Altivar 68
Telemecanique

Variable speed drives for asynchronous motors

Programming manual

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Contents

This document describes how to configure the Altivar 68.
For connection and setup procedures, also refer to the User's Manual.

The drive's detection functions (overspeed and veering) must not be used as safety functions if there is a risk to operating personnel. External safety devices must then be provided for the drive.
When the drive is powered up, the power components and some of the control components are connected to the line supply. *It is extremely dangerous to touch them. The drive cover must be kept closed.*

As a rule, *the drive power supply must be disconnected* before any operation on either the electrical or mechanical parts of the installation or machine.
After the ALTIVAR has been switched off, *wait for 10 minutes before working on the equipment*. This is the time required for the capacitors to discharge. Check that the voltage between the + and - terminals is lower than 60 V ⎓.
The motor can be stopped during operation by inhibiting start commands or the speed reference while the drive remains powered up. If personnel safety requires prevention of sudden restarts, this electronic locking system is not sufficient : *Fit a device to interrupt the supply on the power circuit*.

The drive is fitted with safety devices which, in the event of a fault, can shut down the drive and consequently the motor. The motor itself may be stopped by a mechanical blockage. Finally, voltage variations, especially line supply failures, can also cause shutdowns.
If the cause of the shutdown disappears, there is a risk of restarting which may endanger certain machines or installations, especially those which must conform to safety regulations.

In this case the user must take precautions against the possibility of restarts, in particular by using a low speed detector to cut off power to the drive if the motor is subject to an unprogrammed shutdown.

Automatic restart :
The drive can be configured to start automatically on power-up. Ensure that no-one is endangered by this type of start-up.

The products and equipment described in this document may be changed or modified at any time, either from a technical point of view or in the way they are operated. Their description can in no way be considered contractual.
The drive must be installed and set up in accordance with both international IEC and national standards. Bringing the device into conformity is the responsibility of the systems integrator who must observe the European directives, especially the EMC directive.
The specifications contained in this document must be applied in order to comply with the essential requirements of the EMC directive.

The Altivar 68 must be considered as a component : it is neither a machine nor a device ready for use in accordance with European directives (machinery directive and electromagnetic compatibility directive). It is the responsibility of the end user to ensure that the machine meets these standards.

Installation recommendations

Contents

1. Information required before powering up the drive

- Note the information on the motor rating plate. This will be useful when filling in the "Motor data" menu.
- Refer to the programming manual for how to use the programming keypad (section on “control keypad, menu layout, parameter setting, setup”).

2. Powering up the drive

- The drive can be powered up in two ways :
  - using the line supply to L1, L2 and L3
  - using an auxiliary 24 VDC supply connected to terminals P24V and P0V
- Read the setup recommendations in the User's Manual.
  The table located above the screen acts as a reminder, allowing quick access to the settings. The current menu is shown at the bottom left of the screen.
- Line B (B1, B2, etc.) corresponds to the minimum setting required when setting up the device.

3. Minimum setup procedure

When the drive is powered up, the A1 “Home” menu appears.

- Go to B1 and select the language required.
- Go to B3 and enter the motor data on the rating plate : Nominal power, nominal current, nominal voltage, nominal frequency and nominal speed.
- Select the type of signal for the "auto. reference" (speed reference) : current in D1.04 and voltage in D1.00.
- Return to position A1 “Home” in order to store these parameters.

4. Setting recommendations with an external braking unit connected to the drive (hoisting application)

- Indicate the presence of a braking unit in C1.03 (external braking unit).
  (This avoids auto-adaptation of the deceleration ramp during braking.)
- Select brake logic mode in C6.01 (hoisting or translation).
- Enter the settings as shown in the manual. Do not forget to set the speed error in C6.10.

5. Autotuning and measurement of motor parameters

If the application requires high performance levels, the motor parameters must be measured.

- The power supply must be present at L1, L2 and L3 to perform autotuning.
- Check that no start commands are present on the logic commands.
  If the drive is fitted with an I/O extension card, input DI5 must be set to 1 to enable the drive.
- Go to B4.00 to start measuring the motor parameters.
  In order to ensure accuracy, the motor must not be rotating during the measurement phase (windmilling fan) and the motor must be cold. The electrical signals sent to the drive for measuring do not cause the motor to rotate. Autotuning lasts from 2 to 4 minutes, depending on the size of the motor.

6. Setting parameters specific to the application

Parameters can be set in two ways :

- Either by going directly to the function containing the required adjustment parameter.
  Eg : assignment of the selected I/O in D1...D6 and the type of control (local, remote) in E1...E6.
- or using preconfigured settings adapted to the current applications.

These preconfigured settings are called application macros. The drive has 4, corresponding to the principal applications. When an application macro is selected, the drive adjustment parameters and I/O are automatically adjusted so that they match the type of application used as closely as possible. This simplifies operation for the user.
The factory configuration is the conveyor macro which is generally used for conveyor type constant torque applications.
The “short menu” in B5 selects (filters) the key parameters of the application, in accordance with the application macro chosen, and all the parameters modified by the user, ie. those which are different from the factory settings. This menu is used to identify these parameters and access them quickly. If one of these parameters reverts to the factory setting value, it is removed from the short menu.

7. Selecting an application macro

- The macro is selected using parameter B2.03 “Macro select”.

8. Adjusting parameters specific to the application

• Go to the short menu B5 and adapt the settings to the application.

To find out the factory settings for the different macros, refer to the application macro section.

Check that the analogue inputs (references) and logic inputs (run forward and run reverse commands) are configured correctly.

9. Storing parameters

• Store the settings in the drive current memory by returning to the “Home” position in A1 (or use the PC software via parameter A1.00). This allows storage of the new settings in the drive current memory after a line supply failure. The parameters are also stored automatically after the drive has been switched on for 5 minutes without interruption.

Caution : If after setting and saving your configuration in the drive current memory, you decide to select a new application macro, the parameters of the latter will override your previous configuration.

• Store the parameters in one of the two user macros (1 or 2).
The “user macro” is used to store a complete configuration in a specially designated memory area. Two complete configurations can be stored in B2.01 (USER M1) and B2.02 (USER M2). The parameters of one of the user macros can be used in the drive current configuration either by configuration (select a user macro in B2.03) or by selection using a logic input (see B2.04).

10. Drive control modes

The drive can be controlled in several ways using :

• the keypad on the programming terminal
• the terminals
• the serial link
• the RS232 link

These control modes can be selected via a logic input assigned to LOCAL/REMOTE control. For purposes of clarity, local mode corresponds to control via the keypad on the graphic terminal (the drive is controlled by the operator at his machine) and remote mode to control via the terminals or serial link (the drive is controlled by a PLC).

See the diagram in D2 and selection of control modes in E4.

Reference

• Check assignment of the analogue inputs : choice of a current (D1.04) or voltage (D1.00) reference.

The reference “freq.ref.aut” is programmed on a current input during factory setting. Use of a potentiometer for the reference means that “freq.ref.aut” must be re-assigned to a voltage input (AIV). The same reference cannot be selected twice (once on the voltage input and once on the current input). The value must therefore be unassigned before being re-assigned.

With a logic input, 2 different references can be selected : one called MANUAL and one called AUT (see the diagram in D1 and assignment of a Manual/Aut input in D2). If an I/O extension card is used, input DI5 (disable) must be set to 1 to allow control of the motor.

Run command

• Local control :
The drive can be controlled directly via the keypad on the graphic terminal :
  - Press the LOCAL/REMOTE key. Check on the screen that the machine has switched to local mode.
  - Press the green RUN key to start and the red STOP key to stop the machine.
  - Enter the reference using the keys ▲, ▼ and the direction of operation using the keys ◀, ▶.
• Remote control :
Check that the analogue and logic inputs have been correctly selected in A4.00...A4.22 before switching the drive to remote mode. This prevents transmission of any accidental commands.
• The terminals can be used either locally or remotely depending on how the inputs are assigned (see section D2 on local/remote control). For example, there is a LOCAL “+speed/-speed” and a REMOTE “+speed/-speed” value.
If the 24V internal supply is used for the logic inputs, it is essential that DIS (common of the logic inputs) is connected to 0V on the terminals.

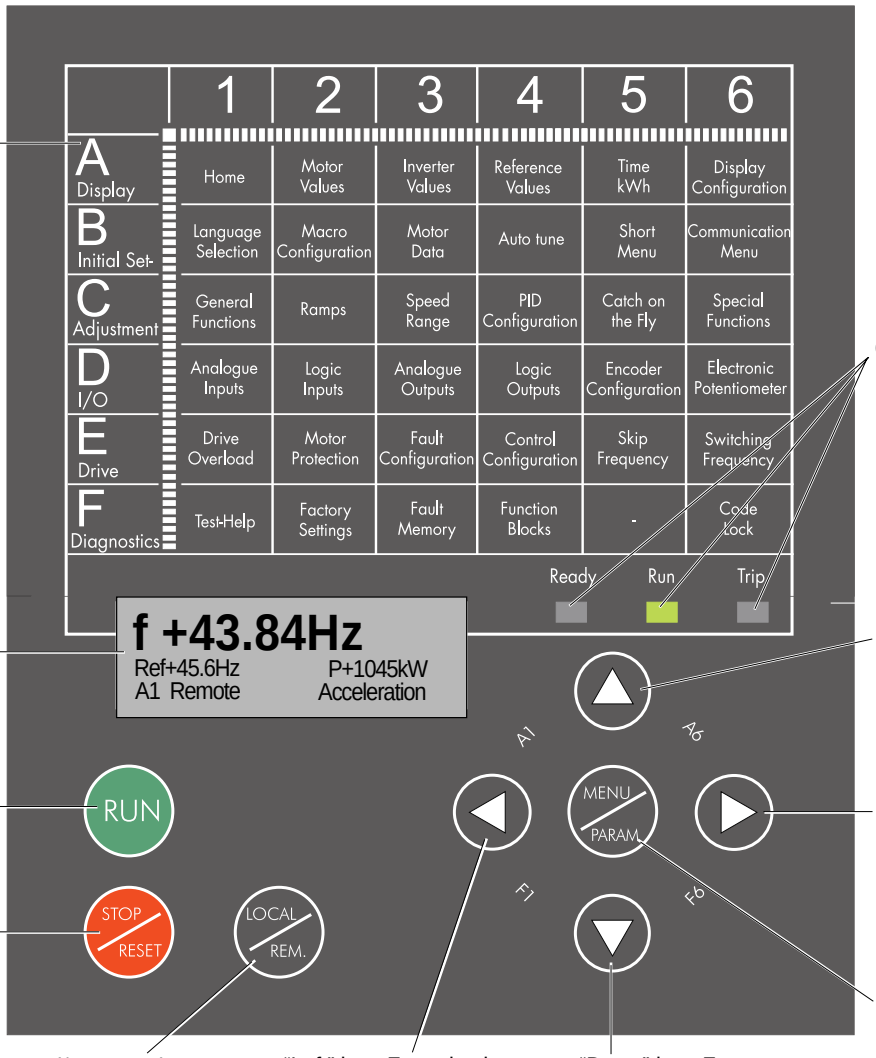
11. Operating with encoder feedback

• Set the number of pulses for one rotation of the encoder in D5.03.
• Maintain the drive in calculated speed control with D5.00 on 2 “Encoder” and D5.02 on 0 (closed loop speed control not active).
• Start the motor to check the direction of rotation on the display screen. The frequency reference and feedback must have the same sign (see D5.03).
• Set the drive to closed loop mode with D5.02 on 1 or 2 (Active) and set D5.04, D5.05, D5.07 and, if necessary, D5.08.

Control

Contents

The control keypad



"Reminder" table for moving around the menus

Configurable liquid crystal display screen

"Run" key in local mode

"Stop" key in local or remote mode, can be programmed for fault acknowledgement (reset)

"Local/Remote" key. Selects control via the keypad or terminals.

"Left" key. For selecting a menu, moving the cursor * to the left and controlling the reverse direction of rotation in local mode

"Down" key. For selecting a menu and decreasing the numeric values or the reference in local mode

"Menu/parameters" key used to access the parameter settings or quit adjust mode to return to the menu

"Right" key. For selecting a menu, moving the cursor * to the right and controlling the forward direction of rotation in local mode

"Up" key. For selecting a menu, increasing the numeric values or the reference in local mode

Display of drive status : Ready, Run or Trip

* The cursor underlines the modifiable parameter. See "parameter setting" section.

The software version can be read in parameters A3.08 and A3.09.
To select menus using the "up", "down", "left" and "right" keys, the "reminder" table must be used.

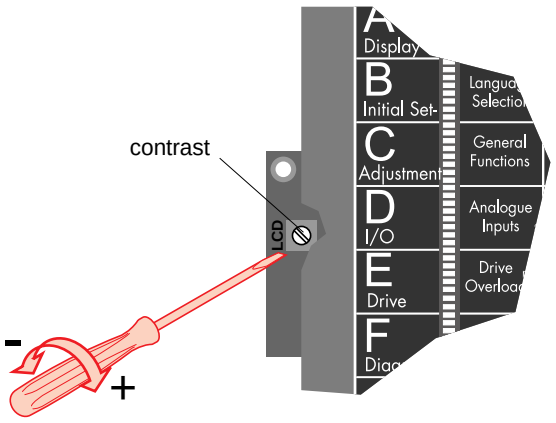
The control keypad

Shortcut keys

Top left (A1-Display)	press simultaneously	◀ + ▲
Top right (A6-Display Configuration)	press simultaneously	▶ + ▲
Bottom left (F1-Test-Help)	press simultaneously	◀ + ▼
Bottom right (F6-Code Lock)	press simultaneously	▶ + ▼

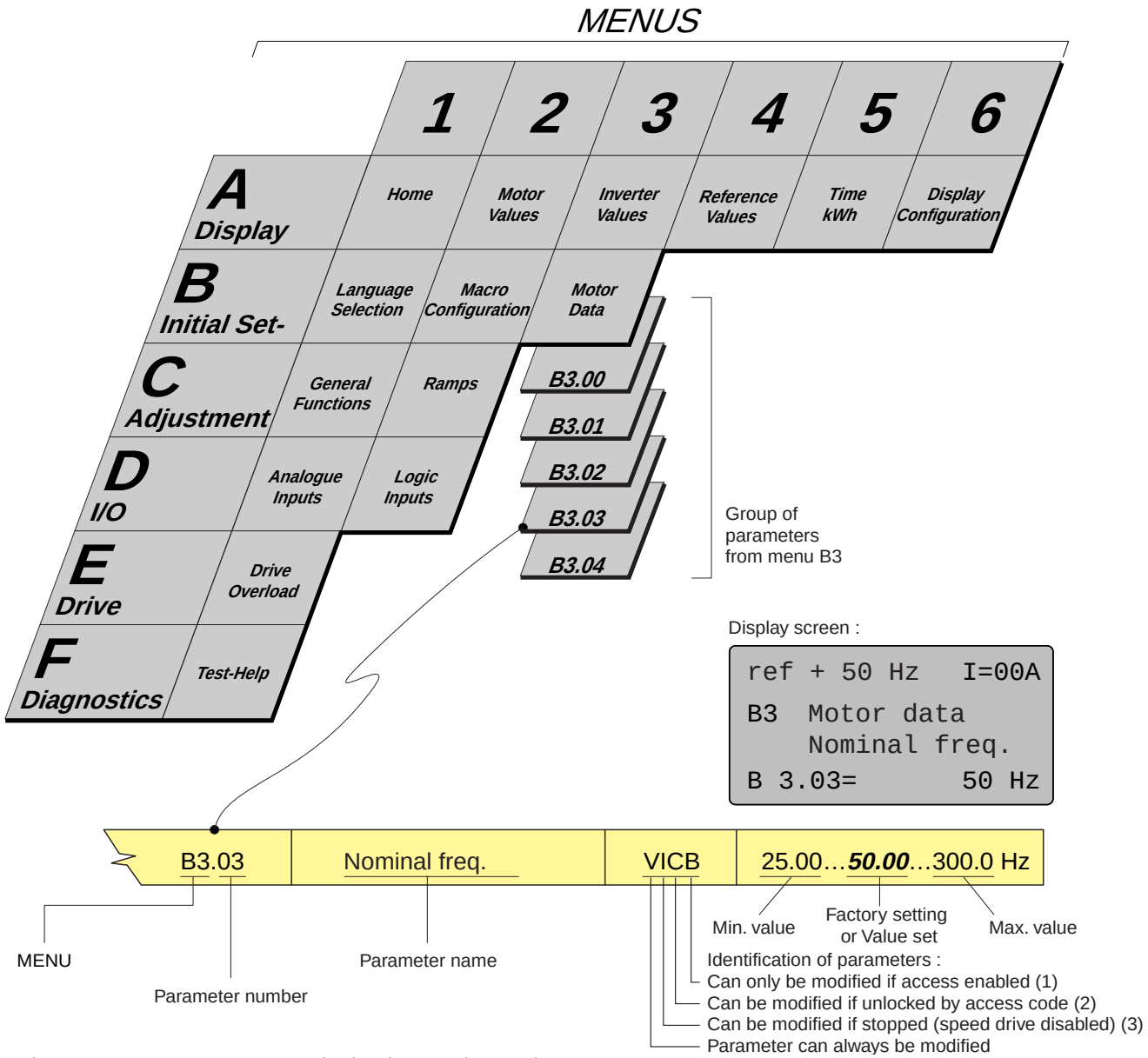
Adjusting the display contrast

The LCD display contrast is adjusted using the potentiometer in the top left-hand corner of the control card.



Menu layout

The 3-D view shows the menu layout and access to the adjustment parameters.
A, B, C, D, E, F define the groups of related menus : A Display menus, B Setup menus etc



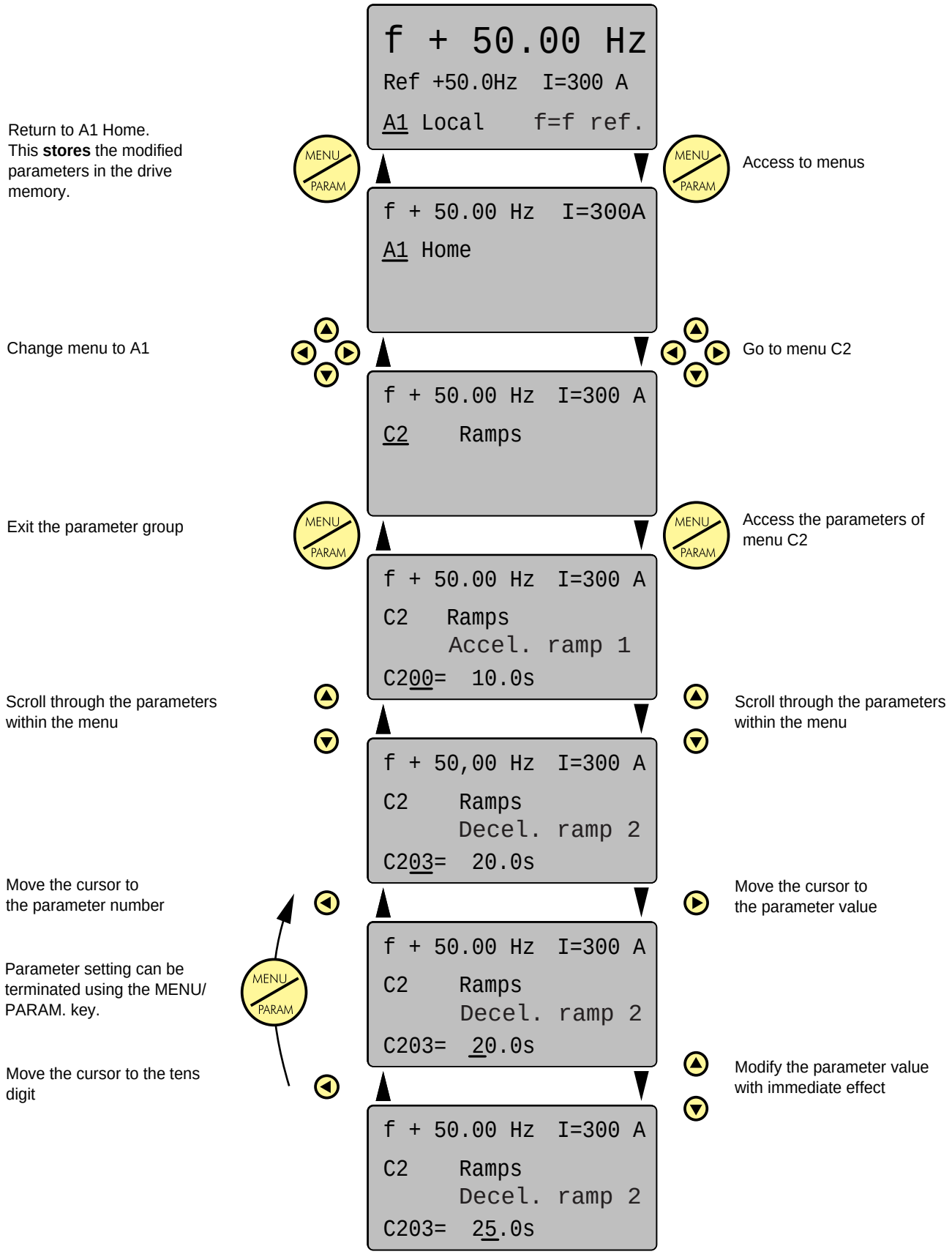
- The menu parameters are accessed using the Menu/Param. key.
- The A1 Home menu performs a special function :
  It does not contain any parameters but shows the basic display. Modified values are stored by switching to the basic display (Menu/ Param. key).

  Modified values are stored by :
  - switching to the A1 Home level
  - or they are stored automatically 5 minutes after the parameter has been modified (drive switched on).
- Each menu can be accessed using the arrow keys.

(1) See parameter F6.02
(2) See parameters F6.00 and F6.01
(3) A run command cannot be executed while this parameter is being modified.
Commands sent by the keypad are ignored and logic commands are suspended if the cursor is to the right of the "=" sign.

Parameter setting

Note that pressing the keys changes the menu or the underlined parameter.



Local control

In order to control the drive from its built-in keypad, the “local” operating mode must be activated.
Use the “LOCAL/REMOTE” key on the programming keypad to switch to “local” mode.
The following keys are then active :

Keys	Keypad	Menu	Parameter group
	Start-up	---	---
	Stop/Reset	Stop/Reset	Stop/Reset
	Increase the reference	Go to menu	Scroll through parameters or increase their value
	Decrease the reference	Go to menu	Scroll through parameters or decrease their value
	Rotate left	Go to menu	Move the cursor to the left
	Rotate right	Go to menu	Move the cursor to the right

If the permanent contacts FWD (run forward) or REV (run reverse) are activated on the terminals, the motor will restart automatically after correction of a fault and resetting.

The local operating mode can be locked by using parameters E4.00, E4.01 and E4.03.

If I/O extension card 1 is used, a high state (logic 1) on terminal DI5 is always necessary to start the motor.

If parameter E4.03 is set to 1 "Terminals" the keys of the control keypad then have no function in local mode (exception : “Stop key”, if parameter E4.04 is set to “1 always active”).

Setup

Set up the drive in the following order :

B Initial Set-		
B 1	Language selection	Selects the language displayed
B 2	Macro Configuration	Selects a macro-program to configure the terminals and transfers the parameters relevant to your application to a short menu.
B 3	Motor Data	Two alternatives are defined depending on the specifications of your application : High torque : high overload (1.5 In) Standard torque : limited overload (1.2 In)
B 4	Auto tune	Measures the motor parameters and autotunes the drive in accordance with the motor specifications.
B 5	Short Menu	Selects the “key” parameters of the application macro selected and any parameters which are different from the factory setting.
Matrix		If additional parameters necessary for optimization of the installation are not in the short menu, they can be selected from one of the menus and then set. They are then automatically added to the short menu.
B 2	Macro Configuration	On completion of setup, the parameter settings can be stored in a user macro via parameters B2.01 and B2.02.

Do not forget to go back to the “A1” basic display to store the parameters.

Powering the drive with an auxiliary 24 VDC supply is very useful during setup. This means that settings can be adjusted without switching on the power component of the Altivar 68 (exception : Autotuning and factory settings).
The user interface is fully operational with this auxiliary voltage.
The settings can be written down on the special forms designed to assist with setup (see “Configuration / settings tables”, page 124).
Make a note of all the parameters shown in the short menu and their values. These are the only parameters which differ from the factory settings.

Display of references and actual values and configuration of the display

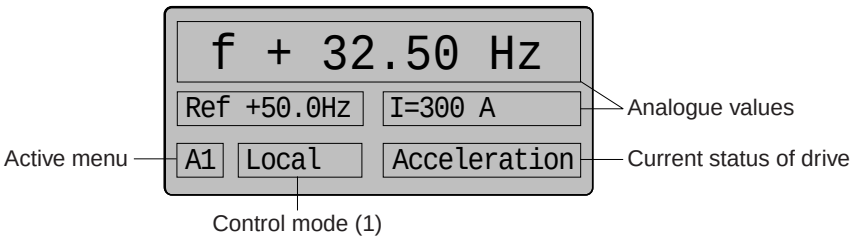
A

Contents

A1. Home

Modified values are stored in the drive memory by :
1. Switching to the basic display level (A1 Home)
2. Or they are stored automatically 5 minutes after the parameter has been modified.

This menu is the drive's basic display. 3 analogue values, the control mode, the drive status and the menu are shown.



The analogue values to be displayed can be selected from menu A6 (Display Configuration). All parameter modifications will be stored by returning to menu A1 "Home".

Status	Comment
Disabled	The drive is disabled if the enable command on the control terminals is not present (factory setting : input DI5_2 on the option card or programmable logic input) or if the drive is locked by the communication bus "step 0, Not Ready to Switch on" and "step 19, Lock switching on".
Stop	The drive is unlocked and waiting for a run command (run command and speed reference).
Not enabled	Only for the communication bus. If the command "bit 3 operation authorization" is missing.
Trip	The drive is faulty. The fault is shown on the screen.
Loading	This shows that the capacitors are currently charging. This information is only available when the 24VDC supply is used on the drive and the latter is controlling the line contactor.
Mains off	The drive is switched off (L1, L2 and L3) by the line contactor which is itself controlled by the drive (line contactor control C6.00).
Mains miss.	"Mains missing" is displayed if the line supply fails while the motor is running and the time delay for appearance of the undervoltage fault (programmed in E3.09) has not elapsed.
Mains disc.	This is displayed if the logic input programmed on "mains ON/OFF" is enabled. The line contactor opens for safety reasons.
Locked	Only local control is authorized. Control via the terminals is not authorized unless the logic inputs of the terminals are programmed to local control (run command and speed reference). Control via the graphic terminal : authorized. Control via the communication bus : not authorized.
Autotuning	The autotuning function is active.

(1) Control mode :
The control mode can be local or remote, see E4 for more details.

A1. Home

Display during operation	
Acceleration	• The drive accelerates in accordance with the acceleration ramp selected. The frequency reference has not yet been reached ($f_{ref} > f_{act}$): frequency reference > stator frequency. • The stator frequency has decreased due to active limitation (drive overload, motor overload, switch to torque or current limiting, etc) when the motor is running ($f_{ref} > f_{act}$). • The drive is operating with limited torque when the motor is running ($f_{ref} > f_{act}$).
Deceleration	• The drive decelerates in accordance with the deceleration ramp selected. The frequency reference has not yet been reached ($f_{ref} < f_{act}$). • The frequency has increased due to active limitation (drive overload, motor overload, switch to torque or current limiting, etc) when the generator is running ($f_{ref} < f_{act}$). • The drive is operating with limited torque in regeneration mode ($f_{ref} < f_{act}$)
f = f ref.	The actual frequency is the same as the frequency reference. Hysteresis and time can be adjusted using parameter D4.08.
USER Macro 1	User macro no. 1 (motor 1 parameters) is being used and the logic input is at 0. When parameter B2.04 is selected on “PAR 1/2” (1 motor) or “PAR 1/2” (2 motors).
USER Macro 2	User macro no. 2 (motor 2 parameters) is being used and the logic input is at 1. When parameter B2.04 is selected on “PAR 1/2” (1 motor) or “PAR 1/2” (2 motors).
Warnings and limitations	See “Faults - causes - remedies”, page 119. (only if A6.03 = 1).
Display during parameter setting	
Code	The user is trying to set a parameter which can only be accessed with a code. Unlock F6!
Para locked	1. The user is trying to modify a parameter which can only be accessed via the logic input “para-locked” (see D2.10 number 35). 2. The user is trying to modify a parameter while parameter B2.04 is selected on “PAR 1/2”. Set parameter B2.04 to “0 not active”.
Not locked	The user is trying to set a parameter which can only be modified when the drive is locked. Send a stop command.
Paramet-Access	The user is trying to set a parameter using an unauthorized access code. Authorize access (see F6.02 Paramet-Access : keypad, bus or RS232).
Read only	The user is trying to set a parameter which cannot be modified (display).

A2. Motor values

Display of actual drive (motor) values

A2.00	**Speed [rpm] (signed value)**	**Read only (1)**	
	Shows the actual speed in revolutions per minute, even when the drive is locked, ie. when the motor is freewheeling. The values are negative when rotating to the left.		
A2.01	**Torque [Nm] (signed value)**	**Read only**	
	Display as a function of the 4 quadrants. Display accuracy : ±5% of the nominal torque		
A2.02	**Motor load [%]**	**Read only**	
	100 % refers to the nominal motor current. Display accuracy : ±1,5%.		
A2.03	**Motor current [A]**	**Read only**	
	Motor rms current in amps. Display accuracy : ±1.5% of the nominal current (rms value of the fundamental of the nominal current)		
A2.04	**Shaft power [kW] (signed value)**	**Read only**	
	Mechanical power on the motor shaft. Display accuracy : ±5% of the nominal power (calculated as a function of speed and torque)		
A2.05	**Appar. power [kVA]**	**Read only**	
	Apparent power of the motor. Display accuracy : ±3% of the nominal power (calculated as a function of current and voltage)		
A2.06	**Motor voltage [V]**	**Read only**	
	Display accuracy : ± 2% of the nominal voltage (rms value of the fundamental)		
A2.07	**Slip frequency [Hz] (signed value)**	**Read only**	
	Calculated from the load as a function of motor nominal slip. (calculated from the torque and flux)		
A2.08	**Linear speed [m/min] (signed value)**	**Read only (1)**	
	Option to display the linear speed of the installation in m/min using a conversion factor with parameter A2.10. (A2.08 = A2.00 x A2.10)		
A2.09	**Rot. speed [rpm] (signed value)**	**Read only (1)**	
	Option to display the rotation speed of the installation in rpm. The reduction ratio is entered in parameter A2.11. (A2.09 = A2.00 x A2.11)		
A2.10	**Process scaling**	**VCB**	**-10.00…*1.000*…10.00**
A2.11	**Machine scaling**	**VCB**	**-10.00…*1.000*…10.00**

(1) If the power is not switched on (“Mains miss.” or “Mains off” on the screen), these actual values equal 0.

A3. Inverter values

Display of actual drive values

A3.00	**Output freq. [Hz] (signed value)**	**Read only**
	Drive output frequency. Resolution : 0.01 Hz	
A3.01	**Drive load [%]**	**Read only**
	Load STATE of the drive, 100 % refers to the drive nominal current ("High torque" version). Display accuracy : ±1.5 % of the nominal current (“High torque” version).	
A3.02	**DC voltage [VDC]**	**Read only (1)**
	Shows the actual voltage of the intermediate circuit (DC bus). Display accuracy : ±2 % of the max. voltage • 400 / 500 V range : The maximum voltage is 920 VDC. • 690 V range : The maximum voltage is 1200 VDC.	
A3.03	**Heatsink temp. [°C]**	**Read only (1)**
	Display accuracy : ±5 % Too high a temperature results in the following, from 80°C for a frequency > 10 Hz and from 60° for a frequency < 10 Hz : 1. a reduction in the switching frequency (see E6) 2. a reduction in the current limit value 3. tripping because the temperature is too high (at 100°C).	
A3.04	**Switching freq. [kHz]**	**Read only**
	Switching frequency	
A3.05	**Drive reference**	**Read only**
	Drive reference : ATV68CxxN4	
A3.06	**Nom. current "C" [A]**	**Read only**
	Drive nominal current	
A3.07	**Hardware vers.**	**Read only**
	Upgrade index of the power component	
A3.08	**Software type**	**Read only**
A3.09	**Software vers.**	**Read only**
A3.10	**Serial no.**	**Read only**
	Drive serial number, determined by the central card	
A3.11	**Drive status**	**Read only**

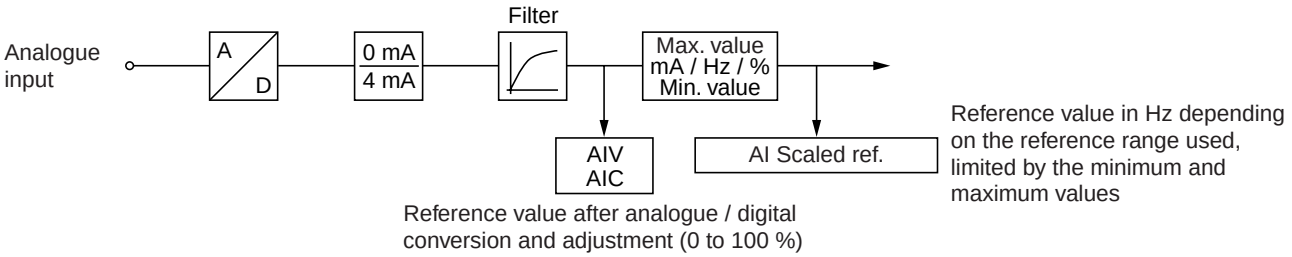
See also Profibus option guide (same as B6.48).

0 . . . . Not Ready ON
1 . . . . Rdy. switch ON
2 . . . . Load DC bus
3 . . . . Ready to run
4 . . . . Oper. release
5 . . . . Ramp enable
6 . . . . Ramp release
7 . . . . Run
8 . . . . Mot. fluxing
9 . . . . Rel. brake 1
10 . . . Crane active
11 . . . JOG1 active
12 . . . JOG1 pause
13 . . . OFF1 active
14 . . . OFF3 active
15 . . . Close brake
16 . . . DC-brake 1
17 . . . DC-brake 2
18 . . . OFF2 active
19 . . . Lock switching on
20 . . . Trip
21 . . . Auto tune
22 . . . Power test
23 . . . Rel. brake 2
24 . . . Rel. brake 3

(1) If the power is not switched on (“Mains miss.” or “Mains off” on the screen), these actual values equal 0.

A4. Reference values

Reference values



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A4.00	**AIV 0...10 V [%]**	**Read only**
	Reference at analogue input AIV terminals (0 V...10 V = 0 %... 100 %).	
A4.01	**AIV scaled [Hz] ([%])**	**Read only**
	Reference and scaling of AIV input.	
A4.02	**AIC 0(4)...20 mA [%]**	**Read only**
	Reference at analogue input AIC terminals (0(4) mA... 20 mA = 0 %... 100 %)	
A4.03	**AIC scaled [Hz] ([%])**	**Read only**
	Reference and scaling of AIC input.	
A4.04	**AI_2 0(4)...20 mA [%]**	**Read only**
	Reference at analogue input terminals (AI+, AI-) of the optional I/O card (slot X2) (0(4) mA... 20 mA = 0 %... 100 %)	
A4.05	**AI_2 scaled [Hz] ([%])**	**Read only**
	Reference and scaling of AI_2 input.	
A4.06	**AI_3 0(4)...20 mA [%]**	**Read only**
	Reference at analogue input terminals (AI+, AI-) of the optional I/O card (slot X3) (0(4) mA... 20 mA = 0 %... 100 %)	
A4.07	**AI_3 scaled [Hz] ([%])**	**Read only**
	Reference and scaling of AI_3 input.	
A4.08	**Pre-set ref. [Hz] ([%])**	**Read only**
	Preset reference currently enabled.	
A4.09	**Local ref. [Hz] ([%])**	**Read only**
	Reference from graphic terminal or terminals but via logic inputs (+speed/-speed).	
A4.10	**Remote ref. [Hz] ([%])**	**Read only**
	Reference from terminals or communication link.	
A4.11	**Freq. before ramp**	**Read only**
	Frequency reference before the ramp.	
A4.12	**Freq. after ramp**	**Read only**
	Frequency reference after the ramp.	

A4. Reference values

A4.13	**Max. torque ref. [%]**	**Read only**
	Maximum torque reference.	
A4.14	**Digital inp. X1**	**Read only**
	This parameter shows the state of the logic inputs on terminals 11 to 14 of terminal block X1, written from right to left.	
A4.15	**Digital inp. X2**	**Read only**
	This parameter shows the state of the logic inputs on terminals 26 to 29 of terminal block X2 (I/O option card), written from right to left. NOTE : When the I/O card is not used, logic input 26 (or DI5 on X2) is automatically written to 1 (in order to authorize switching of the drive to Run)	
A4.16	**Digital inp. X3**	**Read only**
	This parameter shows the state of the logic inputs on terminals 26 to 29 of terminal block X3 (I/O option card), written from right to left.	
A4.17	**BUS CTRL word**	**Read only**
	Displays the drive control word in bus mode (see programming guide of the communication protocol).	
A4.18	**Bus ref. 1 scale**	**Read only**
	Displays reference 1 which has been scaled by the communication link. Therefore given in Hz or as a %.	
A4.19	**Bus ref. 2 scale**	**Read only**
	Displays reference 2 which has been scaled by the communication link. Therefore given in Hz or as a %.	
A4.20	**Bus ref. 3 scale**	**Read only**
	Displays reference 3 which has been scaled by the communication link. Therefore given in Hz or as a %.	
A4.21	**Bus ref. 4 scale**	**Read only**
	Displays reference 4 which has been scaled by the communication link. Therefore given in Hz or as a %.	
A4.22	**Bus ref. 5 scale**	**Read only**
	Displays reference 5 which has been scaled by the communication link. Therefore given in Hz or as a %.	

Parameters A4.18 to A4.22 show the BUS references (PZD2 to PZD6) in the form of standardized values (physical measurements in Hz or as a %) instead of hexadecimal values. For more details, see the instructions for the Profibus option.

A5. Time / kWh

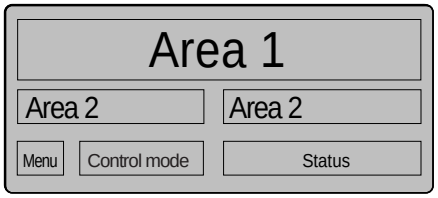
Display of actual drive values

A5.00	**Oper. hrs motor [h]**	**Read only**
	Counter totalling the number of motor operating hours (corresponding to an unlocked drive). (Information visible on the screen - see A6.00 to 02)	
A5.01	**Operat.hours FI [h]**	**Read only**
	Counter totalling the number of drive operating hours (corresponding to a drive powered by mains or 24V supply).	
A5.02	**kWh meter [MWh]**	**Read only**
	Counter totalling the energy consumed by the motor in MWh (active power). Tolerance given at ±3 % (Information visible on the screen : see A6.00 to A6.02).	

Parameters in hours **and** MWh cannot be reset to 0.

A6. Display configuration

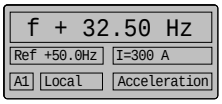
Configuration of the basic display A1



Dynamic or analogue reference values can be assigned to zones 1, 2 and 3. Double assignment is not possible.

The status area is used to display the status of the drive.

Example :



A6.00	**Select zone 1**	**VCB**	**Output frequency**
A6.01	**Select zone 2**	**VCB**	**Internal frequency reference**
A6.02	**Select zone 3**	**VCB**	**Motor current**

0 . . . f	Output frequency	Hz	A3.00
1 . . . L-FI	Inverter load status	% of drive nominal current at constant torque	A3.01
2 . . . C-Mo	Motor load status	% of motor nominal current	A2.02
3 . . . T	Torque	Nm	A2.01
4 . . . V	Motor voltage	V	A2.06
5 . . . I	Motor current	A	A2.03
6 . . . P	Shaft power	kW	A2.04
7 . . . S	Apparent motor power	kVA	A2.05
8 . . . n	Motor speed	rpm	A2.00
9 . . . -	Installation linear speed	m/min	A2.08
10 . . n	Installation rotation speed	rpm	A2.09
11 . . Ref	Ref. val before ramp	Hz	A4.11
12 . . T	Torque reference	%	A4.13
13 . . W	PID reference	%	C4.00
14 . . X	PID feedback value	%	C4.01
15 . . W-X	W-X error	%	C4.02
16 . . Udc	DC bus voltage	V	A3.02
17 . . tMo	No. of motor operating hours	h	A5.00
18 . . W	Motor consumption	MWh	A5.02
19 . . IA	Autotun. current	A (not for A6.01)	B4.05

A6.03	**View limitation**	**VCB**	**not visible**

0 . . . not visible
1 . . . visible

If the parameter is set to 1, the internal values currently being limited are displayed. Example : “current limit” when the drive current is limited during acceleration. The display appears if limitation is effective for at least 1.5 seconds.

Initial settings

B

Contents

B1. Language selection

Selection of the dialogue language

B1.00	Select language	VCB	French
	0 . . . German	German	
	1 . . . English	English	
	2 . . . French	French	
	3 . . .	Spanish*	
	4 . . .	Italian*	*Not yet available

This parameter is not modified if the factory settings are used.

B2. Macro configuration

Selection of an application macro

B2.00	Macro selected	Read only
	Display of the application macro used. In the case of a User Macro (UM), this display also shows which application macro the user macro has come from.	
B2.01	**Store USER M1**	**VCB**
B2.02	**Store USER M2**	**VCB**
	0 . . . Initial state 0, Start 0 -> 1 1 . . . Storing 2 . . . Stored	Set to 1 for storage, Modifiable parameter Read only Read only

B2.01 (B2.02) is used to store a configuration in a designated memory area called “User Macro 1” (User Macro 2).
Adjustment procedure : Select the application macro in B2.03. The application macro is a factory setting of all the parameters specific to the application in question. The parameters specific to the application appear in the short menu. If some parameters have to be modified, this can be done in the short menu or in the other menus. All the new modified parameters will be added automatically to the short menu. This new configuration is stored in the user macro using “Store USER M1 or M2”.

