/2, e.g. incorrect baud rate, parity, frame or overrun error). Reaction: None
KF1, KF2	There is a fault in the link between partner 1/2 and the interface module (line fault at interface 1/2, e.g. character time-out 220ms, acknowledgement time-out 550 ms, return message time-out 5 s, checksum error BCC 3964R after 5 repetitions, open-circuit). Reaction: S387
STF	Configuration fault – Target block cannot be found – Target block too short Reaction: Message frame is rejected, processing aborted. The no. of the errouneous DB (without base) can be read at output ”FBST”.
EPU	Receive buffer overflow Reaction: Execution is continued. The last message is rejected by the interface module if buffer processing does not continue after a waiting time. Remedy: Check processing cycle

Note:

KF and PAF are not set in message-specific manner, they are indicated in all drivers accessing the module during the error bit output (no error interpretation related to the transmitter block).

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior.
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-105 Control-system messages of the TM_S5KE block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	KF1 v KF2	Malfunction on bus or link (S387)	S
6	QBGF	Module malfunction (S321)	S

Table 3-106 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-107 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
GAGB	DB number [1]	INT	–1			–1: not allocated ≥ 0: allocated
BGNR	Module number	INT	–1			0...60, 100...160
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

[1] Target DB no. = Base DB no. (GAGB) + Received DB no. (from message frame)

Table 3-108 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
FBST	No. of the defective block [2]	INT	0			
BGF	Module access fault	BOOL	1			
STOE	Module fault	BOOL	0			
PAF1	Partner 1 defective	BOOL	0			
PAF2	Partner 2 defective	BOOL	0			
KF1	Link 1 defective	BOOL	0			
KF2	Link 2 defective	BOOL	0			
STF	Configuration fault [3]	BOOL	0			
EPU	Receive buffer overflow	BOOL	0			
ST_L	Read pointer error	BOOL	0			
ST_S	Write pointer error	BOOL	0			
QPARF	Parameter assignment error [4]	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

[2] received DB no. (without base)
[3] target DB cannot be found / target DB too short
[4] If QPARF = 1 no processing of the block is done.

3.24 TM_S5KS 3964(R) Linking Transmitter Block

Type/Number FB 322

Calling OBs The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function TM_S5KS transmits data from a S7 data block to another automation system or initiates a data transfer in the opposite direction via a TM Interface module. It is used together with a TM_S5KE block.

Working Method This driver block is used for transferring message frames to automation systems SIMATIC S5–135U, S5–155U and S5–155H, S7–300, S7–400 and other systems using RK512, 3964 / 3964R protocols via one of the TELEPERM M interface modules 6DS1 333-8AB, 6DS1 318-8AB. In addition, user programmable modules based on 6DS1328-8AA hardware allow linking to other protocols, if their transfer RAM drivers are compatible with S5KS/ S5KE handshake.The message frames transmitted contain either an input command (ED) or an output command (AD). The input command fetches data from the partner (e.g. S5), the output command writes data to the partner.

- **Parameters and their meaning**

A driver block must be specified for each message frame. The blocks are enabled via input FSE = 1.

The module number is parameterized via input BGNR.

It can be set to a value between 0 and 60 (base unit) or 100 to 160 (extension unit).

Driver output BGF is set if an incorrect module number is selected on the module or in the driver block or if more then one module repsond to the same BGNR.

The channel number (1 or 2) is selected via input KNR. Single- or two-channel operation is possible.

KNR = 1	Message frame transfer to partner 1 only
KNR = 2	Partner 2 exists: Message frame transfer also to partner 2. No partner 2: Message frame transfer only to partner 1. Transfer occurs only after all messages defined by KNR = 1 have been processed. This facilitates priority.controlled execution of transmission requests.

- **Description of functions**

The user generates the data structure by specifying data type, number and source/target address.

- **Message frame structure in the AS**

The driver block transfers a message frame with a message frame header consisting of 5 Words / 10 Bytes (message frame length = message frame header length for input instruction (ED, fetch message)). The message frame header contains the following data:

Command type
Target in S5
Number of data
Co-ordination flag.

Details:

Command type

Output command	AD [4]	Data block, overwrite data word in S5
Input command	ES	Read absolute address from S5
(Fetch command)	ED [4]	Data block, read data word from S5
	EE	Read input image from S5
	EA	Read output image from S5
	EM	Read flag from S5
	EZ	Read counter value from S5 [1]
	ET	Read timer value from S5 [1]

The individual command types are distinguished by the mode (input MODI)

Target in S5

Inputs PA1 and PA2 specify the address in S5. The input parameterization depends on the command type.

Table 3-109 Allocation of addresses (PA1, PA2) and modes (MODI)

MODI (Commandsart)	PA1	PA2
AD [2) 4)]	Data block	Data word
ED [2) 4)]	Data block	Data word
ES [3) 4)]	Higher-order byte	Lower-order byte
EE	0	No. of . input byte
EA	0	No. of output byte
EM	0	No. of flag byte
ET [1)]	0	No. of timer word
EZ [1)]	0	Nr. of counter word

1) Counter and timer values are transferred as fixed point values. The code bits generated by S5 are not interpreted. The time value must be given in multiples of 1 second.

2) For DAAR = 2 (32 bit floating point numbers): even data word number for PA2. In SIMATIC S5 floating point numbers must be stored on even word boundaries (0,2,4...), if they are to be transferred to PCS7/TM–EA.

