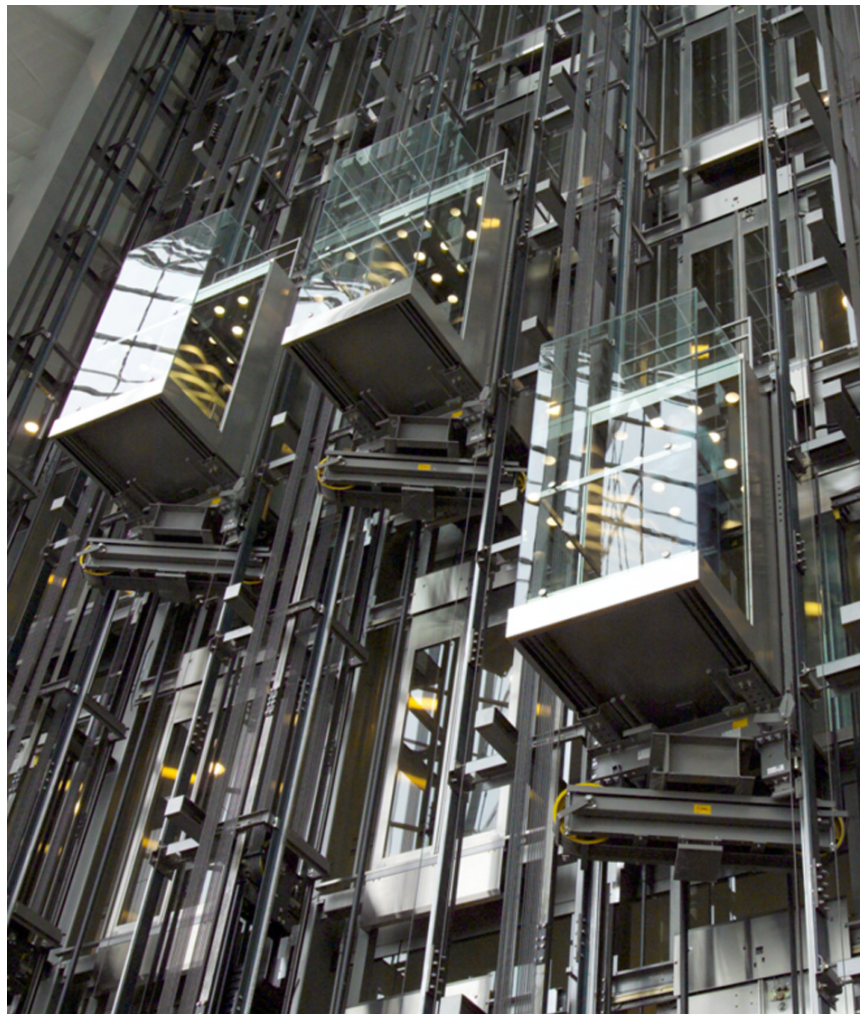
ABB high performance machinery drives

Firmware manual
Lift control program for ACSM1 drives



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List of related manuals

Drive hardware manuals and guides*	Code (English)	
ACSM1-04 drive modules (0.75 to 45 kW) hardware manual	*3AFE68797543*	2)
ACSM1-04 drive modules (55 to 110 kW) hardware manual	*3AFE68912130*	2)

Drive firmware manuals and guides		
ACSM1 lift control program firmware manual	*3AUA0000056610*	2)

Drive PC tools manuals	
DriveStudio user manual	*3AFE68749026*
DriveSPC user manual	*3AFE68836590*

Application manuals and guides		
ACSM1-04 drive modules system engineering manual	*3AFE68978297*	
ACSM1 control panel user's guide	*3AUA0000020131*	2)
Functional safety solutions with ACSM1 drives application guide	*3AUA0000031517*	3)
Safe torque off function for ACSM1, ACL30, ACS850 and ACQ810 drives application guide	*3AFE68929814*	2)
Cybersecurity for ABB drives Technical guide	*3AXD10000492137*	

Option manuals and guides		
FIO-01 digital I/O extension user’s manual*	*3AFE68784921*	2)
FIO-11 analog I/O extension user’s manual*	*3AFE68784930*	2)
FEN-01 TTL encoder interface user’s manual*	*3AFE68784603*	2)
FEN-11 absolute encoder interface user’s manual*	*3AFE68784841*	2)
FEN-21 resolver interface user’s manual*	*3AFE68784859*	2)
FEN-31 HTL encoder interface user’s manual*	*3AUA0000031044*	2)
JPC-01 network communication adapter user’s manual	*3AUA0000072233*	1)

1) Delivered as a printed copy with the drive or optional equipment.

2) Delivered by the Marketing Material Order Service on request (https://order.hansaprint.fi/abb/).