The motor data and the autotuning parameters are also stored (Menus B3 and B4)!

The parameters stored in the user macro can be loaded using parameter B2.03 (including the motor data and autotuning parameters) or via logic input B2.04.
This can be useful if the power component is changed (power block).

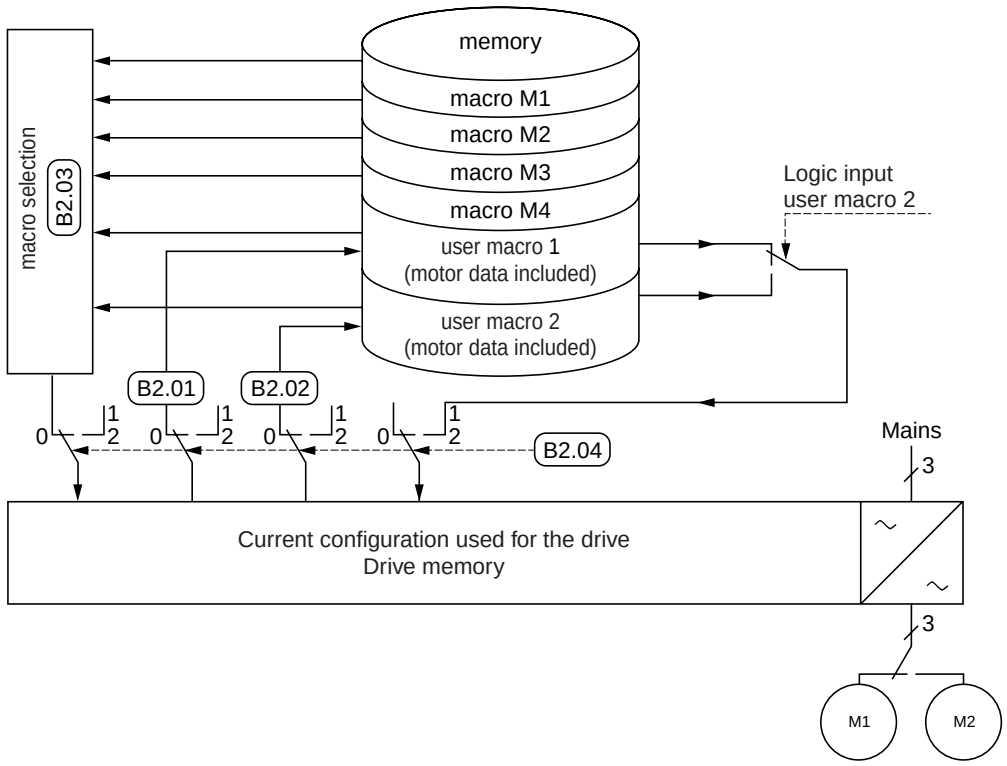
Caution : An application macro cannot be modified.

B2.03	Macro select.	VICB	Conveyor
	0 . . . Conveyor	Macro M1 (page 33)	When an application macro is selected, the existing parameters are replaced by the parameters of the application macro. The motor data is not replaced.
	1 . . . Piston pump	Macro M1 (page 33)	
	2 . . . Centrifugal pump	Macro M2 (page 37)	
	3 . . . Coiler	Macro M4 (page 46)	
	4 . . . Test bench	Macro M4 (page 46)	
	5 . . . Pump & PID controller	Macro M3 (page 41)	
	6 . . . Exhaust fan	Macro M2 (page 37)	
	7 . . . Fan	Macro M2 (page 37)	
	8 . . . Separator	Macro M1 (page 33)	
	9 . . . User macro 1 10 . . User macro 2	When user macro 1 or 2 is selected, the existing parameters are replaced by the parameters of the user macro, including the motor data. It is therefore possible to keep 2 different motor configurations.	
	11 . . No change	Quit the menu without selecting a macro	

To make it easier to adapt the drive to your requirements, a large number of application macros has been stored in the “Library”. Selecting a macro automatically activates the appropriate functions, with optimum parameter setting and configuration of terminals. A short menu is created at the same time, containing each parameter required for this application. For a detailed description of the macros, please see “Short menu” in B5.

Caution : The factory settings of user macros 1 and 2 do not contain motor data. It is essential to perform either an autotuning operation or load the factory settings of a standard motor corresponding to the drive rating (see F2-01).

B2.04	Multi-config.	VCB	Not active
	0 . . . Not active		
	1 . . . Par 1/2 (1 motor)		Selection of user macro 1 or 2 via logic input. Application with a single motor (a single thermal calculation for user macro 1 and 2).
	2 . . . Par 2/2 (2 motors)		Selection of user macro 1 (equivalent to motor 1) or user macro 2 (equivalent to motor 2) via logic input. Application with 2 motors (one thermal calculation for each macro and for each motor).



B2.01 (and B2.02) : storage of the current drive configuration in user macro 1 (and 2).

To store a configuration in a user macro, B2.04 must be set to 0 “not active”.

By selecting 1 or 2, a logic input (configure D2.xx to 20, select user macro 2) can be used to select user macro 1 or 2. The choice of user macro thus depends on the logic input DIx assigned to D2.xx.

1. Select the application macro for the first motor, set the motor data, perform an autotuning operation (if necessary) and set all the parameters required for the application.
2. Select a logic input (parameter D2.00 to D2.10) at position 20 (select user macro 2 or 1).
3. Use B2.01 to store the parameters set on user macro 1.
4. Connect the second motor, set the motor data, perform an autotuning operation (if necessary) and set all the parameters required for the application.
5. Select the same logic input as for user macro 1 (parameter D2.00 to D2.10) at position 20. (Select user macro 2.)!
6. Use B2.02 to store the parameters set on user macro 2.
7. Set parameter B2.04 to 1 “Par 1/2 (1 motor)” or 2 “Par 1/2 (2 motors)” and return to A1 to store the configuration.
8. Depending on the position of the logic input selected in 2) or 5), user macro 1 or 2 is loaded into the current configuration if the drive is locked (Stop, Mains miss. with 24VDC supply). The current user macro is displayed on the screen.
   Logic input at 0 = User Macro 1: display “USER Macro 1”.
   Logic input at 1 = User Macro 2: display “USER Macro 2”.
9. Set parameter B2.04 (multi-config.) to 0 to modify the configuration of the user macro again.
   Then store the new configuration using parameter B2.01 or B2.02. Set parameter B2.04 to 1 or 2 again.

If B2.04 stays at 1 or 2, the parameters of the user macros cannot be modified.

B3. Motor data

Entering data from the motor rating plate

B3.00	**Nominal power [kW]**	**VICB**	**0...*motor power*..2500 kW**

Enter the power value shown on the motor rating plate.

B3.01	**Nominal current [A]**	**VICB**	**0...*motor current*..2500 A**

Enter the nominal current value shown on the motor rating plate.

B3.02	**Nominal voltage [V]**	**VICB**	**0...*voltage*...1000 V**

Enter the voltage value shown on the motor rating plate.

B3.03	**Nominal freq. [Hz]**	**VICB**	**25..*frequency*..300 Hz**

Enter the frequency value shown on the motor rating plate.

B3.04	**Nominal speed [rpm]**	**VICB**	**0...*speed*...18000 rpm**

Enter the speed value shown on the motor rating plate.

Notes :

1. The factory setting for parameters B3.00 to B3.04 corresponds to a 4-pole motor and to the motor power of the drive used with standard torque (eg. ATV-68C33N4, Pn = 315 kW).
   If the motor used is different, these parameters must be modified.
   The nominal speed set must be lower than or equal to the synchronous speed. If it is higher, the drive will calculate the wrong number of poles and the value on the display screen will be incorrect.
2. If the drive is used with "high torque", the settings must be re-entered.
3. To operate a 50 Hz motor at constant torque ("delta" connection) up to 87 Hz, the settings must be re-entered. Eg : 230 V/400 V, 110 kW, 50 Hz motor
   B3.00 = Pn • √3 = 110 • √3 = 190.5 kW
   B3.01 = Inominal ("delta" connection 230 V) = 270 A
   B3.02 = Un ("star" connection) = 400 V
   B3.03 = fn • √3 = 50 • √3 = 87 Hz
   B3.04 = Nn • √3 = 1460 • √3 = 2530 rpm

B3.05	**Line voltage (V)**	**VICB**	**0....*3*....3**

0 . . . 400 V; 50/60 Hz	400V ± 15%, 50/60Hz ±5%
1 . . . 440 V; 60 Hz	440V ± 10%, 60Hz ±5%
2 . . . 460 V; 60 Hz	460V to 480V ± 10%, 60Hz ±5%
3 . . . 500 V; 50 Hz	500V -15% +10%, 50Hz ±5%
4 . . . 690 V; 50 Hz	690V ±10%, 50Hz ±5%

- Positions 0 - 1 - 2 - 3 are for the ATV-68 400 / 500 V range.

Enter the value of the line voltage.
An incorrect value may result in an error message (undervoltage) during operation or damage to the rectifier bridge if there is a mains break on a line of a higher value than the value set (charging of capacitors without the charging resistor). The voltage selected in B3.05 automatically adjusts the undervoltage level.

- Position 4 is for the ATV-68 690 V range only.

Caution : This parameter is not modified if the machine reverts to the factory settings.

B3.06	**Overmodulation**	**VICB**	**not active**

0 . . . Not active
1 . . . Active

If B3.06 is set to 1, the drive supplies the maximum output voltage possible to offset the voltage drop of 2 to 3% caused by the line choke. However, in this case the current harmonics are higher.

B3.07	**Output filter**	**VICB**	**not used**

0 . . . Not used	If a motor choke is used.
1 . . . Used	With output filter (not yet available).

Note : The encoder feedback option cannot be used with the output filter.

B4. Auto tune

Exact adaptation between the drive and the motor

B4.00	Autotuning	VICB
	0 . . . Start 0 -> 1	Initial state 0, switch to 1 with ▲ key to start autotuning.
	1 . . . Autotuning	Start of autotuning.
	2 . . . Rotor coeff.	Calculation of a rotor leakage coefficient and automatic loading.
	3 . . . Rot. time const.	Calculation of the rotor time constant.
	4 . . . Stator R	Measurement of the winding and cable resistance.
	5 . . . I-flux 1	Calculation of the flux current in 5 steps.
	6 . . . I-flux 2	
	7 . . . I-flux 3	
	8 . . . I-flux 4	
	9 . . . I-flux 5	
	10 . . O.K.	Autotuning is complete and the motor data is sent to parameters B4.01 to B4.04.
	11 . . Stop	Autotuning stops if the “Stop” key on the keypad is pressed.

The motor does not rotate during the autotuning procedure. Autotuning lasts from 2 to 4 minutes, depending on the size of the motor.

1. The drive must be unlocked (“Stop” showing on the screen) to perform autotuning (if an option card is present, enable input DI5).
2. The motor must not rotate during the autotuning phase (connected to an external unit, eg. fan)!
3. Voltage on L1, L2 and L3 must be present.
4. The motor must be cold.

Caution :
If an output filter is used, open connections X16 and X18 between the drive and the output filter! (Not applicable for a motor choke).

Note : There may be several reasons why an error message appears during autotuning :

Message “12 Err.rotor k” :
Possible cause :
- Drive locked, see input DI5 on option card or bus control.
- Motor not connected.

Message “13 Err.rot.tc” :
Possible cause :
- Motor power too high.

Message “14 Err.stat.R” :
Possible cause :
- Motor not connected.

Message “15 Error:I-flux” :
Possible cause :
- Motor data (B3.00 to 04) not correct.
- The motor is rotating during autotuning.

If the motor does not operate correctly after autotuning (eg. in the case of special motors), it is possible to return just the autotuning parameters to the factory settings. Use F2.01 “Ret. fact. motor”.

B4.01	Rotor coeff.	VICB	0...*depending on rating*...99999
B4.02	Rot. time const.	VICB	0.000...*depending on rating*...4.000 s
B4.03	Stator R	VICB	0.00..*depending on rating*. 20000.00 mOhm
B4.04	I-flux	VICB	0.0...*depending on rating*..2500 A

When the drive is delivered or after using F2.01 to return to the factory settings, motor parameters B4.01 to B4.04 correspond to a 4-pole motor with the same power as the drive used with standard torque (eg. ATV68C33N4, Pn = 315 kW).
These values are modified after autotuning and can be reset manually.

These parameters must only be modified by specialists.

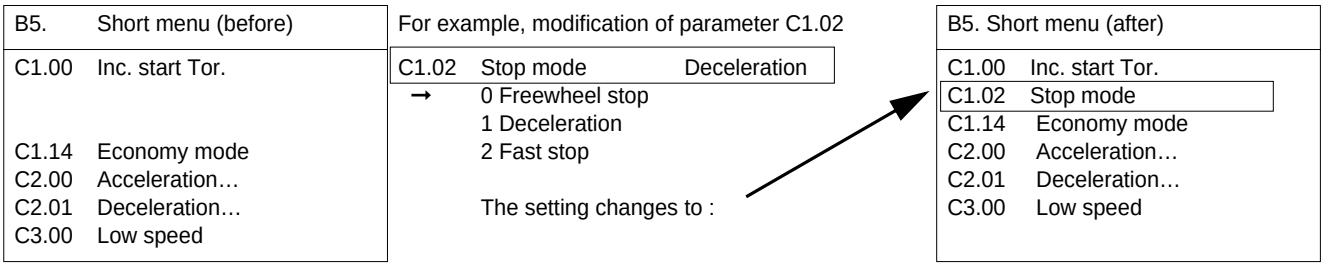
B4.05	I autotuning [A]	Read only

The current can be displayed during autotuning.
→ See also parameters A6.00 to A6.02.

B5. Short menu

Adjustment of parameters in the short menu

The parameters for an application appear in the short menu according to the application macro selected.
In many cases, the definition or adaptation of only those parameters contained in the short menu will be sufficient.
If optimization is then required, for example, when an optional card or certain additional functions are used, the menus are used to modify the necessary settings.
These modifications will then appear in the short menu.
Parameters are moved automatically to the short menu which gives a quick overview of the settings. Parameters whose value is the same as the factory setting are not shown in the short menu.



The short menu contains the principal parameters of the application (according to the Configuration Macro selected) and those parameters which have been modified by the user and are different from the original factory setting.
It is used to access the settings quickly. It selects (and filters) all the adjustment parameters.

B5. Short menu

Macro M1 - Motors with high overload (factory setting)

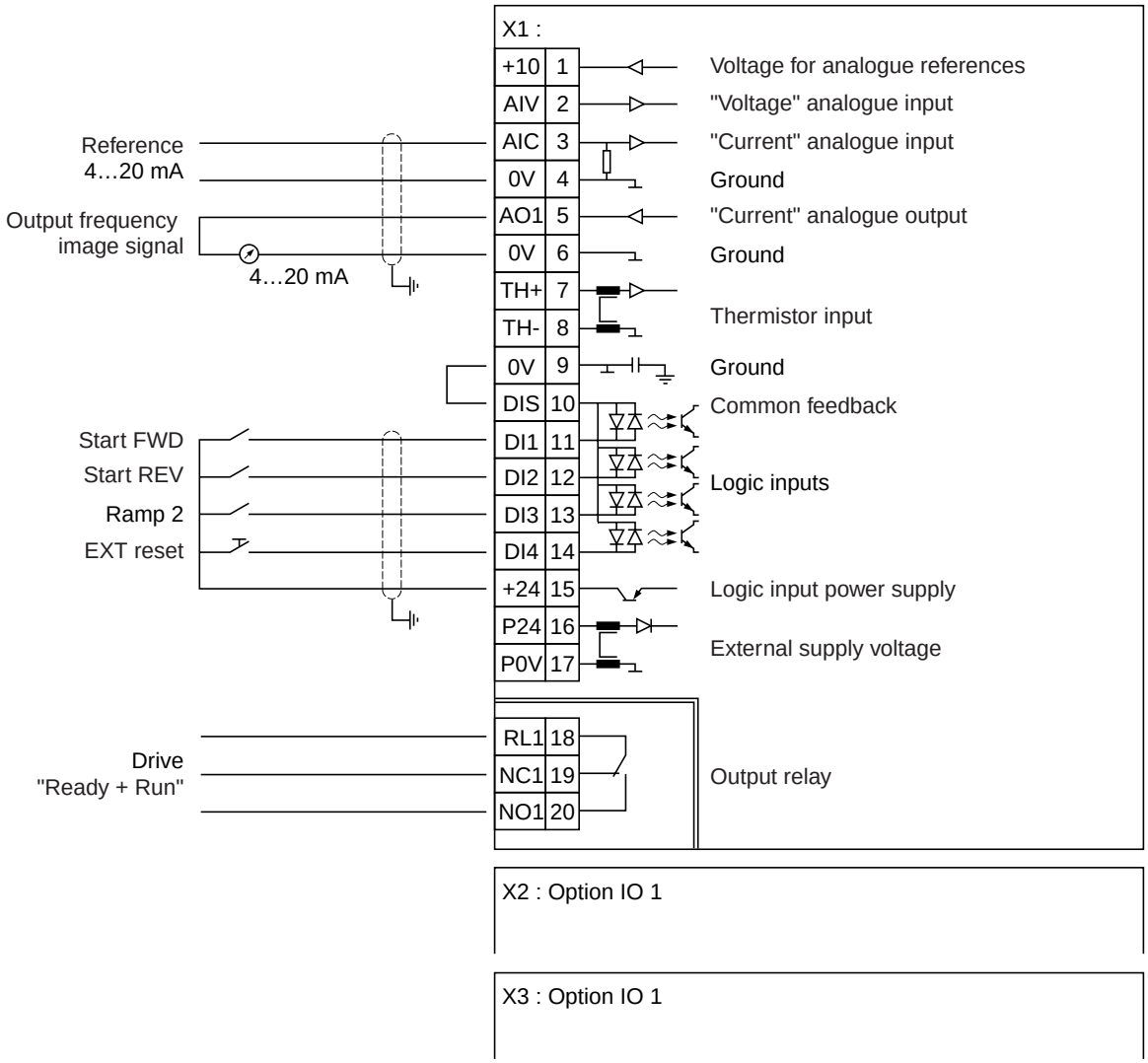
Conveyors
Piston pumps
Vertical hoisting and horizontal movement
Separators, etc

The starting torque can be set up to a maximum of 180% for difficult starts (parameter C1.00 “Inc. start Tor.”).
The references are preset remotely at 4-20mA and local control is obtained via the keypad of the graphic terminal.
The drive logic inputs are assigned to :

- Forward
- Reverse
- Controlling a second ramp
- Resetting faults

All the parameters can be reset using the different menus.
The modified settings can be stored in the user macro. All the modified parameters are automatically stored in the short menu where they are arranged in order.

Connection diagram



B5. Short menu

Short menu for macro M1

Parameter	Name	Setting	Note
B2.03	Macro select.	Conveyor	or : Piston pump, Separator
C1.00	Inc. start Tor.	0...**1**...30 %	The starting torque can be increased from 150 to 180 %
C2.00	Accel. ramp 1	0.0...**5.0**...3200 s	Setting in seconds for the nominal motor frequency
C2.01	Decel. ramp 1	0.0...**5.0**...3200 s	Setting in seconds for the nominal motor frequency
C3.01	Max. frequency	25.00...**50.00**...300 Hz	Setting for the upper frequency limit
C3.02	Dir. Enable	Enable FW/RV	Permits forward and reverse directions of rotation
D1.04	AIC-selection	Freq.ref.aut	Automatic frequency reference on input AIC in mA
D1.06	AIC value 0%	-300.0...**0.00**...300.0 Hz	Determines the frequency for 0 % of AIC
D1.07	AIC value 100%	-300.0...**50.00**...300.0 Hz	Determines the frequency for 100 % of AIC
D2.00	DI1-selection	Start FWD	Forward/Stop (permanent contact)
D2.01	DI2-selection	Start REV	Reverse/Stop (permanent contact)
D2.02	DI3-selection	Ramp 2	Switches to the second set of acceleration and deceleration ramps
D2.03	DI4-selection	EXT reset	External fault reset (normally open fleeting contact)
D3.00	AO1-selection	|f-out|	Analogue output no. 1 - Value of the frequency generated 4-20 mA = 0-fmax
D4.01	Relay output 1	Ready + Run	Ready on RL1
E2.00	Thermistor input	not active	
E2.02	I.max. at 0 Hz	0...**50**...150 %	I^2t motor protection, maximum current at frequency of 0 Hz as a percentage of the nominal motor current
E2.03	I.max. at f.nom	0...**100**...150 %	I^2t motor protection, maximum current at nominal frequency as a percentage of the nominal motor current
E2.05	Motor-tme const	0...**5**...3200 min	If > 5 min, the 24 V external supply is necessary

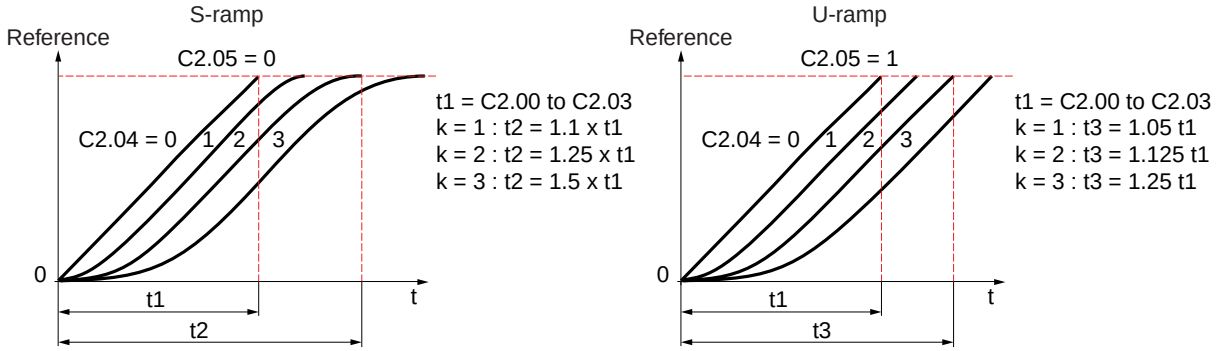
Note : All the motor data (matrix field B3) is displayed in the short menu.

B5. Short menu

Additions to macro M1

Rounded deceleration and acceleration ramps

A rounded ramp profile can be set in order obtain a smooth transition from motor stopped to motor acceleration phase and then to a fixed number of revolutions.

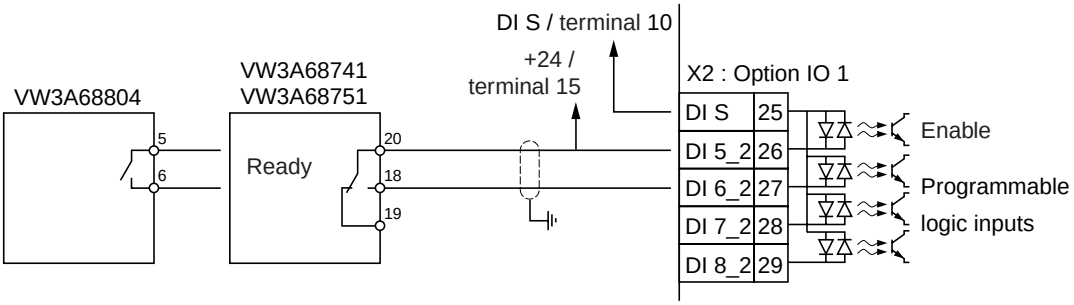


Parameter modifications necessary in addition to macro M1 :

Parameter	Name	Setting	Note
C2.04	S-ramp	S-ramp step 1, 2 or 3	Selection according to requirement
C2.05	S-ramp mode	Begin + End and Begin only	Selection of S or U-ramp

Use of an external braking unit

The presence of a braking unit must be indicated in C1.03 for the drive to operate correctly (1 external braking unit).
A logic input can be assigned to process the status relay in the braking unit.
A processing delay can be set.
The brake sequence can be adjusted in C6.



Parameter settings if logic input DI6_2 (on option card IO1) is used :

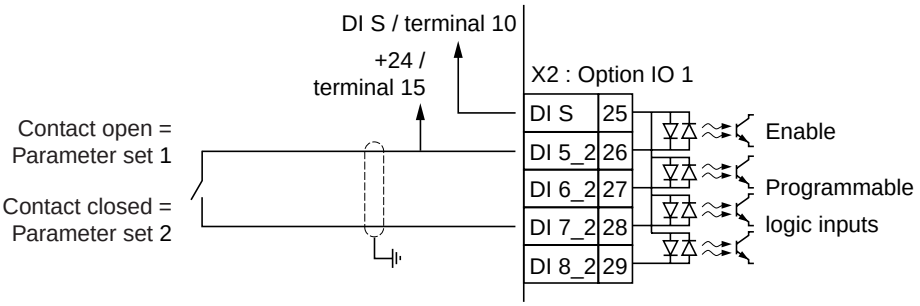
Parameter	Name	Setting	Note
D2.04	DI6_2-selection	Ext.BU-trip	Monitoring of an external braking unit
E3.06	Trip of ext. BU	N.C. ready + r	Normally closed contact.
E3.07	Delay f. E3.06	0.0...**5.0**...160 s	2 s is sufficient for the VW3A68804.

B5. Short menu

Switching to the 2nd set of parameters

The drive can store 2 complete configurations.
The adjusted motor data, the values measured during autotuning and the optimized parameter values are stored in “User Macro 1” and “User Macro 2”.
A logic input is used to switch the drive from parameter set 1 to 2.

Application examples :
- Using the drive with two different motors
- Parameter setting for two different work processes using a single motor
- Operation possible with or without speed feedback



Parameter	Name	Setting	Note
D2.05	DI7_2-selection	2.Para.Set.ac	Setting of the function on DI7_2
B2.01	Store USER M1	Store when switching to 1	Set to 1 for storing
B2.02	Store USER M2	Store when switching to 1	Set to 1 for storing
B2.04 (*)	Multi-config.	Par 1/2 1 motor	Application with 1 motor

(*) Once the parameter is in position 1 or 2, the parameters in the user macros cannot be modified (return to position 0 to modify user macros)!

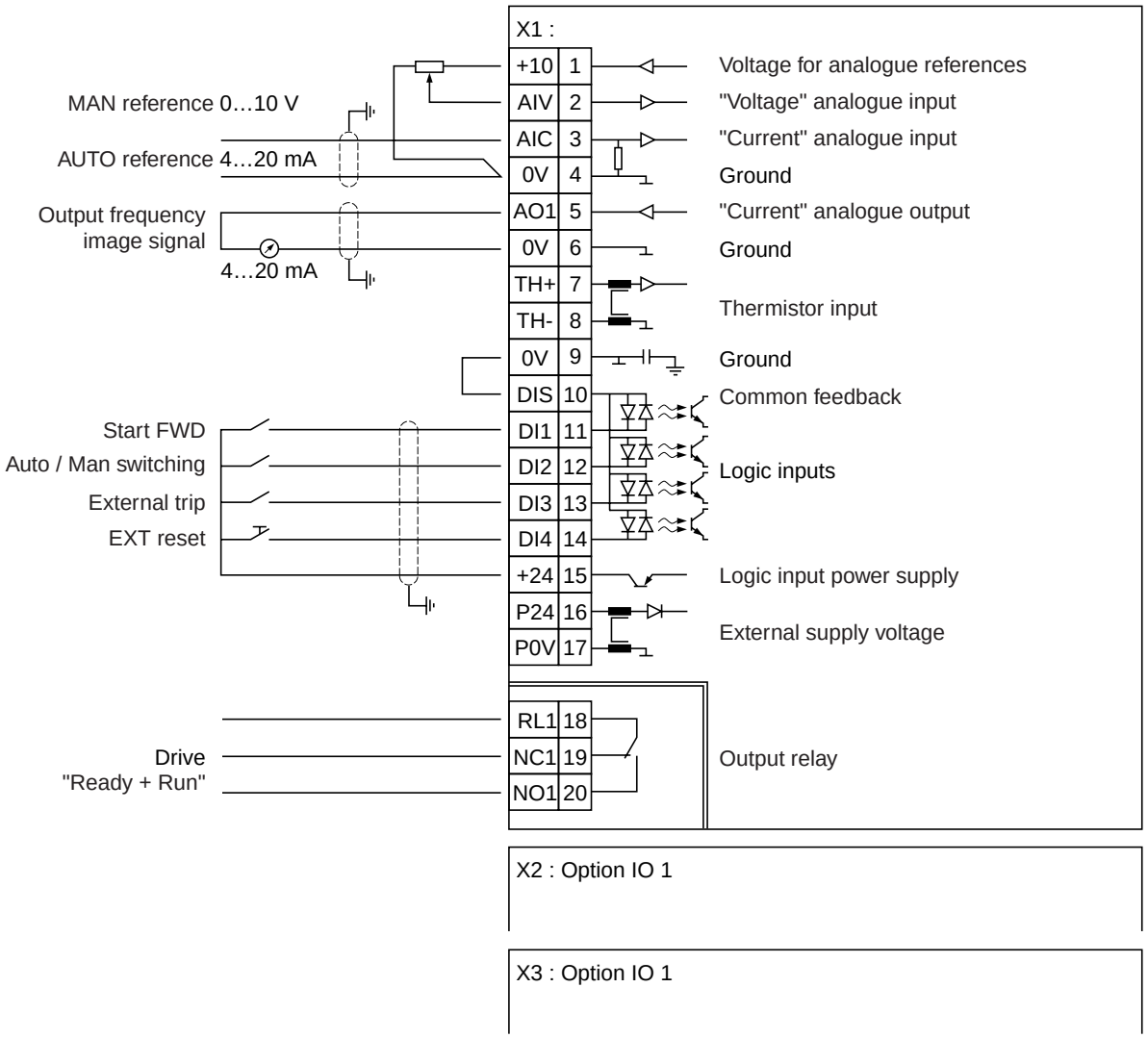
B5. Short menu

Macro M2 - Motors with standard torque (motor with torque in kn^2)

Centrifugal pumps
Fans
Exhaust fans etc

The drive can be used with “standard torque”, ie. with a high average current but low transient overtorque (see the "Speed controller - motor connection" section in the User’s Manual). Set the relevant motor data in parameters B3.00 to B3.01.
The economy mode function can be activated for applications with quadratic torque.
The Auto or Man frequency references are selected using one logic input.
The 0-10 V reference is activated if the MAN/AUTO button is closed. Otherwise, the AIC current reference is taken into account by the drive.
Only forward operation is authorized; reverse operation is interlocked. The terminal functions “External trip” and “External reset” are also programmed.
The modified settings can be stored in the user macro. All the modified parameters are automatically stored in the short menu where they are arranged in order.

Connection diagram



B5. Short menu

Short menu for macro M2

Parameter	Name	Setting	Note
B2.03	Macro select.	Centrifugal pump	or : Exhaust fan, Fan
C1.14	Economy mode	Step 1	Economy mode, level 1
C2.00	Accel. ramp 1	0.0...**10.0**...3200 s	Setting in seconds for the nominal motor frequency
C2.01	Decel. ramp 1	0.00...**10.0**...3200 s	Setting in seconds for the nominal motor frequency
C3.00	Min. frequency	0.00...**5.00**...300 Hz	Setting for the lower frequency limit
C3.01	Max. frequency	25.00...**50.00**...300 Hz	Setting for the upper frequency limit
D1.00	AIV-selection	Freq.ref.man	Manual frequency reference on AIV in volts
D1.01	AIV value 0 %	0.00...**0.00**...300.0 Hz	Determines the frequency for 0 % of AIV
D1.02	AIV value 100 %	0.00...**50.00**...300.0 Hz	Determines the frequency for 100 % of AIV
D1.04	AIC-selection	Freq.ref.aut	Automatic frequency reference on input AIC in mA
D1.06	AIC value 0 %	-300.0...**0.00**...300.0 Hz	Determines the frequency for 0 % on AIC
D1.07	AIC value 100 %	-300.0...**50.00**...300.0 Hz	Determines the frequency for 100 % on AIC
D2.00	DI1-selection	Start FWD	Forward/Stop (permanent contact)
D2.01	DI2-selection	Manual (Aut)	When open AIC is enabled (AUTO), when closed AIV is enabled (MAN)
D2.02	DI3-selection	External trip	Takes an external fault into account
D2.03	DI4-selection	EXT reset	External fault reset (normally open fleeting contact)
D3.00	AO1-selection	|f-out|	Analogue output no. 1 - Value of the frequency generated 4-20 mA = 0-fmax
D4.01	Relay output 1	Ready + Run	Ready on RL1
E1.00	Curr. max. val.	125 %	Max. I as a percentage of the nominal current of a drive using high torque
E2.00	Thermistor input	not active	
E2.03	I.max. at f.nom	0...**100**...150 %	I^2t motor protection, maximum current at nominal frequency as a percentage of the nominal motor current
E2.05	Motor-tme const	0...**5**...3200 min	If > 5 min, the 24 V external supply is necessary
E3.02	External trip	N.O. ready + r	External faults are transmitted via a normally open contact and are only taken into account if the drive is ready or operating

Note : All the motor data (matrix field B3) is displayed in the short menu.

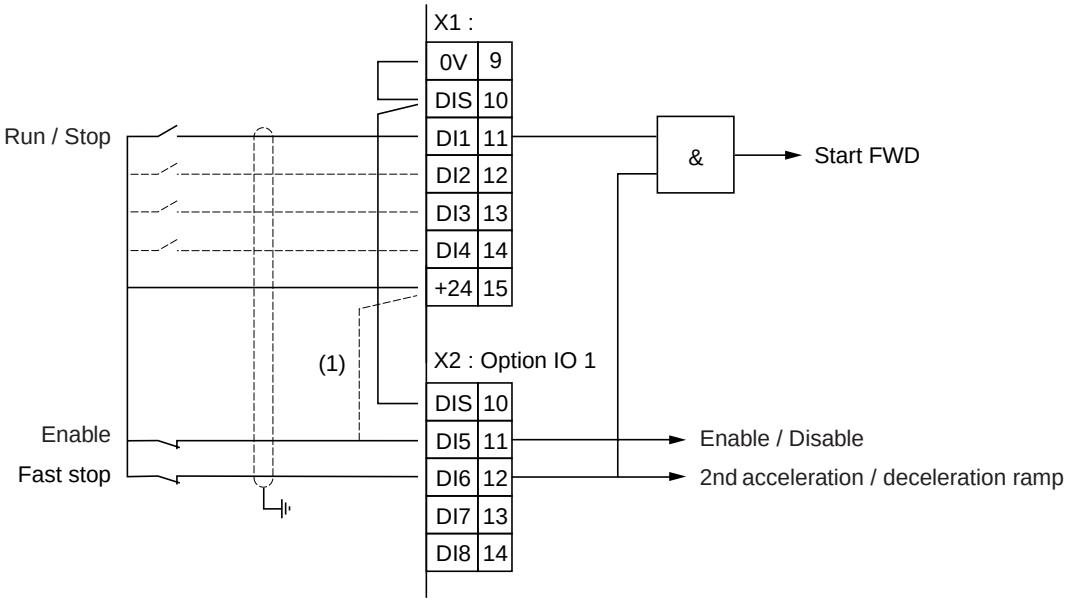
B5. Short menu

Additions to macro M2

Quick stop with motor braking

When using fans, it often useful to have a fast stop function in special operating situations.
Thanks to the new motor braking function, the deceleration time can be reduced to 10...20% of the time required for stopping when no braking unit is used.
3 logic inputs are used to select the different types of stop :

DI1	Start FWD on acc. ramp 2 / Stop 1	Deceleration on decel. ramp 2
DI5_2	Start FWD on acc. ramp 2 / Stop 2	Locking of the drive = freewheel stop
DI6_2	Start FWD on acc. ramp 2 / Stop 3	Fast stop on decel. ramp 1 (for stop mode, see C1-02)

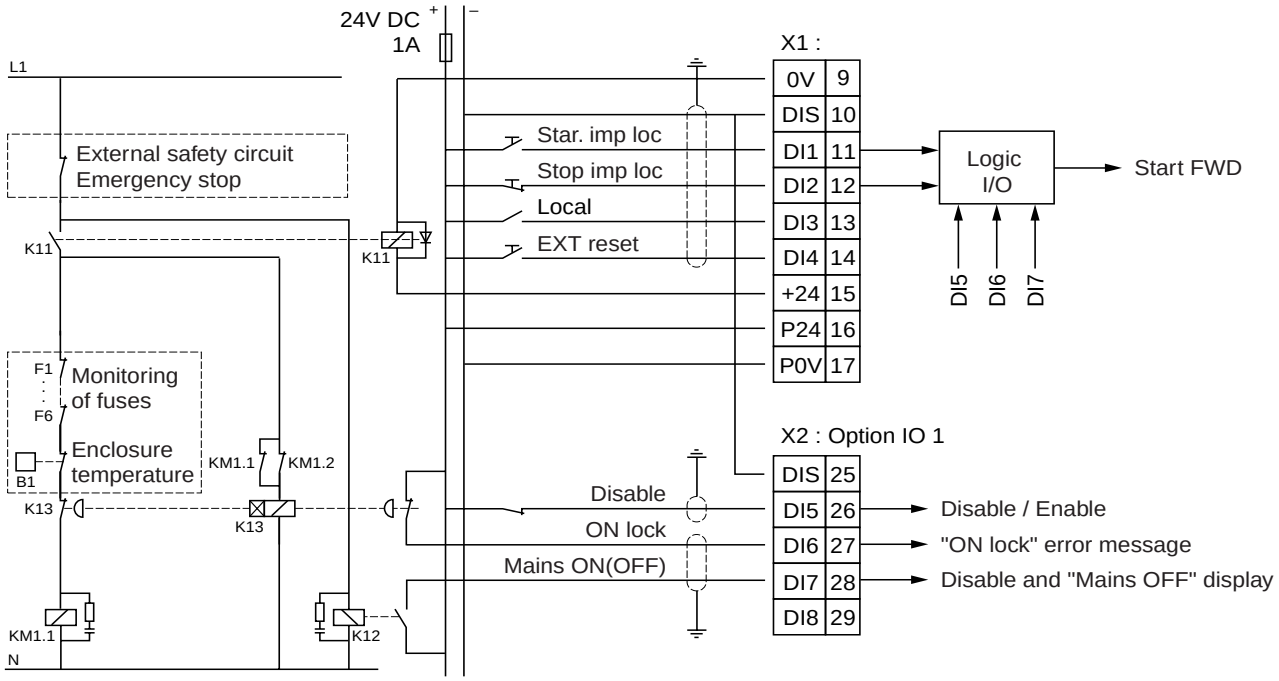


(1) Shunt : if it is not necessary to disable the drive on stopping.

Parameter	Name	Setting	Note
C2.00	Accel. ramp 1	0.0...**10.0**...3200 s	no function
C2.01	Decel. ramp 1	0.0...**0.1**...3200 s	The deceleration time depends on the load inertia and the braking efficiency set in C1.03.
C2.02	Accel. ramp 2	0.0...**10.0**...3200 s	If inertia is too great, the motor accelerates with the maximum current possible.
C2.03	Decel. ramp 2	0.0...**10.0**...3200 s	Adjust the deceleration time so that the motor is not overloaded during normal deceleration
D2.00	DI1-selection	not used	Required only by the logic block
D2.04	DI6_2-selection	Ramp 2	Required in addition by the logic block
F4.44	L5 signal D1	DI1	Required by logic input DI1
F4.45	L5 signal D2	DI6_2	Required by logic input DI6_2
F4.46	L5 Funct. type	AND	The motor only starts if the contacts for “Start FWD” and “Fast stop” are closed.
F4.49	L5-selection	Start FWD	Internal wiring

Control of the line contactor with built-in monitoring devices for locking parameters (ON lock)

If control of the line contactor is being used, the line voltage is applied to the drive when a run command is given. This minimizes drive losses and considerably increases the lifetime of the fans (see also parameter C6.00!). The control electronics are permanently supplied with a 24V auxiliary voltage.
Different parts of the line supply can be monitored (for example mains fuses, main contactor, fan etc.).



F1 … F6	Monitoring of mains fuses
24V DC	Auxiliary voltage for supplying the control electronics when there is no mains supply “Mains miss.”
K11	Auxiliary relay (max. 100mA, 24V) controlled by the +24V output assigned to “Line ON” (contactor control). Control of line contactor.
K12	Auxiliary relay (230V AC) for managing the external safety circuit (Emergency stop). A new start pulse must be given to restart the machine. The drive cannot restart if the safety circuit is open.
K13	Timing relay (delayed by 0.5s; 230V AC) for managing the monitoring circuit (tripped mains fuse, excess temperature, faulty line contactor, etc). K1.1 interrupts the automatic supply, the error message is stored in the drive and indicated as a fault.
KM1.1	Main contactor for applying the line voltage. Opens after each deceleration and in the case of locking, faults and "Mains OFF".