3) The values are to be specified as decimal numbers. Range/byte: 0–255

4) Only these two modes are permitted for CP525 (SIMATIC U-series, 6ES5 525-3UA11).

The parameters GAGB and ELNR of the driver block are used to specify the source (AD, data output) or the target (ED, fetch message) in the AS.

A data block of appropriate length has to be defined in the AS.

Number of data (see table 3–96)

The number (input ANZ) depends on the data type (see table 3–96). Up to 64 words (128 Byte) are available for data transfer. Each message contains only one data type.

Co-ordination flag

S5 expects the co-ordination flag (byte/bit) here. The transmitter driver always transfers the value ”FFFF” to S5.

Table 3-110 Parameterization of the TM_S5KS transmitter driver

DAAR	GAGB	ELNR	ANZ
0: Binary value	DB No.	0 –255	1 – 1024 binary values (16 values/word)
1: Fixed point number (16 Bit)	DB No.	0 –255	1 – 64 values (1 value/word)
2: Floating point number (32 Bit)	DB No.	0 –255	1 – 32 values (1 value/2 words)
3: Binary value, swapped (same as Code 0, but bytes swapped two by two)	DB No.	0 –255	1 – 64 words

These specifications apply for input and output commands. As SIMATIC S5 does not verify the data type, it should be selected in expedient manner. In an output command, inputs GAGB and ELNR refer to the data source, in an input command (fetch command) they refer to the data target in the AS.

The parameters PA1 and PA2 specify the data target (output command) and the data source (input command/fetch message) in the S5.

- **Link monitoring**

The transmitter driver does not contain any mutual monitoring functions between the AS and S5; this is performed by the TM_S5KE receiver driver. A receiver driver must be specified for monitoring only if a data receiver driver (TM_S5KE) is not required for data transfer.

- **Fault processing**

The following outputs are set for fault detection:

BGF Module fault (ready time-out)
Reaction: Execution is aborted, S305

STOE Module failure (self-detection)
Reaction: Execution is aborted.

KAFE — Second channel is missing (is set if the jumper has been configured for single-channel operation and channel 2 has been addressed by the TM_S5KS block)
Reaction: Error message when the second channel is addressed. Message frames are transferred to channel 1 (only after all message frames from the buffer have been transferred there (priority dependent transmission).

KF1, KF2 — There is a fault in the link between partner 1/2 and the interface module (line fault at interface 1/2, e.g. character time-out 220ms, acknowledgement time-out 550 ms, return message time-out 5 s, checksum error BCC 3964R after 5 repetitions, open-circuit).
Reaction: S387; The message frame is transferred to the interface module

PAF1, PAF2 — The partner connected to channel 1 or channel 2 respectively is defective (USART fault at interface 1/2, e.g. incorrect baud rate, parity, frame or overrun error).
Reaction: The message frame is transferred to the interface module.

STF — Configuration fault
1. Incorrect definition of DB block:
   – Source block cannot be found
   – Source block too short
2. Incorrect parameterization of transmitter driver
   – Incorrect number of data
     (floating point numbers: ANZ >32)
3 Fixed point overflow
  Range of fixed point number to be transferred has been exceeded

. — Reaction: Execution is aborted.

TF1, TF2 — Message frame fault: S5 at channel 1 or channel 2 resp. has not accepted the last message frame (an error number was contained in the reaction message frame).
Reaction: None

SPU1, SPU2 — Transmit buffer overflow on interface module (channel 1 or channel 2 resp.)
Reaction: Execution is aborted until the overflow bit in the concerned channel has been cleared. No message frames are transferred as long as the overflow bit is set.

Note:

KF and PAF are not set in message-specific manner, they are indicated in all drivers accessing the module during the error bit output (no error interpretation related to the transmitter block).

Output TF is only displayed by the driver block accessing first, as the driver resets the bit in the dual port RAM.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- QPARF = 1: Parameter assignment error (see startup characteristics)
- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  QVZ: Module time-out (incorrect address, incorrect jumpers or module is defective),
  EANK: multiple addressing/acknowledge from modules (incorrect jumper setting)
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Startup Characteristics

During a startup/initial run or parameter change all parameters are checked for permitted values. If the allowed limits are exceeded, the driver sets its output QPARF = 1 and does not carry out any further processing in the subsequent cycles, e.g. no I/O accesses are done and the outputs retain their old values.

Time Response

Does not exist. If the driver output values are needed from blocks with time response (e.g. closed-loop control block) the driver has to be installed in the same OB before this block.

Message Behavior

Description of the message behavior

The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-111 Control-system messages of the TM_S5KS block

Message No.	Block parameter	Initial start message text	Message class
1	QPARF	Parameter assignment error (F410)	S
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	EANK	Multiple addressing (S313)	S
5	KF1 v KF2	Malfunction on bus or link (S387)	S

Table 3-112 Assignment of the accompanying values to the block parameters

Accompanying value	Block parameter
1	BGNR
2	KNR
3	DAAR
4	ELNR
5	ANZ
6	MODI
7	PA1
8	PA2

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-113 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
FSE	Transmitter enable	BOOL	0	Q		
BGNR	Module number	INT	–1			0...60, 100...160
KNR	Channel number	INT	1			1, 2
DAAR	Data type	INT	0			0, 1, 2, 3
GAGB	Data block no. (DB no.) in PCS 7	INT	–1			$\geq$ 0; with MODI <> 'AD' max. 254
ELNR	Element number (word offset in the DB)	INT	0			$\geq$ 0; with MODI <> 'AD' max. 254
ANZ	Number of data (in words)	INT	1			1...32, 1...64
PA1	Partner address 1	INT	0			0...255
PA2	Partner address 2	INT	0			0...255
MODI	Command mode	STRING2	'AD'			AD, ES, ED, EE, EA, EM, EZ, ET
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Table 3-114 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
BGF	Module access fault	BOOL	1			
STOE	Module fault	BOOL	0			
PAF1	Partner 1 defective	BOOL	0			
PAF2	Partner 2 defective	BOOL	0			
KF1	Link 1 defective	BOOL	0			
KF2	Link 2 defective	BOOL	0			
KAFE	Channel 2 missing	BOOL	0			
TF1	Message frame fault 1	BOOL	0			
TF2	Message frame fault 2	BOOL	0			
STF	Configuration fault 1)	BOOL	0			
SPU1	Transmit buffer 1 overflow	BOOL	0			
SPU2	Transmit buffer 2 overflow	BOOL	0			
ST_L	Read pointer error	BOOL	0			
ST_S	Write pointer error	BOOL	0			
QPARF	Parameter assignment error	BOOL	0			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

1) source DB cannot be found / source DB too short / fixed point overflow

3.25 TM_MELD Driver Block for I&C Messages

Type/Number

FB 323

Calling OBs

The instance of the driver block must be installed in OB100 (warm restart) and in OB102 (cold restart), in addition to its usual watchdog interrupt OB (for example OB32).

Function

This driver block is used to acquire cabin I&C faults and to output I&C signals via a M7 interface module IF961–DIO (Digital In/Output). For the read values the corresponding control system fault messages are generated.

Error handling

During processing the driver monitors both the hardware and the values. This results in the following error displays:

- BGF = 1: This output indicates the module or the process values are not available. Possible causes:
  Module is defective or missing.
  Note: The module IF961–DIO has to be configured in HW Config.
- ENO = 0: The operating system has recognized a general error by itself (e.g. overflow).

Time Response

Does not exist.

Message Behavior

Description of the message behavior
The PCS 7 block ALARM_8P is used to generate control-system messages.

Table 3-115 Control-system messages of the TM_MELD block

Message No.	Block parameter	Initial start message text	Message class
2	QCOM	Communication error FM	S
3	QVZ	Module time-out (S305)	S
4	ME1	Fan contact (S346)	S
5	ME2	Excessive temperature (S340)	S
6	ME3	Door contact (S343)	S

Operating and Monitoring via OS

For this driver block no allocated display block is necessary in the OS. Instead of this the elements of the standard grafic library of WinCC can be used for display.

I/O Bars

The following tables present the input and output bars of the block.

Table 3-116 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
MA0	Message output 0: reserved	BOOL	0	Q		
MA1	Message output 1: I&C group alarm	BOOL	0	Q		
MA2	Message output 2: Horn block group alarm	BOOL	0	Q		
MA3	Message output 3: reserved	BOOL	0	Q		
MA4	Message output 4: reserved / AM1	BOOL	0	Q		
MA5	Message output 5: reserved /AM2	BOOL	0	Q		
MA7	Message output 7: reserved /AM3	BOOL	0	Q		
INV_E	Inversion mask for DIO inputs	BYTE	16#FF	U		
INV_A	Inversion mask for DIO outputs	BYTE	16#FF	U		
EN_MSG	Enable control-system messages	BOOL	0	Q		
EV_ID	Message number	DWORD	0	U		

Message output 6 is toggled by the TM_MELD block by each execution (watchdog trigger signal).

Table 3-117 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
ME0	Message input 0: reserved	BOOL	0			
ME1	Message input 1: fan function	BOOL	0			
ME2	Message input 2: excess temperature	BOOL	0			
ME3	Message input 3: door contact	BOOL	0			
ME4	Message input 4: bus redundancy indication	BOOL	0			
ME5	Message input 5: horn acknowledgement	BOOL	0			
ME6	Message input 6: reserved /EM1	BOOL	0			
ME7	Message input 7: reserved /EM2	BOOL	0			
BGF	Module fault	BOOL	1			
STATUS	Block state	WORD	0	U		
QERR	Inverted value of ENO	BOOL	1	U		

Communication

4

Description of this Chapter

This chapter describes the communication blocks.

In this Chapter

The individual subjects are described on the following pages:

4.1 Overview

The process values to and from the TELEPERM I/O peripherals are transferred between the S7 CPU and the FM456 via the K bus. For this the connections are used, that are configured on both sides. They allow the transfer of data packets of up to 64 Kbytes.

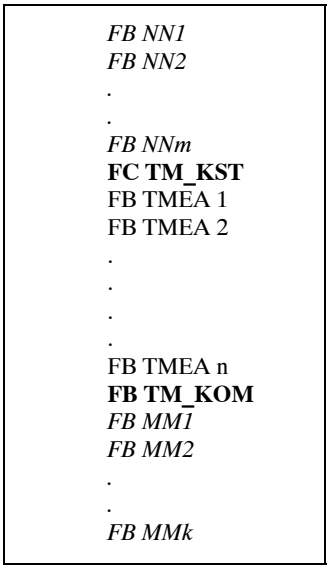
In order to minimize the number of connections and the required ressources of the CPU for the communication of the I/O driver blocks, the communication of all I/O drivers, which are allocated to a watchdog interrupt, is processed by two special communication blocks. These two blocks, TM_KST and TM_KOM, must be parameterized and added to the watchdog interrupt OBs.