Parameter	Name	Setting	Note
C6.00	Contactor cont.	active	
D2.00	DI1-selection	Start FWDimp	Setting on fleeting contacts
D2.01	DI2-selection	Stop-imp	
D2.02	DI3-selection	Manual (Aut)	
D2.03	DI4-selection	EXT reset	
D2.04	DI6_2-selection	ON lock	Feedback from fuse monitoring
D2.05	DI7_2-selection	Mains ON(OFF)	Feedback from the external safety circuit
D4.00	+24 dig. output	Line ON	Output for controlling the line contactor

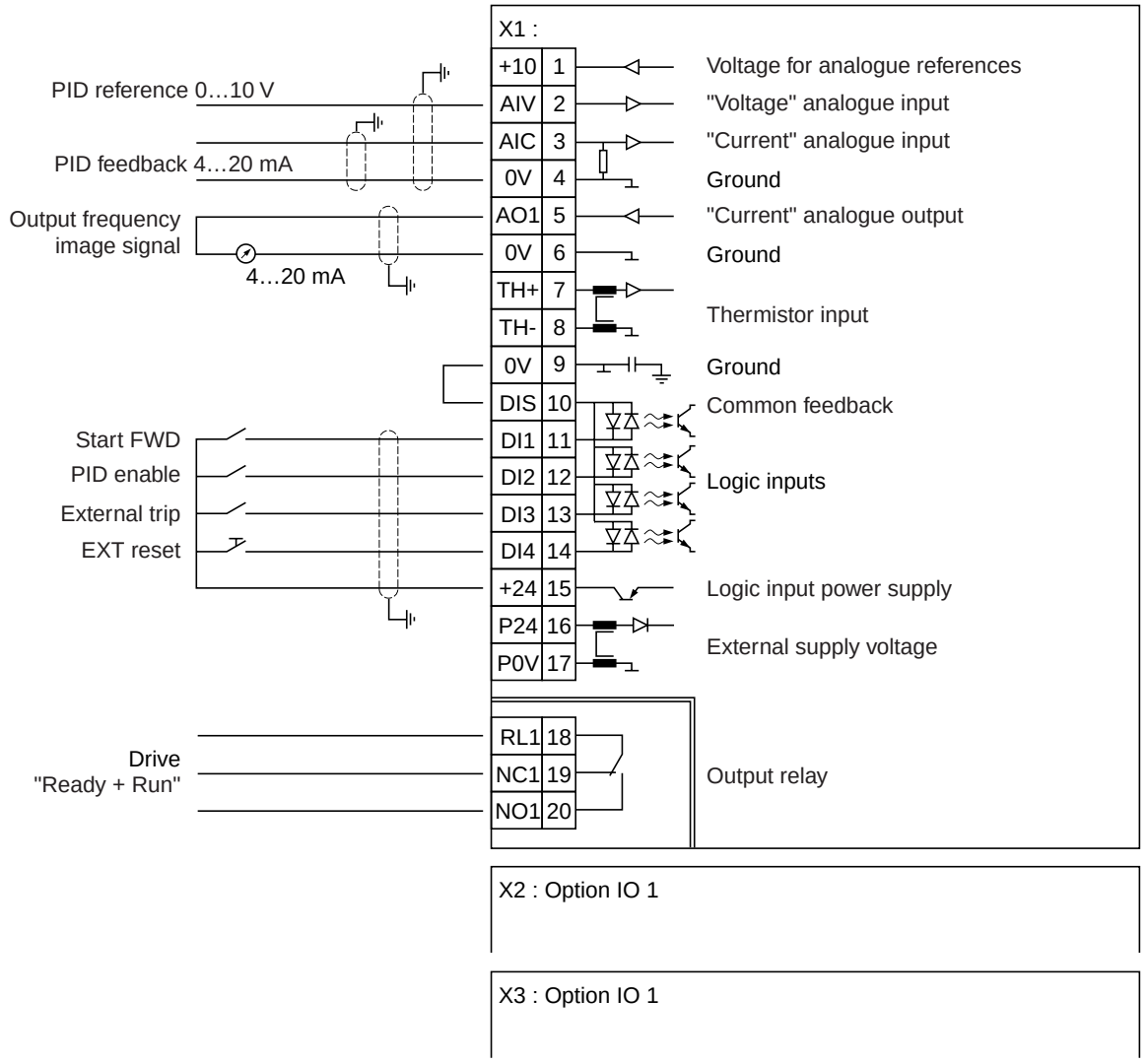
B5. Short menu

Macro M3 - Motors with torque in kn^2 and PID controller

Regulating pressure, level and quantities

The drive is changed to “standard torque” by adjusting the motor data in parameters B3.00 to B3.01 (see the "Speed controller - motor connection" section in the User's Manual).
The economy mode function is activated on step 1. The process references are preset on AIV by a 0-10V signal and feedback of the actual value in 4-20mA is processed by AIC. Only forward operation is authorized; rotation to the left is interlocked. The terminal functions “External trip” and “External reset” are programmed.
The modified settings can be stored in the user macro. All the modified parameters are automatically stored in the short menu where they are arranged in order.

Connection diagram



B5. Short menu

Short menu for macro M3

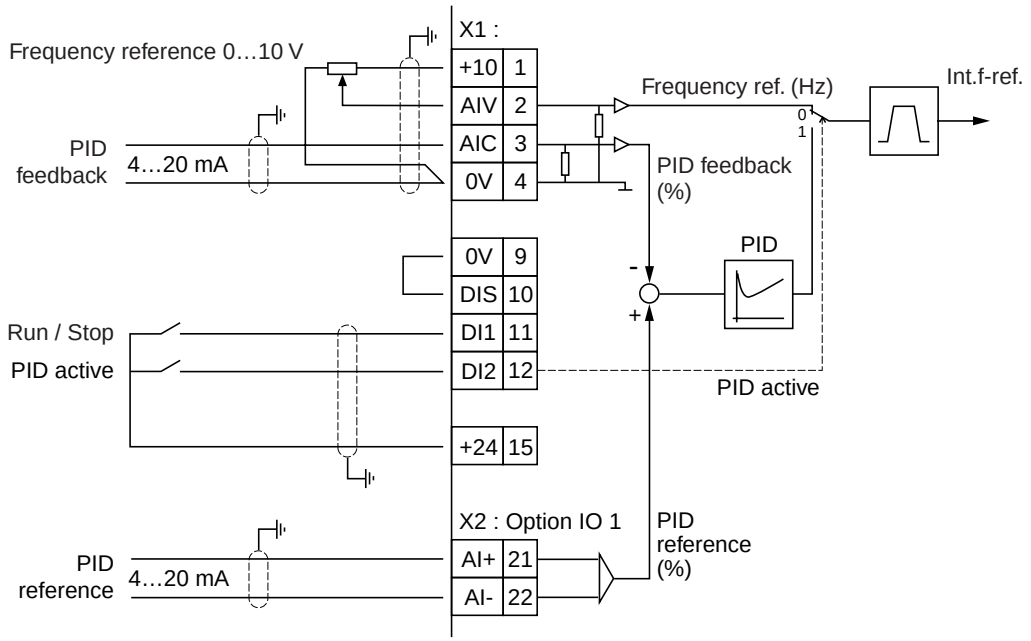
Parameter	Name	Setting	Note
B2.03	Macro select.	Pump + PID	
C1.14	Economy mode	Level 1	Economy mode, level 1
C3.00	Min. frequency	0.00...**5.00**...300 Hz	Setting for the lower frequency limit
C3.01	Max. frequency	25.00...**50.00**...300 Hz	Setting for the upper frequency limit
C4.04	PID-enable	active	Activates the PID controller
C4.05	Prop. gain (kp)	0.0...**20.0**...3200 %	Adjustment : proportional gain
C4.06	Integ. time (Tn)	0.00...**10.00**...320.0 s	Adjustment : integration
C4.07	Deriv. time (Tv)	0.00...**0.00**...320.0 s	Adjustment : derivative
C4.08	Ref. acc. ramp	0.0...**10.0**...3200 s	Setting of acceleration in s for 100 %
C4.09	Ref. dec. ramp	0.0...**10.0**...3200 s	Setting of deceleration in s for 100 %
C4.10	Out. scaling -	-300...**+10.00**..+300 Hz	Minimum limit of the PID controller output
C4.11	Out. scaling +	-300...**+50.00**..+300 Hz	Maximum limit of the PID controller output
D1.00	AIV-selection	PID reference	0-10V signal (AIV) for process reference
D1.01	AIV value 0 %	0...**0**...200 %	Determines the frequency for 0 % of AIV
D1.02	AIV value 100 %	0...**100**...200 %	Determines the frequency for 100 % of AIV
D1.04	AIC-selection	PID feedback	Actual value of sensor feedback on AIC 4-20 mA
D1.06	AIC value 0 %	0...**0**...200 %	Determines the frequency for 0% (4mA) on AIC
D1.07	AIC value 100 %	0...**100**...200 %	Determines the frequency for 100% (20 mA) on AIC
D2.00	DI1-selection	Start FWD	Forward/Stop (permanent contact)
D2.01	DI2-selection	PID-enable	Inhibits PID action
D2.02	DI3-selection	External trip	Takes an external fault into account
D2.03	DI4-selection	EXT reset	External fault reset (normally open fleeting contact)
D3.00	AO1-selection	|f-out|	Analogue output no. 1 - Value of the frequency output (4 -20 mA : 0-f max.)
D4.01	Relay output 1	Ready + Run	Ready on RL1
E1.00	Curr. max. val.	125 %	Max. I current limit as a percentage of the nominal current of a drive using "high torque"
E2.00	Thermistor input	not active	
E2.03	I.max. at f.nom	0...**100**...150 %	I^2t motor protection, maximum current at nominal frequency as a percentage of the nominal motor current
E2.05	Motor-tme const	0...**5**...3200 min	> 5 min : 24 V power supply necessary
E3.02	External trip	N.O. ready + r	External faults are transmitted via a normally open contact and are only taken into account if the drive is "Ready" or operating

Note : All the motor data (matrix field B3) is displayed in the short menu.

Additions to macro M3

Selection between PID active and direct frequency reference

By selecting a logic input on “PID active” C4.04, the internal frequency reference of the drive can be either the output of the PID controller or a direct external frequency reference.



Parameter settings from macro M3 :

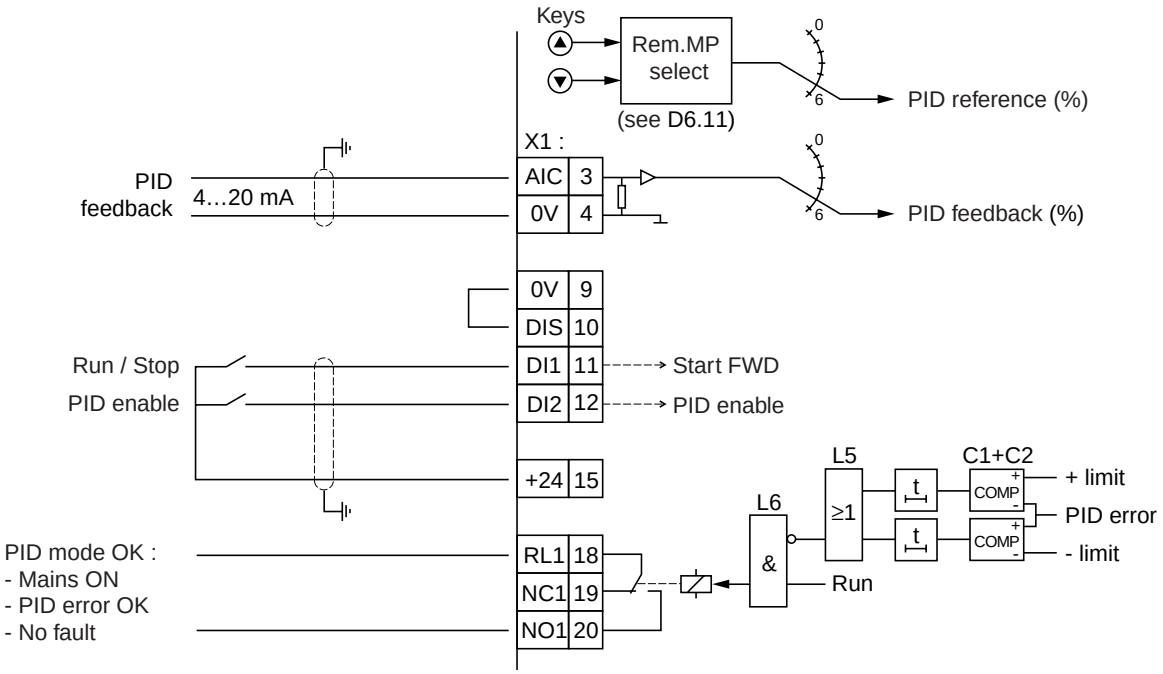
Parameter	Name	Setting	Note
A6.00	Select zone 1	PID error	Adaptation of the display for
A6.01	Select zone 2	PID reference	the “PID active” or
A6.02	Select zone 3	Motor speed	“direct frequency reference” function
C4.04	PID-enable	Logic input	“PID active” or “direct frequency reference” depending on the logic input
D1.00	AIV-selection	Freq.ref.aut	Frequency reference for voltage
D1.01	AIV value 0%	-300...10.00...+300 Hz	with minimum
D1.02	AIV value 100%	-300...50.00...+300 Hz	and maximum limit
D1.09	AI_2-selection	PID reference	PID reference, 4...20mA signal
D1.10	AI_2 level	4...20mA	
D1.11	AI_2 value 0%	-200...0.00...+200 %	
D1.12	AI_2 value 100%	-200...50.00...+200%	
D2.01	DI2-selection	PID active	If the contact is closed, the PID function is active

Due to permanent feedback from the PID controller output, there is a smooth transition on change of mode.

B5. Short menu

PID controller with preset reference on the control keypad

The drive can be controlled directly by its control keypad. Only the signal of the actual PID feedback value (for example actual pressure value 4... 20mA) is connected to terminals 3 and 4. A shunt between terminals 9 - 10 and 11 - 15 starts the motor immediately after the drive has been powered up. (To lock parameters (VICB) : change to local mode and press the stop key!)



B5. Short menu

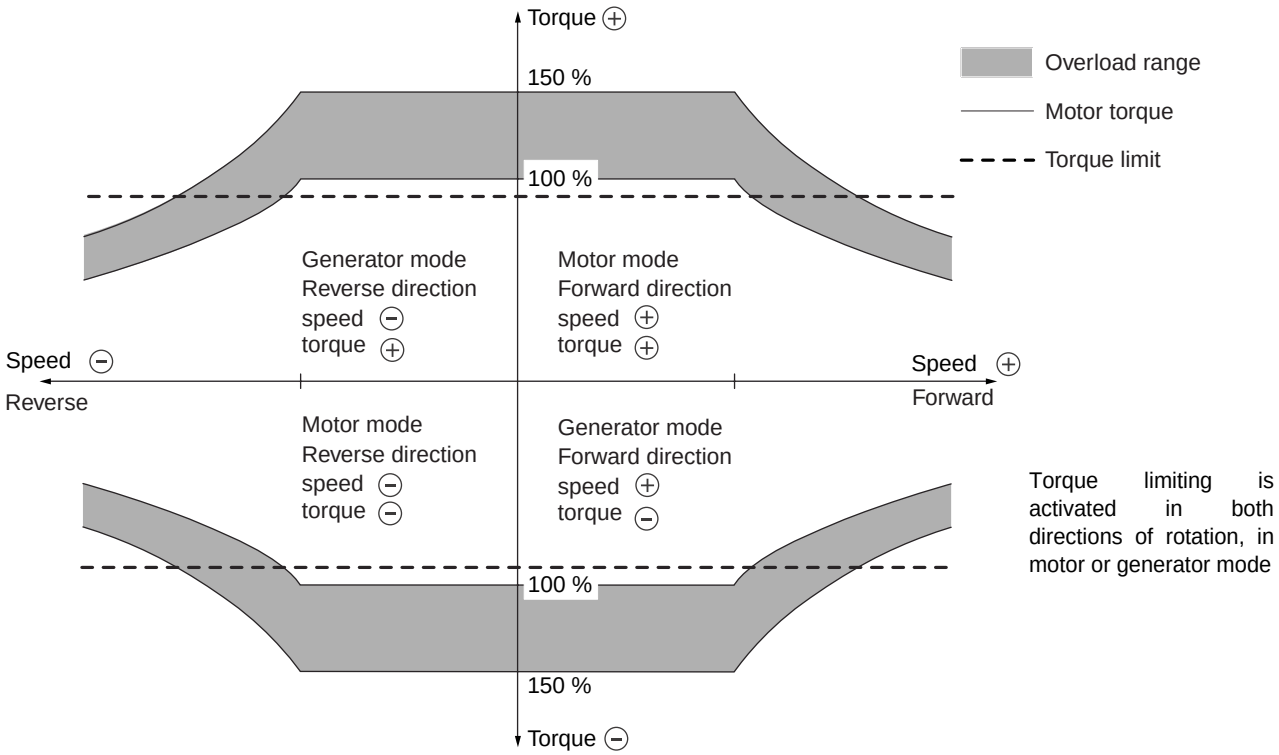
Parameter settings from macro M3 :

Parameter	Name	Setting	Note
A6.00	Select zone 1	PID error W-X	Adaptation of the display for PID control mode
A6.01	Select zone 2	PID reference W	
A6.02	Select zone 3	PID feedback X	
D1.00	AIV-selection	not used	The parameters are removed from the short menu because they are set to the factory values
D1.01	AIV value 0%	0.0...**0.01**...300 Hz	
D1.02	AIV value 100%	0.0...**50.01**...300 Hz	
D4.01	Relay output 1	Output L6	“Setting OK” message
D6.06	Rem. MP select	PID reference	The remote motorized potentiometer is the PID reference
D6.07	Rem. MP Min. val.	-200...**0.00**...+200 %	Minimum value of the PID reference
D6.08	Rem. MP Max. val.	-200...**100.00**...+200 %	Maximum value of the PID reference
D6.11	Keypad / terminal	Keypad	The keys of the keypad provide the PID reference
D6.12	Rem. ref. storage	active	The adjusted reference value remains stored after a stop command or a mains failure. After a new run command, the drive will therefore return to its previous operating state in accordance with the reference stored.
F4.00	C1 signal E1	PID error	Monitoring the positive PID error of the controller
F4.02	C1 reference	-200...**+50**...+200 %	PID with a time delay in order to avoid taking the regulation overshoot into account.
F4.03	C1 comp. function	E1 > E2	
F4.04	C1 ComHyst/Band	0.0...**2.0**...100.0 %	
F4.06	C1 time-set	0.0...**30.0**...3200 s	
F4.08	C2 signal E1	PID error	Monitoring of the negative PID error with a time delay if the negative limit is exceeded.
F4.10	C2 reference	-200...**-5.0**...+200 %	
F4.11	C2 comp. function	E1 < E2	
F4.12	C2 ComHyst/Band	0.0...**2.0**...100.0 %	
F4.14	C2 time-set	0.0...**10.0**...3200 s	
F4.44	L5 signal D1	Out.comp.C1	Monitoring of the PID error by 2 logic blocks
F4.45	L5 signal D2	Out.comp.C2	
F4.46	L5 logic funct.	OR	
F4.50	L6 signal D1	Ready + Run	Logical comparison with the “Ready+Run” message
F4.51	L6 signal D2	Out.log.L5	
F4.52	L6 logic funct.	AND neg. (D2)	

Macro M4 - Motors with torque limiting

Test benches
Coiler uncoiler
etc

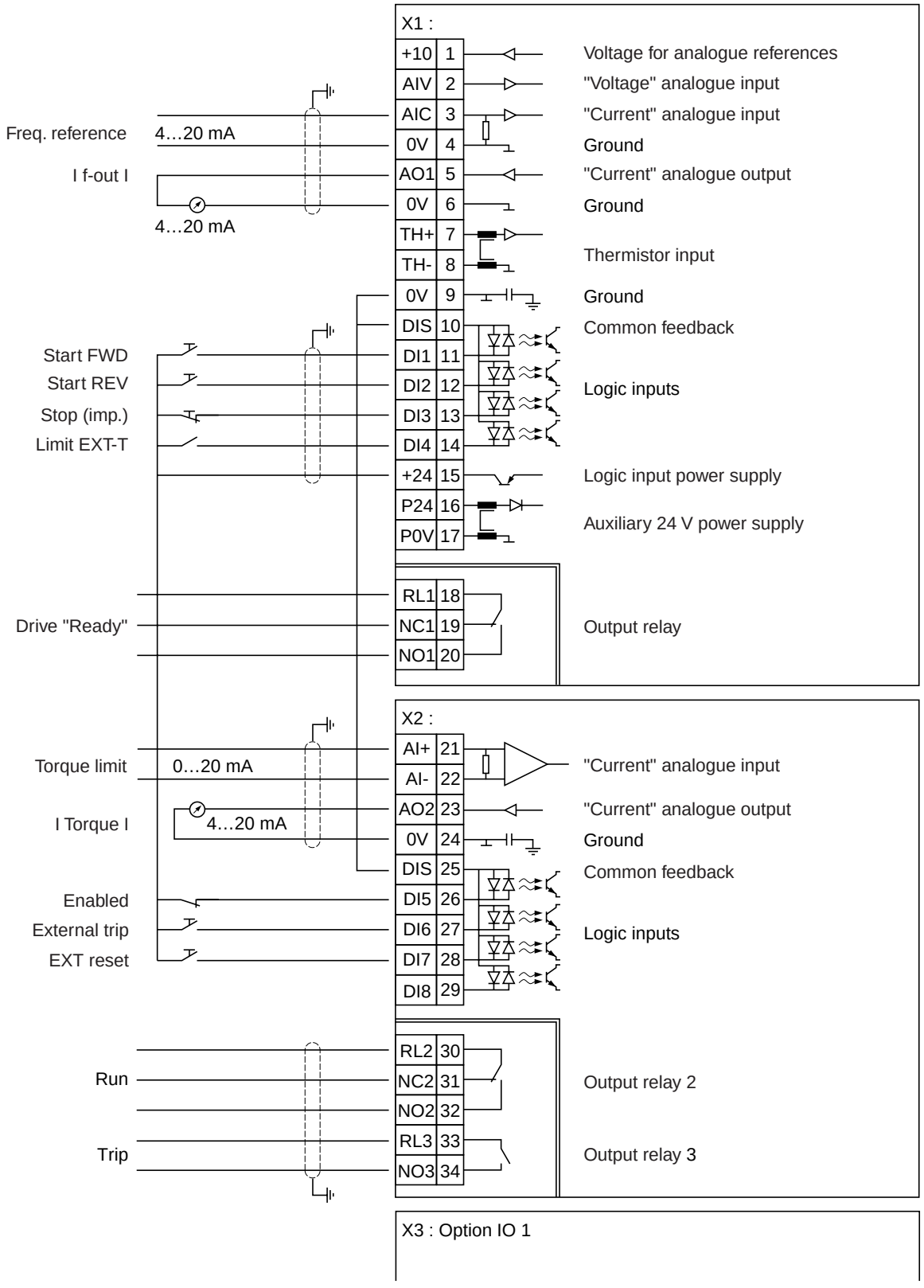
The torque limit signal and frequency reference are preset on an AI_2 (0-20 mA) and AIC (4-20 mA) current input.
The active quadrant is determined according to the direction of rotation selected.



If the motor or drive is overloaded, the drive reduces the motor speed in motor mode and increases it in generator mode.
The drive is controlled using pulsed signals FWD, REV or Stop.
The logic input “EXT-T limit” must be set to 1 to activate the torque limiting function.
The terminal functions “External trip” and “External reset” are also programmed.
The modified settings can be stored in the user macro. All the modified parameters are automatically stored in the short menu where they are arranged in order.

B5. Short menu

Connection diagram



B5. Short menu

Short menu for macro M4

Parameter	Name	Setting	Note
B2.03	Macro select.	Test bench	or : Coiler uncoiler
C2.00	Accel. ramp 1	0.0...**3.0**...160 s	Setting in seconds for the nominal motor frequency
C2.01	Decel. ramp 1	0.0...**3.0**...160 s	
C3.01	Max. frequency	25.00...**50.00**...300.0 Hz	Setting for high speed
C3.02	Dir. Enable	Enable FW/RV	Permits forward and reverse directions of rotation
D1.04	AIC-selection	Freq.ref.aut	Automatic frequency reference on input AIC in mA
D1.06	AIC value 0 %	0.00...**0.00**...300.0 Hz	Determines the frequency for 0 % on AIC
D1.07	AIC value 100 %	0.00...**50.00**...300.0 Hz	Determines the frequency for 100 % on AIC
D1.09	AI_2-selection	Torque limit	Torque limit reference (± 0.20mA = + xxx % to - xxx% of Tn)
D1.11	AI_2 value 0 %	0.00...**0.00**...200.0 %	Determines the torque for 0 % on AIC
D1.12	AI_2 value 100 %	0.00...**100.0**...200.0 %	Determines the torque for 100 % on AIC
D2.00	DI1-selection	Start FWDimp	Forward/Stop (normally open fleeting contact)
D2.01	DI2-selection	Start REVimp	Reverse/Stop (normally open fleeting contact)
D2.02	DI3-selection	Stop-imp	Stops the drive (normally closed fleeting contact)
D2.03	DI4-selection	EXT-T limit	Takes the external torque limit into account
D2.04	DI6_2-selection	External trip	Takes an external fault into account
D2.05	DI7_2-selection	EXT reset	External fault reset (normally open fleeting contact)
D3.00	AO1-selection	|f-out|	Analogue output no. 1 – Frequency value (4-20 mA = 0-f max.)
D3.04	AO2_2-selection	|Torque|	Analogue output no. 2 - Value of the torque at the motor shaft 4-20 mA = 0-1.5 Tn
D3.07	AO2_2 max. val.	0...**150**...200 %	Determines the maximum value of the motor torque for 20 mA on AO2_2
D4.01	Relay output 1	Ready	Ready on RL1
D4.02	Relay output 2_2	Run	Indicates “run” mode for the drive on RL2_2
D4.03	Relay output 3_2	Trip	Indicates a fault on the drive on RL3_2
E2.00	Thermistor input	not active	
E2.02	I.max. at 0 Hz	0...**50**...150 %	I^2t motor protection, maximum current at frequency of 0 Hz
E2.03	I.max. at f.nom	0...**100**...150 %	I^2t motor protection, maximum current at nominal frequency
E2.05	Motor-tme const	0...**5**...3200 min	If > 5 min : the 24 V external supply is necessary
E3.02	External trip	N.O. ready + r	External faults are transmitted via a normally open contact and are only taken into account if the drive is ready

Note : All the motor data (matrix field B3) is displayed in the short menu.

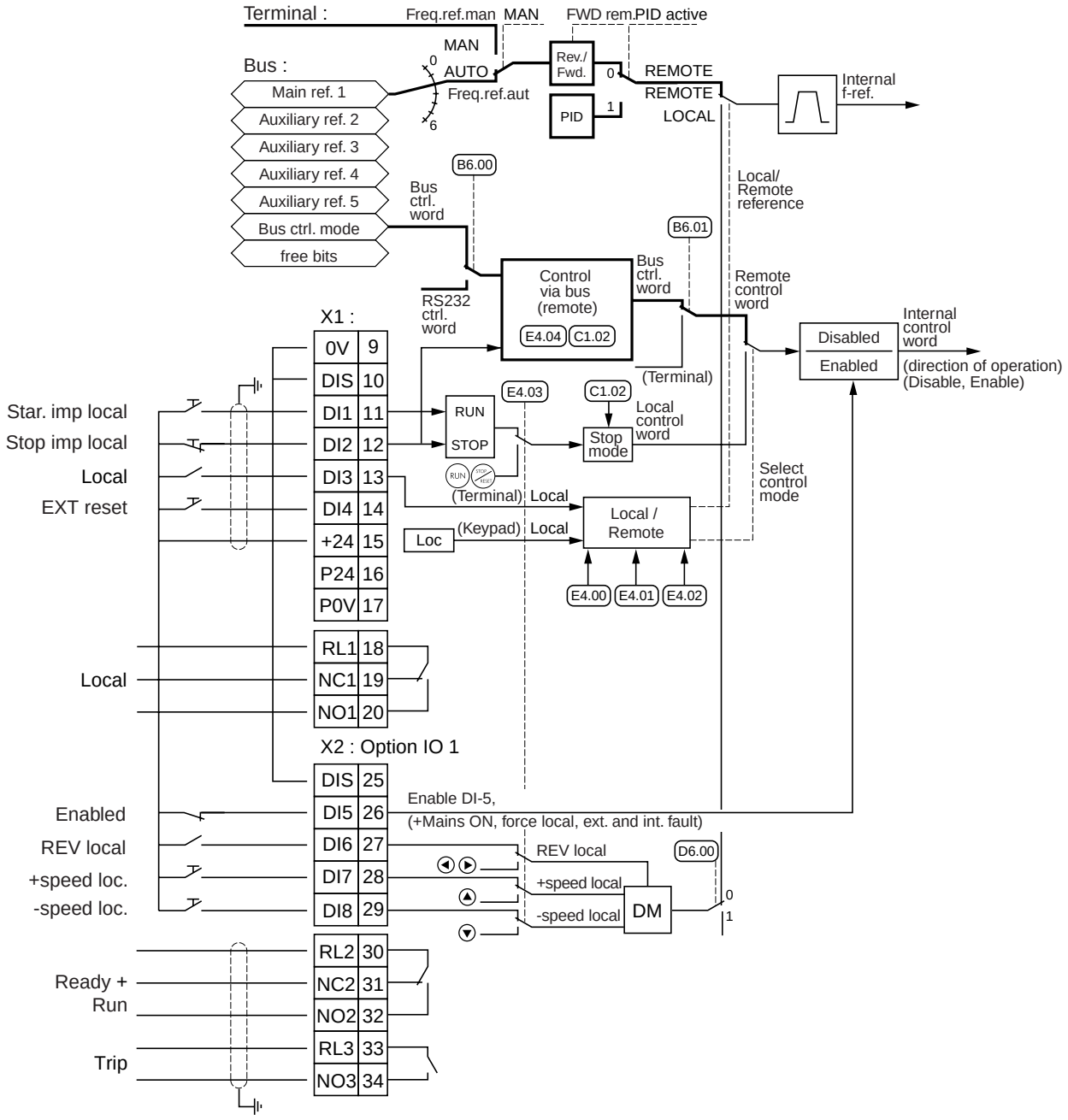
Note : We recommend setting parameter C1.02 (stop mode) to “freewheel”.

B5. Short menu

Additions to macros M1 to M4, Local/remote control mode

Switching to “local control” using the control keys

The descriptions given in sections D2 “Configuration of logic inputs” and D1 “Configuration of analogue inputs” show the different ways of switching from one control mode to another.
There is a smooth changeover from remote control (serial link or terminal) to local control (keypad).
The example below shows how to switch from serial link control mode (remote) to local control mode. Local/remote changeover affects both logic inputs and references.



B5. Short menu

Parameter settings from macro M1 :

Parameter	Name	Setting	Note
B6.00	Select bus	Profibus DP	Selection of the communication link
B6.01	Select remote	Bus	
B6.02	Slave address	0...**Address**...126	
B6.03	Bus fault	Trip	Reaction in the event of a bus fault with adjustable time delay
B6.04	Delay B6.03	0,0...**10.0**...3200 s	
B6.06	Main reference 1	Freq.ref.aut	Frequency reference no. 1
D1.04	AIC-selection	not used	
D2.00	DI1-selection	Star. imp loc	Starting with fleeting contact (NO contact)
D2.01	DI2-selection	Stop imp loc	Stopping with fleeting contact (NC contact)
D2.02	DI3-selection	Local/Remote	The drive is in local mode if the contact is closed
D2.03	DI4-selection	EXT reset	Fault reset
D2.04	DI6_2-selection	REV local	The drive is in reverse if the contact is closed
D2.05	DI7_2-selection	+speed loc.	Faster via fleeting contact (NO contact)
D2.06	DI8_2-selection	-speed loc.	Slower via fleeting contact (NO contact)
E4.02	Loc/Rem-switch	Terminal	Switch to local mode via the terminal
E4.03	Ctrl. mode local	Terminal	The keypad keys are replaced by logic inputs

B6. Communication menu

Configuration and diagnostics of the communication protocol

All the communication parameters are available in the User's Manual of the corresponding protocol.

Specific functions

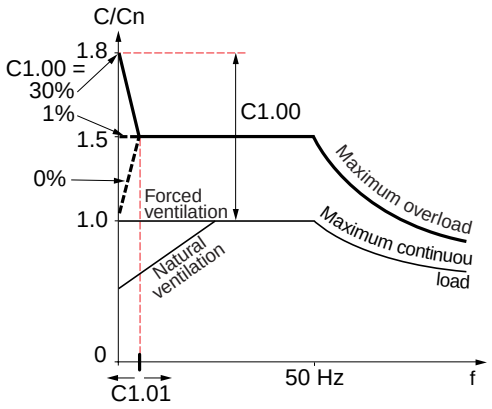
C

Contents

Overtorque on starting, stop modes, preset references, economy mode and jog function

C1.00	Inc. start Tor.	VCB	0...*1*...30 %	See 'macro'
	Setting additional overtorque on starting			

C1.01	Inc. steady Tor.	VCB	5...*10*...45
	Frequency range of overtorque		



The starting torque Tn can be raised from 150% to 180% for applications which require a high starting torque.

Setting at 0% is sufficient for centrifugal pump and fan applications.

Setting the additional overtorque :

C1.00 = 0 % total overtorque 100 % $Tn_{(high\ torque)}$
C1.00 = 1 % total overtorque 150 % $Tn_{(high\ torque)}$
C1.00 = 30 % total overtorque 180 % $Tn_{(high\ torque)}$

The range in which this accentuation operates is defined in parameter C1.01.

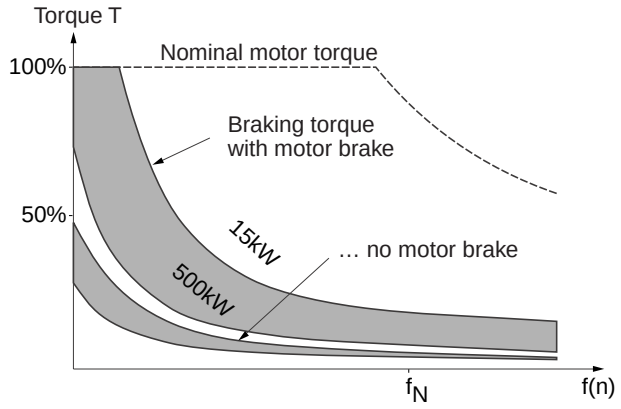
Setting these parameters does not affect autotuning.

The overtorque amounts shown refer to the nominal torque of the drive operating with high torque.

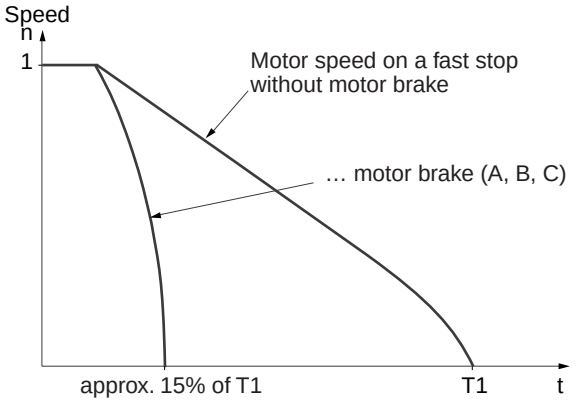
C1.02	Stop mode	VCB	Deceleration ramp
	0 . . . Freewheel (Stop 2)	The motor decelerates under the load inertia.	
	1 . . . Deceleration (Stop 1)	The motor decelerates according to the ramp time selected.	
	2 . . . Fast stop (Stop 3)	The motor decelerates as fast as possible (can be used with a braking module, a reversible drive or loss braking C1.03).	

The stop mode is enabled for a stop command in local or remote mode.

C1.03	Braking mode	VICB
	0 . . . no brak.func	No braking unit. The drive automatically adapts the deceleration ramp according to the DC bus voltage.
	1 . . . ext.br.unit	The drive is fitted with an external braking unit.
	2 . . . Mot. Brake A	The braking energy is largely dissipated in the motor, cable and drive. Mot. Brake A, B or C must be selected according to the motor type (test A, B and C and use the most appropriate one). During this operation, losses are equivalent to the nominal losses of the motor over the whole frequency range (ie. efficiency).
	3 . . . Mot. Brake B	
	4 . . . Mot. Brake C	



Braking torque available with motor braking



Deceleration with motor braking

Motor braking is a low-cost alternative to purchasing an external braking unit. Fast stopping of a 250 kW motor with total inertia applied to the motor of 2 to 3 times its inertia, is performed in less than 4 seconds.
Motor noise increases during braking.
The deceleration ramp is not linear.

C1.04	Preset.ref.		VICB	Not used
	0 . . . None	Hz		
	1 . . . Freq.ref.man	Hz		
	2 . . . Freq.ref.auto	Hz		
	3 . . . Freq correct	Hz		
	4 . . . Torque limit	%		
	5 . . . PID-ref.	%		
	6 . . . PID-feedback	%		

If it is not possible to select some adjustment values, it is because they have already been used by other references such as D1.00, D1.04, D1.09, D1.14, D6.06, or by the serial link.

This parameter is used to assign a reference source for preset references.

See also diagram “D1. Analogue inputs”, page 69.

C1.05	**Preset.ref. 1**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.06	**Preset.ref. 2**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.07	**Preset.ref. 3**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.08	**Preset.ref. 4**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.09	**Preset.ref. 5**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.10	**Preset.ref. 6**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.11	**Preset.ref. 7**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**
C1.12	**Preset.ref. 8**	**VCB**	**-300.00...*0.00*...300.00 Hz -200.00...*0.00*...200.00 %**

Selection of Hz or % depends on C1.04.
Combinations of logic inputs A, B and C are used for the 8 preset speeds. The input terminals are assigned in group D2.

Logic input A	Logic input B	Logic input C	Value selected
0	0	0	Preset ref. 1
1	0	0	Preset ref. 2
0	1	0	Preset ref. 3
1	1	0	Preset ref. 4
0	0	1	Preset ref. 5
1	0	1	Preset ref. 6
0	1	1	Preset ref. 7
1	1	1	Preset ref. 8

→ Presetting does not require any input programming!

Note : Logic inputs A, B and C only select the preset reference values. A run command is necessary to make the motor rotate at the corresponding speed.

C1.13	**Jog frequency**	**VCB**	**-10.00...*0.00*...10.00 Hz**

The jog reference (slow speed) is used for setting, adjusting and monitoring operations using a logic input assigned to “Jog frequency” (see D2). The reference set for the jog function is generated directly at the drive output, without using the acceleration and deceleration ramps and without the need for a run/stop command. Jog frequency can only be engaged when stationary (“STOP” state). The drive will remain at frequency 0 Hz to maintain motor fluxing and allow a more dynamic new start for at least 1 s after completion of the jog command.

C1.14	**Economy mode**	**VCB**	**Not active**	**See ‘macro’**

0 . . . Not active
1 . . . Step 1 (= small decrease)
2 . . . Step 2 (= medium decrease)
3 . . . Step 3 (= large decrease)
4 . . . Step 4 (= very large decrease)

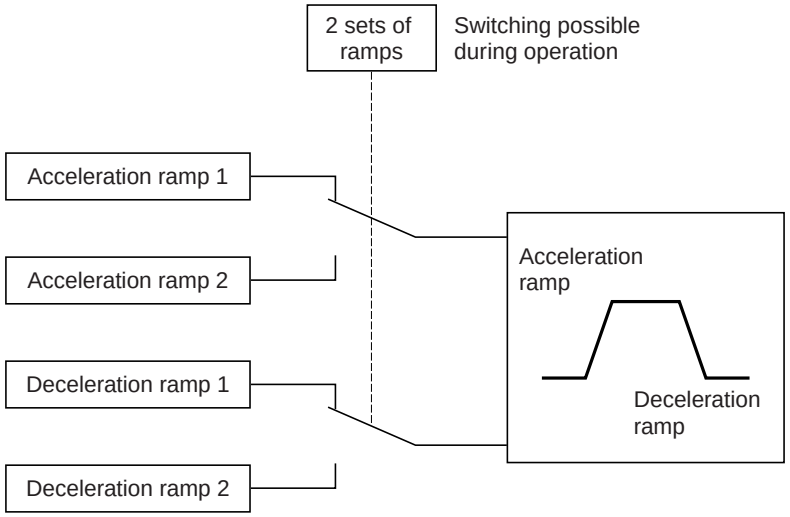
In applications with quadratic torque (for example, centrifugal pumps, fans), the fluxing current of the motor can be reduced when the speed is reduced, which saves energy and reduces motor noise. The transient torque capacities are then reduced.

C2. Ramps

Acceleration and deceleration ramps, S-ramp, U-ramp

C2.00	**Accel. ramp 1**	**VCB**	**0.0...*0.0*...3200 s**	**See 'macro'**
C2.01	**Decel. ramp 1**	**VCB**	**0.0...*0.0*...3200 s**	**See 'macro'**
C2.02	**Accel. ramp 2**	**VCB**	**0.0...*20.0*...3200 s**	
C2.03	**Decel. ramp 2**	**VCB**	**0.0...*20.0*...3200 s**	

The two sets of acceleration and deceleration ramps are selected using a logic input assigned to "2.ramp" (see D2). Applications use this function for speed-dependent acceleration and deceleration ramps. The adjusted ramp time corresponds to the time taken by the reference to change from 0 to the nominal motor frequency B3.03.



C2.04	**S-ramp**	**VCB**	**No S-ramp**

0 . . . No S-ramp
1 . . . S-ramp step1
2 . . . S-ramp step2
3 . . . S-ramp step3

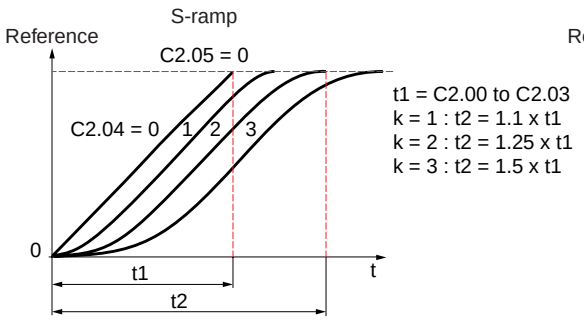
The ramp is linear.
See C2.05.