4.2 Deployment of the Communication Blocks

For each watchdog interrupt OB3x, for which TELEPERM I/O drivers are needed, the following configuration steps are required:

- The TM_KST FC has to be called before the first TM I/O driver. The TM_KOM FB has to be called behind the last TM I/O driver.
- A S7connection between the S7 CPU and the FM456 has to be configured with the SIMATIC manager .The resulting assigned unique identifier must be entered at the C_ID input of the TM_KOM communication block.
- A global data block has to be reserved. Its number has to be input to the TM_KST and TM_KOM communication blocks. The communication blocks themselves create these data blocks. They are used for transmitted data, received data and for administration.

Example for a block sequence in the OB35:



Notice

The numbers used for communication data blocks should be within the DB number range that is not allowed for the CFC. This avoids interferences with instance DBs. The range used by the CFC can be configured with the CFC options menu.

4.3 TM_KOM Communication Block

Type/Number FB 331

Calling OBs The block must be installed in a watchdog OB as the last block behind the sequence of TM I/O blocks. In addition, it has to be installed in OB100.

Function The TM_KOM communication block transfers the output data of the TM I/O driver blocks to the FM456 and initiates data transport from the FM456 to the drivers blocks.
In the case of resource problems or communication problems they are signaled by the STATUS output variable.

I/O Bars The following tables present the input and output bars of the block.

Table 4-1 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
C_ID	Connection ID (output of the connection configuration process)	WORD	0			> 0
DB_KOM	Number of the DB for transmitted data and received data of the driver blocks. The DB is created automatically.	INT	0			Unassigned DB (i.e., DB number available for user)

Table 4-2 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
STATUS	Block state	WORD	16# FFFF			0: OK –1: wrong parameters detected else: Information for communication (s.u.)
S_STATUS	Status word of the subordinate BSEND SFB	WORD	16# FFFF			Status word of the BSEND SFB /1/
R_STATUS	Status word of the subordinate BRCV SFB	WORD	16# FFFF			Status word of the BRCV SFB /1/
C_STATUS	Status word of the connection or diagnostic information (is incremented continuously if communication is okay)	WORD	16# FFFF			(not for user)
D_COUNT	Number of driver blocks logged on	INT	0			
QERR	Inverted value of ENO	BOOL	1	U		

Error codes of the STATUS output value:

STATUS (hexadecimal)	Description
16#8010	Ressource problem (Error at delete DB AELI)
16#8020	Ressource problem (Error at create DB AELI)
16#8040	Initialization error
16#8080	DB 3 missing
16#8100	DB 3 too short
16#8200	Internal error No. 1
16#8400	Internal error No. 2
16#8800	Illegal number for DB_KOM (must be > 3)
16#0001	Send error (see S_STATUS)
16#0002	Receive error (see R_STATUS)
16#0003	Send error + receive error (see S_STATUS/R_STATUS)

4.4 TM_KST Communication Function

Type/Number FC 331

Calling OBs The block must be installed in a watchdog OB as the first block before the sequence of TM I/O blocks.

Function The **TM_KST** communication block updates the internal status values of the send and receive jobs of the TM E/A driver block instances, which are called by the same OB.

I/O Bars The following tables present the input and output bars of the block.

Table 4-3 Input bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
DB_KOM	Number of the DB for transmitted data and received data of the driver blocks (must be identical with DB_KOM of the TM_KOM FB)	INT	0			Unassigned DB (i.e., DB number available for user)

Table 4-4 Output bar

Element	Meaning	Type	Initial value	Attr.	O & M	Permitted values
STATUS	Block state	WORD	0			same as FB TM_KOM

4.5 Configuration of the Connections

Basic rules

For each watchdog interrupt OB3x, which calls TELEPERM I/O drivers, a S7 connection between the S7 CPU and the FM456 must be configured.

Configuring with the SIMATIC Manager

Select the object **Connections** of the S7 CPU in the project

Define a new connection with **Insert** as follows:

1. Enter the SIMATIC-Station **S7–CPU** and the module **FM456–4** as partners of the connection.

2. Select the connection type **S7 Connection**

3. Set the mode **"Establish an active connection"** for the S7 CPU in the object properties of the connection.

4. Note the **Local Id**. and its planned allocation to an alarm OB. The **Local Id** has been allocated automatically or modified manually.

Repeat the Steps 1 – 4 for all planned connections / watchdog alarms.

Select the configured connections between the S7–CPU and the FM456 and **load** the connections onto both, the S7–CPU and on the module FM456–4.

After the connections have been loaded the FM456 has to be **boot**ed.

Notice

If the procedure described above has been executed and shall be extended by configuring additional I/O blocks, the connections need not be modified. However the S7 CPU must be restarted, in order to allow the the driver block to use the communication services.

Notice

After clear/reset of the S7 CPU only the system data and blocks, i.e. the whole block container, may be loaded into the CPU, but not the connection data. After the CPU is restarted the connections are then active again immediately. After the connections have been loaded the FM456 has to be booted.

4.6 Other Configuration Informations

DB3 ist reserved for TM_KOM.

The configured instances of the communication block TM_KOM all use the global data block DB3. The DB3 is part of the library and is transferred to the CPU with the CFC. The DB number 3 must be kept for the instances of the communication block TM_KOM.

Subordinated communication-blocks TM_ANM, TM_KIDB, TM_SEND und TM_RECV

Three other blocks are subordinated under the TM_KOM and TM_KST communication blocks:

- S TM_ANM,
- S TM_KIDB,
- S TM_SEND,
- S TM_RECV

These are loaded into the CPU by the CFC automatically.