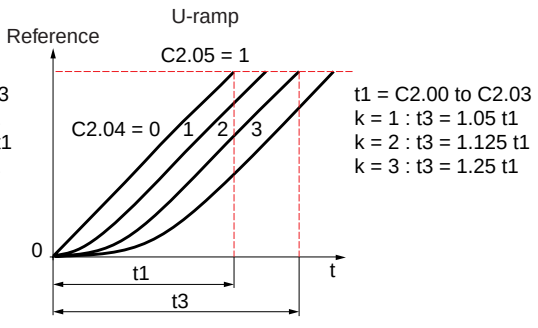
This parameter defines the type of ramp profile required. Slower starting is possible during the transient phases. For conveyor, hoisting or lift type applications.

C2.05	**S-ramp mode**	**VCB**	**Begin + End**

0 . . . Begin + End
1 . . . Begin only

selection of S-ramp
selection of U-ramp



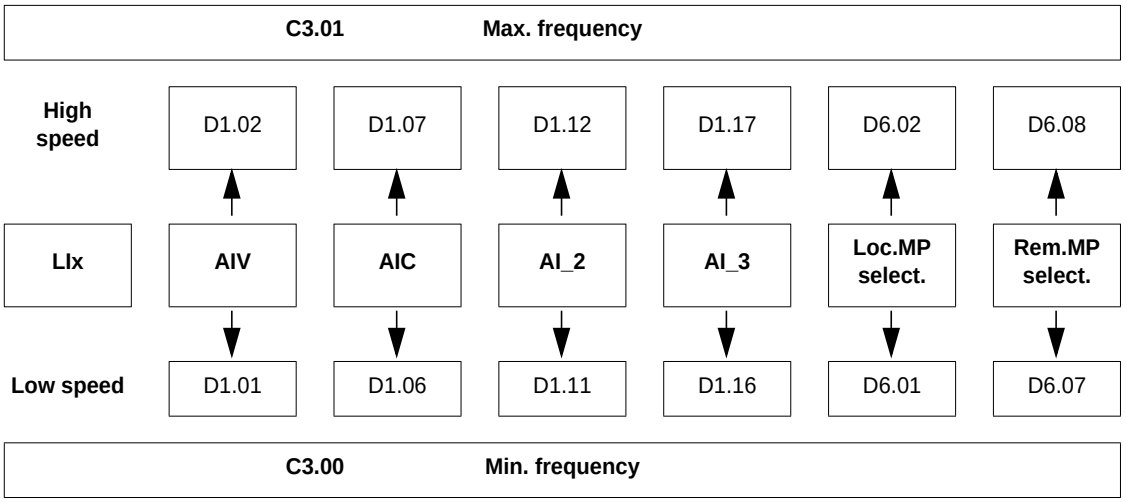


C3. Speed range

Frequency range and direction of rotation

C3.00	**Min. frequency**	**VCB**	**0.00...*0.00*...300.00 Hz**
	Defines the minimum speed for all references.		
C3.01	**Max. frequency**	**VCB**	**25.00...*50.00*...300.00 Hz**

Defines the maximum speed for all references.



Comment : Each reference has an individual low speed and high speed.

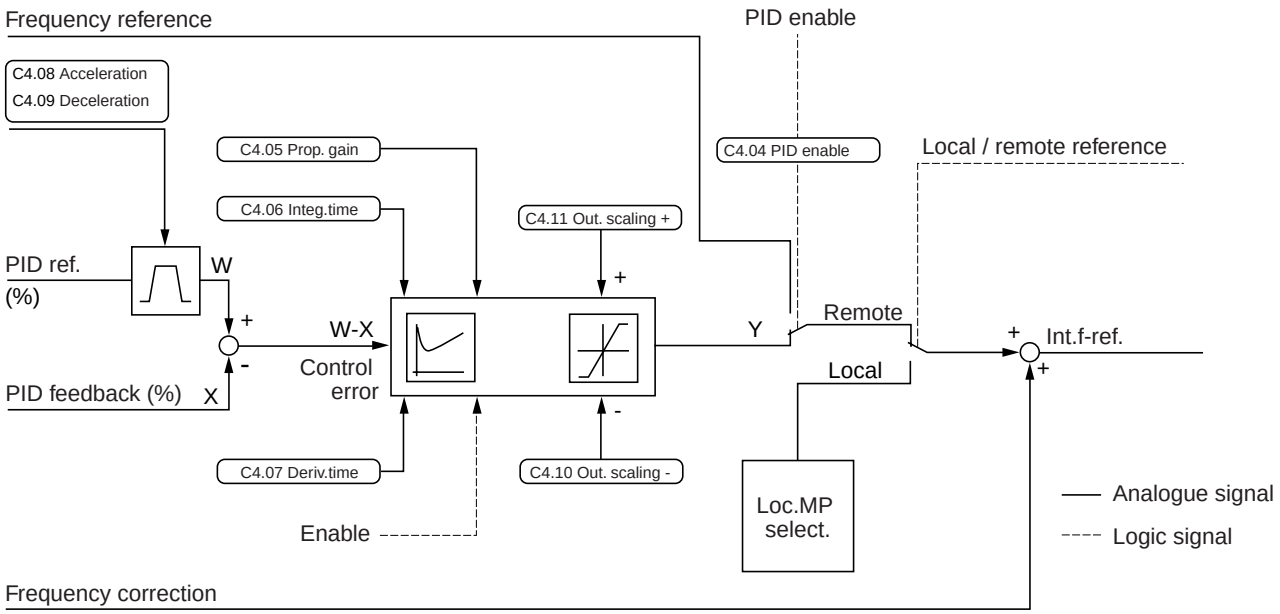
The minimum frequency limit C3.00 is not active if both directions of rotation are active in C3.02 (FWD and REV).

In this case, the minimum frequency limits of the references used must be programmed.

C3.02	**Dir. Enable**	**VICB**	**Disable REV**	**See 'macro'**
	0 . . . Disable REV 1 . . . Disable FWD 2 . . . Enable FW/RV	Reverse rotation is inhibited. Forward rotation is inhibited. Both directions of rotation enabled.		

C4. PID configuration

PID process controller



References :

The following values can be used as references :

- External motorized potentiometer	Parameter D6.06 (given by 2LI on the terminals)
- Preset references	Parameter C1.04
- Analogue input AIV : 0 -10 V	Parameter D1.00
- Analogue input AIC : 0(4)-20 mA	Parameter D1.04
- Analogue input AI_2 : 0(4)-20 mA	Parameter D1.09
- Analogue input AI_3 : 0(4)-20 mA	Parameter D1.14
- Reference via the bus	Parameters B6.06 to B6.10

To optimize controller performance, it is preferable to adjust the acceleration and deceleration ramps (C2) to a low value close to 0. The PID reference ramp can be adjusted separately using parameters C4.08 and C4.09.

PID feedback :

All the analogue inputs (AIV, AIC, AI_2, AI_3 and buses) can be used as inputs for PID feedback (process feedback). The references and PID feedback are given as a % and must be scaled with the parameters of the selected input.

Displays :

All controller-specific values such as reference and feedback values, control deviation and controller output are available as actual values for display.

Control (W-X) error :

Control deviation is the difference between the PID reference after ramps and the PID feedback. It is calculated independently of PID activation (C4.04) and can be processed in the logic block (F4).

PID controller

The PID controller output provides a “Frequency (Hz)” reference. Gains P (k), I (Tn) and D (Tv) can be adjusted individually. The actions of gains P, I and D can be disabled (see D2). In this case, the controller output is kept at its last value.

Limit :

The PID output is limited by C4.10 and C4.11. The speed reference of the drive is in Hz and takes this limit into account.

C4. PID configuration

PID active :

The PID controller can be activated in several ways (see parameter C4.04). There is a smooth changeover from a non active PID (drive controlled directly by a frequency reference) to an active PID (drive controlled by the PID controller output). When switching from non active to active mode, the PID controller output first takes into account the value of the frequency reference before adjusting its control based on the PID reference and PID feedback. If the control deviation is different from 0 when the PID is reactivated, the proportional gain is immediately reactivated.

Changeover from PID active to PID not active mode :

If one of the logic inputs (see D2) is used for the “PID active” function, it will be active at 1 (24V applied to the logic input). If the PID is not active, the PID output remains at its last value.

Changing the direction of rotation of the motor while the PID is active :

By changing the motor phases : the direction of rotation shown by the drive is then reversed.
By changing the parameters : negative limit, PID reference and feedback in negative scale. Use a run reverse command when the PID is disabled.

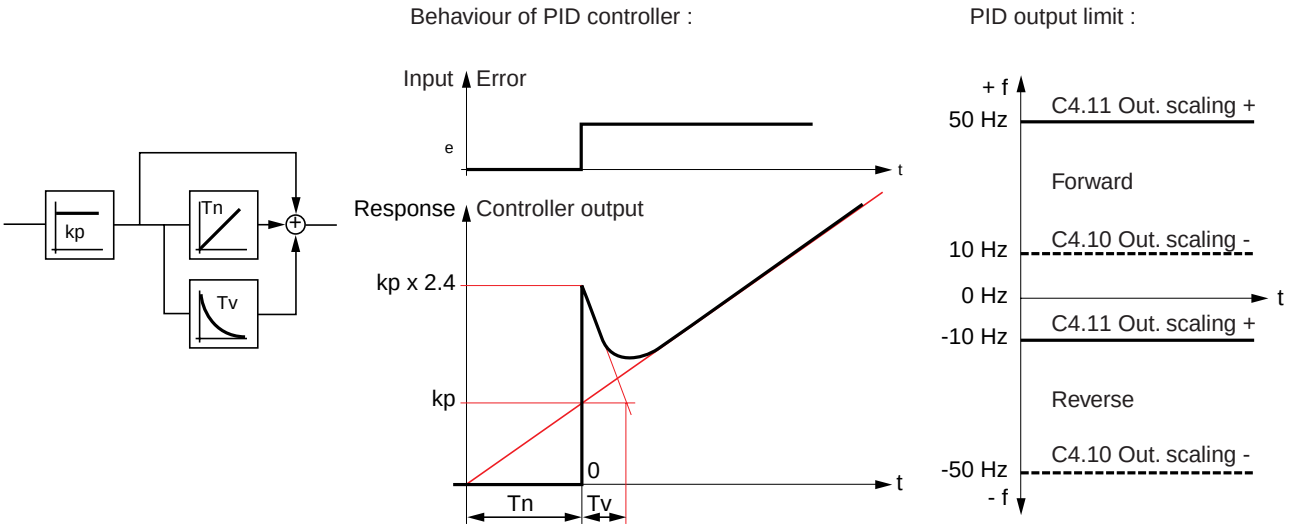
Changeover from PID active (remote) to local reference mode :

In “remote” mode the drive is controlled by the PID controller output or a reference transmitted by the terminals or bus. In “local” mode the drive is controlled directly by a frequency reference from the motorized potentiometer accessed using the keys ▼ and ▲ on the keypad or by the motorized potentiometer accessed via the logic inputs of the keypad (+ speed/- speed). There is a smooth changeover from “remote” to “local” mode. The PID controller output first takes into account the value of the local frequency reference before adjusting its control based on the PID reference and PID feedback. If the control deviation is different from 0 when switching back to “remote” mode, the proportional gain is immediately reactivated.

C4.00	**Reference mon. [%]**	**Read only**	
	Reads the PID reference.		
C4.01	**Feedback mon. [%]**	**Read only**	
	Reads PID feedback.		
C4.02	**w-x Error [%]**	**Read only**	
	Reads the deviation between the reference (W) and feedback (X).		
C4.03	**PID output [Hz]**	**Read only**	
	Reads the PID output. 100% error corresponds to 163.84 Hz at the PID output (if there is no reference limit).		
C4.04	**PID enable**	**VICB**	**Not active**
	0 . . . Not active 1 . . . Active 2 . . . Terminals	PID not active, the reference is then local or remote. PID still active. PID active via a logic input. See D2.	
C4.05	**Prop. gain (kp)**	**VCB**	**0.0...*20.0*...3200 % See macro**
	Proportional gain.		
C4.06	**Integ.time (Tn)**	**VCB**	**0.00...*10.00*...320.0 s See macro**
	Integral gain, setting T_n=0 deactivates the integration time.		

C4. PID configuration

C4.07	**Deriv.time (Tv)**	**VCB**	**0.00...*0.00*...320.0 s**
	Derivative gain. The effect of the integration time and derivative time depends on the proportional gain.		



C4.08	**Ref. acc. ramp**	**VCB**	**0.0...*10.0*...3200 s See macro**
	Setting of the acceleration ramp for the PID reference.		
C4.09	**Ref. dec. ramp**	**VCB**	**0.0...*10.0*...3200 s See macro**
	Setting of the deceleration ramp for the PID reference.		
C4.10	**Out. scaling -**	**VCB**	**-300...*+10.00*...+300.0 Hz See macro**
	Minimum limit value of the PID controller output.		
C4.11	**Out. scaling +**	**VCB**	**-300...*+50.00*...+300.0 Hz See macro**
	Maximum limit value of the PID controller output.		

C

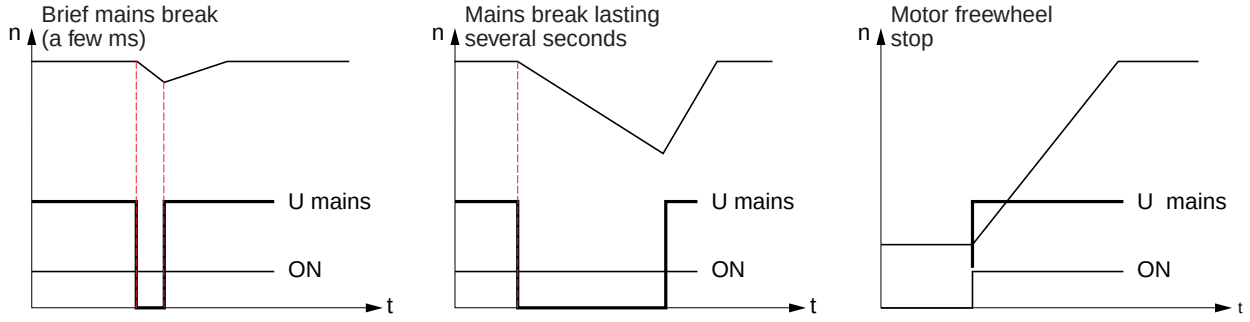
C5. Catch on the fly

Catch on the fly for a motor in free rotation

Due to the innovation of AVC (Auto Vector Control) together with the FMC (Flux Mode Control) modulation procedure, the Altivar 68 can catch a spinning load in less than 0.1 s.
This function of catching a spinning load guarantees an immediate restart regardless of the duration of the mains break.

This is obviously based on the assumption that the motor remains connected to the drive.

The run command must be delayed by 3 to 5 seconds so that the required speed is reached without significant deceleration for motors switched to the drive output.



C5.00	Detection level	VCB	*0.6*...15 %

The catch on the fly function is always active for optimum control of the motor. However, parameter C5.00 is used to adjust the detection level of the catch on the fly around zero speed (voltage level corresponding to 0 Hz).
When the brake sequence is used for hoisting and travel applications, the drive automatically adjusts the detection level to 12 %.
The higher the value, the lower the detection level.

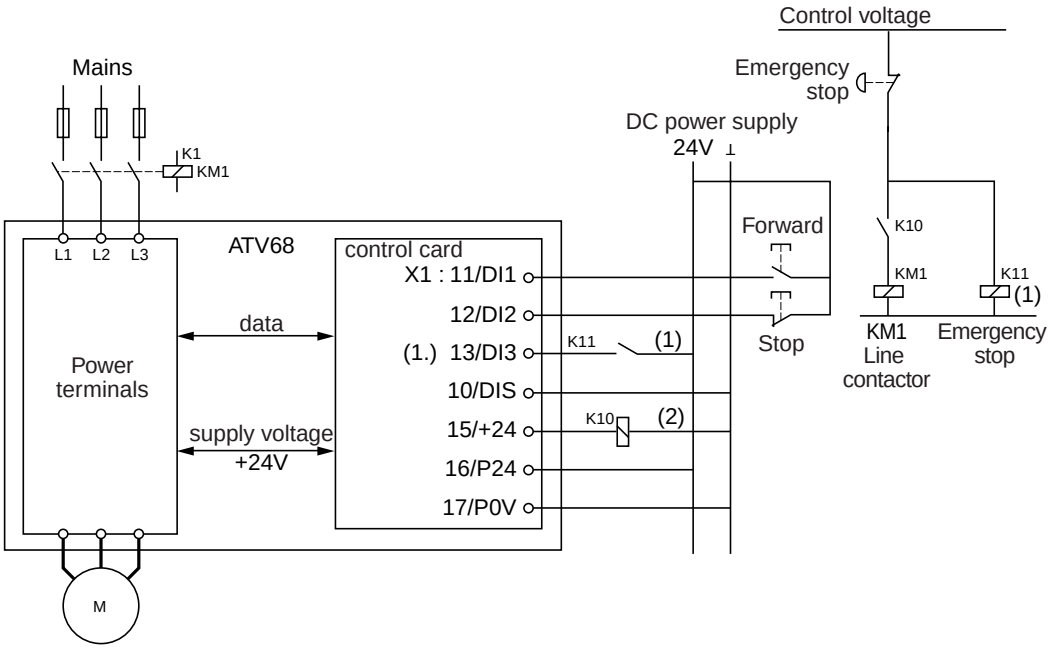
C6. Special functions

Control of the line contactor on hoisting applications

C6.00	Contactor cont.	VICB	not active

0 . . . Not active
1 . . . Active
The drive must be supplied with an external 24VDC supply to activate the "Line contactor control" special function. With this method, each run command (forward or reverse) (using the keypad or the terminals) unlocks the drive and activates the selected logic output (see D4 and assign "Line contactor control" to 8) controlling the line contactor. When the pulses are inhibited (disable command following deceleration or fault) the line contactor de-energizes and disconnects the power circuit from the supply. The message “Mains off” appears on the screen.
The "Ready" diode lights up as soon as the 24V supply voltage is applied. If the line voltage (DC bus voltage) fails to reach its nominal value in the next 3 seconds, the message “Undervltg2” appears. Possible reasons for this are :

- The logic output is not programmed correctly
- The line contactor is not energized
- The upstream power circuit is open
- The drive load circuit is faulty



(1) Management of emergency stops via an external contact :
The K11 contact locks the drive in the event of an emergency stop and disables the drive enable command via a logic input programmed on “MainsON(OFF)” (see D2).

Caution : If this contact is not integrated, the drive can restart automatically after the emergency stop command has disappeared.

In order to avoid automatic restarting after a mains break, send the run forward or reverse command as a pulse command.

Caution : If a mains break occurs, the pulse command remains active for the period set in E3.09 (see also undervoltage management in E3.08).

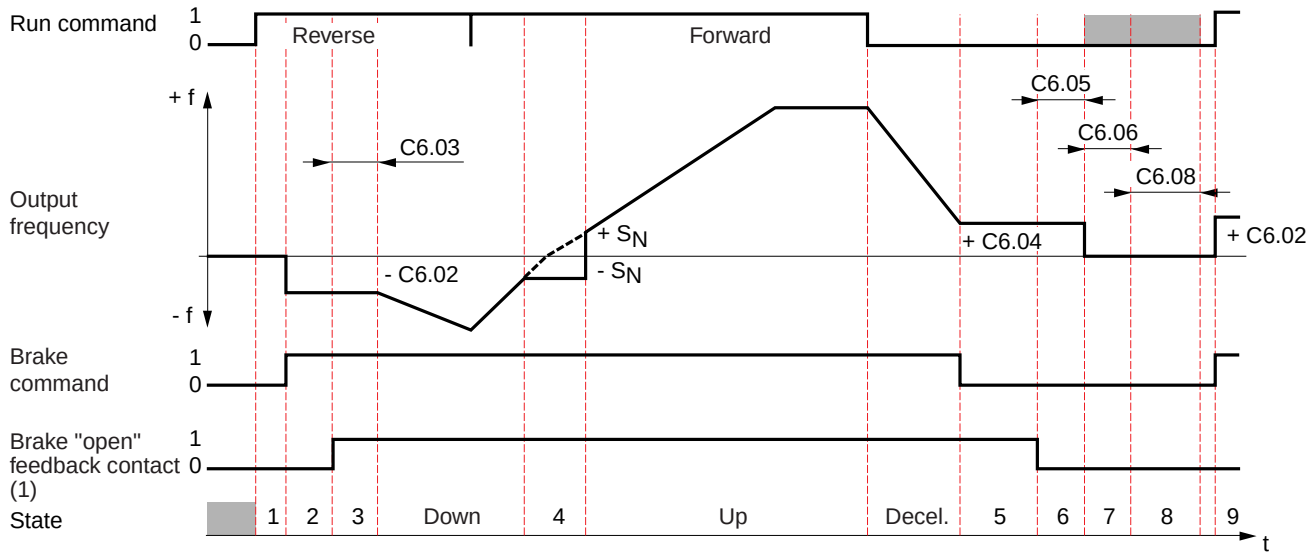
(2) K10 : +24 logic output assigned to line contactor control (see D4).

C6. Special functions

C6.01	Crane-function	VICB	not active
	0 . . . Not active		
	1 . . . Hoisting	adapted for hoisting movement	
	2 . . . Travel	adapted for travel movement	

Parameter C6.01 is used to select either hoisting or travel. A relay output can be assigned to brake control (D4 brake control).
If the crane function is being used with an external braking unit, its presence must be indicated in C1.03 (1, ext.br.unit). This prevents automatic adaptation of the deceleration ramp in accordance with the DC bus voltage.

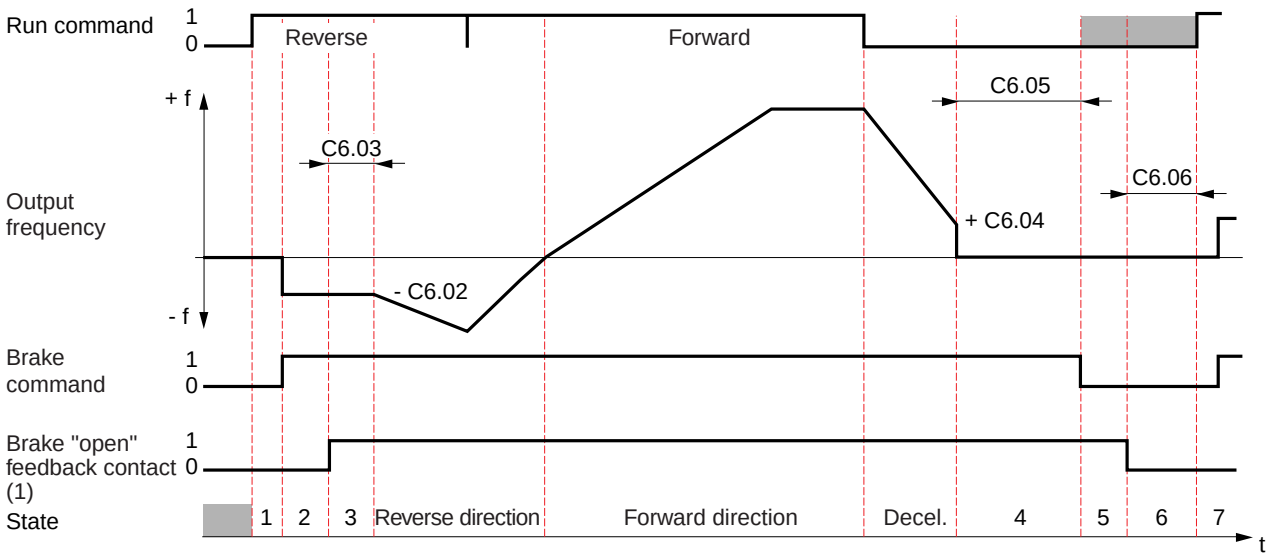
Sequence for hoisting movement :



1. Motor fluxing phase (between 50 and 300 ms, automatically selected by the drive in accordance with the motor power).
2. Time between the brake contactor command and brake open feedback (only if a logic input has been assigned to 31 "brake open").
3. Adjustable brake release time delay taking into account the time required by the brake to open.
   If a logic input is assigned to 31 "brake open", brake release delay C6.03 starts when the "brake open" logic input changes to 1.
   If no logic input is assigned to 31 "brake open", brake release delay C6.03 starts from the internal brake command, after changing to state 1.
4. Frequency automatically skipped with + / - the nominal slip frequency (only if there is no encoder feedback).
5. Time between the brake command and brake closed feedback (only if a logic input has been assigned to 31 "brake open").
   If no logic input is assigned to "brake open" state 5 is zero.
6. Brake engage time delay taking into account the time required by the brake to close (restarting is possible immediately).
   If a logic input is assigned to 31 "brake open", brake engage delay C6.05 starts when the "brake open" logic input changes to 0.
   If no logic input is assigned to 31 "brake open", brake engage delay C6.05 starts when the brake engage frequency threshold C6.05 is reached (state 5 is zero).
7. The DC injection time can be adjusted until the brake is fully closed (immediate restarting is not possible without encoder feedback).
8. Delay time before a new start operation (recommended if there is no encoder feedback).
9. Restart

(1) If a "brake open-closed" contact does not exist on the brake, use a contact from the brake command contactor instead.

Sequence for travel movement :



1. Motor fluxing phase (between 50 and 300 ms, automatically selected by the drive in accordance with the motor power).
2. Time between the brake contactor command and brake open feedback (only if a logic input has been assigned to 31 "brake open").
3. Adjustable brake release time delay. Time delay taking into account the time required by the brake to open.
   If a logic input is assigned to 31 "brake open", brake release delay C6.03 starts when the "brake open" logic input changes to 1.
   If no logic input is assigned to 31 "brake open", brake release delay C6.03 starts from the internal brake command, after changing to state 1.
4. This time is necessary to slow down inertia and dampen any machine elasticity before the brake command.
5. Brake engage time delay taking into account the time necessary between the brake command and brake closed feedback (only if a logic input has been assigned to 31 "brake open").
   If no logic input is assigned to 31 "brake open", state 5 is zero.
6. The DC injection time can be adjusted until the brake is fully closed (immediate restarting is possible with or without encoder feedback).
7. Restart

(1) If a "brake open-closed" contact does not exist on the brake, use a contact from the brake command contactor instead.

C6. Special functions

Adjustment procedure :

General :

Operating mode	Open loop frequency control	Encoder feedback without speed control from encoder feedback	Encoder feedback with speed control from encoder feedback
Encoder	–	necessary	necessary
Encoder feedback option	–	necessary	necessary
D5.00 “encoder/slipcom”	0 “no encoder”	2 “encoder”	2 “encoder”
D5.02 “sp.ctrl.act.”	0 “not active”	0 “not active”	1 “active”
D5.03 “Pulse/rotation”	–	Set in accordance with the encoder used	Set in accordance with the encoder used
D5.04 to D5.11	–	–	Setting necessary (1)
Overload protection used :	calculated speed	measured speed	measured speed
Skip frequency at 0 Hz	yes	no	no
Minimum speed	2.5 Hz (5 % of the nominal speed)	2.5 Hz (5 % of the nominal speed)	0 Hz
Braking mode C1.03	External braking unit	External braking unit	External braking unit

(1) The drive parameters must be set under no load. As a general rule, the load improves the reactions of the drive. The parameters should preferably be set in the following order : D5.07, D5.05, D5.04, and if necessary D5.08.

Hoisting :

Operating mode	Open loop frequency control	Encoder feedback without speed control	Encoder feedback with speed control
Restart delay	necessary	no delay	no delay
C6.01 “crane-function”	1 “hoisting”	1 “hoisting”	1 “hoisting”
C6.02 “release freq.”	1.2 to 1.5 times the nominal slip frequency of the motor	1.0 to 1.3 times the nominal slip frequency of the motor	0.1 to 0.4 times the nominal slip frequency of the motor
C6.03 “release time”	set to the brake release time (or from 0.0 to 0.5 seconds with a brake open feedback contact)		
C6.04 “engage freq.”	1.1 to 1.4 times the nominal slip frequency of the motor	1.0 to 1.2 times the nominal slip frequency of the motor	0.0 Hz
C6.05 “engage time”	set to the brake engage time (or from 0.0 to 0.5 seconds with a brake open feedback contact)		
C6.06 “DC braking time” C6.07 “DC braking curr”	0.0 to 0.5 seconds with 0% to x% of the nominal current or 0.5 to 2 sec. with 80 to 120% of the drive nominal current	0.0 to 0.5 seconds	0.0 to 0.5 seconds
C6.08 “restart delay”	0.5 to 2.0 seconds depending on the motor capacity	0.0 seconds	0.0 seconds
C6.09 “hoist mode”	yes/no, as required	yes/no, as required	no
C6.10 “max (n)error”	5 to 15 Hz.s depending on dynamic requirements	5 to 10 Hz.s depending on dynamic requirements	5 to 10 Hz.s depending on dynamic requirements

C6. Special functions

Travel :

Operating mode	Open loop frequency control	Encoder feedback without speed control	Encoder feedback with speed control
Restart delay	no delay	no delay	no delay
C6.01 “crane-function”	2 “travel”	2 “travel”	2 “travel”
C6.02 “release freq.”	0 to 1.5 times the nominal slip frequency of the motor	0 to 1.2 times the nominal slip frequency of the motor	0 to 0.4 times the nominal slip frequency of the motor
C6.03 “release time”	set to the brake release time (or from 0.0 to 0.5 seconds with a brake open feedback contact)		
C6.04 “engage freq.”	0.5 to 1.0 times the nominal slip frequency of the motor	0.0 Hz	0.0 Hz
C6.05 “engage time”	0.0 to 15.0 seconds according to the inertia of the trolley (the brake stays open)		
C6.06 “DC braking time”	0.1 to 1.0 seconds depending on the brake close time (or 0.0 to 0.2 seconds with a brake closed feedback contact)		
C6.07 “DC braking curr”	40 to 80%	–	–
C6.08 “restart delay”	–	–	–
C6.09 “hoist mode”	–	–	–
C6.10 “max (n)error”	10 to 50 Hz x seconds (depending on dynamic requirements)		

C6.02 **Release freq. (Hz)** **VCB** **0.0...*1.7*...20.0 Hz**

The release frequency corresponds to the frequency applied to the motor during the brake sequence.
1. For hoisting applications without encoder feedback, the release frequency must not be set below the nominal slip frequency (corresponding to the nominal load).
2. The frequency reference must be higher than the release frequency.
3. For hoisting applications with encoder feedback, the release frequency can be set close to 0.

C6.03 **Release time (s)** **VCB** **0.0...*0.3*...160.0 s**

Adjust the brake release time.
The release time must be slightly longer than the brake opening time. If a brake close contact is used, an additional delay can be set with this parameter.

C6.04 **Engage freq. (s)** **VCB** **0.0...*1.5*...20.0 Hz**

Adjust the brake engage frequency so that it is slightly higher than the nominal slip frequency.
Adjust according to the result obtained.

C6.05 **Engage time (s)** **VCB** **0.0...*0.3*...160.0 s**

Adjust the brake engage time so that it is slightly longer than the brake closing time. If a brake close contact is used, an additional delay can be set with this parameter. Restarting is possible during the engage time.

C6.06 **DC braking time (s)** **VCB** **0.0...*0.3*...160.0 s**

Adjust the injection time of the direct current. The DC current is injected after the brake engage time delay. Restarting is not possible without encoder feedback during the DC injection phase. Restarting is possible after “restart delay” C6.08.

C6. Special functions

C6.07	DC braking curr (%)	VCB	0...*100*...150 % IN"C"

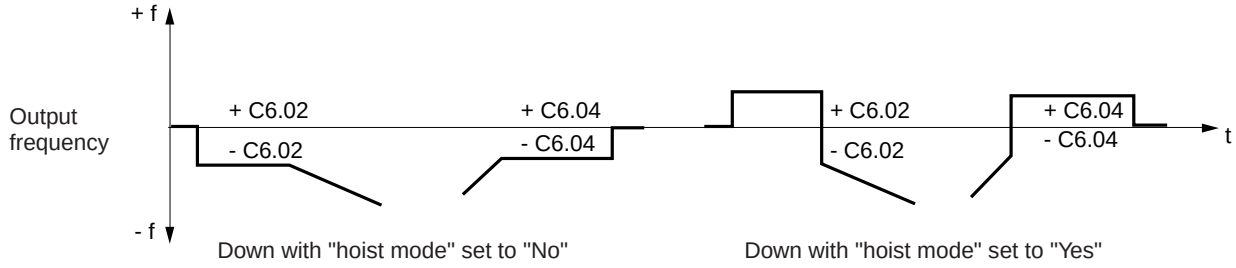
Set the DC injection current to a % of the nominal current of the drive when operating with high torque.
With a DC injection time from 0 to 0.5 seconds, the best setting of the DC current is 0.
With DC injection times greater than 0.5 seconds, the best setting is from 80 to 100%.
The parameter serves no purpose if encoder feedback is used.

C6.08	Restart delay (s)	VCB	0...*0.7*...10.0 sec

The drive is capable of hoisting the full load from the brake sequence since it manages the motor fluxing necessary for obtaining torque. To ensure this also occurs after disabling the drive, a "restart delay" must be applied to allow the motor to deflux.
This function is only enabled if DC injection is used and if the drive is in an open loop configuration (no encoder feedback).
Adjust the time from completion of DC injection to authorization of a new restart. This parameter serves no purpose in travel applications.

C6.09	Hoist mode	VCB	No

0 . . . No Setting recommended for hoisting applications with a counterweight.
1 . . . Yes Hoist mode in forward direction.
The brake release pulse prevents forcing on the brake as it opens when downward movement is requested. It also shows that the motor can hoist the load before lowering it.



If "Hoist mode" = yes, the brake release current is then applied in the forward direction (up direction) during the brake release time, regardless of whether the direction requested is forward or reverse (up or down). This parameter serves no purpose in travel applications.
If this function is used, the motor phases must be connected so that a forward direction of rotation hoists the load.

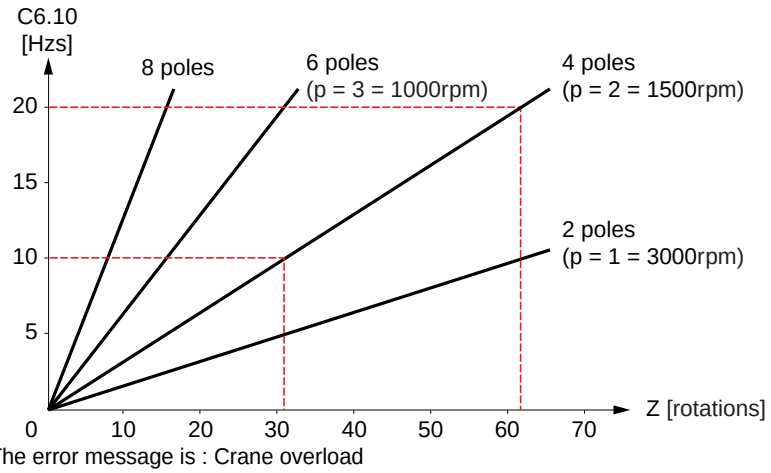
C6.10	Max (n)error	VCB	0...*5*...300 (Hz.s)

The parameter adjusts the detection level of the "hoist overload" protection function. Protection is provided by monitoring the difference between the frequency reference after the ramp and the stator frequency, as a function of time (angular deviation). The drive speed changes to fault mode if the deviation in Hz.s is greater than or equal to the parameter set in C6.10.

$$Z = \frac{2\pi x(C6,10)}{p}$$

Z . . . rotations
p . . . number of pairs of poles

This function can be disabled if parameter C6.10 is set to 0.



The error message is : Crane overload

Analogue and logic I/O

D

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D1. Analogue inputs

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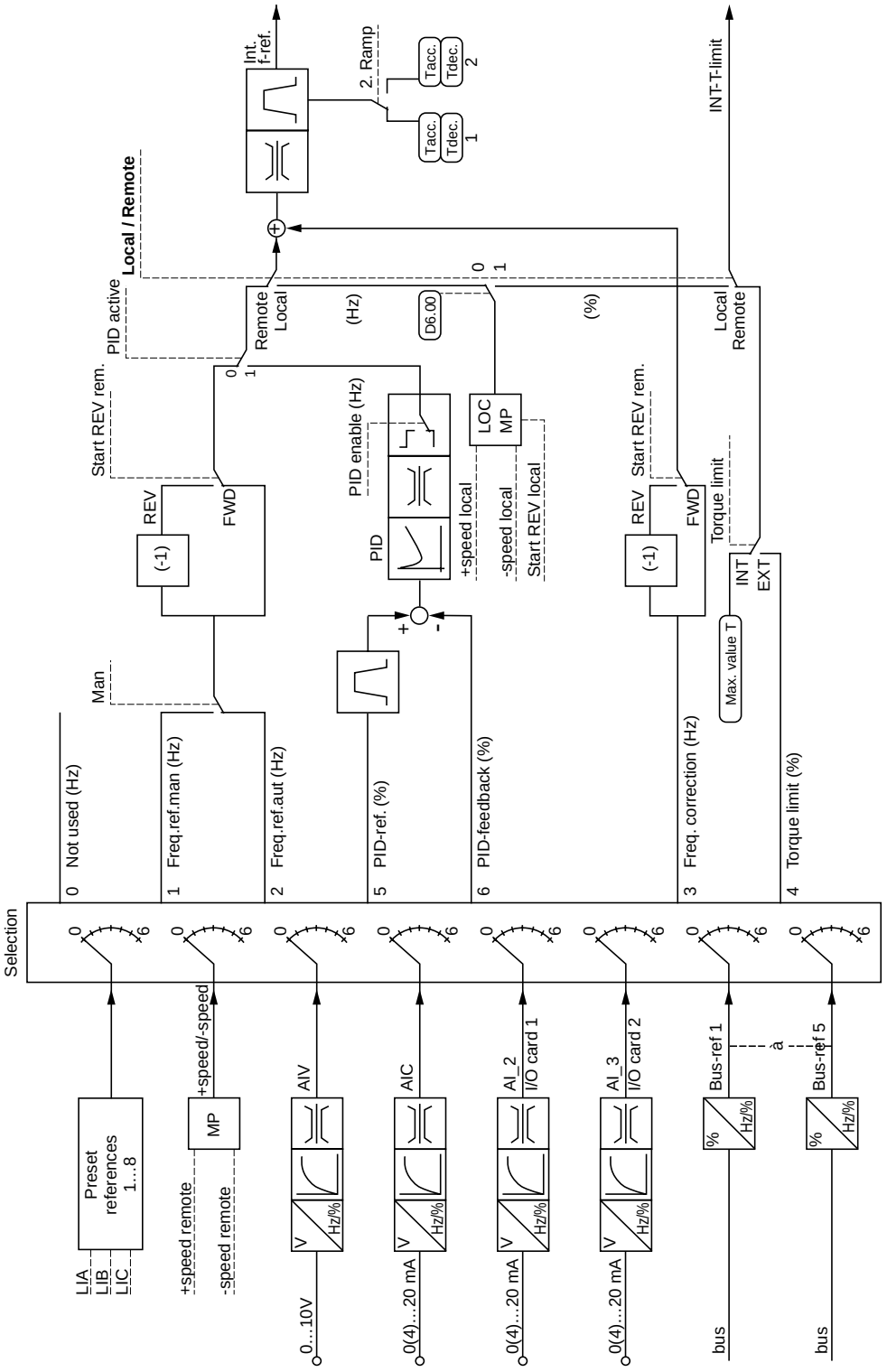
Simplified diagram of analogue references



D1. Analogue inputs

D1.00	AIV-selection	VICB	not used	See 'macro'

0 . . . Not used Hz
1 . . . Freq.ref.man Hz
2 . . . Freq.ref.aut Hz
3 . . . Freq correct Hz
4 . . . Torque limit %
5 . . . PID-ref. %
6 . . . PID-feedback %

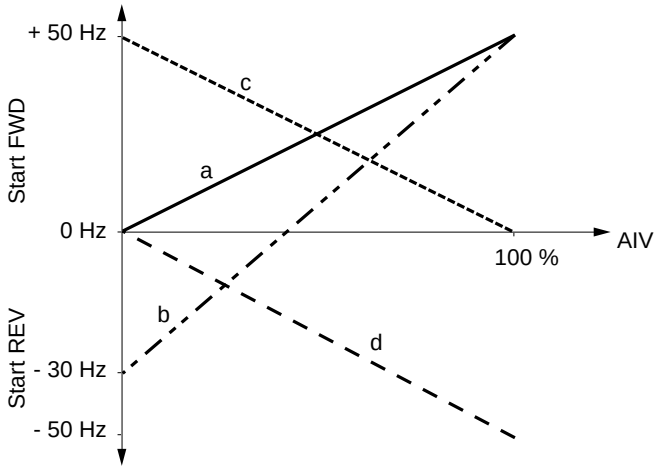
If it is not possible to select some adjustment values, it is because they have already been used by other analogue references or by the bus.

Note : If "Freq.ref.man" is selected another logic input must then be assigned to Manual (Aut).

As the diagram on page 69 shows, the analogue value of voltage input AIV (0-10 V) can be a source for various references.

D1.01	AIV-value 0 %	VCB	-300.0...*0.01*...300.0 Hz -200.0...*0.01*...200.0 %	See 'macro'

D1.02	AIV-value 100 %	VCB	-300.0...*50.01*...300.0 Hz -200.0...*50.01*...200.0 %	See 'macro'



The level of the AIV analogue input signal (0-10 V) is set in accordance with a frequency range. Negative frequencies correspond to reverse rotation of the motor.

a ... 0-100 % corresponds to 0 to 50 Hz
b ... 0-100 % corresponds to -30 to 50 Hz
c ... 0-100 % corresponds to 50 to 0 Hz
d ... 0-100 % corresponds to 0 to -50 Hz

D1.03	AIV-filter time	VCB	0.00...*0.05*...10.00 s

In order to reduce high frequency interference which could change the value of the signal on the AIV analogue input, a digital reference filter can be activated (D1.03).

D1.04	AIC-selection	VICB	Freq.ref.aut	See 'macro'

0 . . . Not used Hz
1 . . . Freq.ref.man Hz
2 . . . Freq.ref.aut Hz
3 . . . Freq correct Hz
4 . . . Torque limit %
5 . . . PID-ref. %
6 . . . PID-feedback %

If it is not possible to select some adjustment values, it is because they have already been used by other analogue references or by the bus.