Moving function blocks to other watchdog OBs.

When moving the allocation of the driver and communication blocks from one watchdog alarm to another with the CFC, the blocks must be deleted in the watchdog alarm used before (e.g. by clear/reset). Else interferences are possible that lead to data and address errors

4.7 Data of the Group Interrupt Module

The system software on the FM456 checks, if a group interrupt module (module number = 61, IRQ module) is present and if an interrupt request is active. If an interrupt request is pending, the 48 Bits of the group interrupt module are transferred to the peripheral RAM area of the FM456. A status byte immediately behind this data contains the validity information of the the inputs of the group interrupt module.

After an interrupt has been detected and the binary values have been transferred to the peripheral RAM, an interrupt on the S7–CPU is triggered. The user can then process it with an alarm OB.

Logical address	Contents	Remark
512	Byte 1 of the IRQ module	binary values of the IRQ module
513	Byte 2 of the IRQ module	binary values of the IRQ module
514	Byte 3 of the IRQ module	binary values of the IRQ module
515	Byte 4 of the IRQ module	binary values of the IRQ module
516	Byte 5 of the IRQ module	binary values of the IRQ module
517	Byte 6 of the IRQ module	binary values of the IRQ module
518	0: binary values valid 1: binary values not valid	Status byte / validity code

Logical address of the peripheral area = 512

During hardware configuration with the SIMATIC manager the logical address of the periperal area of the FM456 is set to 512 (default value). This value has to be maintained..

4.8 Error Messages of the FM456 (Communication)

The system software of the FM456, which processes communication with the S7 CPU, generates error messages, if an error has been detected. The messages are then entered into the diagnostics buffer of the FM456–4 and the S7–CPU. They can be read with the SIMATIC manager, using the appropriate menus.

Selecting the diagnostics buffer

Select module (FM456 or S7 CPU)

⟶ Select menu “PLC”

⟶ Select menu “Hardware diagnostics”

⟶ Select menu “Diagnostic buffer”

If those errors occur, the maintenance personnel should be informed. This is necessary in order to decode the error messages.

Additional Code in the diagnostics message (hexadecimal)	**Meaning**
16xA015	Error when creating connection task
16xA016	Error when starting connection task
16xA017	Error Nr. 1 start of connection task
16xA018	Error Nr. 2 start of connection task
16xA019	Error Nr. 3 start of connection task
16xA01A	Error Nr. 4 start of connection task
16xA01B	Error initialization of connection
16xA01C	Error alarm generation
16xA01D	Error direct writing to peripheral

4.9 Status Word of the Driver Blocks

The Status output word of the driver blocks contains information that can be read after an error has occured.

Driver	Bit 7 16#80	Bit 6 16#40	Bit5 16#20	Bit4 16#10	Bit3 16#08	Bit2 16#04	Bit1 16#02	Bit0 16#01
TM_A110	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_AA	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_ABR	–	BRBK	QBGF	TYP	EANK	QVZ	QCOM	LTM
TM_AE	–	–	KF	XF	EANK	QVZ	QCOM	LTM
TM_BAU	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_BEI	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_BRBK	BGF	BSP	QBGF	TYP	EANK	QVZ	QCOM	LTM
TM_BU16	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_BU8	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_DZ	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_E110	–	–	–	–	EANK	QVZ	QCOM	LTM
TM_EG	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_EK	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_EU	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_MELD	–	–	–	–	–	QVZ	QCOM	LTM
TM_MSB	BART	BRBK	QBGF	TYP	EANK	QVZ	QCOM	LTM
TM_RK	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_RZ	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_RZA	–	–	–	QBGF	EANK	QVZ	QCOM	LTM
TM_S5KE	–	DBWR	DB_F	QBGF	EANK	QVZ	QCOM	LTM
TM_S5KS	–	–	DB_F	–	EANK	QVZ	QCOM	LTM
TM_TVB	–	BRBK	QBGF	TYP	EANK	QVZ	QCOM	LTM
TM_ZE	–	–	–	–	EANK	QVZ	QCOM	LTM

Legend

LTM	Sending of I&C messages disabled (ALARM_8P)
QCOM	Communication S7 CPU with FM456–4 disturbed (K-Bus)
QVZ	TM module time out
EANK	TM modules multiple addressing
TYP	Wrong module type for number BGNR
QBGF	Module fault
BRBK	Higher TM_BRBK block not running

XF	Analog signal disturbed
KF	Channel fault
BSP	Processing blocked
BGF	Module fault (from module)
BART	Mode BART/ESG missing
DB_F	DB missing / too short
DBWR	DB is write protected

Technical Data

A

Description of A Appendix

This Appendix deals with the following subjects:

A.1 Hardware and software requirements

Hardware-requirements

- SIMATIC PG or PC
- SIMATIC S7–4xx
  (recommended S7 416–2)

Software-requirements

- Microsoft Windows 95
- STEP 7, minimal Version = 4.01
- SCL Compiler (for S7) and CFC recommended
- Option: WinCC V2.0 with the Option Basic Process Control
  (required for the usage of the OS displays (OCX))

A.2 Block data

In the table below the block data for block version 1.0
in a CPU S7 416–2 DP, CPU version 1.0 is listed.
With other CPUs the processing time depends on the CPU's perfomance.