Note : If "Freq.ref.man" is selected another logic input must then be assigned to Manual (Aut).

As the diagram on page 69 shows, the analogue value of voltage input AIC (0/4 - 20 mA) can be a source for various references.

D1.05	AIC-level	VCB	4-20 mA

0 . . . 0-20 mA
1 . . . 4-20 mA

Note : Loss of the 4-20mA signal can be detected by programming E3.01.

D1.06	**AIC-value 0 %** Similar function to D1.01	VCB VCB	-300.0...*0.00*...300.0 Hz -200.0...*0.00*...200.0 %	See 'macro'

D1.07	**AIC-value 100 %** Similar function to D1.02	VCB VCB	-300.0...*50.01*...300.0 Hz -200.0...*50.01*...200.0 %	See 'macro'

D

D1. Analogue inputs

D1.08	**AIC-filter time** Similar function to D1.03	**VCB**	**0.00...*0.05*...10.0 s**
D1.09	**AI_2-selection**	**VICB**	**not used** **See 'macro'**

0 . . . Not used Hz
1 . . . Freq.ref.man Hz
2 . . . Freq.ref.aut Hz
3 . . . Freq correct Hz
4 . . . Torque limit %
5 . . . PID-ref. %
6 . . . PID-feedback %

If it is not possible to select some adjustment values, it is because they have already been used by other analogue references or by the bus.

Note : If "Freq.ref.man" is selected another logic input must then be assigned to Manual (Aut).

The AI_2 analogue reference corresponds to the analogue input 0(4)...20 mA present on the differential input of the X2 terminals I/O option card. It has the same function as the AIC reference.

D1.10	**AI_2-level**	**VCB**	**0-20 mA**

0 . . . 0-20 mA
1 . . . 4-20 mA

Note : Loss of the 4-20mA signal can be detected by programming E3.01.

D1.11	**AI_2-value 0 %** Similar function to D1.01	**VCB** **VCB**	**-300.0...*0.01*...300.0 Hz** **See 'macro'** **-200.0...*0.01*...200.0 %**
D1.12	**AI_2-value 100 %** Similar function to D1.02	**VCB** **VCB**	**-300.0...*50.01*...300.0 Hz** **See 'macro'** **-200.0...*50.01*...200.0 %**
D1.13	**AI_2-filter time** Similar function to D1.03	**VCB**	**0.00...*0.05*...10.0 s**
D1.14	**AI_3-selection**	**VICB**	**not used** **See 'macro'**

0 . . . Not used Hz
1 . . . Freq.ref.man Hz
2 . . . Freq.ref.aut Hz
3 . . . Freq correct Hz
4 . . . Torque limit %
5 . . . PID-ref. %
6 . . . PID-feedback %

If it is not possible to select some adjustment values, it is because they have already been used by other analogue references or by the bus.

Note : If "Freq.ref.man" is selected another logic input must then be assigned to Manual (Aut).

The AI_3 analogue reference corresponds to the analogue input 0(4)...20 mA present on the differential input of the X3 terminals IO1 option card. It has the same function as the AIC reference.

D1.15	**AI_3-level**	**VCB**	**0-20 mA**

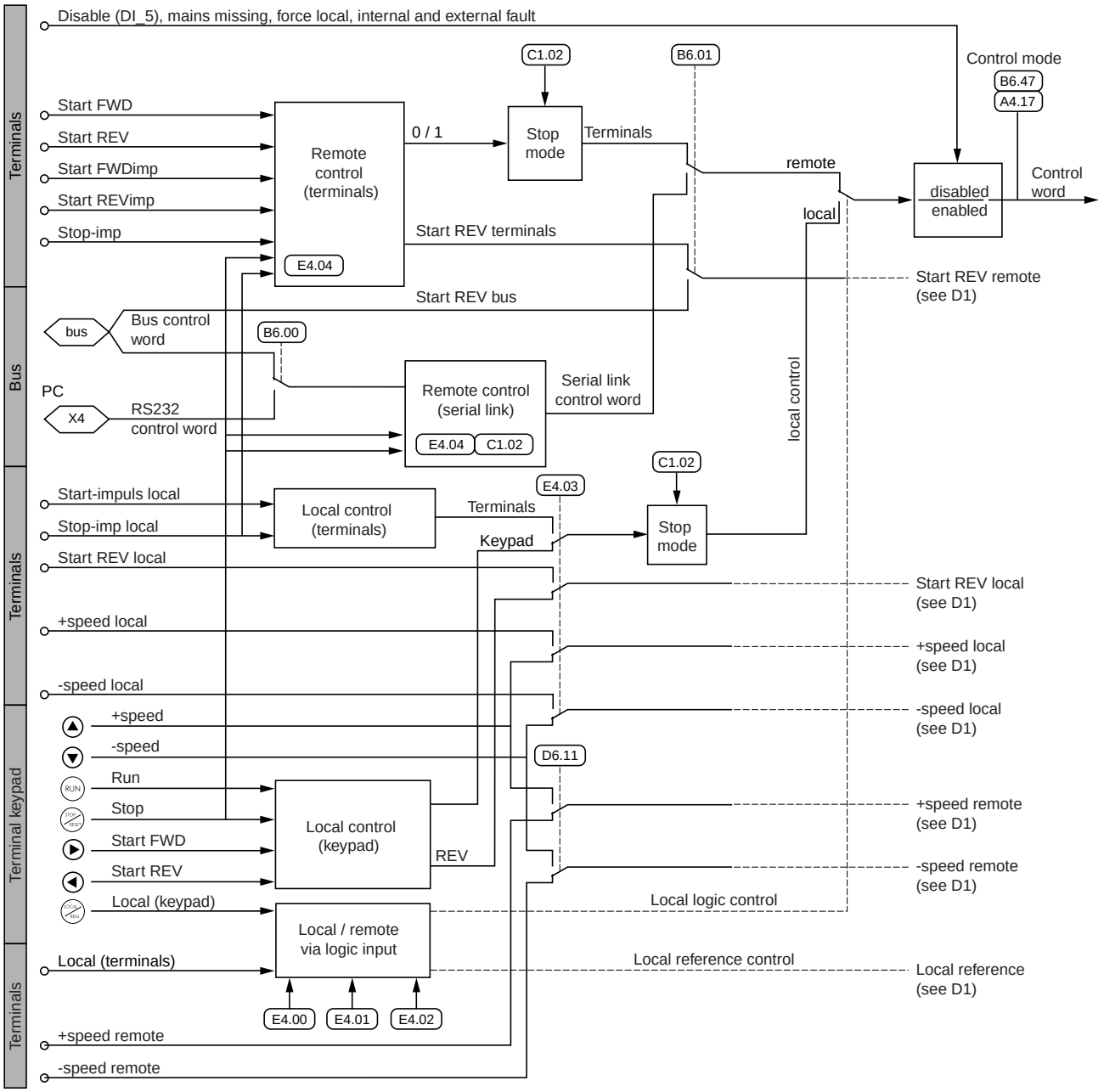
0 . . . 0-20 mA
1 . . . 4-20 mA

Note : If the 4-20 mA signal is to be monitored for absence of 4mA (line break), this must be programmed in E3.01

D1.16	**AI_3-value 0 %** Similar function to D1.01	**VCB** **VCB**	**-300.0...*0.0*...300.00 Hz** **-200.0...*0.00*...200.0 %**
D1.17	**AI_3-value 100 %** Similar function to D1.02	**VCB** **VCB**	**-300.0...*50.01*...300.0 Hz** **-200.0...*50.01*...200.0 %**
D1.18	**AI_3-filter time** Similar function to D1.03	**VCB**	**0.00...*0.05*...10.0 s**

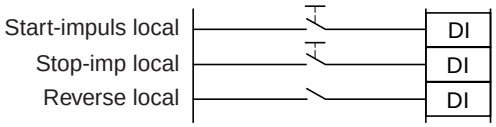
Configuration of logic inputs

Overview of control inputs



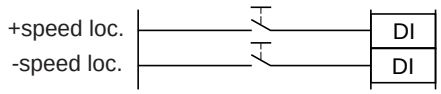
D2. Logic inputs

Run/Stop for local control : (run / stop command in local mode from the terminals)



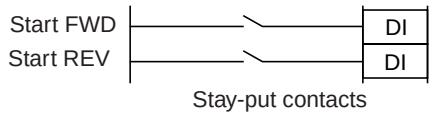
The logic signals sent in pulse form by the logic inputs of the terminals replace the RUN and STOP keys on the keypad. In addition to the logic inputs, parameters E4.00 to E4.03 must be taken into account.

Motorized potentiometer for local control : (reference in local mode from the terminals)



The logic signals sent in pulse form by the logic inputs of the terminals replace the ▲ and ▼ keys on the keypad.
For configuration of the local motorized potentiometer see D6.00 to D6.04 and E4.00, 01 and 03.

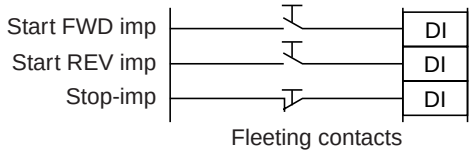
Run/Stop by stay-put contact :



Closing the contact starts operation in the required direction. Opening the contact stops the motor. Closing the Start FWD and Start REV contacts simultaneously also causes the motor to stop.

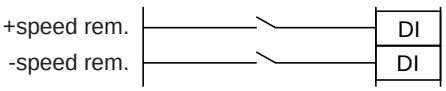
The machine restarts once faults are reset

Run/Stop by fleeting contacts :



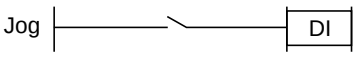
A closing pulse starts operation in the required direction. A pulse on the normally closed “Stop-imp.” contact stops the drive. A run command is automatically cancelled in the event of disabling, tripping or undervoltage for a period greater than the time set in E3.07. A new run pulse is necessary.

Motorized potentiometer (remote control) :



The MP increase and MP decrease signals vary the value of the remote motorized potentiometer reference.
The reference increases and decreases in accordance with the acceleration and deceleration ramps selected.
The motorized potentiometer is configured in Menu D6.

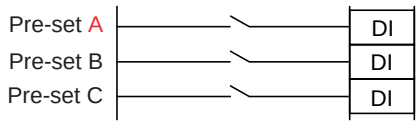
Jog function :



The Jog command accelerates the motor to the frequency fixed in parameter C1.13 as quickly as possible. The jog function can only be used if the drive is stopped.

D2. Logic inputs

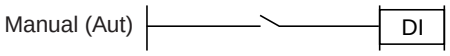
Preset references :



The preset references are adjusted in menu C1. They do not perform the run/stop functions; a run/stop command must therefore be given. Signals LIA to LIC are used to select one of the 8 preset speed references as shown in the table below :

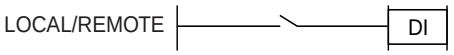
LIA	LIB	LIC	References
0	0	0	1 (C1.05)
1	0	0	2 (C1.06)
0	1	0	3 (C1.07)
1	1	0	4 (C1.08)
0	0	1	5 (C1.09)
1	0	1	6 (C1.10)
0	1	1	7 (C1.11)
1	1	1	8 (C1.12)

Manual (Aut) :



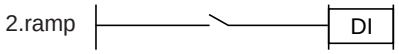
The Manual (Aut) command switches between the two references “Freq.ref.man” and “Freq.ref.aut”. Contact closed = Manual, contact open = Aut.

LOCAL/REMOTE :



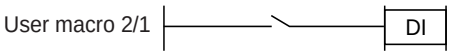
The Local/Remote command is used to select local or remote mode.
Local mode corresponds to a command from the keypad and to logic signals sent in pulse form by the logic inputs of the terminals. The latter are assigned to the Run/Stop functions for local control and to the local motorized potentiometer function (Loc. MP select).
Remote mode corresponds to the logic and analogue signals sent by the terminals and bus.
By default, the local/remote key on the keypad is used for local/remote switching. If parameter E4.02 on the terminals is selected, a logic input is then used for switching (for example with a key-operated switch). Contact open = “remote”, contact closed = “local”.

Selection of ramps 2 or 1 :



Two sets of acceleration/deceleration ramps can be selected via the “2.ramp” logic input. The ramp times are set in parameter group C2.
Ramp 2 if the contact is closed.

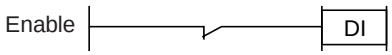
Selection of User macro 2 or 1 :



Parameter B2.04 is set to 1, Par1/2 (1 Mot) or 2, Par1/2 (2 Mot) to select user macro 1 or 2 via a logic input.
If the logic input is at 0 (contact open), user macro 1 is used. If the logic input is at 1 (contact closed), user macro 2 is used. A new user macro is only loaded if the drive is disabled.

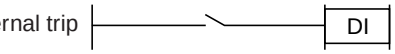
D2. Logic inputs

Enable :



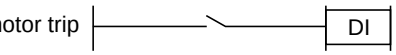
Disabling the drive blocks the commands from the power bridge (IGBT). If the logic input is at 0 (contact open), the power bridge is blocked (freewheel on the motor). No run commands will be taken into account. The display indicates : “Disabled”. If the logic input is at 1 (contact closed), control of the power bridge and therefore the motor is authorized. This function is identical to DI5 on the option card.

External trip :



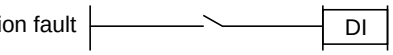
An external fault disables the drive once the period of time set in E3.03 has elapsed. The message “Ext. trip” appears. External faults are transmitted to the drive as NO or NC contacts programmed via parameter E3.02.

External motor trip :



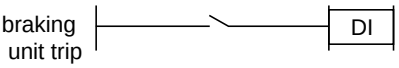
An external motor fault disables the drive once the period of time set in E3.12 has elapsed. The message “EXT-mot.trip” appears. External motor faults are transmitted to the drive as NO or NC contacts programmed via parameter E2.11. This contact can be used to monitor the winding temperature or vibrations using bimetal strip contacts.

External isolation fault :



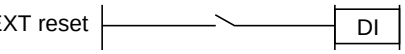
An isolation fault disables the drive once the period of time set in E3.05 has elapsed. The message “Isol.fault” appears.
The fault is transmitted to the drive as NO or NC contacts programmed via parameter E3.04. This input can be used to monitor earth currents (IT state) when the “earth fault detection kit” is being used.

External braking unit trip :



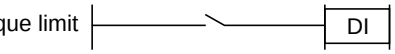
This fault disables the drive once the time period set in E3.07 has elapsed. The message “Ext.BU-fault” appears. The fault is transmitted to the drive as an NO or NC contact programmed via parameter E3.06.

External reset :



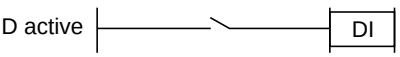
This is used to reset (on a rising edge) the drive after a fault, if the cause of the fault has been eliminated. This command has no effect if the drive is operating. The drive remains in fault mode if a fault is still present even after a reset request.

External torque limit :



When this input is activated, the maximum torque delivered by the drive is limited to a value defined on an analogue output (see D1). This function is used in master/slave applications. Input at 0 (contact open) : maximum torque = value in E1.01.
Input at 1 (contact closed) : maximum torque = external limit of the analogue input.

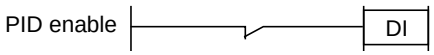
PID active :



This contact is used to switch from a non-active PID (drive controlled directly by a frequency reference) to an active PID (drive controlled by the PID controller output). See PID section for more details. Logic input at 0 (contact open) : PID not active. Logic input at 1 (contact closed) : PID active.

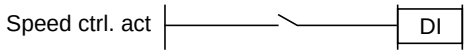
D2. Logic inputs

PID enable :



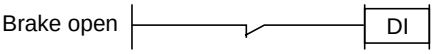
This logic input is used to eliminate the effect of controller gains P, I and D. Logic input at 0 (contact open) : PID action not enabled. In this case, the controller output remains at its last value. Logic input at 1 (contact closed) : PID action enabled.

Closed loop speed control :



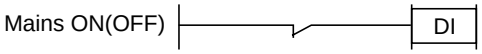
This input is used to switch from frequency control (speed feedback is used to monitor and improve low-speed performance and displays) to speed control taking into account the actual speed of the encoder feedback. Logic input at 0 (contact open) : frequency control. Logic input at 1 (contact closed) : speed control. See D5.00 and D5.02.

Brake open :



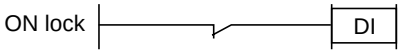
Use of the brake closed contact for processing by the drive in the brake sequence.
Logic input at 0 (contact open) : brake closed.
Logic input at 1 (contact closed) : brake open.

Mains ON/OFF :



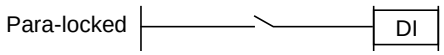
Management of emergency stops via an external contact. The logic input programmed on “Mains ON(OFF)” disables the drive and opens the line contactor if the function is enabled in C6.00. Logic input at 0 (contact open) : drive disabled and opening of the line contactor. The message “Mains disc” appears. Logic input at 1 (contact closed) : no action.

ON lock :



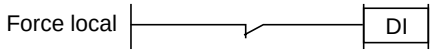
This input is used to monitor and display the status of the drive accessories which may have resulted in a failed start. (Contact from the fuse safety circuit, contactor, fan and external load circuit). Logic input at 0 (contact open) : disables the drive and the message “ON lock” appears. Logic input at 1 (contact closed) : no action.

Parameter locking :



This command is used to prevent any modification of parameters whose settings could be changed using the keypad. Locking can be by a key-operated switch for example. Contact open : parameter locked.

Force local :



This function allows the user to block commands performed remotely. Contact open : operations only possible in local mode. Contact closed : operations possible in local and remote mode.

D2. Logic inputs

D2.00	**DI1-selection**	**VICB**	**not used**	**See 'macro'**
D2.01	**DI2-selection**	**VICB**	**not used**	**See 'macro'**
D2.02	**DI3-selection**	**VICB**	**not used**	**See 'macro'**
D2.03	**DI4-selection**	**VICB**	**not used**	**See 'macro'**
D2.04	**DI6_2-selection**	**VICB**	**not used**	**See 'macro'**
D2.05	**DI7_2-selection**	**VICB**	**not used**	**See 'macro'**
D2.06	**DI8_2-selection**	**VICB**	**not used**	**See 'macro'**
D2.07	**DI5_3-selection**	**VICB**	**not used**	
D2.08	**DI6_3-selection**	**VICB**	**not used**	
D2.09	**DI7_3-selection**	**VICB**	**not used**	
D2.10	**DI8_3-selection**	**VICB**	**not used**	

0 . . . not used	Input not assigned
1 . . . Start FWD	Forward operation
2 . . . Start REV	Reverse operation
3 . . . Start FWDimp	Forward operation via a pulse command
4 . . . Start REVimp	Reverse operation via a pulse command
5 . . . Stop-imp.	Stop via a pulse command
6 . . . +speed rem.	+ speed using remote control
7 . . . -speed rem.	- speed using remote control
8 . . . Star. imp loc	Run via a pulse command using local control
9 . . . Stop imp loc	Stop via a pulse command using local control
10 . . REV local	Reverse operation using local control
11 . . +speed loc.	+ speed using local control
12 . . -speed loc.	- speed using local control
13 . . Jog	Jog command
14 . . Pre-set A	Logic input A (see table of preset references)
15 . . Pre-set B	Logic input B (see table of preset references)
16 . . Pre-set C	Logic input C (see table of preset references)
17 . . Manual (Aut)	Manual or automatic mode command
18 . . Local/remote	Local or remote mode command (see also section E4)
19 . . 2.ramp	Ramp 2 or ramp 1 command
20 . . USER Macro 2	Selection of macro 2 or 1
21 . . Enable	Drive enable command
22 . . External trip	External fault
23 . . EXT-mot.trip	External motor fault
24 . . Isol.fault	Isolation fault
25 . . Ext.BU-fault	External braking unit fault
26 . . EXT reset	Resetting once faults eliminated
27 . . EXT-T limit.	External torque limit
28 . . PID active	Activation of the PID controller
29 . . PID-enable	Enabling the action of the PID gains
30 . . Speed ctrl.act	Closed loop speed control
31 . . Brake open	Management of the brake open contact for the brake sequence
32 . . Mains ON(OFF)	Drive disable with external emergency stop management
33 . . ON lock	Drive disable on external accessory fault
34 . . Force local	Forcing of commands in local mode
35 . . Paramet-lock	Prevents parameter modification

1. Each function can be selected once only. **"Double selection is not permitted".**
2. The outputs of the logic function comparators (see section F4.xx) can be assigned to the functions described above.
3. If two functions are required using the same logic input, logic blocks must be used.
4. The effects of logic input 1 or 0 can be reversed using logic blocks.

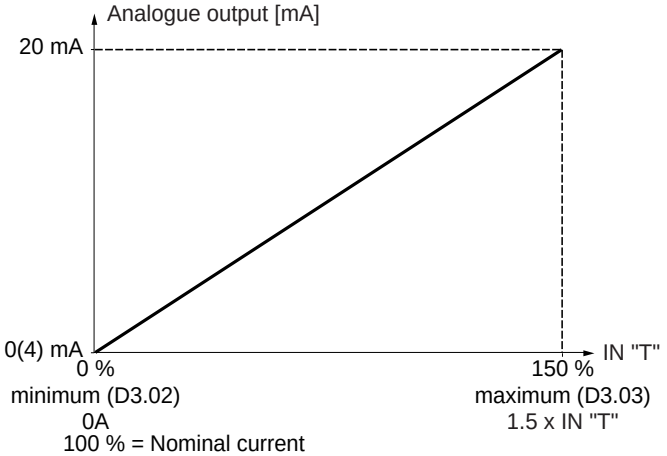
D3. Analogue outputs

Configuration of analogue outputs

D3.00	AO1-selection	VCB	not used	See 'macro'
	0 . . . Not used	output not assigned		
	1 . . . freq. out.sig (signed)	100 % = high speed (C3.01)		
	2 . . . freq. out.sig (not signed)	100 % = high speed (C3.01)		
	3 . . . Out.current	100 % = nominal motor current (B3.01)		
	4 . . . Torque (signed)	100 % = nominal motor torque (B3.00, B3.04)		
	5 . . . (Torque) (not signed)	100 % = nominal motor torque (B3.00, B3.04)		
	6 . . . Power	100 % = nominal motor power (B3.00)		
	7 . . . Motor volt.	100 % = nominal motor voltage (B3.02)		
	8 . . . N-out sig (signed)	100 % = high speed in rpm (C3.01 x 60/p) (1)		
	9 . . . N-out sig (not signed)	100 % = high speed in rpm (C3.01 x 60/p) (1)		
	10 . . Int. f-ref	100 % = high speed (C3.01). Internal frequency reference before the ramp and before slip frequency compensation.		
	11 . . Int. T-ref.	100 % = nominal motor torque (B3.00, B3.04). Torque limit internal reference.		
	12 . . PID-ref.	100 % = 100 % (C4.00)		
	13 . . PID-feedback	100 % = 100 % (C4.01)		
	14 . . PID-error	100 % = 100 % (C4.02)		
	15 . . Bus ref 1	100 % = 4000 hex		
	16 . . Bus ref 2	100 % = 4000 hex		
	17 . . Bus ref 3	100 % = 4000 hex		
	18 . . Bus ref 4	100 % = 4000 hex		
	19 . . Bus ref 5	100 % = 4000 hex		
	20 . . Test minval.	Applies the min. AO signal in AO1. Select 0 or 4 mA in D3.01.		
	21 . . Test maxval.	Applies the max. AO signal (20 mA) in AO1.		
	Note : Several outputs can be assigned the same value. (1) where p = number of pairs of poles.			
D3.01	**AO1_level**	**VCB**	**4-20 mA**	
	0 . . . 0-20 mA 1 . . . 4-20 mA			
D3.02	**AO1-min. value**	**VCB**	**-200.0...*0.0*...200.0 %**	
D3.03	**AO1-max. value**	**VCB**	**-200.0...*100.0*...200.0 %**	

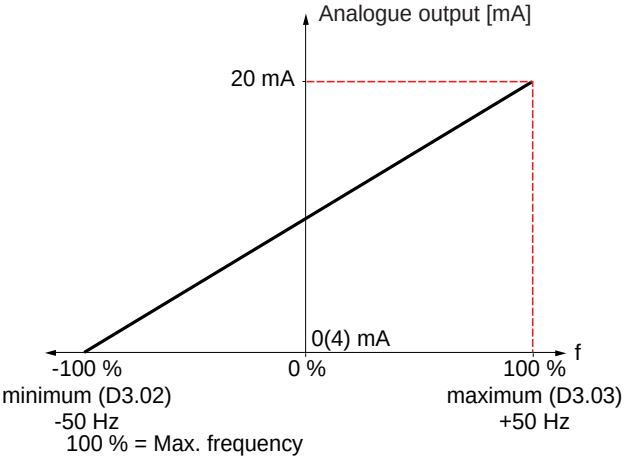
The analogue output is configured using these parameters. The value selected using D3.00 (depending on the corresponding scale) is available as a 0(4)-20 mA signal for external display. The analogue output is set using parameter D3.02 = 0(4) mA and parameter D3.03 = 20 mA.

Example - motor current



100 % = Nominal current
minimum = 0(4) mA = 0 % (0 % x In)
maximum = 20 mA = 150 % (150 % x In)

Example - bipolar output frequency



100 % = Max. frequency
minimum = 0(4) mA = -100 % (- 50 Hz)
maximum = 20 mA = 100 % (+ 50 Hz)

IN "T" = nominal current high torque

D3. Analogue outputs

D3.04	**AO2_2-selection**	**VCB**	**not used**	**See 'macro'**
	See D3.00 for the setting options. Analogue output of the I/O option card on terminal X2 (1st I/O option card)			
D3.05	**A02_2-level**	**VCB**	**4-20 mA**	
	See D3.01 for the setting options.			
D3.06	**AO2_2-min.value**	**VCB**	**-200.0...*0.0*...200.0 %**	
D3.07	**AO2_2-max.value**	**VCB**	**-200.0...*100.0*...200.0 %**	
	See D3.02 and D3.03 for the setting options.			
D3.08	**AO2_3-selection**	**VCB**	**not used**	
	See D3.00 for the setting options. Analogue output of the I/O option card on terminal X3 (2nd I/O option card)			
D3.09	**A02_3-level**	**VCB**	**4-20 mA**	
	See D3.01 for the setting options.			
D3.10	**AO2_3-min.value**	**VCB**	**-200.0...*0.0*...200.0 %**	
D3.11	**AO2_3-max.value**	**VCB**	**-200.0...*100.0*...200.0 %**	
	See D3.02 and D3.03 for the setting options.			

D4. Logic outputs

Assignment of logic outputs

Logic outputs available :
1 output - 24 V voltage, max. 150 mA
1 output - “common point C/O contact” relay
2 outputs - “common point C/O contact” relay, I/O extension card on terminal X2
2 outputs - “normally open contact” relay, I/O extension card on terminal X3

D4.00	**+24 dig. output**	**VC**	**ON (+24 V)**	
	The +24 V output of terminal X1 can be used to supply the logic inputs (D4.00 on +24 V) or as a 0/24 V logic output.			
D4.01	**Relay output 1**	**VCB**	**Ready + Run**	**See ‘macro’**
D4.02	**Relay output2_2**	**VCB**	**not used**	**See ‘macro’**
D4.03	**Relay output3_2**	**VCB**	**not used**	**See ‘macro’**
D4.04	**Relay output2_3**	**VCB**	**not used**	
D4.05	**Relay output3_3**	**VCB**	**not used**	

Status	Relay energized if…
0 . . . Not used	Relay not used.
1 . . . Ready	Depends on the setting in C6.00 "line contactor control". - C6.00 = 0, "Not active" the relay is then energized if : drive powered up, no faults, motor not controlled. - C6.00 = 1, "Active" the relay is then energized if : 24VDC present, no faults.
2 . . . Run	Drive enabled, direction of operation enabled (whatever the reference level).
3 . . . Trip	Fault, before being reset.
4 . . . Ready + Run	Takes one or other condition into account.
5 . . . No alarm	Following programming of an alarm fault E2.01, E2.08, E2.09.
6 . . . Bus-alarm	Following a break in the serial link.
7 . . . Generat.oper	Drive in generator mode.
8 . . . Mains ON	Logic output attached to the function C6.00 "line contactor control". Relay energized if 24VDC supply present and a run command given.
9 . . . Local	Drive control in local mode.
10 . . f = f-Ref	Frequency reference = motor stator frequency.
11 . . f >f-level	Motor frequency > threshold frequency in D4.06. Relay de-energized if motor frequency < threshold frequency in D4.07.
12 . . Lift Brake	Request to lift brake. Depends on parameters C6.01 to C6.05.
13 . . Output C1	The conditions of the comparator functions in block C1 are fulfilled (F4.00 to F4.07).
14 . . Output C2	The conditions of the comparator functions in block C2 are fulfilled (F4,08 to F4,15).
15 . . Output C3	The conditions of the comparator functions in block C3 are fulfilled (F4,16 to F4,29).
16 . . Output C4	The conditions of the comparator functions in block C4 are fulfilled (F4.30 to F4.33).
17 . . Output L5	The conditions of the logic functions in block L5 are fulfilled (F4,44 to F4,49).
18 . . Output L6	The conditions of the logic functions in block L6 are fulfilled (F4.50 to F4.55).
19 . . Thyrist.-ON	The capacitors of the DC bus are charged.
20 . . Bus Cont.W11.	Bit 11 at 1.
21 . . Bus Cont.W12.	Bit 12 at 1.
22 . . Bus Cont.W13.	Bit 13 at 1.
23 . . Bus Cont.W14.	Bit 14 at 1.
24 . . Bus Cont.W15.	Bit 15 at 1.
25 . . ON (+24V)	+24V output of terminal X1D15 is permanently at 24V. It is used to enable the logic inputs (D4.00). Always energized if a relay output is used (useful for testing).
26 . . Manual oper.	Manual control mode (D1 and D2).
27 . . 2.ParaSet.ac	User macro 2 selected (B2.04).
28 . . EXT-T-limit	Torque limiting requested by an external command (E1.01).
29 . . PID active	PID is active (C4.04).
30 . . PID-enable	PID gain operational (C4).
31 . . Speed ctrl.act	Speed control is selected (D5.02).
32 . . Trip inv.	+24VDC or power supply present and no faults.

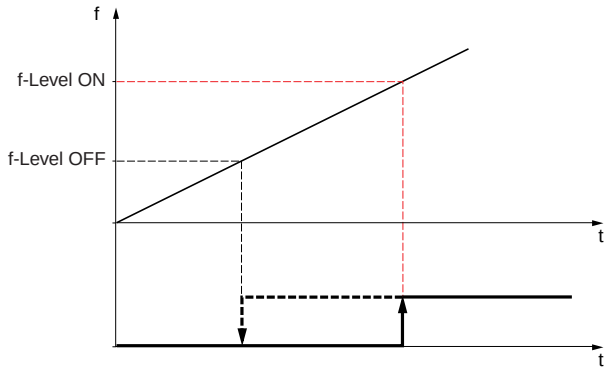
Several outputs can be assigned the same value.

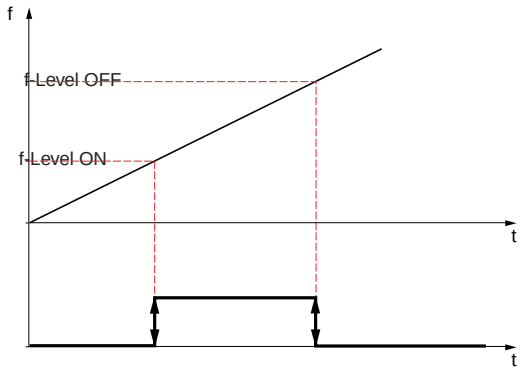
D4. Logic outputs

D4.06	**f-Level ON**	**VCB**	**0.00...*5.01*...300.0 Hz**
D4.07	**f-Level OFF**	**VCB**	**0.00...*2.01*...300.0 Hz**

If the activation threshold is greater than the de-activation threshold :
- the logic output is set to 1 if f > the activation threshold
- the logic output is set to 0 if f < the de-activation threshold

If the activation threshold is less than the de-activation threshold :
- the logic output is set to 1 if the activation threshold < f < the de-activation threshold
- the logic output is set to 0 if f < the activation threshold or f > the de-activation threshold





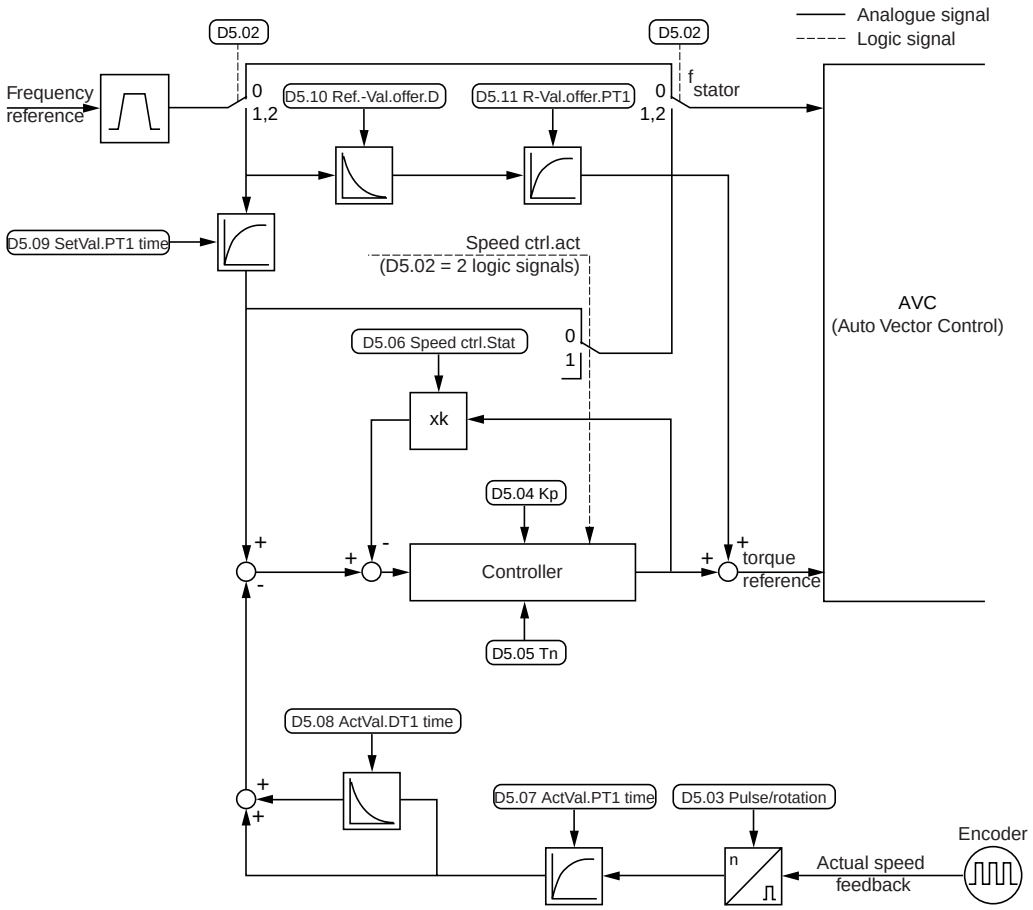
D4.08	**Hyst. f=f-ref**	**VCB**	**0.1...*0.5*...10.0 Hz**

Hysteresis for the logic output : f = f-ref (frequency reference = motor stator frequency). The output is activated if the motor frequency is greater than or equal to the frequency reference plus the hysteresis value for a period of time in seconds equivalent to the hysteresis value set in Hz in D4.08. The output is de-activated if the motor frequency is less than or equal to the frequency reference minus the hysteresis value for a period of time in seconds equivalent to the hysteresis value set in Hz in D4.08.
eg. 0.5 Hz gives ± 0.5 Hz of hysteresis and a time delay of 0.5 sec.

D5. Encoder configuration

Setting encoder feedback and speed control

Simplified diagram of speed feedback processing



D5.00	Encoder/Slipcom	VICB Without encoder
	0 . . . No encoder	No encoder feedback, drive in open loop configuration, speed feedback calculated, for standard applications, without slip compensation.
	1 . . . Slip compens	No encoder feedback, drive in open loop configuration, speed feedback calculated, for applications requiring improved speed accuracy, with slip compensation.
	2 . . . Encoder	With encoder feedback, drive in closed loop configuration, actual speed feedback, for applications requiring excellent speed accuracy and performance at 0 Hz.

- At position 0, there is no slip compensation on the output frequency of the drive, depending on the load. However, the speed is calculated on the basis of the motor frequency and the slip compensation calculated (Auto Vector Control) for information purposes.
- At position 1, the calculated slip is added to the frequency reference in order to obtain a control frequency of the motor which is equal to the reference. This results in excellent static speed accuracy of the asynchronous motor. The dynamic range of the slip compensation can be set using parameter D5.01.
- At position 2, the speed feedback signal is used for all displays and protection devices. Use of encoder feedback means that the motor does not have to operate in unstable zones which are accessible for low-speed ranges. Speed feedback can be processed in two ways, see D5.02.

D5. Encoder configuration

D5.01	Dyn.SlipCompens	VICB	Low
	0 . . . Low 1 . . . Medium 2 . . . High	Dynamic range of the slip compensation.	

D5.02	Speed ctrl.act	VICB	Not active
	0 . . . Not active	The speed feedback signal is used for all displays and protection devices, but the speed used for control is calculated.	
	1 . . . Active	The speed feedback signal is used to control the speed, all displays and protection devices.	
	2 . . . Depend.on DI	LI enables speed control (using the calculated frequency) or the speed controller (using the actual speed).	

Before activating closed loop speed control, check the direction of rotation shown by the encoder and match it to the motor direction of rotation. See also D5.03.
Comment : Setting gains D5.07, D5.04, D5.05, and D5.08 if necessary, is sufficient for most applications.

D5.03	Pulse/rotation	VICB	-10000...*+1024*...+10000 Pulse/rotation

Set the number of pulses for one revolution of the encoder in D5.03. The maximum frequency of the encoder signals is 300 kHz. The maximum frequency of the encoder signal pulses is used to determine the maximum motor speed and the maximum number of points for the encoder.

$$f = \frac{Fs \times Np}{p} = \frac{N \times Np}{60}$$

f ... frequency of the encoder pulses (in Hz)
N ... motor speed (in rpm)
Fs ... supply frequency of the motor (in Hz)
Np ... number of points per encoder revolution
p ... number of pairs of motor poles

Maximum motor speed : $N\,max = \frac{60 \times f\,max}{Np}$

Maximum number of encoder points : $Np\,max = \frac{60 \times f\,max}{N\,max}$

Recommended values :
2-pole motor (30) : 200 to 2048
4-pole motor (60) : 200 to 4096
6-pole motor (90) : 200 to 4096.

A positive or negative sign next to the number of pulses per revolution is used to match the direction of rotation of the motor with that of the encoder (crossing of signals A and B is not necessary).

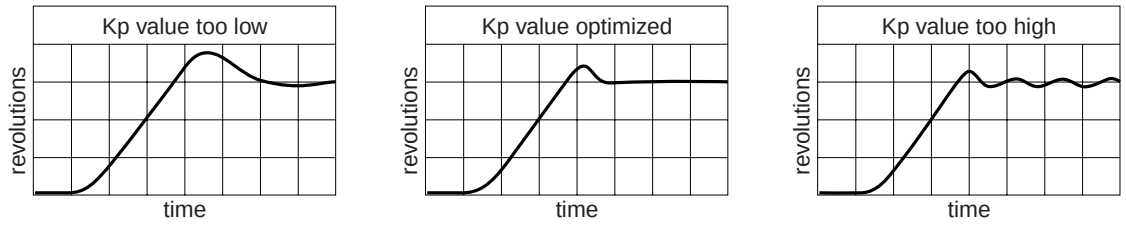
Caution : Setting parameter D5.03 incorrectly may result in safety problems.

D5.04	Speed ctrl. Kp	VCB	0.0...*0.0*...200.0

Proportional gain of the speed control loop. For a drive with strong inertia, a typical control value can be calculated using the following formula :

$$Kp = \frac{t_{acc}\ (\text{Acceleration time with nominal torque) [s]}}{2 \times D5.07} \qquad t_{acc} = \frac{\Sigma j \times n_N}{9.55 \times T_N}$$

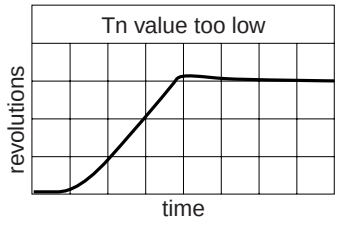
t_{acc} : in seconds
Σj : total moment of inertia applied to the motor shaft in $kg.m^2$
n_N : nominal motor speed in rpm
T_N : nominal motor torque in mN (torque value dedicated to acceleration, excluding resistive torque)
Example : If resistive torque = 0.5 T_N, total torque = 1.5 T_N.

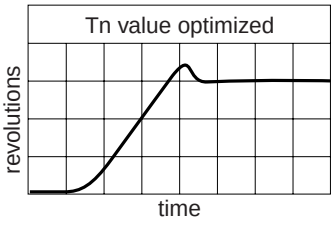


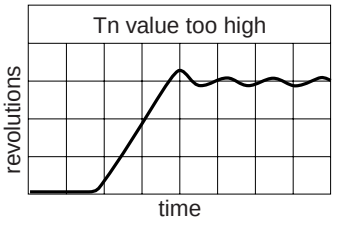
D5. Encoder configuration

D5.05	**Speed ctrl. Tn**	**VCB**	**0.00...*0.00*...10.00 s**

Integral gain of the speed loop (also partially includes the proportional gain).
For a drive with strong inertia, the gain can be calculated using the following formula : Tn = 4 x D5.07







D5.06	**Speed ctrl.Stat**	**VCB**	**0.0...*0.0*...20.0 %**

Reduction of actions Kp and Tn in speed control mode. By reducing the action of Kp and Tn, the controller output is looped back to the input with a negative value. This makes the control mode more flexible. If this parameter is set to a value other than 0, a static error occurs.