Meanings:

- **Block type name:** the symbolic identifier in the symbol table of the library for the respective FB or FC. It must be unique within the project.
- **Typical run time:** The time which the CPU needs to process the corresponding block program under normal circumstances (for example, for a driver this is the execution time in the watchdog interrupt OB).
- **Block length:** Memory requirements of the program code, once for every block type.
- **Instance data length:** Memory requirement of an instance DB.
- **Temporary Memory:** The local data memory required in a priority class when the block is called. This is limited CPU specifically, When it is exceeded a CPU STOP is caused. You have to check it in the CPU configuration and, if necessary, distribute it amongst the priority classes (OBs) to meet the real requirements.
- **Multiple instance block:** The specified blocks are used by the technological block and must exist in the user program (is checked by the CFC). In general these are SFB 34 (ALARM_8) and SFB 35 (ALARM_8P). They must be copied from the STDLIBS library in your user prgram.
- **FB/FC No.:** Block number xxx of FB xxx or FC xxx. This must be unique in your project.

Table A-1 Block data

Block (type name)	Typical run time (ms)	Block length (bytes)	Instance data length (bytes)	Temporary memory (bytes)	Multiple instance block	FB/FC No.
TM_AA	0,33 / 0,60	2744	220	38	SFB 35 + FB 330	FB 304
TM_ABR		5104	242	56	SFB 35 + FB 330	FB 315
TM_AE	0,33 / 0,62	3312	226	40	SFB 35 + FB 330	FB 303
TM_A110	0,32 / 0,62	3310	222	44	SFB 35 + FB 330	FB 308
TM_BAU	0,35 / 0,68	3332	208	42	SFB 35 + FB 330	FB 302
TM_BEI	0,66 / 1,06	8782	222	44	SFB 35 + FB 330	FB 301
TM_BRBK		4460	236	80	SFB 35 + FB 330	FB 314
TM_BU8	0,41 / 0,81	4722	198	38	SFB 35 + FB 330	FB 305
TM_BU16	0,62 / 0,97	7462	202	38	SFB 35 + FB 330	FB 306
TM_DZ		5934	394	76	SFB 35 + SFB 34 + FB 330	FB 309
TM_EG	0,34 / 1,34	4380	304	52	SFB 35 + SFB 34 + FB 330	FB 311
TM_EK		9942	374	76	SFB 35 + SFB 34 + FB 330	FB 312
TM_EU		7382	324	70	SFB 35 + SFB 34 + FB 330	FB 313
TM_E110	0,29 / 0,66	4362	220	36	SFB 35 + FB 330	FB 307
TM_MELD	0,36 / 0,63	2752	192	40	SFB 35 + FB 330	FB 323
TM_MSB		9164	332	66	SFB 35 + SFB 34 + FB 330	FB 317
TM_RK		10024	500	104	SFB 35 + SFB 34 + FB 330	FB 318
TM_RZ		4240	256	50	SFB 35 + FB 330	FB 319
TM_RZA		2612	212	44	SFB 35 + FB 330	FB 320
TM_S5KE		4294	224	54	SFB 35 + FB 330	FB 321
TM_S5KS		7940	262	298	SFB 35 + FB 330	FB 322
TM_TVB		7050	328	52	SFB 35 + SFB 34 + FB 330	FB 316
TM_ZE	0,29 / 0,59	2390	206	34	SFB 35 + FB 330	FB 310
TM_KOM		5424	146	248	FB 332 + FB 333	FB 331
TM_KIDB		142		8		FC 330
TM_KST		160	–	8		FC 331

The run times are valid for EN_MSG = 0 (without I&C message) and EN_MSG = 1 (with I&C message). They have been measured on an AS 416–2DP.

Table A-2 Used multi instance blocks

Block	FB/FC No.	Code (bytes)	Local data (bytes)
TM_ANM	FB 330	1252	74
TM_BRCV	FB 332	204	18
TM_BSEND	FB 333	212	18
ALARM_8	SFB 34	2	–
ALARM_8P	SFB 35	2	–

A.3 Data types

Data types in the I/O bar

In the I/O bars of the blocks there are the following data types:

Table A-3 Data types in the I/O bars

Data type	Bits	Range	Application example
BOOL	1	0/1 or FALSE/TRUE	Switches and displays
BYTE	8	16#00 to 16#FF	Driver
WORD	16	16#0000 to 16#FFFF	Driver
DWORD	32	16#00000000 to 16#FFFFFFFF	Batch-ID, Message number
INT	16	–32738 to 32767	Selection
DINT	32	–2147483648 to 2147483647	Counter parameter
REAL	32	–3.402822E+38 to –1.175495E–38 or 1.175495E–38 to 3.402822E+38	Process values etc.
STRING[n]	8 x (n+1)	characters (text)	Blocks for BATCH *flexible*, with dynamic associated text.
ANY	320	Interconnection information (pointer)	message block, Interconnection input for any qualifiers

List of Abbrevations

B

API	Application Interface
AS	Automation system
BGF	Module fault
BGNR	Module number
Bgr	Module
BRCV	Block receive
BSEND	Block send
CFC	Continuous function chart
CP	Communication processor
CPU	Central processing unit
DB	Data block
DPRAM	Dual ported RAM (Interface between FM456–4 and TPM478–2)
EANK	Multiple addressing
EN	Enable input
ES	Engineering System