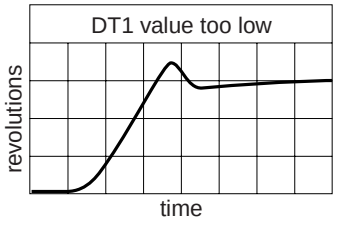
D5.07	**ActVal.PT1 time**	**VCB**	**0.00...*0.00*...10.00 s**

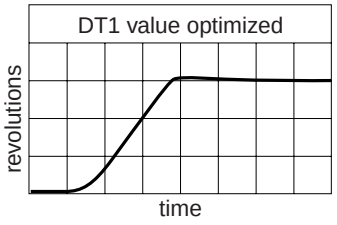
This parameter is used to set the dynamic range of the speed controller (P = proportional).

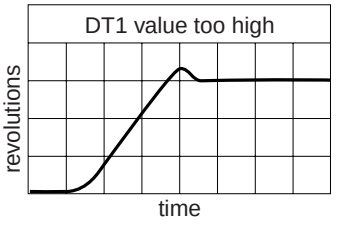
Very high dynamic range :	0.02s (encoder feedback pulses> 200 recommended)
High dynamic range :	0.10s
Medium dynamic range :	0.20s (encoder feedback pulses> 30 recommended)

D5.08	**ActVal.DT1 time**	**VCB**	**0.00...*0.00*...10.00 s**

This parameter is used to set the dynamic range of the speed controller on a torque surge (D = derivative).

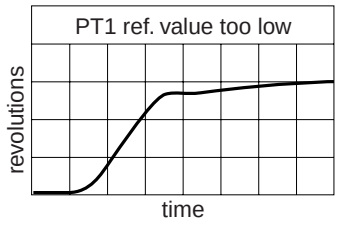


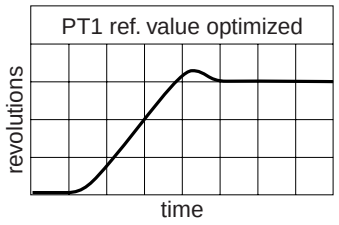


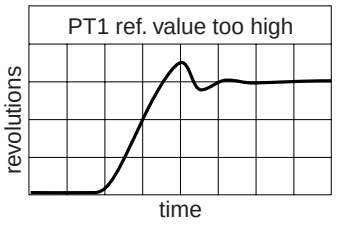


D5.09	**SetVal.PT1 time**	**VCB**	**0.00...*0.00*...10.00 s**

This parameter is used to filter the reference (time constant). D5.10 and D5.11 are used to improve the torque reaction when the reference changes.







D5.10	**Ref-Val.offer.D**	**VCB**	**0.0...*0.0*...10.0**

This parameter is used to set the dynamic range of the speed controller when the reference changes.

D5.11	**R-Val.offer.PT1**	**VCB**	**0.00...*0.00*...10.00 s**

This parameter is used to filter the reference (time constant) in order to adapt the dynamic reaction as required.

D5. Encoder configuration

Setting parameters in accordance with the performance required :

	D5.00	D5.01	D5.02	D5.03	D5.04 ... 11
"Frequency control" Standard drive (SVC without encoder feedback)	0	X	X	X	X
"Slip compensation" for accurate static speed (SVC without encoder feedback)	1	0...2	X	X	X
"Safety of encoder feedback" Good performance at 0 Hz. (SVC with encoder feedback, but not in speed control mode)	2	X	0	Pulse/rotn.	X
"Speed controller" for maximum accuracy of the static and dynamic speed (FVC with encoder feedback)	2	X	1 or 2	Pulse/rotn.	Adjust setting

(x ... parameter not affected)

Speed and torque accuracy, torque response time :

Operating mode	Without encoder	Slip compensation	Encoder feedback, without using speed feedback for speed control (1)	Encoder feedback, control based on encoder feedback (1) (2)
Analogue reference resolution Analogue reference accuracy	10 bit = 0.1 % of the maximum reference ±0.6 % AIV; ±0.9 % AIC; ±1.1 % AI2_2 and AI2_3			
Digital reference resolution	0.01 Hz			
Speed accuracy Speed > 10 % Speed < 5 % Speed > synchronism speed	 f_{slip} f_{slip} $f_{max.}$ / f_n x f_{slip}	 0.3 f_{slip} 0.5 f_{slip} $f_{max.}/f_n$ x $f_{slip}/3$	 f_{slip} f_{slip} $f_{max.}$ / f_n x f_{slip}	 ± 0.01 % C3.01 ± 0.01 % C3.01 ± 0.01 % C3.01
Torque accuracy f > f_{slip} at 0 Hz Speed > synchronism speed	 ± 5 % T_{nom} – ± 5 % T_{nom}	 ± 5 % T_{nom} – ± 5 % T_{nom}	 ± 5 % T_{nom} ± 5 % T_{nom} ± 5 % T_{nom}	 ± 5 % T_{nom} ± 5 % T_{nom} ± 5 % T_{nom}
Torque response time	Approx. 2 ms	Approx. 2 ms	Approx. 2 ms	Approx. 2 ms

(1) It is normal for the maximum output voltage of the drive to be between 92% and 95% of the input voltage. This ensures a dynamic response is obtained even when approaching nominal operating levels. We recommend use of a motor designed for this reduced voltage.

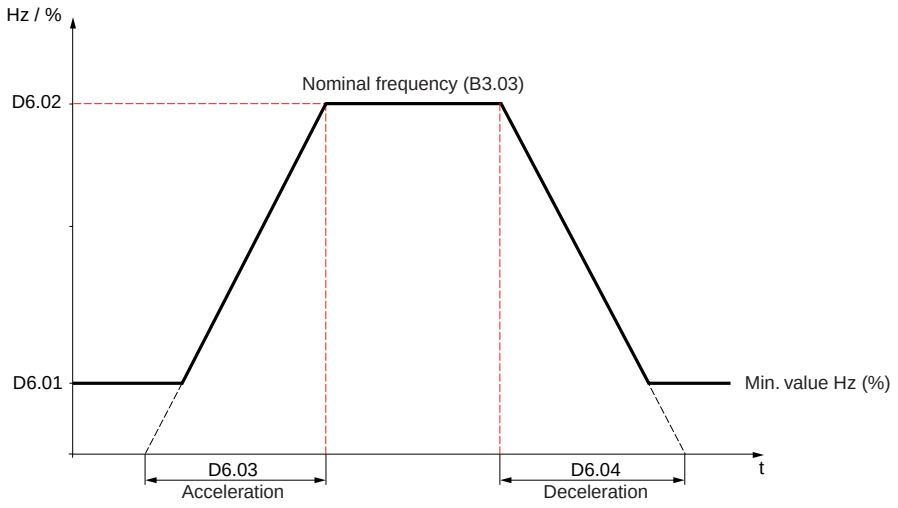
(2) In order to reduce the effect of internal limitations when excessive overtorque is requested at nominal speed, we recommend :
- increasing the acceleration time
- reducing the current limit to less than 150%
- setting D5.07 ≥ 0.04 sec.

D6. Electronic potentiometer

Local and remote +/- speed, local and remote electronic motorized potentiometer function

The local electronic motorized potentiometer is controlled using the keypad or the terminals if local +/- speed functions are programmed (see D2). The remote motorized potentiometer is controlled remotely using the terminals.

D6.00	**Loc.MP select.**	**VICB**	**Freq. ref.**
	0 . . . Freq. ref. Hz 1 . . . Torque ref. % The local "motorized potentiometer" can be used as a source for the frequency reference or as a torque limit. The unit used is automatically adapted to the application (frequency reference in Hz, torque reference in %).		
D6.01	**Loc.MP min. val.**	**VCB**	**0.00...*0.00*...300.0 Hz** **0.00...*0.00*...200.0 %**
D6.02	**Loc.MP max. val.**	**VCB**	**0.00...*50.00*...300.0 Hz** **0.00...*100.0*...200.0 %**
D6.03	**Loc.MP acc.time**	**VCB**	**0.0...*10.0*...3200 s**
D6.04	**Loc.MP dec.time**	**VCB**	**0.0...*10.0*...3200 s**



The period required to change from 0 Hz to the nominal motor frequency (B3.03) and from nominal frequency to 0 Hz is the MP acceleration ramp time D6.03 and deceleration ramp time D6.04.

D6.05	**Loc.ref.storage**	**VCB**	**not active**
	0 . . . not active 1 . . . active The value of the reference (parameter D6.05 active) remains stored after a stop command or a loss of mains. In this way, the drive will revert, after a new run command, to its previous state according to the stored reference.		

D6. Electronic potentiometer

D6.06	**Rem.MP select.**	**VICB**	**not used**

0 . . . Not used Hz
1 . . . Freq.ref.man Hz
2 . . . Freq.ref.aut Hz
3 . . . Freq correct Hz
4 . . . Torque limit %
5 . . . PID-ref. %

If it is not possible to select some adjustment values, it is because they have already been used by other analogue references or by the bus.

Note : If "Freq.ref.man" is selected another logic input must then be assigned to Manual (Aut).

The motorized potentiometer controlled remotely (+/- speed function) serves as a source for various references. The sources are assigned using parameter D6.06. Two logic inputs between D2.00 and D2.10 must be configured for the function : +speed rem. and -speed rem.

Note : See diagram on page 69.

D6.07	**Rem.MP min. val.**	**VCB**	**-300.00...*0.01*..+300.00 Hz** **-200.00...*0.01*...+200.00 %**
D6.08	**Rem.MP max. val.**	**VCB**	**-300.00...*50.01*..+300.00 Hz** **-200.00...*30.50*...+200.00 %**
D6.09	**Rem.MP acc.time**	**VCB**	**0.0...*10.0*...3200 s**
D6.10	**Rem.MP dec.time**	**VCB**	**0.0...*10.0*...3200 s**

Same function as D6.03 / D6.04.

D6.11	**Rem.MP control**	**VCB**	**Terminals**

0 . . . Keypad
1 . . . Terminals

By selecting 0 (keypad), the +/- speed commands come from the ▼ and ▲ keys of the programming terminal. By selecting 1 (terminals), the +/- speed commands come from the terminals, if the local +/- speed functions are selected (see D2).
If the PID controller is used, an external reference is not necessary. The required reference is adapted directly using the keypad.

D6.12	**Rem.ref.storage**	**VCB**	**not active**

Same function as D6.05.

Adaptation of the drive to installation requirements

E

Contents

E1. Drive overload

Maximum drive overload

E1.00	Curr. max.val	VCB	10...*150*...150 %	See 'macro'

This parameter defines the maximum current value as a % of the nominal drive current configured for high torque even if the drive is configured for standard torque.
The maximum limit of the drive current set in E1.00 can be automatically reduced by the drive in accordance with the operating conditions when heating of the heatsink exceeds the permitted limits.

For an output frequency > 10 Hz : At the maximum ambient temperature, limiting to 150 % is available when the drive is configured for high torque and for a period of one minute in every ten. After an overload period, the current is reduced to 120 % of the nominal drive current. This value can be permanently maintained. If the maximum value is adjusted to below 120 % of the nominal current, no additional limits are produced.

E1.01	Torque max.val.	VCB	10...*200*...200 %

This parameter defines the maximum torque value. 100 % corresponds to the nominal motor torque. If this value is exceeded, the drive automatically reduces its output frequency. If an analogue input (terminals or bus) is used on the "torque limit" function, this has priority over the current limit function defined in E1.00. A logic input (or the output of a comparator) can be assigned to the "EXT-T limit" function (external torque limit) in order to select the type of limit : limit via analogue input (external limit) or limit configured in E1.00. At state 1 (contact closed), it is the external torque limit which is taken into account.

	Analogue input	
Logic input	Not assigned	Assigned
Not assigned	Torque limit = Param E1.01	Torque limit = analogue signal
Assigned and = 0	Torque limit = Param E1.01	Torque limit = Param E1.01
Assigned and = 1	Torque limit = Param E1.01	Torque limit = analogue signal

E2. Motor protection

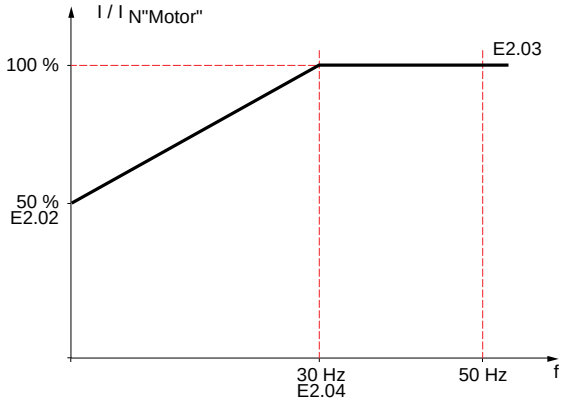
Protection adapted to the motor

E2.00	Thermistor input	VCB	Not active
	0 . . . Not active	No PTC probe used.	
	1 . . . Always active	The PTC probe is connected and processed by the drive.	
	2 . . . Ready / Run	The PTC probe is only processed when the drive is in Ready or Run state.	
	3 . . . Run	The PTC probe is only processed when the drive is in Run state.	
	Nominal value of the PTC probe circuit is : 1.5 kOhm for 6 PTC in series. Trip value : 3 kOhm. Hysteresis value after tripping : 1.8 kOhm. Monitoring a short-circuit on the probe : < 50 Ohm.		

E2.01	Thermist.protec	VCB	Not active
	0 . . . Trip	Drive disabled, fault indicated.	
	1 . . . Alarm	The drive continues to operate and indicates tripping of the PTC probe. A logic output must be assigned to “alarm” for this purpose. The message “Mot. Temp >” appears.	
	This parameter defines whether a thermal fault indicated by the PTC probe is processed by tripping or by an alarm.		

Thermal motor protection - Thermal model of the motor (1)

Unlike the overload limit function (parameter E1.00) which protects the drive, the thermal model evaluates motor heating. It uses the maximum permanent current at the nominal operating point, with derating according to the actual speed and the motor thermal constant. If overloading occurs, the current is reduced to the value set in parameters E2.02 and E2.03. This causes a reduction in speed and for quadratic loads (pumps, fans) creates a stable operating point. Otherwise, and this is the case for constant loads, the output frequency drops to 0 Hz. If the frequency remains below the stalling detection frequency (E2.07) for longer than the detection time set (E2.06), the drive trips and the message “(60) Mot.Overl.” appears.
A break in the mains voltage resets the electronic motor protection. To preserve the thermal calculation when a mains break occurs, the drive must be supplied with a 24 VDC auxiliary voltage, via terminals P24 and P0 V.



Motor cooling is reduced at low speeds if the drive is naturally cooled.

E2.02	I max at 0 Hz	VCB	0...*31*...150 %	(1)
	Maximum permanent current permitted at 0 Hz for the motor (manufacturer data). 100 % = nominal motor current (B3.01). This value is used for thermal calculations, it is not a permanent limit applied to the drive.			

E2.03	I max at f nom.	VCB	0...*100*...150 %	(1)
	Maximum permanent current permitted at the nominal motor frequency (manufacturer data). 100 % = nominal motor current (B3.01) This value is used for thermal calculations, it is not a permanent limit applied to the drive.			

E2.04	Therm.f-limit	VCB	0...*30*...300 Hz	(1)
	If the motor is naturally cooled, the nominal motor current cannot be permanently maintained below a certain speed (defined in thermal frequency parameter E2.03), as cooling is not efficient enough. This value is used for thermal calculations, it is not a permanent limit applied to the drive.			

(1) See UL thermal motor protection on page 91.

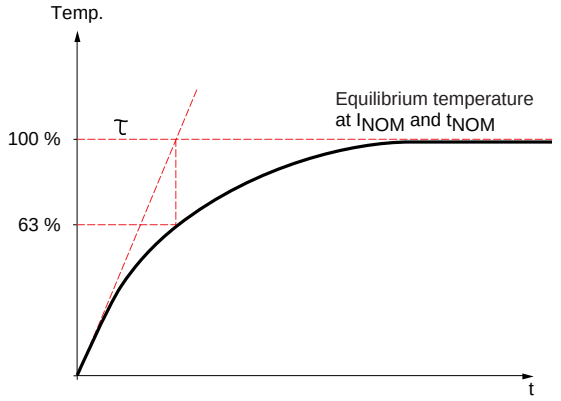
E2. Motor protection

E2.05	Motor-tme const(t)	VCB	1...*5*...3200 min	(1)

The motor time constant **t** is used to define motor heating. Under nominal operating conditions, the motor takes 4 to 5 times this time constant to reach thermal equilibrium. The factory default for this constant is 5 minutes in order to provide sufficient protection if mains breaks are frequent and no auxiliary 24 VDC supply is present, thus maintaining calculation of the thermal state from the state preceding the break. If the motor is often subject to overloads, it is preferable to enter the data of the motor manufacturer and use a 24 VDC auxiliary supply. If this data is not available, see the table given for information purposes.
A partial return to the motor data factory settings can be set using F2.01.

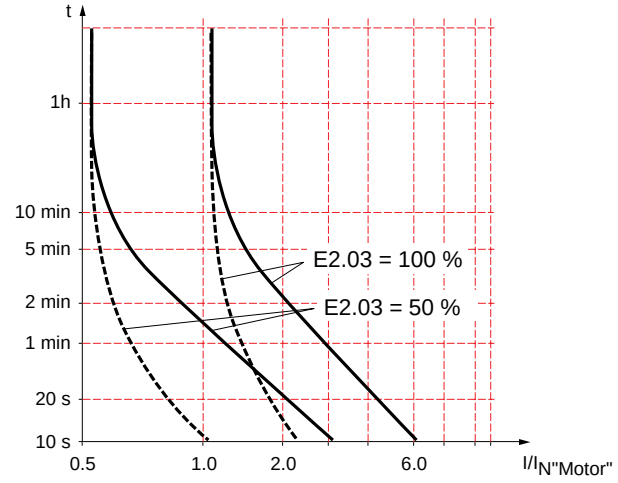
If a mains break occurs, thermal protection of the motor performed by the drive is not saved. When the drive is powered up again, the thermal calculation restarts from 0. In order to preserve the thermal calculation even if a break in the mains voltage occurs, a 24 VDC auxiliary supply must be used.

Thermal characteristics of the motor



No. of pairs of poles	Shaft height		
	160-200	225-280	315-400
2,4 poles	45 min	50 min	60 min
6,8 poles	60 min	80 min	100 min

(1) **UL thermal motor protection**
If parameter B3.05 “Line voltage” is set to “460 V - 60 Hz”, the drive automatically selects the protection model of the motor (and cable) according to UL certification. In this case, parameters E2.02, E2.04 and E2.05 lose their function.
Monitoring of the overcurrent as a function of time depends on E2.03 (nominal motor current). If the current/time values are exceeded, a fault message appears : motor overload.



—— motor cold
---- motor warm with nominal current

E2.06	**Stalling time**	**VCB**	**0...*60*...160 s**
E2.07	**Stalling frequ.**	**VCB**	**0...*5*...20 Hz**
E2.08	**Stalling curr.**	**VCB**	**0...*80*...150%**

100 % corresponds to the nominal motor current (see B3.01).
A motor is considered to be overloaded on starting or stalled if its frequency is less than stalling frequency E2.07, and the current is greater than stalling current E2.08 during stalling time E2.06.

E2.09	**n>> protection**	**VCB**	**Trip**

0 . . . Not active
1 . . . Trip
2 . . . Alarm

Overspeed protection (max. speed set in E2.10) can be processed as an “alarm” or a “trip”, even if the drive is disabled (driving loads). The alarm has a hysteresis of 100 rpm.

E2.10	**N max motor**	**VCB**	**200...*3200*...18000 rpm**

Maximum speed in rpm. The default value corresponds to a 2-pole/60 Hz motor. This value must be adapted for other frequencies and numbers of poles.

E2.11	**EXT-mot.trip**	**VCB**	**Not active**

0 . . . Not active

1 . . . N.O. active	Normally open contact, the external fault is taken into account regardless of the drive status.
2 . . . N.O.ready+r	Normally open contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
3 . . . N.O. run	Normally open contact, the external fault is taken into account if the drive is enabled and running.
4 . . . N.C. active	Normally closed contact, the external fault is taken into account regardless of the drive status.
5 . . . N.C.ready+r	Normally closed contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
6 . . . N.C. run	Normally closed contact, the external fault is taken into account if the drive is enabled and running.

Used to monitor components of the installation, for example : monitoring the temperature of the motor bearings, detecting vibration. The contact can be normally open or normally closed. Operating conditions from 1 to 6 can be selected.

See D2 for assigning a logic input to the motor external fault.
See F4 for use of a logic block.

E2.12	**Delay f. E2.11**	**VCB**	**0.0...*1.0*...160 s**

This parameter sets a time condition for taking into account external fault E2.11. The external fault must be present during E2.12 to be taken into account.

E3. Fault configuration

Fault reset and installation protection

E3.00	Autorestart 3x	VCB	Not active

0 . . . Not active
1 . . . Active

If “automatic restart” is active, the drive tries to reactivate the system after tripping due to a fault (3 times in 5 minutes before final tripping). The fault must have disappeared to be reset.

This resetting must not be used on a “mechanically dangerous” machine.

E3.01	Loss of 4-20 mA	VCB	Loss of 4-20 mA

0 . . . Not active	
1 . . . Active	Taken into account regardless of the drive status.
2 . . . Ready+r	Taken into account if the drive is disabled or enabled and running.
3 . . . Run	Taken into account if the drive is enabled and running.

All the 4-20 mA current analogue references are monitored even if they are not programmed.

E3.02	External trip	VCB	Not active	See ‘macro’

0 . . . Not active	
1 . . . N.O. active	Normally open contact, the external fault is taken into account regardless of the drive status.
2 . . . N.O.ready+r	Normally open contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
3 . . . N.O. run	Normally open contact, the external fault is taken into account if the drive is enabled and running.
4 . . . N.C. active	Normally closed contact, the external fault is taken into account regardless of the drive status.
5 . . . N.C.ready+r	Normally closed contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
6 . . . N.C. run	Normally closed contact, the external fault is taken into account if the drive is enabled and running.

Used to monitor components of the installation, for example : overpressure. The contact can be normally open or normally closed. Operating conditions from 1 to 6 can be selected.

See D2 for assigning a logic input to “external trip”.
See F4 for use of a logic block.

E3.03	Delay f. E3.02	VCB	0.0...*0.0*...160 s

This parameter sets a time condition for taking external fault E3.02 into account. The external fault must be present during E3.03 to be taken into account.

E3.04	Isolation Fault	VCB	Not active

0 . . . Not active	
1 . . . N.O. active	Normally open contact, the external fault is taken into account regardless of the drive status.
2 . . . N.O.ready+r	Normally open contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
3 . . . N.O. run	Normally open contact, the external fault is taken into account if the drive is enabled and running.
4 . . . N.C. active	Normally closed contact, the external fault is taken into account regardless of the drive status.
5 . . . N.C.ready+r	Normally closed contact, the external fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
6 . . . N.C. run	Normally closed contact, the external fault is taken into account if the drive is enabled and running.

The operating mode is the same as for an external fault, except that in this case the fault shown on the display is an isolation fault. This fault is useful if the isolation fault detection kit is being used between a phase and earth in isolated neutral type networks (IT). Operating conditions from 1 to 6 can be selected.

See D2 for assigning a logic input to “isolation fault”.
See F4 for use of a logic block.

E3.05	Delay f. E3.04	VCB	0.0...*10.0*...160 s

This parameter sets a time condition for taking isolation fault E3.04 into account. The isolation fault must be present during E3.05 to be taken into account.

E3.06	Trip of ext. BU	VCB	2 . . . N.O.ready+r

0 . . . Not active
1 . . . N.O. active — Normally open contact, the braking unit fault is taken into account regardless of the drive status.
2 . . . N.O.ready+r — Normally open contact, the fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
3 . . . N.O. run — Normally open contact, the fault is taken into account if the drive is enabled and running.
4 . . . N.C. active — Normally closed contact, the fault is taken into account regardless of the drive status.
5 . . . N.C.ready+r — Normally closed contact, the fault is taken into account if the drive is ready (waiting for enable command) or enabled and running.
6 . . . N.C. run — Normally closed contact, the fault is taken into account if the drive is enabled and running.

The fault is used to disable the drive when the external braking unit switches to fault state. Operating conditions from 1 to 6 can be selected.

See D2 for assigning a logic input to “braking unit fault”.
See F4 for use of a logic block.

E3.07	Delay f. E3.06	VCB	0.0...*5.0*...160 s

This parameter is used to delay the fault signal being taken into account during powering up phases of the drive.

E3.08	Undervoltage	VCB	Trip inv.

0 . . . Not active — No monitoring of undervoltage.
1 . . . Fault — The fault is taken into account if the drive is enabled and running.
2 . . . Alarm — The drive continues to operate and indicates the appearance of an undervoltage. A logic output must be assigned to “alarm” for this purpose. The message “Undervoltage” appears.

By default (factory configuration), an undervoltage is not stored as a fault. On a return to normal voltage, the drive will restart (if it is enabled and a run command is present). By selecting E3.08 “Fault”, each undervoltage which lasts longer than time delay E3.09 is processed as a fault and must be reset to restart the drive. This function is used particularly when the drive must not restart automatically (safety of personnel).

In this case, automatic resetting must not be active.

E3.09	Delay f. E3.08	VCB	0.0...*2.0*...20.0 s

This parameter sets a time condition for taking the fault into account. The undervoltage fault must be present during E3.09 to be taken into account.

A time delay longer than 2 seconds can only be processed if the drive is connected to a 24 VDC external supply.

E3.10	Local reset	VCB	active

0 . . . Not active
1 . . . Active

If E3.10 is set to 1, a fault can be reset by the Stop key on the keypad of the programming terminal.

E4. Control configuration

Selection of the drive control modes

Note : The control mode can be shown on the display.

E4.00	**Loc/Rem ref.**	**VICB**	**Local/remote**
	0 . . . Local/remote	The reference taken into account can be local or remote (see E4.02).	
	1 . . . Local only	The reference taken into account can only be local.	
	2 . . . Remote only	The reference taken into account can only be remote.	

This parameter is used to select the possible source(s) for the frequency reference.

REMOTE : In “remote” mode the drive is controlled by a reference transmitted by the terminals or bus. Possible references : Freq.ref.man or Freq.ref.aut and PID-ref. The frequency reference can come from one of the analogue inputs AIV, AIC, AI_2 or AI_3, from the preset references, the remote motorized potentiometer or from one of the 5 bus references.

LOCAL : In “local” mode the drive is controlled directly by :

- E4.03 = 0 keypad : a frequency reference from the motorized potentiometer, obtained using the ◀ , ▲ , ▶ and ▼ keys on the keypad.
- E4.03 = 1 terminals : the motorized potentiometer, obtained via the logic inputs of the terminals (+speed loc., -speed loc. and REV local, see D2.00 to D2.10).

E4.01	**Operate-Mode**	**VICB**	**Local/remote**
	0 . . . Local/remote	The commands taken into account can be local or remote (see E4.02).	
	1 . . . Local only	The commands taken into account can only be local.	
	2 . . . Remote only	The commands taken into account can only be remote.	

In “local” mode the drive is controlled directly by :

- E4.03 = 0 keypad : the RUN/STOP keys (green and red keys on the keypad).
- E4.03 = 1 terminals : the logic inputs “Star.imp loc.” (run using fleeting contact) and “Stop imp loc.” (stop using fleeting contact).

In “remote” mode the drive is controlled directly by :

- B6.01 = 0 terminals : the commands on the terminals “Start FWD”, “Start REV”, “Start FWDimp”, “Start REVimp” and “Stop-imp.”
- B6.01 = 1 communication link : the Run/Stop commands of the communication link control word (bit 0 to 10).

Possible combinations for reference and control mode sources :

Control mode setting (1)		Selection of the local / remote control mode (E4.02)
E4.00 Frequency reference source	E4.01 Control source	
Local / remote	Local / remote	The frequency reference taken into account depends on the selection. Control depends on the selection.
Local / remote	Local	The frequency reference taken into account depends on the selection. Control is always local and independent of the selection.
Local / remote	Remote	The frequency reference taken into account depends on the selection. Control is always remote and independent of the selection.
Local	Local / remote	The frequency reference taken into account is always local and independent of the selection. Control depends on the selection.
Local	Local	The frequency reference taken into account is always local and independent of the selection. Control is always local and independent of the selection.
Local	Remote	The frequency reference taken into account is always local and independent of the selection. Control is always remote and independent of the selection.
Remote	Local / remote	The frequency reference taken into account is always remote and independent of the selection. Control depends on the selection.
Remote	Local	The frequency reference taken into account is always remote and independent of the selection. Control is always local and independent of the selection.
Remote	Remote	The frequency reference taken into account is always remote and independent of the selection. Control is always remote and independent of the selection.

E4. Control configuration

(1) The control mode of the drive defines the source of the frequency reference and the drive control which can be local or remote. It can be selected :

- using the terminals
- using the communication link
- using the keypad

These control modes can be selected using :

- a logic input on the terminals, where local/remote selection depends on the position of the logic input (see E4.02)
- the "local/rem." key on the keypad to select local or remote mode (see E4.02)
- or by programming local or remote selection in the parameters

E4.02	Loc/Rem-switch	VICB	Keypad
	0 . . . Keypad	Local / remote control using the “Local/remote” key on the keypad of the programming terminal.	
	1 . . . Terminals	Local / remote control using a logic command from the terminals (see D2). In this mode, the local/remote key on the keypad is disabled.	

E4.03	Ctrl.mode local	VICB	Keypad
	0 . . . Keypad	Only local commands from the keypad are taken into account.	
	1 . . . Terminals	Only local commands from the terminals are taken into account.	

This parameter defines the source of the Run and Stop commands, and the signals from the local motorized potentiometer (+speed/-speed).
E4.03 = 0 : using the RUN/STOP keys on the keypad (green and red keys).
E4.03 = 1 terminals : using the logic inputs “Star.imp loc.” (run using fleeting contact), “Stop imp loc.” (stop using fleeting contact) and “REV local”, “+speed loc.” and “-speed loc.”.

E4.04	Local STOP	VICB	Loc.act.only
	0 . . . Loc.act.only	Only the stop command from the keypad is taken into account.	
	1 . . . Active	All the stop commands are taken into account.	

If “active” in “Local STOP” is selected : all stop commands are taken into account regardless of their source (terminals logic input “Stop imp loc” or the STOP key on the keypad). The type of stop depends on the setting of parameter C1.02 “Stop mode”. A run command must be resent to restart the drive.

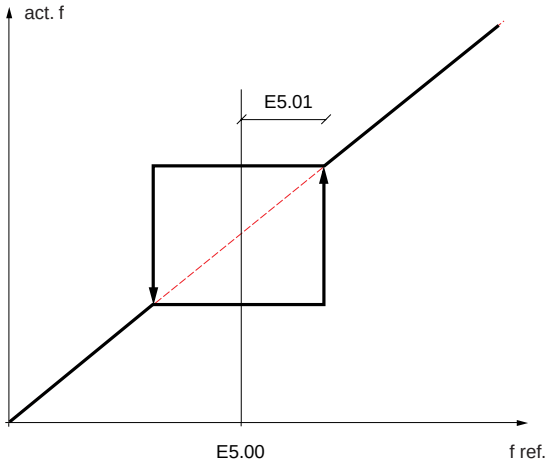
Note : See also the “local control” example with a local logic command in section B5, Short menu, addition to macros M1 to M4.

E5. Skip frequency

Skip frequency (anti-resonance)

E5.00	**Skip frequency**	**VCB**	**5.00...*5.00*...300.0 Hz**
E5.01	**Hysteresis**	**VCB**	**0.00...*0.00*...4.00 Hz**

The skip frequency E5.00 defines the frequency at which the drive must not remain continually. The hysteresis adjustment determines the symmetrical bandwidth.



E

E6. Switching frequency

Automatic adaptation of the switching frequency

E6.00	**Min.pulse freq.**	**VCB**	**2.5 kHz**
	0 . . . 2.5 kHz 1 . . . 5.0 kHz 2 . . . 10.0 kHz		
E6.01	**Max.swit. freq.**	**VCB**	**2.5 kHz**
	0 . . . 2.5 kHz 1 . . . 5.0 kHz 2 . . . 10.0 kHz		

The drive is fitted with a circuit which automatically adapts the switching frequency. It operates normally at the maximum switching frequency. When the drive is subject to high loads together with a high heatsink temperature, the switching frequency is decreased. The drive therefore continues to operate. However, the noise of the motor increases slightly when the frequency is lowered. Parameters E6.00 and E6.01 offer the possibility of limiting the automatic range of the switching frequency. The factory default is the lowest switching frequency possible in order to limit emissions from the motor cable and overheating of the motor chokes and radio interference filters.

Help function, factory settings, fault memory, configuration and locking code

F

Contents

F1. Test-Help

Contextual help on a fault

F1.00	Test power part	VICB Test
	0 . . . Start	0= Initial state, the parameter must be set to 1 to start the test procedure
	1 . . . Test.lower	Signalling of test level : low channels
	2 . . . Test.upper	Signalling of test level : high channels
	3 . . . No earth flt	No problem detected
	4 . . . Earth fault	Detection of an earth fault on the power output of the drive, motor side
	5 . . . Test.not pos	The drive cannot perform the test
	This test is used to detect earth faults on the motor side. When the test is activated, the three IGBTs of a half-bridge are blocked for a short period of time. If an overcurrent appears during this test, the message “earth fault” appears. If the “line contactor control” function is activated, the contactor is energized for approximately 1 second.	

F1.01	Test-cont.part	VICB Test
	0 . . . Start 0 ->1 (1 . . . Testing) (2 . . . Fault!) (3 . . . No fault)	Test started on change to 1
	This test performs a self-test on the control components of the drive and resets them.	

F1.02 to F1.29

Fault codes and solutions. See “Faults - causes - remedies”, page 119.

F2. Factory settings

Return to the factory settings

F2.00	Ret. fact.appli.	VICB	Test
	0 . . . Start	0= Initial state, the parameter must be set to 1 to return to the factory settings	
	1 . . . Return fact.	Indicates that the return to factory settings is in progress	
	2 . . . O.K.	Indicates that the return to factory settings has been completed correctly	

The test program recalls the factory configuration of the application parameters (macro 1 conveyor) but not the motor data (B3.00 to B3.04 and B4.01 to B4.04). All the settings entered by the client are replaced by the factory configuration.

The following parameters are not replaced : user macro, fault memory, operating hours, kWh counter, language and parameter “B3.05 line voltage”.

F2.01	Ret. fact.motor	VICB	Test
	0 . . . Start	0= Initial state, the parameter must be set to 1 to return to the factory settings	
	1 . . . Return fact.	Indicates that the return to factory settings is in progress	
	2 . . . O.K.	Indicates that the return to factory settings has been completed correctly	

The test program recalls the factory configuration of the motor parameters (B3.00 to 04 and B4.01 to 04).

If the line voltage is not applied to the drive at L1, L2 and L3, the motor data and autotuning parameters are not replaced.

F3. Fault memory

Fault log and diagnostics

F3.00	Fault code	Read only
	Number of faults since the start of the drive life.	
F3.01	**Review**	**Read only 0...*0*...15 (0 last fault)**
	Used to select the number of the fault to be analyzed. Only the last 16 faults can be displayed. The 14 data items related to the fault selected in F3.01 are displayed in F3.02 to F3.15.	

F3 Fault memory

			Last fault entered in memory			
F3.00	Fault code				15	(1)
F3.01	Review			2 n-2	1 n-1	0 n	
F3.02	Trip number			13	14	15	
F3.03	Fault			61 Stall prot	58 Mot. Temp >	54 Ext.trip	(1)
F3.04	Operat.hours FI A	(A5.01)		362.37 hr	438.84 hr	817.73 hr	(2)
F3.05	F-out	(A3.00)		+0.6 Hz	+23.0 Hz	+43.4 Hz	(2)
F3.06	Speed	(A2.00)		+ 3 rpm	+ 649 rpm	+ 1260 rpm	(2)
F3.07	Motor current	(A2.03)		602 A	478 A	342 A	(2)
F3.08	DC-voltage	(A3.02)		533 V	541 V	545 V	(2)
F3.09	Heatsink temp.	(A3.03)		+ 25° C	+ 71° C	+ 63° C	(2)
F3.10	Freq.after ramp	(A4.12)		+ 50.0 Hz	+ 23.0 Hz	+ 43.4 Hz	(2)
F3.11	Operate-Mode	(A1.02)		0 Remote	0 Remote	0 Remote	(2)
F3.12	Drive status word (ETA)	(A3.11)		7 - Operation	7 - Operation	7 - Operation	(2)
F3.13	Drive cont.word (CMD)	(A4.17)		047F hex	047F hex	047F hex	(2)(3)
F3.14	Drive status	(A1.03)		2 Acceleration	1 cons. f = f-Ref	1 cons. f = f-Ref	(2)
F3.15	*daughter card			0000 hex	0000 hex	0000 hex	(2)(3)

(1) Each failure of the line supply or 24 VDC auxiliary voltage causes a fault message "Loss of 24 V". When parameter E3.03 "Undervoltage" is set to 0 "No fault" or 2 "Alarm", this fault message appears, but is overwritten by the next fault.

(2) All values correspond to the actual values 10 ms before the fault appears.

(3) Message in hexadecimal format for processing by Schneider services.

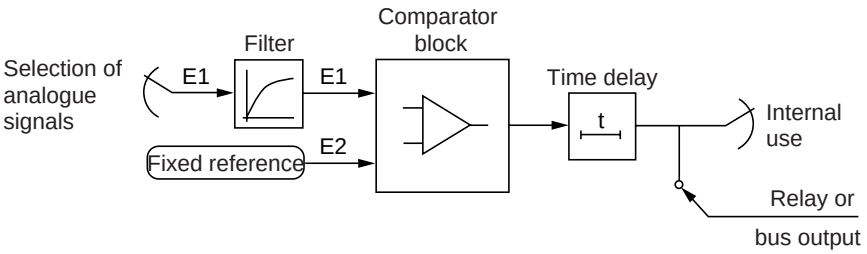
F4. Function blocks

Logic and comparator function blocks

The drive contains 4 comparator blocks to monitor analogue signals and 2 logic blocks.
The output signals of the function blocks can be used :

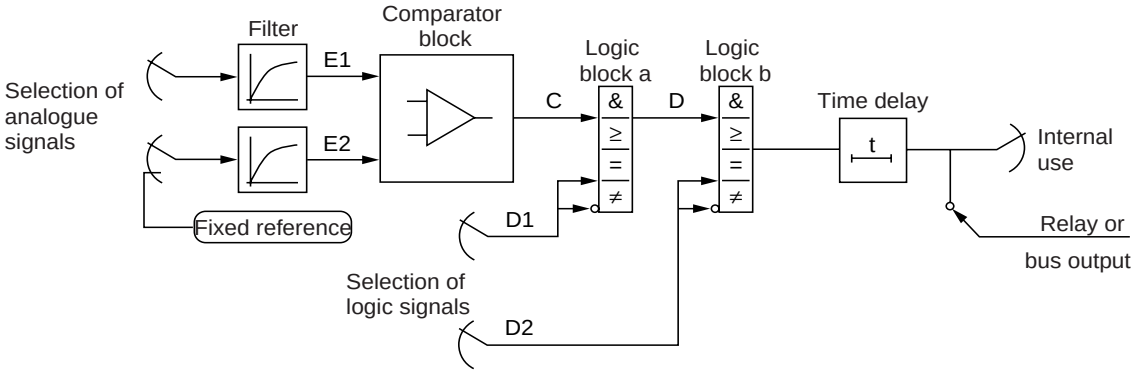
- with a time delay : comparator blocks C1 and C2, and logic function blocks L5 and L6.
- with a time delay and logic function blocks : comparator blocks C3 and C4.
- on relay outputs, by the bus and/or internally as control signals.

C1 and C2



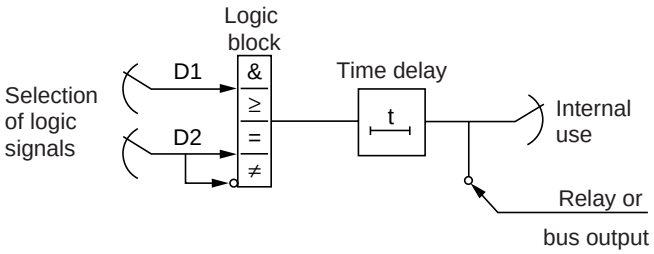
Comparator 1 : Parameters F4.00 to F4.07
Comparator 2 : Parameters F4.08 to F4.15

C3 and C4



Comparator 3 : Parameters F4.16 to F4.29
Comparator 4 : Parameters F4.30 to F4.43

L5 and L6



Logic block 5 : Parameters F4.44 to F4.49
Logic block 6 : Parameters F4.50 to F4.55

Selection of the signal to be compared

F4.00	**C1 signal E1**	**VCB**	**0.0 %**
F4.08	**C2 signal E1**	**VCB**	**0.0 %**
F4.16	**C3 signal E1**	**VCB**	**0.0 %**
F4.30	**C4 signal E1**	**VCB**	**0.0 %**

0 . . . 0.0 %	Initial state
1 . . . f- out (signed)	100 % = high speed (C3.01)
2 . . . |f- out| (not signed)	100 % = high speed (C3.01) (absolute value)
3 . . . Out.current	100 % = nominal motor current (B3.01)
4 . . . Torque (signed)	100 % = nominal motor torque (B3.00, B3.04)
5 . . . |Torque| (not signed)	100 % = nominal motor torque (B3.00, B3.04) (absolute value)
6 . . . Power	100 % = nominal motor power (B3.00)
7 . . . Heat.temp.	100 % = 100 ° C (C4.02)
8 . . . Switch-freq.	100 % = high speed in rpm (C3.01 x 60/p) (1)
9 . . . Speed (signed)	100 % = high speed in rpm (C3.01 x 60/p) (1)
10 . . |Speed| (not signed)	100 % = high speed in rpm (C3.01 x 60/p) (1)
11 . . PID-error	100 % = 100 %
12 . . Int. f-ref	100 % = high speed (C3.01) internal frequency reference before the ramp and before slip frequency compensation
13 . . |Int.f-ref|	100 % = high speed (C3.01) internal frequency reference before the ramp and before slip frequency compensation (absolute value)
14 . . Int. T-ref.	100 % = nominal motor torque (B3.00, B3.04) torque limit internal reference
15 . . AIV	100 % = 10 V (A4.00)
16 . . AIC	100 % = 20 mA (A4.02)
17 . . AI_2	100 % = 20 mA (A4.04)
18 . . AI_3	100 % = 20 mA (A4.06)
19 . . DC-voltage	100 % = 813 V
	(1) p = number of pairs of poles

Selection of the signal used for comparison

F4.18	**C3 signal E2**	**VCB**	**Selection of fixed value with F4.02**
F4.32	**C4 signal E2**	**VCB**	**Selection of fixed value with F4.02**

0 . . . Refer.-value (%)	Choice of using a fixed reference value for input E2 of comparators C1, C2, C3 and C4. The value is adjusted using F4.02, F4.10, F4.20 and F4.34.
1 . . . AIV, Voltage input	100 % = 10 V (A4.00)
2 . . . AIC, Current input	100 % = 20 mA (A4.02)
3 . . . AI_2, Current input I/O card no.1	100 % = 20 mA (A4.04)
4 . . . AI_3, Current input I/O card no.2	100 % = 20 mA (A4.06)
5 . . . Preset.ref.	100 % = 100 %, 100 % = 163.84 Hz (A4.08)
6 . . . REM-MP ref. (+/- speed, remote)	100 % = 100 %, 100 % = 163.84 Hz (A4.10)

Analogue input filter 1 of comparators C1, C2, C3 and C4

F4.01	**C1 filter f. E1**	**VCB**	**0.0...*0.2*...160s**
F4.09	**C2 filter f. E1**	**VCB**	**0.0...*0.2*...160s**
F4.17	**C3 filter f. E1**	**VCB**	**0.0...*0.2*...160s**
F4.31	**C4 filter f. E1**	**VCB**	**0.0...*0.2*...160s**

Analogue input filter 2 of comparators C3 and C4

F4.19	**C3 filter f. E2**	**VCB**	**0.0...*0.2*...160s**
F4.33	**C4 filter f. E2**	**VCB**	**0.0...*0.2*...160s**

Value of the fixed reference for the comparator (see F4.18 and F4.32)

F4.02	**C1 Reference**	**VCB**	**-200.0...*0.0*...+200.0%**
F4.10	**C2 Reference**	**VCB**	**-200.0...*0.0*...+200.0%**
F4.20	**C3 Reference**	**VCB**	**-200.0...*0.0*...+200.0%**
F4.34	**C4 Reference**	**VCB**	**-200.0...*0.0*...+200.0%**

Selection of the comparison type for the different comparator blocks

F4.03	**C1 compFunction**	**VCB**	**E1 > E2**
F4.11	**C2 compFunction**	**VCB**	**E1 > E2**
F4.21	**C3 compFunction**	**VCB**	**E1 > E2**
F4.35	**C4 compFunction**	**VCB**	**E1 > E2**
	0 . . . E1 > E2 1 . . . E1 < E2 2 . . . E1 = E2 3 . . . E1 ! = E2		

Hysteresis on comparator input E1

F4.04	**C1 comHyst/Band**	**VCB**	**0.0...*5.0*...100.0 %**
F4.12	**C2 comHyst/Band**	**VCB**	**0.0...*5.0*...100.0 %**
F4.22	**C3 comHyst/Band**	**VCB**	**0.0...*5.0*...100.0 %**
F4.36	**C4 comHyst/Band**	**VCB**	**0.0...*5.0*...100.0 %**

Hysteresis operates symmetrically. See diagram below :

Response for functions : E1 > E2 or E1 < E2

Response for functions : E1 = E2 or E1 ≠ E2

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F4. Function blocks

Assignment of the logic function block input

F4.23	**C3 Input D1**	**VCB**
F4.24	**C3 Input D2**	**VCB**
F4.37	**C4 Input D1**	**VCB**
F4.38	**C4 Input D2**	**VCB**
F4.44	**L5 signal D1**	**VCB**
F4.45	**L5 signal D2**	**VCB**
F4.50	**L6 signal D1**	**VCB**
F4.51	**L6 signal D2**	**VCB**

States	Logic at 1 if :
0 . . . State ZERO	Input at state 0 and does not change to 1
1 . . . Ready	Drive enabled, no faults, motor not controlled
2 . . . Run	Drive enabled, direction of operation enabled, reference level not taken into account
3 . . . Trip	Fault, before being reset
4 . . . Ready+Run	Takes one or other condition into account
5 . . . Alarm	Following programming of an alarm fault E2.01, E2.08, E2.09
6 . . . Bus-alarm	Following a break in the communication link
7 . . . Generat.oper	Drive in generator mode
8 . . . Local	Drive control in local mode
9 . . . f = f-Ref	Frequency reference = motor stator frequency
10 . . f > f-level	Motor frequency > threshold frequency in D4.06. Relay de-energized if motor frequency < threshold frequency in D4.07.
11 . . Start-impuls	Forward or reverse operation via a pulse command
12 . . DI1	Logic input DI1 at 1
13 . . DI2	Logic input DI2 at 1
14 . . DI3	Logic input DI3 at 1
15 . . DI4	Logic input DI4 at 1
16 . . DI5_2	Logic input I/O option card DI5_2 at 1
17 . . DI6_2	Logic input I/O option card DI6_2 at 1
18 . . DI7_2	Logic input I/O option card DI7_2 at 1
19 . . DI8_2	Logic input I/O option card DI8_2 at 1
20 . . DI5_3	Logic input I/O option card DI5_3 at 1
21 . . DI6_3	Logic input I/O option card DI6_3 at 1
22 . . DI7_3	Logic input I/O option card DI7_3 at 1
23 . . DI8_3	Logic input I/O option card DI8_3 at 1
24 . . State 1	Input at state 1 and does not change to 0
25 . . Lift Brake	Request to lift brake
26 . . Thyrist.-ON	DC bus capacitors charged, thyristors fully open
27 . . Limit I>	Motor current has reached the current limit of the drive, heatsink temperature too high. Available at a later date.
28 . . Limit V>	DC bus voltage has reached the voltage threshold causing a reduction in the motor frequency
29 . . Lim.temp>	Motor temperature calculated by the drive higher than the maximum motor temperature.
30 . . Limit	One of the drive limits has been reached
31-32 . . Reserved	
33 . . Out.comp.C1	Logic output of comparator C1
34 . . Out.comp.C2	Logic output of comparator C2
35 . . Out.comp.C3	Logic output of comparator C3
36 . . Out.comp.C4	Logic output of comparator C4
37 . . Out.log. L5	Logic output of logic block L5
38 . . Out.log. L6	Logic output of logic block L6
39-40 . . Reserved	
41 . . Bus Cont.W 11	Bit 11 at 1
42 . . Bus Cont.W 12	Bit 12 at 1
43 . . Bus Cont.W 13	Bit 13 at 1
44 . . Bus Cont.W 14	Bit 14 at 1
45 . . Bus Cont.W 15	Bit 15 at 1

Selection of the logic function type for the different blocks

F4.25	**C3 log.'a'funct**	**VCB**
	Function type for logic block “a” at the output of comparator C3 (see diagram on page 103).	
F4.26	**C3 log.'b'funct**	**VCB**
	Function type for logic block “b” at the output of comparator C3 (see diagram on page 103).	
F4.39	**C4 log.'a'funct**	**VCB**
	Function type for logic block “a” at the output of comparator C4 (see diagram on page 103).	
F4.40	**C4 log.'b'funct**	**VCB**
	Function type for logic block “b” at the output of comparator C4 (see diagram on page 103).	
F4.46	**L5 logic funct.**	**VCB**
	Function type for logic block L5 (see diagram on page 103).	
F4.52	**L6 logic funct.**	**VCB**

Function type for logic block L6 (see diagram on page 103).

0 . . . AND
1 . . . OR
2 . . . EQUAL
3 . . . UNEQUAL
4 . . . AND $\overline{Dx}$. Not input D1 or D2, according to selection of logic block a or b.
5 . . . OR $\overline{Dx}$ Not input D1 or D2, according to selection of logic block a or b.
6 . . . EQUAL $\overline{Dx}$ Not input D1 or D2, according to selection of logic block a or b.
7 . . . UNEQUAL $\overline{Dx}$ Not input D1 or D2, according to selection of logic block a or b.

Logic input D1 is taken into account on logic block a.
Logic input D2 is taken into account on logic block b.

Table of logic functions with D2 :

D1	D2	AND	OR	EQUAL	NOT EQUAL
0	0	0	0	1	0
0	1	0	1	0	1
1	0	0	1	0	1
1	1	1	1	1	0

Table of logic functions with $\overline{D2}$:

D1	$\overline{D2}$	AND	OR	EQUAL	NOT EQUAL
0	1	0	1	0	1
0	0	0	0	1	0
1	1	1	1	1	0
1	0	0	1	0	1

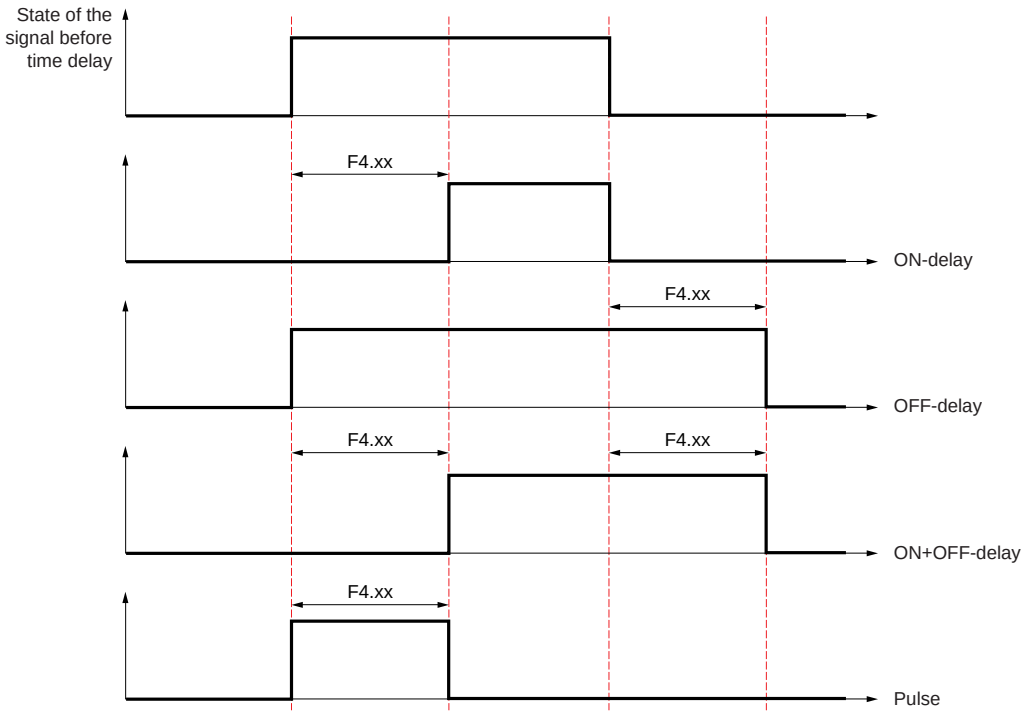
F4. Function blocks

Selection of the time delay at the comparator output

F4.05	**C1 time-funct**	**VCB**	
F4.13	**C2 time-funct**	**VCB**	
F4.27	**C3 time-funct**	**VCB**	
F4.41	**C4 time-funct**	**VCB**	
F4.47	**L5 time-funct**	**VCB**	
F4.53	**L6 time-funct**	**VCB**	
	0 . . . ON-delay	Time delay for the output to change from 0 → 1. If the time it takes for the output to change state is shorter than the time delay set, the signal maintains its state at the end of the time delay.	
	1 . . . OFF-delay	Time delay for the output to change from 1 → 0	
	2 . . . ON+OFF-delay	Time delay for the output to change from 0 → 1 et 1 → 0. If the time it takes for the output to change state is shorter than the time delay set, the signal maintains its state at the end of the time delay.	
	3 . . . Impulse	Pulsed output on changing from 0 to 1 or 1 to 0. Setting of the pulse duration.	

Duration of the time delay selected in F4.05, F4.13, F4.27, F4.41, F4.47 and F4.53.

F4.06	**C1 time-set**	**VCB**	**0.0...*0.0*...3200 s**
F4.14	**C2 time-set**	**VCB**	**0.0...*0.0*...3200 s**
F4.28	**C3 time-set**	**VCB**	**0.0...*0.0*...3200 s**
F4.42	**C4 time-set**	**VCB**	**0.0...*0.0*...3200 s**
F4.48	**L5 time-set**	**VCB**	**0.0...*0.0*...3200 s**
F4.54	**L6 time-set**	**VCB**	**0.0...*0.0*...3200 s**



F4. Function blocks

Assignment of the function block output

These parameters define what actions the drive must perform if all the conditions of the function blocks are fulfilled.

F4.07	**C1 selection**	**VCB**	**not used**
F4.15	**C2 selection**	**VCB**	**not used**
F4.29	**C3 selection**	**VCB**	**not used**
F4.43	**C4 selection**	**VCB**	**not used**
F4.49	**L5 selection**	**VCB**	**not used**
F4.55	**L6 selection**	**VCB**	**not used**

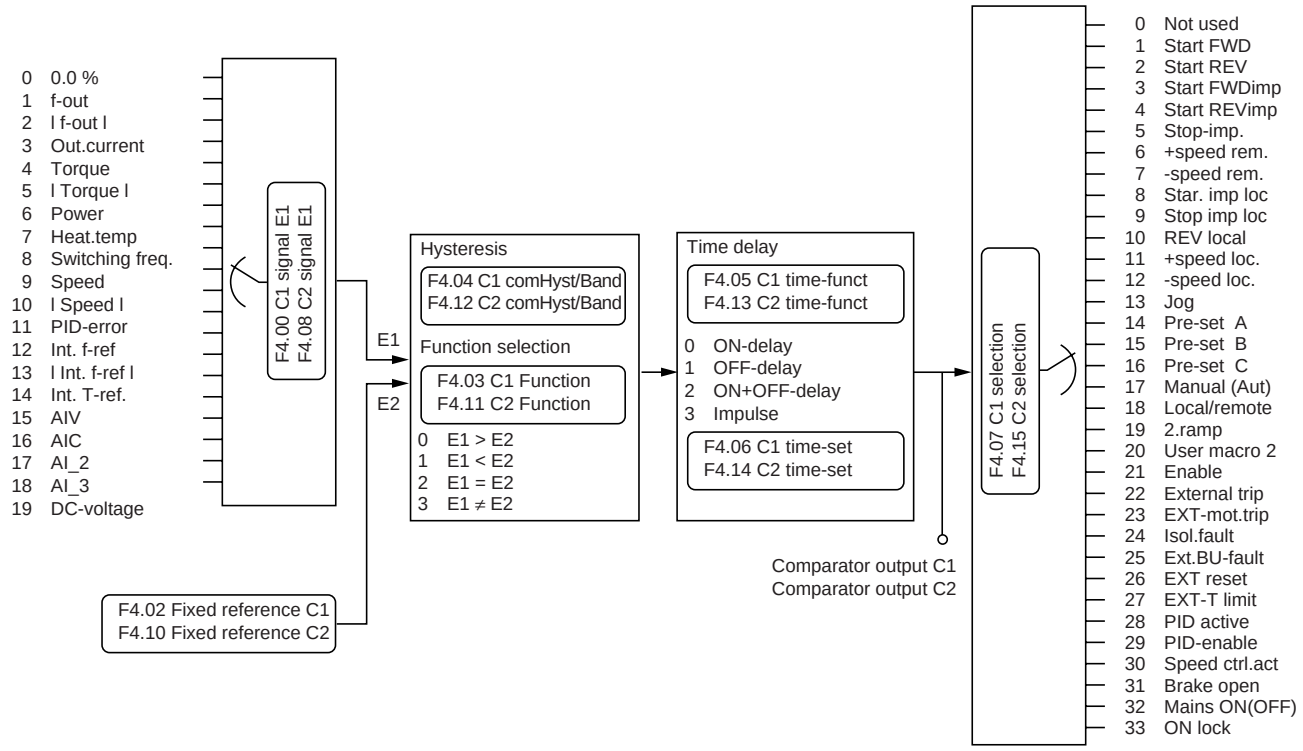
0 . . . Not used	Input not assigned
1 . . . Start FWD	Forward operation
2 . . . Start REV	Reverse operation
3 . . . Start FWDimp	Forward operation via a pulse command
4 . . . Start REVimp	Reverse operation via a pulse command
5 . . . Stop-imp.	Stop via a pulse command
6 . . . +speed rem.	Increase speed using remote control
7 . . . -speed rem.	Decrease speed using remote control
8 . . . Star.imp loc	Run via a pulse command using local control
9 . . . Stop imp loc	Stop via a pulse command using local control
10 . . REV local	Reverse operation using local control
11 . . +speed loc.	Increase speed using local control
12 . . -speed loc.	Decrease speed using local control
13 . . Jog	Jog command
14 . . Pre-set A	Logic input A, Preset speeds
15 . . Pre-set B	Logic input B, Preset speeds
16 . . Pre-set C	Logic input C, Preset speeds
17 . . Manual (Aut)	Manual or automatic mode command. If the output is set to 1, “Manual” mode is selected
18 . . Local/remote	Local or remote mode command. If the output is set to 1, “Local” mode is selected
19 . . 2.ramp	Ramp 2 or ramp 1 command
20 . . User macro 2	Selection of macro 2 or 1. If the output is set to 1, user macro 2 is selected
21 . . Enable	Drive enable command
22 . . External trip	External fault (Setting in E3.02)
23 . . EXT-mot.trip	External motor fault (Setting in E2.11)
24 . . Isol.fault	Isolation fault (Setting in E3.04)
25 . . Ext.BU-fault	External braking unit fault (Setting in E3.06)
26 . . EXT reset	Resetting once faults eliminated
27 . . EXT-T limit.	External torque limit
28 . . PID active	Activation of the PID controller
29 . . PID-enable	Enabling the action of the PID gains
30 . . Speed ctrl.act	Closed loop speed control
31 . . Brake open	Management of the brake open contact
32 . . Mains ON(OFF)	Disable drive using an external emergency stop. Only if the line contactor control function is activated.
33 . . ON lock	Disable drive on external accessory faults
34 . . Force local	Local control mode only
35 . . Paramet-lock	Prevents parameter modification

The output of the comparator or logic block can be processed internally without going via a relay output and a logic input.

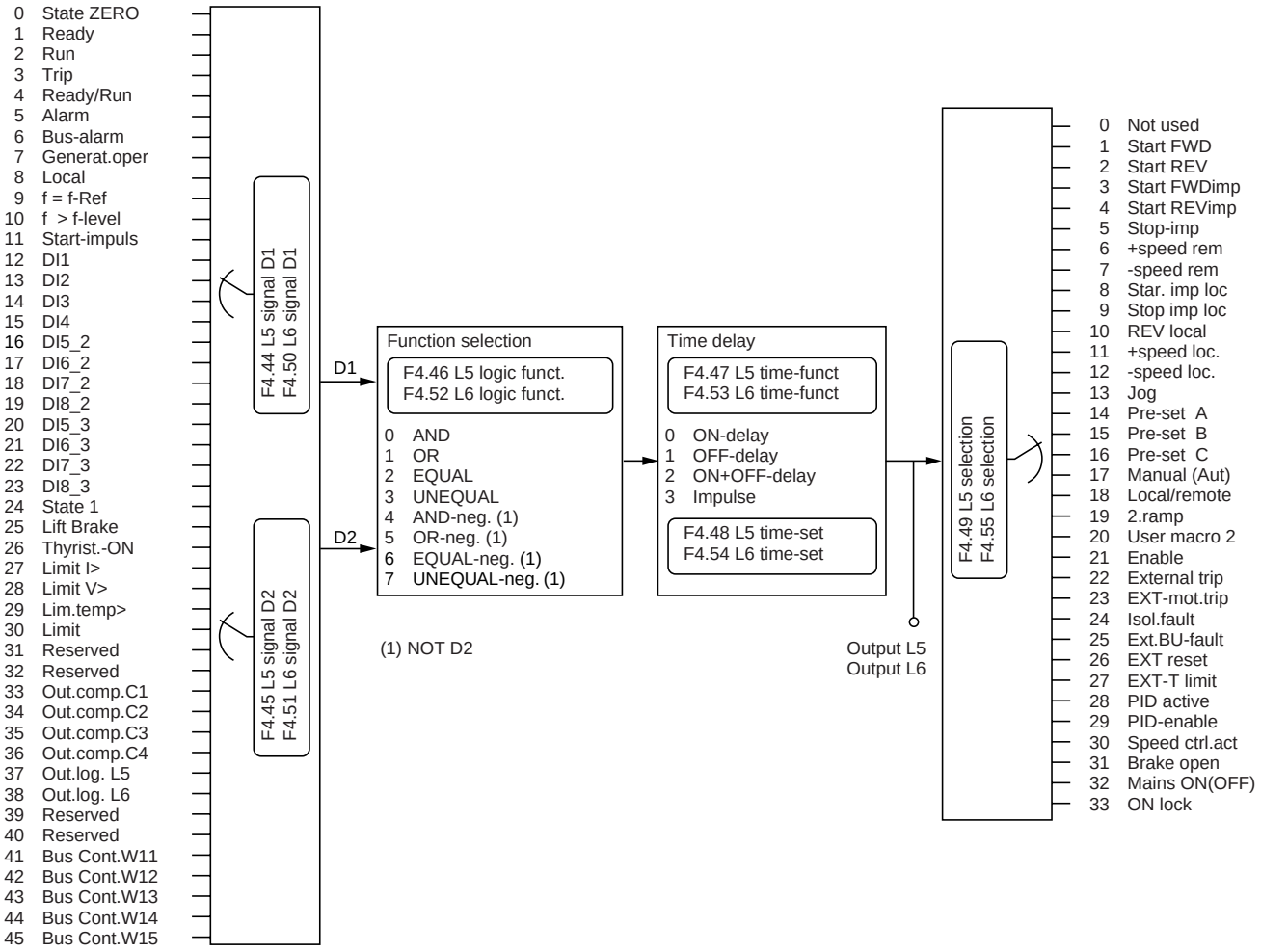
Each function can be selected once only. The output of the function block cannot be assigned if it has already been assigned to a D2 logic input, another comparator or a logic block.

F4. Function blocks

Block diagram of comparators C1 and C2

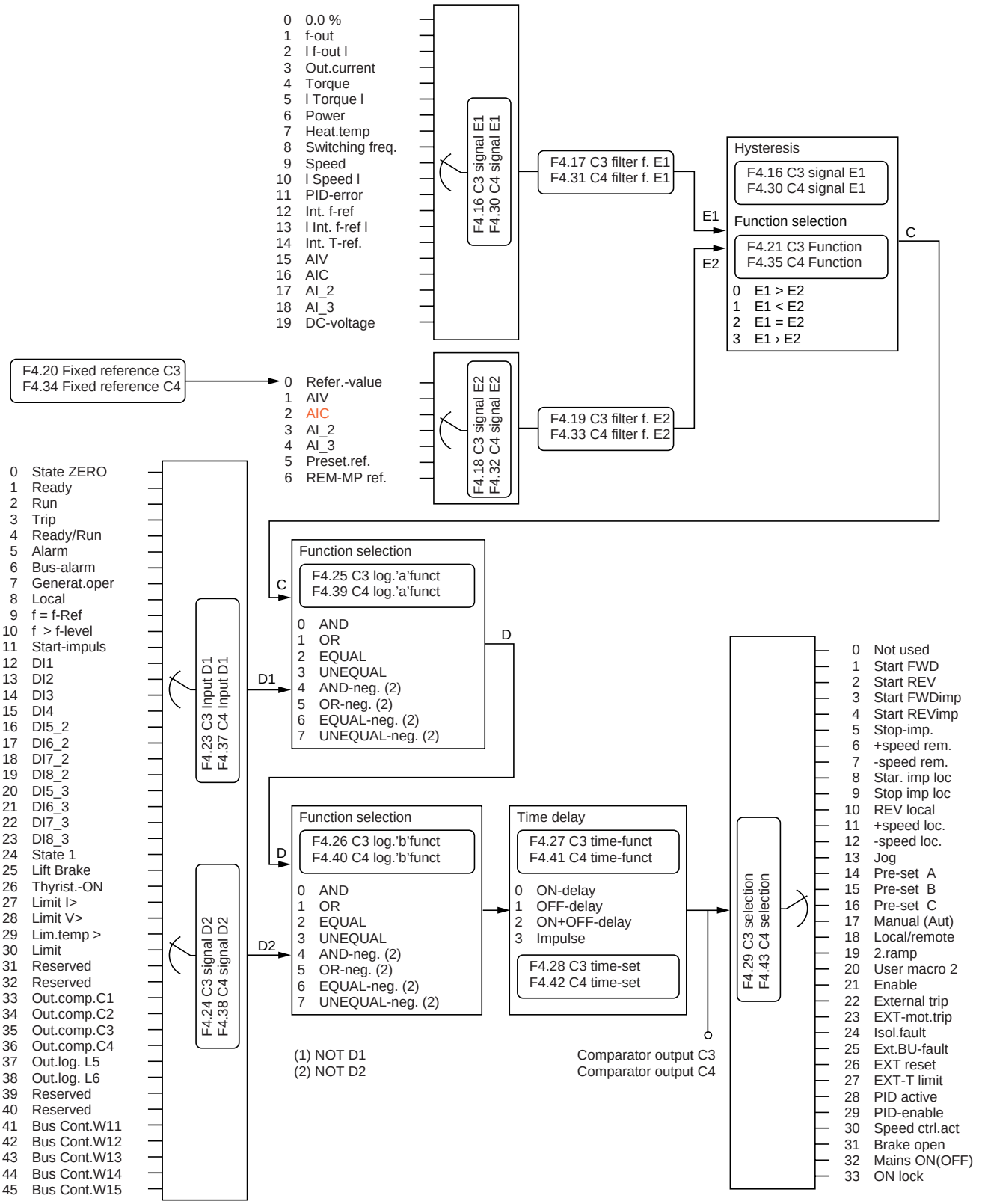


Block diagram of logic blocks L5 and L6



F4. Function blocks

Block diagram of a comparator with logic blocks C3 and C4



F5. Zero adjustment

Adjustment of current transformers for the different switching frequencies

F5.00	**SensorA-Offset**	**Read only**	
F5.01	**SensorB-Offset**	**Read only**	
	Parameters F5.00 and F5.01 display the current settings of the current transformers. The values can be modified using the corresponding parameters F5.02 to F5.06 if necessary. Wait until the drive is stationary (approximately 5 minutes).		
F5.02	**SensA5kHz-Off.**	**VCB**	**-1000...*0*...+1000**
F5.03	**SensB5kHz-Off.**	**VCB**	**-1000...*0*...+1000**
F5.04	**SensA10kHz-Off.**	**VCB**	**-1000...*0*...+1000**
F5.05	**SensB10kHz-Off.**	**VCB**	**-1000...*0*...+1000**

These parameters do not have to be set. Schneider internal use only.

F6. Code lock

Code to lock parameter access

F6.00	**Code**	**VB**	**0...*0*...9999**
F6.01	**Code value**	**VB**	**0...*0*...9999**
	Select an access code between 0 and 9999. Enter this code in F6.01. To unlock, the code value entered in F6.00 must correspond to that of the security code in F6.01. Each time the mains is activated, parameter F6.00 is reset to zero.		
F6.02	**Paramet.-Access**	**V**	**Keypad**
	0 . . . Keypad 1 . . . Communication link 2 . . . RS232 (PC)		

Setup / Maintenance

Contents

PC setup software : VW3-A68331

Installation and operating recommendations

1. Hardware required

Use cable VW3-A68332 to connect the computer to the drive. This cable connects one of the computer serial ports to the RJ45 socket on the control card in X4.

2. Minimum configuration required

Minimum : PC with a Pentium 100 microprocessor, Windows 95, 16 Mb of RAM and enough disk space for the program and data created.
Recommended : PC with a Pentium 233 microprocessor, Windows 95, Windows 98 or Windows NT; 32 Mb of RAM and enough disk space for the program and data created.

3. Software specifications

The setup software provides the following functions :

a. Local control

This function is used for on-line monitoring and control of a frequency converter. The "Local" button is used to switch from Monitoring mode to Control mode.
The content of the analogue indicators and some digital display areas can be modified using the “Parameter setting” tab (Menu B6 “Communication parameter”, parameter group B6.08, B6.10, B6.12, B6.14, B6.16 and from B6.23 to B6.27).

b. Oscilloscope

This function is used to record up to 5 analogue states and 8 digital states during operation. The actual analogue values and some of the actual digital values can be modified using the “Parameter setting” tab (B6 “Communication menu”, parameter groups B6.08, B6.10, B6.12, B6.14, B6.16 and from B6.23 to B6.27).
To start or complete recording, press the Record button (maximum recording time : 200 s). A trigger is available in B6.30 whose level and storage area can be set (eg : 100 ms before and 100 ms after).

c. Parameter setting

All the parameters can be called up on-line and modified using the menus given in the matrix tables. If a parameter is to be not only displayed but also modified, the commands “modify parameter” and then “send” must be used so that it is taken into account.
Changes are stored in the drive using parameter A1.00 : storage by the operator or automatic storage 5 minutes after the last modification of a parameter.

d. List of parameters / Printing

This function is used to archive configurations (saving to hard or floppy disk). It is also possible to transfer the stored parameter data to an unlimited number of drives.
When a configuration stored on one drive is loaded into another drive, we recommend restarting the B3 “motor data” menu and repeating the autotuning procedure in B4.
The Print button is used to print out a complete list of parameters (including actual values if required). It is also possible to print out only those settings which are different from the factory settings.

e. ATV68-SOFT server

The server is an independent program which opens automatically when the setup software is started.

4. Operating recommendations

The setup software package cannot be used with versions of frequency converter software lower than PSR4!

In order to guarantee optimum performance, we recommend disabling any screen savers used.
The reaction time of the program is automatically increased if several windows are open at the same time. For this reason we recommend closing windows which are not being used.

A1.00	Save Backup	VB	Program

0 Start 0 → 1 Switch to 1 to store using the key –.
1 Store Backup
2 Stored

When the drive is configured using the programming terminal, modified parameters are stored in the drive memory by returning to menu A1.
Unlike the programming terminal, when parameters are modified using the setup software, storage is not automatic. Storage in the drive memory must be requested using A1.00.

A1.01	Device-Mode	Read only

0 „ “
1 Mains disc.
2 Locked
3 Mains off
4 Disabled
5 Stop
6 Loading
7 Not enabled
8 Mains miss.
9 Trip
10 Autotuning
11 Test power p

These parameters correspond to display A1 of the drive status over the largest display area.

A1.02	Operate-Mode	Read only

0	Remote only	
1	Rem/Loc	Remote reference, local control
2	Loc/Rem	Local reference, remote control
3	Local only	
4	Bus	
5	Bus/Local	Reference by communciation link/Control local
6	Loc Bus	Reference local/Control by communication link
7	Local only	

These parameters correspond to display A1 of the drive “control mode”.

A1.03	Device status	Read only

This parameter shows the drive status with the following priorities :

- Control mode (lowest priority)
- Parameter selected
- Limit active
- Fault (highest priority)

A1.04	LED-state	Read only

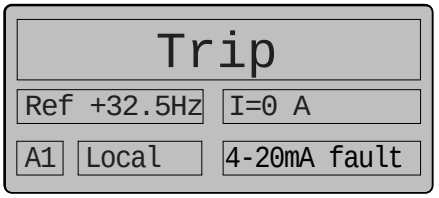
0 Not READY
1 Ready
2 Run
3 Trip

This menu shows the state of the LEDs on the programming terminal (operating state of the drive).

Faults - causes - remedies

Signalling faults

When a fault occurs the drive is disabled and any stored run commands are cancelled (local control or fleeting contact). The fault signal is then displayed in the status sector.



The F1-Help menu is used each time a fault is signalled to display further information for trouble-shooting.

How is a fault reset?

A fault can be reset as follows :

- by pressing the STOP/RESET key on the keypad
- by switching the drive supply off (Mains + 24 V)
- using a logic input assigned to parameters D2.00 to D2.10
- by activating the automatic reset function, parameter E3.00
- using the serial link

If permanent contacts FWD or REV are used, the motor restarts automatically once the fault has been reset.

Display of limit messages :

Display	Description and possible causes
(20) delta Ud >	DC bus charging circuit open during an operating mode because of an undervoltage. Drive disabled.
(22) U-Motor	Drive disabled because the motor voltage is higher than the DC bus voltage (with a sine filter).
(25) U-DC limit.	The drive is in generator mode (fast deceleration) and it increases the deceleration time.
(26) I-limit.mot	Operation in motor phase. The motor current has reached the limit current of the drive. The drive reduces the frequency.
(27) I-limit.gen.	Operation in generator phase. The motor current has reached the limit current of the drive. The drive increases the frequency.
(28) f-skip	The internal frequency reference is within the skip frequencies.
(29) Motortemp.	Motor temperature too high. The drive reduces the output current. See E2.02 and E2.05.
(30) Drive temp.	Heatsink temperature too high. Automatic reduction of the output current by the drive.

Faults - causes - remedies

Alarms :

Display	Description and possible causes
(33) Memory fail	EEPROM fault alarm (too many write operations in the fault memory). Only one more fault can be stored. Change the EEPROM.
(34) DSP (35) Language 1 (36) Language 2 (37) Language 3 (38) Language 4 (39) Font (40) Bitmap	Fault in part of the drive software. → Change the EEPROM
(49) Bus Comm.2	The control word of the PLC (Master) does not contain "Control OK". Bit 10 is set to 0 by the communication link, PLC fault.
(50) Undervltg1	Undervltg1 : undervoltage fault while operating if the undervoltage time is greater than E3.07. Alarm programming in E3.08.
(51) Mot. Temp (52) Therm. SC	Monitoring of the PTC probe is programmed on an alarm in E3.01.
(53) Overspeed	Monitoring of the maximum speed is programmed on an alarm in E2.09.

Error messages :

(Priority) Error message	Help-F1 Parameter	Description and possible causes
(34) Overvoltage	F1.02	**Overvoltage in the DC circuit** Deceleration too short? Mains voltage too high? External braking device connected and OK?
(51) Undervltg1 (52) Undervltg2	F1.03	**Undervoltage in the DC circuit** Mains present? All phases present? Fuses intact? Undervltg1 : undervoltage fault while operating if the undervoltage time is greater than E3.07. Undervltg2 : fault on powering up if the function for controlling the line contactor by the drive is selected and if the DC bus (thyristors fully open) is not completely charged after 2 seconds.
(33) Overcurr.1 (40) Overcurr.2	F1.04	**Overcurrent at the drive output** Test the power stage (F1.00) Short-circuit? Earth fault? Overcurr.1: I>>, overcurrent 2 : differential fault I>>
(54) External trip	F1.05	**External fault** An external fault is seen at the terminals. Correct setting in parameter E3.02?
(57) 4mA-fault	F1.06	**4-20 mA fault** A 4-20 mA setpoint is less than 3 mA ->Open circuit? E3.01?
(58) Mot. Temp >	F1.07	**Motor thermistor temperature exceeded?** Motor overload? Auxiliary fan operating correctly?
(59) Therm SC	F1.08	**Thermistor short-circuited** Check the wiring
(55) EXT-mot.trip	F1.09	**External motor fault** An external motor fault is seen at the terminals Correct setting in parameter E2.11?

Faults - causes - remedies

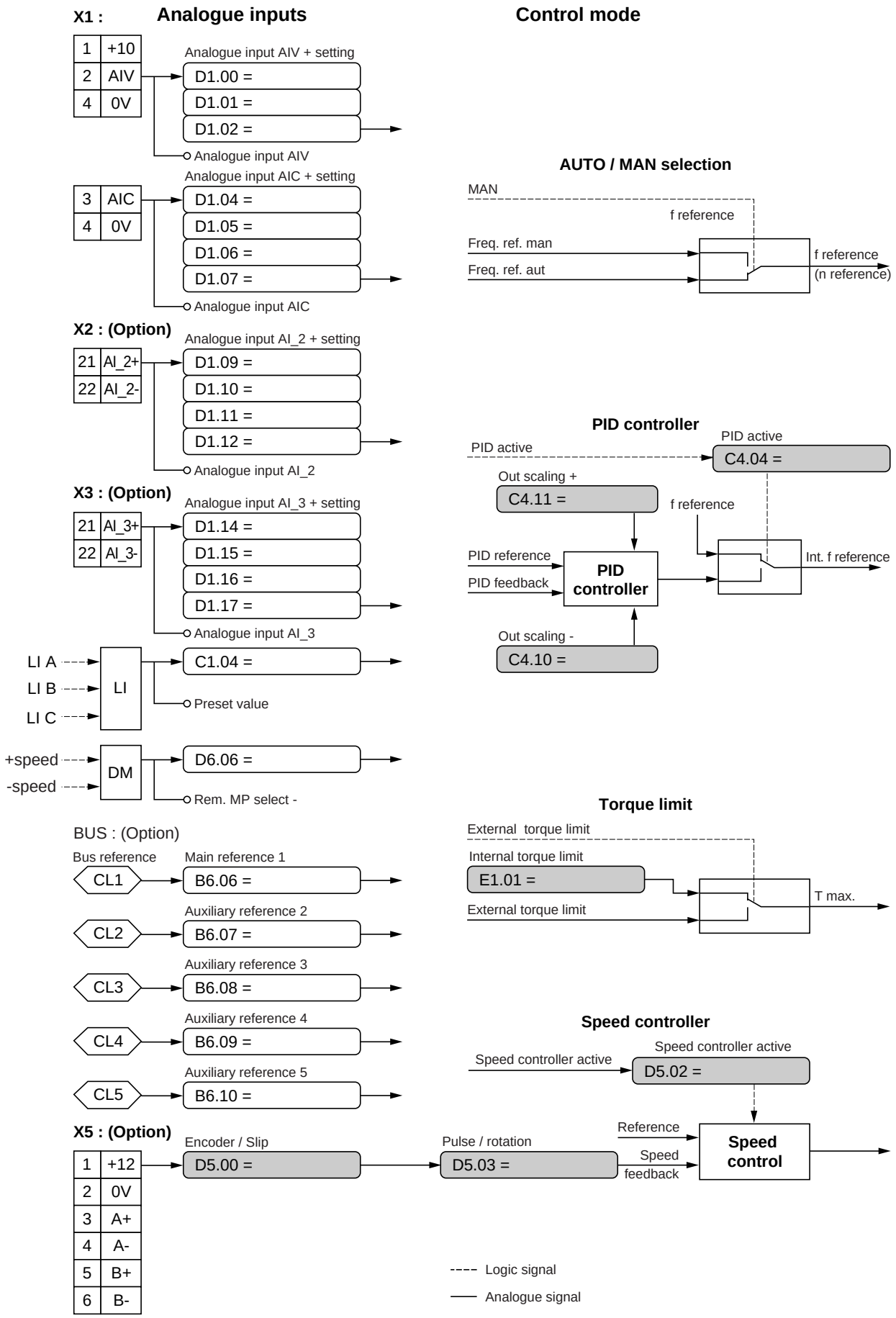
(Priority) Error message	Help-F1 Parameter	Description and possible causes
(60) Mot.Overl.	F1.10	**Motor overload! (Motor thermal calculation by the drive)** Motor overload, thermal characteristics exceeded See parameters E2.02 to E2.07
(61) Stall prot	F1.11	**Mechanical stall protection** The motor does not start, it is mechanically stalled or overloaded
(56) Isol.fault	F1.12	**Isolation fault** Isolation fault in the cable or motor earth.
(64) Ext.BU-fault	F1.13	**External braking unit fault**
(62) Mot.overspeed	F1.14	**Motor overspeed** Speed greater than the limit defined in parameter E2.10
(63) Encoder trip	F1.15	**Fault in the encoder or encoder feedback option card.**
(49) Overtemp.1(47) Overtemp.2	F1.16	**Excessive heatsink temperature** Check the fan Check enclosure ventilation and state of filters Ambient temperature too high? The drive distinguishes 2 types of overtemperature : Overtemp.1 : heatsink temperature too high Overtemp.2 : parameter A3.03 (heatsink temperature) is - higher than 100°C : heatsink temperature exceeded or short-circuit on a temperature probe - lower than -25°C : open circuit
(41) ZB Temp.	F1.17	**Excessive temperature on the CPU card** Apply mains voltage - the fan of the power stage being supplied from the intermediate circuit
(36) Power	F1.18	**Fault in the power stage** Change the units concerned.
(35) AR-Flt.1.0 (48) AR-Flt.2.0 (10) AR-Flt.3.0 (11) AR-Flt.3.1 (23) AR-Flt.3.2	F1.19	**Fault in the daughter board of the CPU card** Change the units concerned. The drive distinguishes three types : 1.0 : Reference voltage fault 2.0 : ASIC fault, change the CPU card 3.x : EEPROM fault, change the CPU card
(15-18, 20) Int.Com 1.0 to 1.4 (19) Int.Com2.0 (37) Int.Com3.0	F1.20	**Internal communication fault** Reset? Change the electronics (CPU card, control card) The drive distinguishes 3 types of fault : Int.Com1.0 to 1.4 : communication check - no dialogue Int.Com2.0 : CPU program failed or transmission fault Int.Com3.0 : disabling fault, interference on input DI5
(1) UI-Flt.1.0 (2) UI-Flt.2.0 (3) UI-Flt.2.1 (4-6) UI-Flt.3.0 to 3.2 (7-9) UI-Flt.4.0 to 4.2 (12) UI-Flt.5.0 (13) UI-Flt.6.0 (14) UI-Flt.7.0	F1.21	**Control card fault** Test the control circuit Change the control card The drive distinguishes 7 types of fault : UI-Flt.1.0 : Processor fault (change the control card) UI-Flt.2.0 : Code fault (change the memory and control card) UI-Flt.2.1 : Code fault (change the memory) UI-Flt.3.0 : Task overflow (change the memory and control card) UI-Flt.4.0 : Back-up fault (change the memory) UI-Flt.5.0 : LCD display fault (change the control card) UI-Flt.6.0 : FLASH memory fault (change the memory) UI-Flt.7.0 : Display register fault (change the control card)
(53) Crane overload	F1.22	**Load too high** Error betweeen the reference and actual speed of the motor. See C6.10. Drive cooling insufficient

Faults - causes - remedies

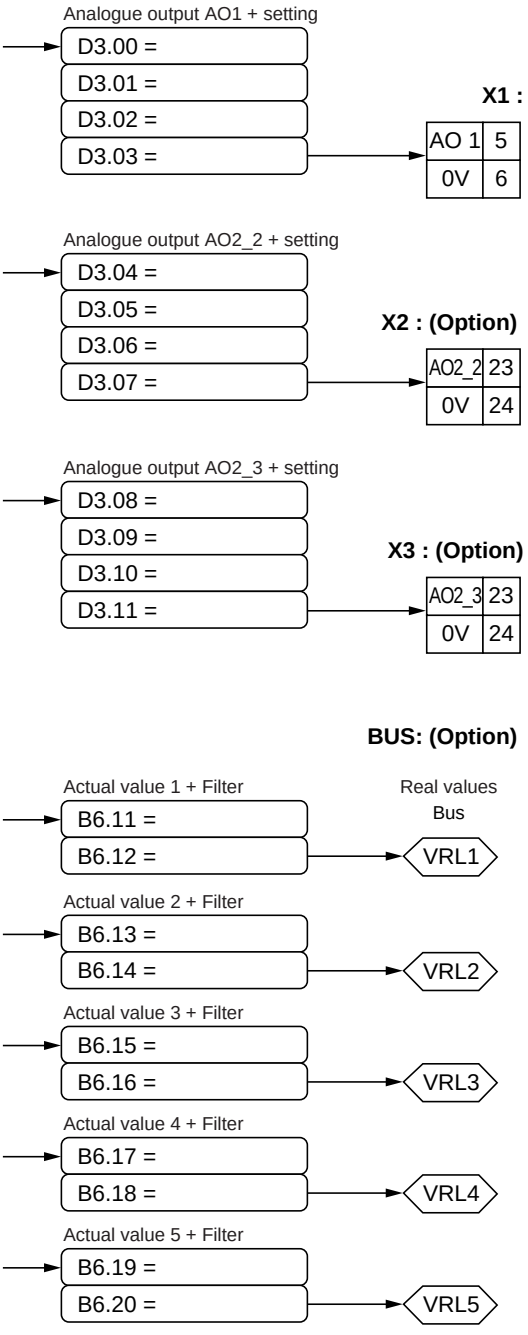
(Priority) Error message	Help-F1 Parameter	Description and possible causes
(22) Bus comm. 1	F1.23	**Watchdog :** fault during exchange of data between the PLC (Master) and the Profibus communication card. The drive has not received a request from the PLC (Master) for a period of time greater than the time selected. Communication link or PLC fault.
(50) Bus comm. 2	F1.24	**The control word of the PLC (Master) does not contain "Control OK"** Bit 10 is set to 0 by the communication link, PLC fault.
(21) Com.card-Flt	F1.25	**Profibus option card initialization fault** Profibus card connection or assembly fault. Profibus card fault.
(65) Charge protect.	F1.26	**Thermal fault on the DC bus charging resistors** The drive powering up procedures are too close together and too high : the resistor cooling time lasts approximately 5 minutes. The charging circuit is faulty.
(66) ON lock	F1.27	**An input has been assigned to “ON lock”** Check the state of the accessories which are monitored by the input selected on “ON lock” (D2) (fuses, contactor, fan, external charging circuit). Logic input at 0 (contact open) : disabling of the drive and the message “ON lock” appears.
(0) +24V off	F1.28	**This is not a fault.** The drive shows that the 24V of the control card is not supplied : see internal connection of the control card, 24V external supply on the terminals.
(32) Fault Histo.	F1.29	**This error message is present in F3.03 when the drive leaves the factory** - it should not be taken into account. It is deleted as soon as a new fault is detected. If this message reappears subsequently, there is a problem with storing the fault log. This message does not disable the drive which continues to operate correctly but faults are not stored. The EEPROM in the control card must be changed to eliminate this problem.