FB	Function block
FC	Function call
FM	Function module
I&C	Instrumentation and control
IEC	International Electronical Commission
I/O	Input/output
IRQ	Interrupt (request)
K-Bus	Communication bus
KNR	Channel number
LTM	I&C fault, control system fault message
L2	Bus system of SIMATIC (= PROFIBUS)
MPI	Multi point interface
M7-SYS	M7 Operating system
OB	Organization block
O&M	Operation and monitoring
OS	Operator station (operator communication and visualization system)
PAA	Process outputs map
PAE	Process inputs map

PC	Personal computer
PCS	Process control system
PCS 7	Process control system 7
PG	Programming device
QVZ	Time-out
SCL	Structured control language
SFB	System function block
SFC	System function call
SINEC	Siemens network architecture
SPS	Programmable controller
STEP 7	Software engineering environment for SIMATIC S7 / M7
STL	STEP 5/STEP 7 Statement list method of representation
S5	SIMATIC line 5
S7	SIMATIC line 7
TM	TELEPERM M
TPM	TELEPERM process module (TPM478)
WinCC	Windows control center (operator station)

Applicable Documents

C

You can order the following manuals and instructions from your sales partner:

Number	Title	Order from	Order No.
/8/	Reference Manual SIMATIC S7–400, M7–400 Programmable Controllers Module Specifications		A5E00069467-04 Part of the documentation package with oder number 6ES7498-8AA03-8BA0
/10/ /31/	Installation Manual SIMATIC S7–400, M7–400 Programmable Controllers Hardware and Installation		A5E00069481-02 Part of the documentation package with oder number 6ES7498-8AA03-8BA0
/11/	Manuals TELEPERM M I/O-Modules – Function Modules – Signal Modules – Interface and Calculation Modules	 KA KA KA	 C79000-G8076-C030 C79000-G8076-C031 C79000-G8076-C032
/12/	Manual TELEPERM M AS 235 Automation System	 KA	 C79000-G8076-C295
/17/	Manual SIMATIC NET PROFIBUS Networks		 6GK1970-5CA20-0AA1
/18/	Product Brief Network Solutions for PROFIBUS		 6ZB5530-0AQ02-0BB0
/22/	Manual TELEPERM M CS 275 Bus System	 KA	 C79000-G8076-C006
/23/	Manual SIMATIC ET 200 Distributed I/O-System		 6ES5998-3ES22
/24/	Manual SIMATIC ET 200B Distributed I/O Station		 6ES5998-4ET21
/25/	Manual SIMATIC ET 200M Distributed I/O Device		 6ES7153-1AA00-8BA0
/30/	Manual TELEPERM M Instructions and Guidelines for Planning, Installation and Operation	 KA	 C79000-G8076-C417
/34/	Technical Descriptions Migration TELEPERM M – SIMATIC PCS7 WinCC/TM WinCC/TM-OCX (NORA) and WinCC/TM-OCX (PCS7)	 KA KA	 C79000-T8076-C740 C79000-T8076-C741
/100/	Manual Coupling of TELEPERM I/O Peripherie with PCS 7	KA	C79000-G8076-C710 (in preparation)

Num-ber	Title	Order from	Order No.
/106/	Referenzhandbuch SIMATIC PCS 7 Driver Blocks		A5E00057447-02
/107/	Manual SIMATIC PCS 7 Technological Blocks		C79000-G7076-C715

Glossary

A

Aspect

Attributes of a block with regard to its application in the AS (FB, FC), ES (display in the library or in CFC, display for testing and commissioning purposes) and OS (texts for messages and operations, corresponding faceplate for visualization in the OS).

B

Block

Object of a library or of a block structure, divided into function blocks (executable on an automation system) and faceplates (display blocks) (executable on an OS). The block has aspects for AS, OS and ES which are described by properties. Both blocks are configured with ES. The block type is contained in the library. ES is used to create an instance data block and to configure it further.

Block library

Software package which contains block types combined in accordance with common features. It is installed via ES.

Block header

Section of the block with management information on its assignment (for example type name, block name, etc.).

Block body

Section of the block with function-specific information (for example values at data blocks, program code at functions).

Block type

Object of a library which passes its properties to the respective instance data block when it is used in a block structure. The block type (method, data maintenance and aspect description) is stored in ES.

C

CS Bus system for exchanging data between components.

Combined block Block which is formed from basic blocks and/or combined blocks (see multi-instance blocks)

D

Data block This is used for storing data which are processed by programs or functions.

Display element Object as a component of the faceplate which corresponds to a specific I/O element of a block type.

Driver block Block which imports and exports automation-system values into or from the module. It forms the software interface to the process, converts the physical values into process values (and vice versa) and supplies additional information with regard to the availability of the hardware addressed.

E

Enable input Enable input, through which processing of a function block is enabled or disabled (only exists in CFC display mode).

F

Faceplate (display block Block which is executable in the OS and which is used to operate and monitor the corresponding automation-system block. It is also supplied for certain block types in the libraries. Also includes checking of the operated values.

Fetch principle

The value which is interconnected to an input of a block is only updated (fetched) by the method associated with the block of the interconnected input and not earlier. If this block is not processed, the input will not have an updated value, despite its being interconnected.

Function

This term is defined in IEC 1131–3 as a software unit which when executed delivers a single result (which can also be a complex data type) and which does not have the capability of saving data (memory).
The essential difference between it and an FB is the lack of a data storage capability (instance). The result of the FC call must therefore either be saved explicitly by the user or it must be used immediately. The FC is represented similarly to the FB (with several inputs and one output) for the process control system user programming with the ES ensuring that handling is uniform.