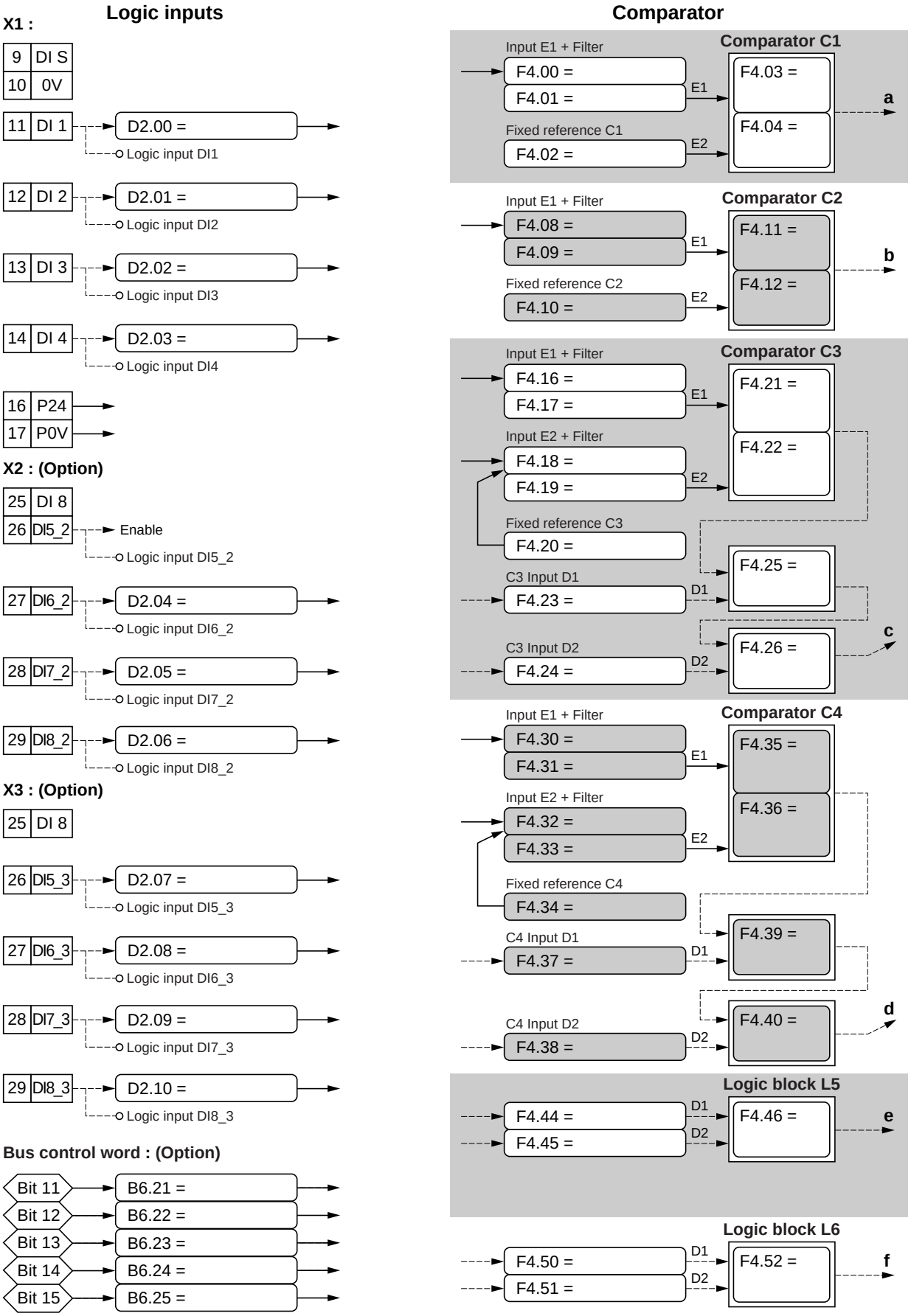
Configuration / settings tables

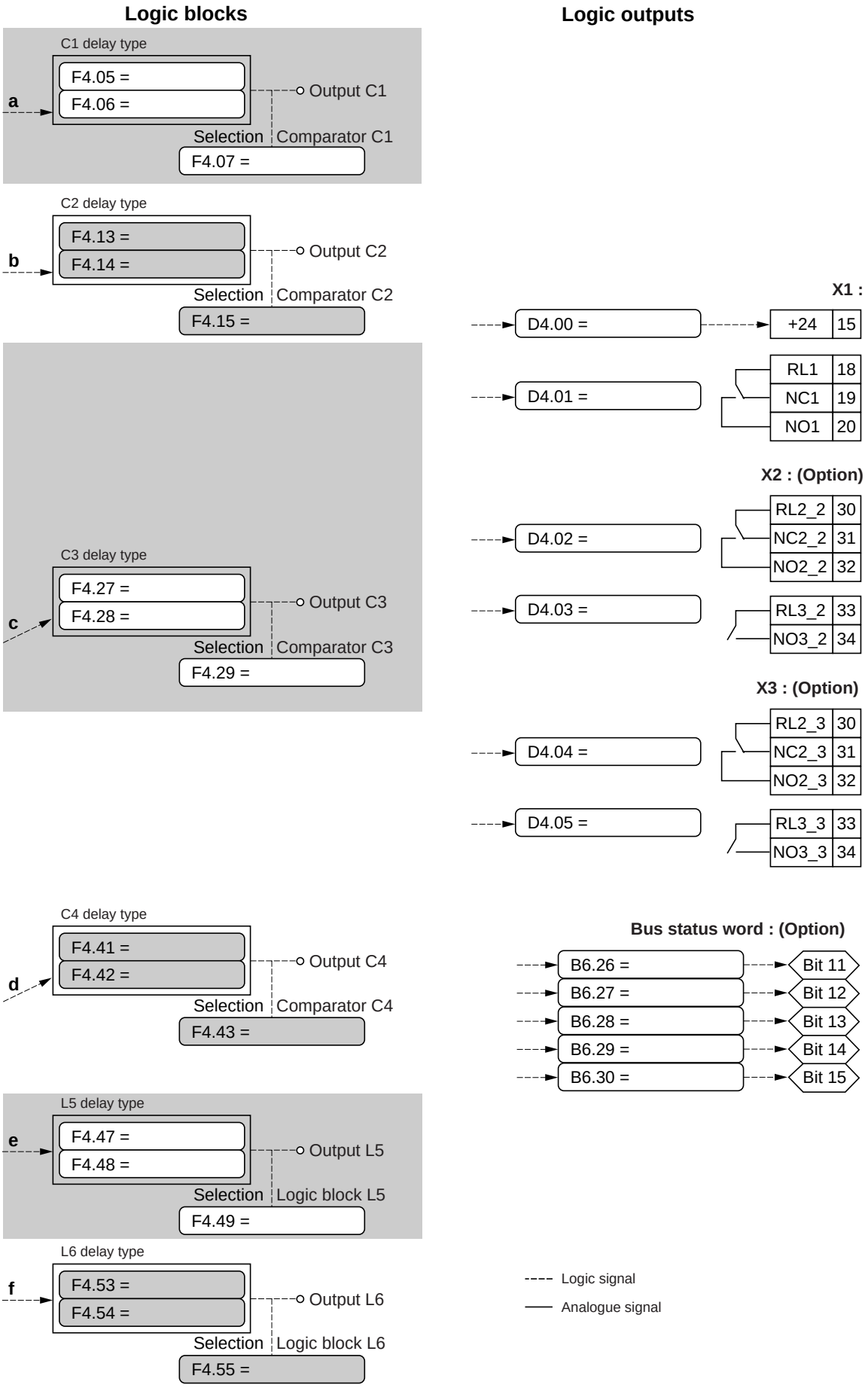
Contents


X1 :
Analogue inputs
1 +10
2 AIV
4 0V
Analogue input AIV + setting
D1.00 =
D1.01 =
D1.02 =
Analogue input AIV
3 AIC
4 0V
Analogue input AIC + setting
D1.04 =
D1.05 =
D1.06 =
D1.07 =
Analogue input AIC
X2 : (Option)
21 AI_2+
22 AI_2-
Analogue input AI_2 + setting
D1.09 =
D1.10 =
D1.11 =
D1.12 =
Analogue input AI_2
X3 : (Option)
21 AI_3+
22 AI_3-
Analogue input AI_3 + setting
D1.14 =
D1.15 =
D1.16 =
D1.17 =
Analogue input AI_3
LI A
LI B
LI C
LI
C1.04 =
Preset value
+speed
-speed
DM
D6.06 =
Rem. MP select -
BUS : (Option)
Bus reference
Main reference 1
CL1
B6.06 =
Auxiliary reference 2
CL2
B6.07 =
Auxiliary reference 3
CL3
B6.08 =
Auxiliary reference 4
CL4
B6.09 =
Auxiliary reference 5
CL5
B6.10 =
X5 : (Option)
1 +12
2 0V
3 A+
4 A-
5 B+
6 B-
Encoder / Slip
D5.00 =
Pulse / rotation
D5.03 =
Control mode
AUTO / MAN selection
MAN
f reference
Freq. ref. man
Freq. ref. aut
f reference
(n reference)
PID controller
PID active
PID active
C4.04 =
Out scaling +
C4.11 =
f reference
PID reference
PID feedback
PID controller
Int. f reference
Out scaling -
C4.10 =
Torque limit
External torque limit
Internal torque limit
E1.01 =
External torque limit
T max.
Speed controller
Speed controller active
Speed controller active
D5.02 =
Reference
Speed feedback
Speed control
Logic signal
Analogue signal

Analogue outputs




Logic inputs
X1 :
9 DI S
10 0V
11 DI 1
D2.00 =
Logic input DI1
12 DI 2
D2.01 =
Logic input DI2
13 DI 3
D2.02 =
Logic input DI3
14 DI 4
D2.03 =
Logic input DI4
16 P24
17 P0V
X2 : (Option)
25 DI 8
26 DI5_2
Enable
Logic input DI5_2
27 DI6_2
D2.04 =
Logic input DI6_2
28 DI7_2
D2.05 =
Logic input DI7_2
29 DI8_2
D2.06 =
Logic input DI8_2
X3 : (Option)
25 DI 8
26 DI5_3
D2.07 =
Logic input DI5_3
27 DI6_3
D2.08 =
Logic input DI6_3
28 DI7_3
D2.09 =
Logic input DI7_3
29 DI8_3
D2.10 =
Logic input DI8_3
Bus control word : (Option)
Bit 11
B6.21 =
Bit 12
B6.22 =
Bit 13
B6.23 =
Bit 14
B6.24 =
Bit 15
B6.25 =
Comparator
Comparator C1
Input E1 + Filter
F4.00 =
F4.01 =
E1
F4.03 =
F4.04 =
a
Fixed reference C1
F4.02 =
E2
Comparator C2
Input E1 + Filter
F4.08 =
F4.09 =
E1
F4.11 =
F4.12 =
b
Fixed reference C2
F4.10 =
E2
Comparator C3
Input E1 + Filter
F4.16 =
F4.17 =
E1
F4.21 =
F4.22 =
Input E2 + Filter
F4.18 =
F4.19 =
E2
Fixed reference C3
F4.20 =
F4.25 =
C3 Input D1
F4.23 =
D1
c
C3 Input D2
F4.24 =
D2
F4.26 =
Comparator C4
Input E1 + Filter
F4.30 =
F4.31 =
E1
F4.35 =
F4.36 =
Input E2 + Filter
F4.32 =
F4.33 =
E2
Fixed reference C4
F4.34 =
F4.39 =
C4 Input D1
F4.37 =
D1
d
C4 Input D2
F4.38 =
D2
F4.40 =
Logic block L5
F4.44 =
D1
F4.46 =
e
F4.45 =
D2
Logic block L6
F4.50 =
D1
F4.52 =
f
F4.51 =
D2


Logic blocks
C1 delay type
F4.05 =
F4.06 =
a
Output C1
Selection
Comparator C1
F4.07 =
C2 delay type
F4.13 =
F4.14 =
b
Output C2
Selection
Comparator C2
F4.15 =
C3 delay type
F4.27 =
F4.28 =
c
Output C3
Selection
Comparator C3
F4.29 =
C4 delay type
F4.41 =
F4.42 =
d
Output C4
Selection
Comparator C4
F4.43 =
L5 delay type
F4.47 =
F4.48 =
e
Output L5
Selection
Logic block L5
F4.49 =
L6 delay type
F4.53 =
F4.54 =
f
Output L6
Selection
Logic block L6
F4.55 =
Logic outputs
X1 :
D4.00 =
+24
15
D4.01 =
RL1
18
NC1
19
NO1
20
X2 : (Option)
D4.02 =
RL2_2
30
NC2_2
31
NO2_2
32
D4.03 =
RL3_2
33
NO3_2
34
X3 : (Option)
D4.04 =
RL2_3
30
NC2_3
31
NO2_3
32
D4.05 =
RL3_3
33
NO3_3
34
Bus status word : (Option)
B6.26 =
Bit 11
B6.27 =
Bit 12
B6.28 =
Bit 13
B6.29 =
Bit 14
B6.30 =
Bit 15
Logic signal
Analogue signal

Configuration/Settings table

❒ Drive rating : ❒ Identification ❒ Line voltage	
Serial no. :	
Setup date :	

Parameter adjustment							
Parameter	**Description**	**Macro M1** Conveyor, Piston pump, Separator	**Macro M2** Centr. pump, Exhaust fan, Fan	**Macro M3** Pump + PID	**Macro M4** Coiler, Test bench	**User Macro 1**	**User Macro 2**
A 2	**Motor values**						
A 2.10	Process scaling	1.000	1.000	1.000	1.000		
A 2.11	Machine scaling	1.000	1.000	1.000	1.000		
A 3	**Inverter values**						
A 3.05	Drive reference						
A 3.06	Nom.current 'C'						
A 3.07	Hardware vers.						
A 3.08	Software-type						
A 3.09	Software Vers.						
A 3.10	Serial No.						
A 6	**Display configuration**						
A 6.00	Select zone 1	Output freq.	Output freq.	Output freq.	Output freq.		
A 6.01	Select zone 2	Speed ref.	Speed ref.	Speed ref.	Speed ref.		
A 6.02	Select zone 3	Motor current	Motor current	Motor current	Motor current		
A 6.03	View limitation	Not visible	Not visible	Not visible	Not visible		
B 1	**Language selection**						
B 1.00	Select language						
B 2	**Macro configuration**						
B 2.01	Store USER-M1	Start 0 → 1	Start 0 → 1	Start 0 → 1	Start 0 → 1		
B 2.02	Store USER-M2	Start 0 → 1	Start 0 → 1	Start 0 → 1	Start 0 → 1		
B 2.03	Macro select.	**Conveyor**	**Centrif.pump**	**Pump+PID**	**Coiler**		
B 2.04	Multi-config.	not active	not active	not active	not active		
B 3	**Motor data**						
B 3.00	Nominal power						
B 3.01	Nominal current						
B 3.02	Nominal voltage						
B 3.03	Nominal freq.						
B 3.04	Nominal speed						
B 3.05	Line voltage						

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
B 3.06	reserved	not active	not active	not active	not active		
B 3.07	Output filter	not used	not used	not used	not used		
B 4	**Auto tune**						
B 4.00	Autotuning	Start 0→1	Start 0→1	Start 0→1	Start 0→1		
B 4.01	Rotor coeff.						
B 4.02	Rot.time const						
B 4.03	Stator R						
B 4.04	I-flux						
B 6	**Communication menu**						
B 6.00	Select bus	No bus	No bus	No bus	No bus		
B 6.01	Select remote	Terminals	Terminals	Terminals	Terminals		
B 6.02	Slave address	0	0	0	0		
B 6.03	Bus fault	Alarm	Alarm	Alarm	Alarm		
B 6.04	Delay B6.03	0.0 s	0.0 s	0.0 s	0.0 s		
B 6.05	ON after OFF1,3	Alarm	Alarm	Alarm	Alarm		
B 6.06	Main-reference1	not used	not used	not used	not used		
B 6.07	Aux.-reference2	not used	not used	not used	not used		
B 6.08	Aux.reference 3	not used	not used	not used	not used		
B 6.09	Aux.reference 4	not used	not used	not used	not used		
B 6.10	Aux.reference 5	not used	not used	not used	not used		
B 6.11	Actual val.1	Out.freq.sig	Out.freq.sig	Out.freq.sig	Out.freq.sig		
B 6.12	act 1 filt.time	0.10 s	0.10 s	0.10 s	0.10 s		
B 6.13	Aux.-act.val.2	n-output sig	n-output sig	n-output sig	n-output sig		
B 6.14	act 2 filt.time	0.10 s	0.10 s	0.10 s	0.10 s		
B 6.15	Aux.-act.val.3	Out.current	Out.current	Out.current	Out.current		
B 6.16	act 3 filt.time	0.10 s	0.10 s	0.10 s	0.10 s		
B 6.17	Aux.-act.val.4	Torque	Torque	Torque	Torque		
B 6.18	act 4 filt.time	0.10 s	0.10 s	0.10 s	0.10 s		
B 6.19	Aux.-act.val.5	Power	Power	Power	Power		
B 6.20	act 5 filt.time	0.10 s	0.10 s	0.10 s	0.10 s		
B 6.21	Bit 11 Contr.W	not used	not used	not used	not used		
B 6.22	Bit 12 Contr.W	not used	not used	not used	not used		
B 6.23	Bit 13 Contr.W	not used	not used	not used	not used		
B 6.24	Bit 14 Contr.W	not used	not used	not used	not used		
B 6.25	Bit 15 Contr.W	not used	not used	not used	not used		
B 6.26	Bit 11 Stat.-W	DI1	DI1	DI1	DI1		
B 6.27	Bit 12 Stat.-W	DI2	DI2	DI2	DI2		
B 6.28	Bit 13 Stat.-W	DI3	DI3	DI3	DI3		
B 6.29	Bit 14 Stat.-W	DI4	DI4	DI4	DI4		
B 6.30	Bit 15 Stat.-W	DI6_2	DI6_2	DI6_2	DI6_2		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
B 6.34	Com. PPO Type	Type 2	Type 2	Type 2	Type 2		
C 1	**General functions**						
C 1.00	Inc.start Tor.	**1 %**	0 %	0 %	1 %		
C 1.01	Inc.steady Tor.	10 Hz	10 Hz	10 Hz	10 Hz		
C 1.02	Stop mode	Deceleration	Deceleration	Deceleration	Deceleration		
C 1.03	Braking mode	no brak.func	no brak.func	no brak.func	no brak.func		
C 1.04	Preset.ref.	not used	not used	not used	not used		
C 1.05	Pre-set ref. 1	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.06	Pre-set ref. 2	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.07	Pre-set ref. 3	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.08	Pre-set ref. 4	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.09	Pre-set ref. 5	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.10	Pre-set ref. 6	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.11	Pre-set ref. 7	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.12	Pre-set ref. 8	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.13	Jog-Frequency	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
C 1.14	Economy mode	not active	**Step 1**	**Step 1**	not active		
C 2	**Ramps**						
C 2.00	Accel. ramp 1	**5.0 s**	**10.0 s**	0.0 s	**3.0 s**		
C 2.01	Decel. ramp 1	**5.0 s**	**10.0 s**	0.0 s	**3.0 s**		
C 2.02	Accel. ramp 2	20.1 s	20.1 s	20.1 s	20.1 s		
C 2.03	Decel. ramp 2	20.1 s	20.1 s	20.1 s	20.1 s		
C 2.04	S-ramp	no S-ramp	no S-ramp	no S-ramp	no S-ramp		
C 2.05	S-ramp mode	Begin + End	Begin + End	Begin + End	Begin + End		
C 3	**Speed range**						
C 3.00	Min. frequency	0.00 Hz	**5.00 Hz**	**5.00 Hz**	0.00 Hz		
C 3.01	Max. frequency	**50.00 Hz**	**50.00 Hz**	**50.00 Hz**	**50.00 Hz**		
C 3.02	Dir. Enable	**Enable FW/RV**	Disable REV	Disable REV	**Enable FW/RV**		
C 4	**PID configuration**						
C 4.04	PID enable	not active	not active	**active**	not active		
C 4.05	Prop. gain (kp)	0.0 %	0.0 %	**20.0 %**	0.0 %		
C 4.06	Integ.time (Tn)	0.00 s	0.00 s	**10.00 s**	0.00 s		
C 4.07	Deriv.time (Tv)	0.00 s	0.00 s	**0.00 s**	0.00 s		
C 4.08	Ref. acc. ramp	0.0 s	0.0 s	**10.0 s**	0.0 s		
C 4.09	Ref. dec. ramp	0.0 s	0.0 s	**10.0 s**	0.0 s		
C 4.10	Out. scaling -	0.00 Hz	0.00 Hz	**10.00 Hz**	0.00 Hz		
C 4.11	Out. scaling +	0.00 Hz	0.00 Hz	**50.00 Hz**	0.00 Hz		
C 6	**Special functions**						
C 6.00	Contactor cont.	not active	not active	not active	not active		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
C 6.01	Crane-function	not active	not active	not active	not active		
C 6.02	Release freq.	1.7 Hz	1.7 Hz	1.7 Hz	1.7 Hz		
C 6.03	Release time	0.3 s	0.3 s	0.3 s	0.3 s		
C 6.04	Engage freq.	1.5 Hz	1.5 Hz	1.5 Hz	1.5 Hz		
C 6.05	Engage time	0.3 s	0.3 s	0.3 s	0.3 s		
C 6.06	DC braking time	0.3 s	0.3 s	0.3 s	0.3 s		
C 6.07	DC braking curr	100 %	100 %	100 %	100 %		
C 6.08	Restart delay	0.7 s	0.7 s	0.7 s	0.7 s		
C 6.09	Hoist mode	No	No	No	No		
C 6.10	Max (n)error.	5	5	5	5		
D 1	**Analogue inputs**						
D 1.00	AIV-selection	not used	**Freq.ref.man**	**PID-ref.**	not used		
D 1.01	AIV-value 0%	0.01 Hz	**0.00 Hz**	**0.00 %**	0.01 Hz		
D 1.02	AIV-value 100%	50.01 Hz	**50.00 Hz**	**100.0 %**	50.01 Hz		
D 1.03	AIV-filter time	0.05 s	0.05 s	0.05 s	0.05 s		
D 1.04	AIC-selection	**Freq.ref.aut**	**Freq.ref.aut**	**PID-feedback**	**Freq.ref.aut**		
D 1.05	AIC-level	4-20 mA	4-20 mA	4-20 mA	4-20 mA		
D 1.06	AIC-value 0%	**0.00 Hz**	**0.00 Hz**	**0.00 %**	**0.00 Hz**		
D 1.07	AIC-value 100%	**50.00 Hz**	**50.00 Hz**	**100.00 %**	**50.00 Hz**		
D 1.08	AIC-filter time	0.05 s	0.05 s	0.05 s	0.05 s		
D 1.09	AI_2-selection	not used	not used	not used	**Torque limit**		
D 1.10	AI_2-level	0-20 mA	0-20 mA	0-20 mA	0-20 mA		
D 1.11	AI_2-value 0%	0.01 Hz	0.01 Hz	0.01 Hz	**0.00 %**		
D 1.12	AI_2-value 100%	50.01 Hz	50.01 Hz	50.01 Hz	**100.00 %**		
D 1.13	AI_2-filter time	0.05 s	0.05 s	0.05 s	0.05 s		
D 1.14	AI_3-selection	not used	not used	not used	not used		
D 1.15	AI_3-level	0-20 mA	0-20 mA	0-20 mA	0-20 mA		
D 1.16	AI_3-value 0%	0.01 Hz	0.01 Hz	0.01 Hz	0.01 Hz		
D 1.17	AI_3-value 100%	50.01 Hz	50.01 Hz	50.01 Hz	50.01 Hz		
D 1.18	AI_3-filter time	0.05 s	0.05 s	0.05 s	0.05 s		
D 2	**Logic inputs**						
D 2.00	DI1-selection	**Start FWD**	**Start FWD**	**Start FWD**	**Start FWDimp**		
D 2.01	DI2-selection	**Start REV**	**Manual (Aut)**	**PID-enable**	**Start REVimp**		
D 2.02	DI3-selection	**2.ramp**	**External trip**	**External trip**	**Stop-imp.**		
D 2.03	DI4-selection	**EXT reset**	**EXT reset**	**EXT reset**	**EXT-T limit**		
D 2.04	DI6_2-selection	not used	not used	not used	**External trip**		
D 2.05	DI7_2-selection	not used	not used	not used	**EXT reset**		
D 2.06	DI8_2-selection	not used	not used	not used	not used		
D 2.07	DI5_3-selection	not used	not used	not used	not used		
D 2.08	DI6_3-selection	not used	not used	not used	not used		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
D 2.09	DI7_3-selection	not used	not used	not used	not used		
D 2.10	DI8_3-selection	not used	not used	not used	not used		
D 3	**Analogue outputs**						
D 3.00	AO1-selection	**|freq.out.sig|**	**|freq.out.sig|**	**|freq.out.sig|**	**|freq.out.sig|**		
D 3.01	AO1_level	4-20 mA	4-20 mA	4-20 mA	4-20 mA		
D 3.02	AO1-min. value	0 %	0 %	0 %	0 %		
D 3.03	AO1-max. value	100 %	100 %	100 %	100 %		
D 3.04	AO2_2-selection	not used	not used	not used	**|Torque|**		
D 3.05	A02_2-level	4-20 mA	4-20 mA	4-20 mA	4-20 mA		
D 3.06	AO2_2-min.value	0 %	0 %	0 %	0 %		
D 3.07	AO2_2-max.value	100 %	100 %	100 %	**150 %**		
D 3.08	AO2_3-selection	not used	not used	not used	not used		
D 3.09	AO2_3-level	4-20 mA	4-20 mA	4-20 mA	4-20 mA		
D 3.10	AO2_3-min.value	0 %	0 %	0 %	0 %		
D 3.11	AO2_3-max.value	100 %	100 %	100 %	100 %		
D 4	**Logic outputs**						
D 4.00	+24 dig.output	ON (+24V)	ON (+24V)	ON (+24V)	ON (+24V)		
D 4.01	Relay output 1	**Ready+Run**	**Ready+Run**	**Ready+Run**	**Ready**		
D 4.02	Relay output2_2	not used	not used	not used	**Run**		
D 4.03	Relay output3_2	not used	not used	not used	**Trip**		
D 4.04	Relay output2_3	not used	not used	not used	not used		
D 4.05	Relay output3_3	not used	not used	not used	not used		
D 4.06	f-Level ON	5.01 Hz	5.01 Hz	5.01 Hz	5.01 Hz		
D 4.07	f-Level OFF	2.01 Hz	2.01 Hz	2.01 Hz	2.01 Hz		
D 4.08	Hyst. f =f-ref	0.5 Hz	0.5 Hz	0.5 Hz	0.5 Hz		
D 5	**Encoder configuration**						
D 5.00	Encoder/Slipcom	no encoder	no encoder	no encoder	no encoder		
D 5.01	Dyn.SlipCompens	low	low	low	low		
D 5.02	Speed ctrl.act	not active	not active	not active	not active		
D 5.03	Pulse/rotation	1024	1024	1024	1024		
D 5.04	Speed ctrl. Kp	0.0	0.0	0.0	0.0		
D 5.05	Speed ctrl. Tn	0.00 s	0.00 s	0.00 s	0.00 s		
D 5.06	Speed ctrl.Stat	0.0 %	0.0 %	0.0 %	0.0 %		
D 5.07	ActVal.PT1 time	0.00 s	0.00 s	0.00 s	0.00 s		
D 5.08	ActVal.DT1 time	0.00 s	0.00 s	0.00 s	0.00 s		
D 5.09	SetVal.PT1 time	0.00 s	0.00 s	0.00 s	0.00 s		
D 5.10	Ref-Val.offer.D	0.0	0.0	0.0	0.0		
D 5.11	R-Val.offer.PT1	0.00 s	0.00 s	0.00 s	0.00 s		
D 6	**Electronic potentiometer**						
D 6.00	Loc.MP select.	Freq. ref.	Freq. ref.	Freq. ref.	Freq. ref.		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
D 6.01	Loc.MP min.val.	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz		
D 6.02	Loc.MP max.val.	50.00 Hz	50.00 Hz	50.00 Hz	50.00 Hz		
D 6.03	Loc.MP acc.time	10.0 s	10.0 s	10.0 s	10.0 s		
D 6.04	Loc.MP dec.time	10.0 s	10.0 s	10.0 s	10.0 s		
D 6.05	Loc.ref.storage	not active	not active	not active	not active		
D 6.06	Rem.MP select.	not used	not used	not used	not used		
D 6.07	Rem.MP min.val.	0.01 Hz	0.01 Hz	0.01 Hz	0.01 Hz		
D 6.08	Rem.MP max.val.	50.01 Hz	50.01 Hz	50.01 Hz	50.01 Hz		
D 6.09	Rem.MP acc.time	10.0 s	10.0 s	10.0 s	10.0 s		
D 6.10	Rem.MP dec.time	10.0 s	10.0 s	10.0 s	10.0 s		
D 6.11	Rem.MP control	Terminals	Terminals	Terminals	Terminals		
D 6.12	Rem.ref.storage	not active	not active	not active	not active		
E 1	**Drive overload**						
E 1.00	Curr. max.val	150 %	**125 %**	**125 %**	150 %		
E 1.01	Torque max.val.	200 %	200 %	200 %	200 %		
E 2	**Motor protection**						
E 2.00	Thermistor input	**not active**	**not active**	**not active**	**not active**		
E 2.01	Thermist.protec	Trip	Trip	Trip	Trip		
E 2.02	I max at 0 Hz	**50 %**	31 %	31 %	**50 %**		
E 2.03	I max at f nom.	**100 %**	**100 %**	**100 %**	**100 %**		
E 2.04	Therm.f-limit	30 Hz	30 Hz	30 Hz	30 Hz		
E 2.05	Motor-tme const	**5 min**	**5 min**	**5 min**	**5 min**		
E 2.06	Stalling time	60 s	60 s	60 s	60 s		
E 2.07	Stalling frequ.	5 Hz	5 Hz	5 Hz	5 Hz		
E 2.08	Stalling curr.	80 %	80 %	80 %	80 %		
E 2.09	n>> protection	Trip	Trip	Trip	Trip		
E 2.10	N max motor	3200 rpm	3200 rpm	3200 rpm	3200 rpm		
E 2.11	EXT-mot.trip	not active	not active	not active	not active		
E 2.12	Delay f. E2.11	1.0 s	1.0 s	1.0 s	1.0 s		
E 3	**Fault configuration**						
E 3.00	Autorestart	not active	not active	not active	not active		
E 3.01	Loss of 4-20mA	not active	not active	not active	not active		
E 3.02	External trip	not active	**N.O. ready + r**	**N.O. ready + r**	**N.O. ready + r**		
E 3.03	Delay f. E3.02	0.0 s	0.0 s	0.0 s	0.0 s		
E 3.04	Isolation Fault	not active	not active	not active	not active		
E 3.05	Delay f. E3.04	10.0 s	10.0 s	10.0 s	10.0 s		
E 3.06	Trip of ext. BU	**N.O. ready + r**	**N.O. ready + r**	**N.O. ready + r**	**N.O. ready + r**		
E 3.07	Delay f. E3.06	5.0 s	5.0 s	5.0 s	5.0 s		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
E 3.08	Undervoltage	Not active	Not active	Not active	Not active		
E 3.09	Delay f. E3.08	2.0 s	2.0 s	2.0 s	2.0 s		
E 3.10	Local reset	active	active	active	active		
E 4	**Control configuration**						
E 4.00	Loc/Rem ref.	Local/Remote	Local/Remote	Local/Remote	Local/Remote		
E 4.01	Operate-Mode	Local/Remote	Local/Remote	Local/Remote	Local/Remote		
E 4.02	Loc/Rem-switch	Keypad	Keypad	Keypad	Keypad		
E 4.03	Ctrl.mode local	Keypad	Keypad	Keypad	Keypad		
E 4.04	Local STOP	Loc.act.only	Loc.act.only	Loc.act.only	Loc.act.only		
E 5	**Skip frequency**						
E 5.00	Skip frequency	5.00 Hz	5.00 Hz	5.00 Hz	5.00 Hz		
E 5.01	Hysteresis	0.00Hz	0.00 Hz	0.00 Hz	0.00 Hz		
E 6	**Switching frequency**						
E 6.00	Min.pulse freq.	2.5 kHz	2.5 kHz	2.5 kHz	2.5 kHz		
E 6.01	Max.swit. freq.	2.5 kHz	2.5 kHz	2.5 kHz	2.5 kHz		
F 1	**Test-Help**						
F 1.00	Test power part	Start	Start	Start	Start		
F 1.01	Test-cont.part	Start	Start	Start	Start		
F 2	**Factory settings**						
F 2.00	Ret.fact.appli.	Start	Start	Start	Start		
F 2.01	Ret.fact.motor	Start	Start	Start	Start		
F 4	**Function blocks**						
F 4.00	C1 signal E1	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.01	C1 filter f. E1	0.1 s	0.1 s	0.1 s	0.1 s		
F 4.02	C1 Reference	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.03	C1 compFunction	E1 > E2	E1 > E2	E1 > E2	E1 > E2		
F 4.04	C1 comHyst/Band	5.0 %	5.0 %	5.0 %	5.0 %		
F 4.05	C1 time-funct	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.06	C1 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.07	C1 selection	not used	not used	not used	not used		
F 4.08	C2 signal E1	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.09	C2 filter f. E1	0.1 s	0.1 s	0.1 s	0.1 s		
F 4.10	C2 Reference	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.11	C2 compFunction	E1 > E2	E1 > E2	E1 > E2	E1 > E2		
F 4.12	C2 comHyst/Band	5.0 %	5.0 %	5.0 %	5.0 %		
F 4.13	C2 time-funct.	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.14	C2 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.15	C2 selection	not used	not used	not used	not used		
F 4.16	C3 signal E1	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.17	C3 filter f. E1	0.1 s	0.1 s	0.1 s	0.1 s		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
F 4.18	C3 signal E2	Refer.-value	Refer.-value	Refer.-value	Refer.-value		
F 4.19	C3 filter f. E2	0.1 s	0.1 s	0.1 s	0.1 s		
F 4.20	C3 Reference	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.21	C3 compFunction	E1 > E2	E1 > E2	E1 > E2	E1 > E2		
F 4.22	C3 comHyst/Band	5.0 %	5.0 %	5.0 %	5.0 %		
F 4.23	C3 Input D1	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.24	C3 Input D2	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.25	C3 log.'a'funct	OR	OR	OR	OR		
F 4.26	C3 log.'b'funct	OR	OR	OR	OR		
F 4.27	C3 time-funct	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.28	C3 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.29	C3 selection	not used	not used	not used	not used		
F 4.30	C4 signal E1	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.31	C4 filter f. E1	0.1 s	0.1 s	0.1 s	0.1 s		
F 4.32	C4 signal E2	Refer.-value	Refer.-value	Refer.-value	Refer.-value		
F 4.33	C4 filter f. E2	0.1 s	0.1 s	0.1 s	0.1 s		
F 4.34	C4 Reference	0.0 %	0.0 %	0.0 %	0.0 %		
F 4.35	C4 compFunction	E1 > E2	E1 > E2	E1 > E2	E1 > E2		
F 4.36	C4 comHyst/Band	5.0 %	5.0 %	5.0 %	5.0 %		
F 4.37	C4 Input D1	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.38	C4 Input D2	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.39	C4 log.'a'funct	OR	OR	OR	OR		
F 4.40	C4 log.'b'funct	OR	OR	OR	OR		
F 4.41	C4 time-funct	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.42	C4 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.43	C4 selection	not used	not used	not used	not used		
F 4.44	L5 signal D1	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.45	L5 signal D2	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.46	L5 logic funct.	OR	OR	OR	OR		
F 4.47	L5 time-funct	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.48	L5 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.49	L5 selection	not used	not used	not used	not used		
F 4.50	L6 signal D1	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.51	L6 signal D2	State ZERO	State ZERO	State ZERO	State ZERO		
F 4.52	L6 logic funct.	OR	OR	OR	OR		
F 4.53	L6 time-funct	ON-delay	ON-delay	ON-delay	ON-delay		
F 4.54	L6 time-set	0.0 s	0.0 s	0.0 s	0.0 s		
F 4.55	L6 selection	not used	not used	not used	not used		

Configuration/Settings table

Parameter	Description	Macro M1	Macro M2	Macro M3	Macro M4	User Macro 1	User Macro 2
F 5							
F 5.02	SensA5kHz-Off.	0	0	0	0		
F 5.03	SensB5kHz-Off.	0	0	0	0		
F 5.04	SensA10kHz-Off.	0	0	0	0		
F 5.05	SensB10kHz-Off.	0	0	0	0		
F 6	**Code lock**						
F 6.00	Code	0	0	0	0		
F 6.01	Code value	0	0	0	0		
F 6.02	Paramet.-Access	RS 232	RS 232	RS 232	RS 232		