Function block

In accordance with the IEC TC65/WG6 draft standard of May 1995 this term is defined as follows:
The function block (FB instance) is a functional software unit which consists of a designated individual copy of the data structure defined by the function block type, with the data structure being retained from one call of the function block to the next.

The main features of the FB instance are as follows:

- Type and instance identifier
- Input and output events. These use algorithms of the OB in which the FB instance is processed or are used by these algorithms.
- Input or output variables which are read or changed respectively by the FB algorithm.
- Functional features which are defined by the type description and which are generally realized via the algorithm of the FB.

As a rule the algorithm of an FB is not visible from outside the FB unless the FB manufacturer describes it in any form.

Result: The user sees the FB through the data storage as an input/output bar with the information: ”What must exist at which input in order for the desired result to be obtained at the defined output?”. The FB manufacturer has dealt with the question of how the result is obtained. The user can thus restrict himself to the technological aspects without having to deal with the programming details. Suitable means (ES) can be used to ensure that the FBs are handled graphically, in a clear structure and with additional ease.

I

Initial startup

From the point of view of the block the process in which the block is executed for the first time after having been instanced. Afterwards the block is in a defined state with regard to its parameters and operating modes.

Installation

Process by means of which a block (FB or FC) in an OB is logged in for processing. As a rule an existing processing sequence must be observed, which is why the term ”install” is used instead of ”insert” here.

Instance DB

Data block which results from a block type and which serves as the storage unit for a concrete application of this type. In a project, for example, the ”control” block type is represented by several instances (instance DBs) in order to be able to save the respective setpoint value, operating mode, parameters, etc. for each control task.

L

Limit

Reference value for an analog variable which leads to a reaction when the value is reached or exceeded.

M

Message class

Classification of messages in accordance with their cause. The following message classes are used in the SIMATIC process control system:

Process signals which are triggered when process-specific monitoring values (for example: alarms, interrupts, upper/lower tolerance, general process signals) are reached or exceeded.

Control system messages which are output by the control system (system messages), the I/O units (errors in the field) or for preventive maintenance.

Requests for operator input which, in the case of certain operation sequences, draw the operator's attention to the necessity of an operator intervention (for example, request to acknowledge a stepping operation manually in order to enable transition) or operator input lists.

Table of possible message classes and their meaning:

Message class	Meaning
AH	Alarm high (high high alarm)
WH	Warning high (high alarm)
WL	Warning low (low alarm)
AL	Alarm low (low low alarm)
TH	Tolerance high
TL	Tolerance low
F	Process error (field)
S	Control system message (system)
S*	OS control system message (fault)
M	Preventive maintenance
PM	Process message
–	Operation message
OR	Operator request
OM* [1])	Operation message

[1]) If the block is used for operation messages, the inputs I_1, ... have to be supplied with pulses. Assignment of the static value 1 would lead to multiple messages.

Monitoring

Part of the tasks of an OS which allows visualization of the process parameters and states in various forms (numerical, graphical).

Multiple instance block

We speak of multiple instances in cases where additional function blocks are called by one block using its own (meaning without an additional) instance DB.

Prerequisite is that the FBs to be called are registered as static variables in the variable declaration of the FB to be called.

This ensures that a concentration of the instance data in one instance data block is reached, meaning that the number of DBs available can be used better.

O

Operator control

Process in which the plant operator induces changes in values or states at a block. As a rule these are initiated by entries at the OS, chekked and transferred via the CS to the operator control block in the automation system. Because the working process may have changed in the time between the OS sending and the automation system receiving a final check is carried out here before it is assigned to the block.

Operator control block

Block which checks the plant operator intervention at the OS end and, if it is permissible, makes it available in the automation system at the block input interconnected to it. At the same time it presents confirmation of the operation at the OS end.

Operator control text

Text which is allocated to a block input and which is used for image display or for logging the operations on the OS.

Operating mode

Characteristic of a block which marks a certain application-specific processing phase for various cases in the course of the block program. Thus, for example the MANUAL operating mode at a control block signifies the program sequence in which the controller algorithm is not executed and the output variable (manipulated variable) is stipulated manually by the operator. The operating mode is usually coded in the block. It is selected or displayed by means of an integer parameter or combinations of binary parameters.

R

Redundancy

Multiple existence of components having the same tasks, which if required (for example in case of errors or faults) can take over from each other.

S

Sampling time

Interval between two consecutive scans of a block in a temporally equidistant processing class (watchdog interrupt OB). It is defined by the ES on the basis of the configured runtime group.

Standard (block, display block

Generic term for all objects in standard libraries which are supplied by Siemens.

Startup

From the point of view of the CPU the transition between the operating status STOP (internal STOP, i.e. CPU is ready) and operating status RUN (with processing of the user programs). The following types of startups can be differentiated on the basis of the organization blocks (CPU specific):

Cold restart, in which the results and states at interrupts are not taken into consideration (OB100).

Restart, in which the results and states of the user program at the interrupt are considered (not relevant for this library).

Start-up characteristics

Transition of a block into a defined state after it has been processed in a start-up OB. In this library only a cold restart is relevant (OB100).

T

Tracking

Status, which can be activated, of a block during which a (tracked) parameter is overwritten by its own program with the value of another parameter (tracking value). This means that a value defined by the user can be forced upon a parameter which is usually determined by a process or program.

U

User (block, display block)

Generic term for all the objects supplied by the user (customer, engineering office, department planning a project for a customer) in user-specific libraries.