3) Available from your local ABB representative.

*A multilingual quick installation guide is included with the delivery.

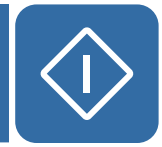
Manuals are available in PDF format on the Internet (unless otherwise noted). See section *Document library on the Internet* on the inside of the back cover.

Firmware manual

Lift control program for ASCM1 drives

Table of contents

Start-up



3AUA0000056610 Rev B
EN
EFFECTIVE: 2016-06-29

Table of contents

4. Start-up

5. Default connections

6. Program features

7. Parameters

8. Additional parameter data

9. Fault tracing

10. Control block diagrams

Further information

1

About the manual

What this chapter contains

This chapter describes the contents of this manual. It also contains information on the compatibility, safety and intended audience.

Compatibility

The manual is compatible with ACSM1 Lift control program.

Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, or use the drive. The complete safety instructions are given at the beginning of the *Hardware manual*.
- Read the **software function specific warnings and notes** before changing the default settings of the function. For each function, the warnings and notes are given in this manual in the section describing the related user-adjustable parameters.

Reader

You are expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Contents

The manual consists of the following chapters:

- *Description of Lift control program* gives a general description of the essentials of the Lift control program.
- *ACSM1 control panel* describes the control panel of the drive.
- *Start-up* instructs in setting up the Lift control program.
- *Default connections* shows the default control connections of the Lift control program.
- *Program features* contains descriptions of the features of the Lift control program.
- *Parameters* describes the parameters of the Lift control program.
- *Additional parameter data* contains further information on the parameters.
- *Fault tracing* lists the alarm and fault messages with possible causes and remedies.
- *Control block diagrams* contains a graphical representation of the Lift control program.

Terms and abbreviations

Term/abbreviation	Definition
AI	Analog Input. Interface for analog input signals.
AO	Analog Output. Interface for analog output signals.
CRC	Cyclic Redundancy Check
DIO	Digital Input/Output. Interface for digital input/output signals.
DTC	Direct Torque Control. The motor control of the frequency converter is based on Direct Torque Control.
FEN-01	Optional TTL encoder interface for the ACSM1
FEN-11	Optional absolute encoder interface for the ACSM1
FEN-21	Optional resolver interface for the ACSM1
FEN-31	Optional HTL encoder interface for the ACSM1
FIO-01	Optional digital I/O extension for the ACSM1
FIO-11	Optional analog I/O extension for the ACSM1
IGBT	Insulated Gate Bipolar Transistor; a voltage-controlled semiconductor type widely used in inverters due to their easy controllability and high switching frequency.
I/O	Input/Output
ID run	Motor identification run. During the identification run, the drive will identify the characteristics of the motor for optimum motor control.
Jerk	Rate of change of acceleration/deceleration
JCU	Control unit of the drive module. The JCU is installed on top of the power unit. The external I/O control signals are connected to the JCU, or optional I/O extensions mounted on it.
JMU	Memory unit attached to the control unit of the drive
Lift operation mode	Normal travel mode, releveling mode, evacuation mode or inspection mode

Term/abbreviation	Definition
Parameter	User-adjustable operation instruction to the drive, or signal measured or calculated by the drive
PI controller	Proportional-Integral Controller
PID controller	Proportional–Integral–Derivative Controller. Drive speed control is based on PID algorithm.
PLC	Programmable Logic Controller. Also referred to as lift controller in this manual.
RFG	Ramp Function Generator
RO	Relay Output. Interface for a digital output signal. Implemented with a relay.
SSI	Synchronous Serial Interface
STO	Safe Torque Off
TH	Thermistor input of the drive
Traveling speed	Speed reference used in the normal travel mode after acceleration has ended until the lift starts to decelerate to the leveling speed. Can be nominal speed, medium speed, speed2, or speed3.
UMFI	Firmware of the ACSM1 drive
UPS	Uninterruptible Power Supply. Power supply equipment with battery to maintain output voltage during power failure.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

2

Description of Lift control program

What this chapter contains

This chapter gives a general description of the essentials of the Lift control program.

Lift control program

The Lift control program is a ready-made application program for the ABB high performance machinery drives ACSM1. The program incorporates all functions commonly needed in lift applications, ensuring optimal control performance and operation. It can be used for a wide range of lift applications, such as passenger lifts and freight elevators. The same application enables geared and gearless applications, supporting both synchronous and asynchronous motors. High lift control performance is achieved by utilizing the Direct Torque Control (DTC) technology. Accurate control of speed and torque can be implemented with or without feedback from the motor shaft.

The Lift control program covers the following lift control functions with a basic parameter interface:

- Basic start/stop operation
- Automatic fault reset
- Lift operation modes
- Speed reference selection and scaling
- Speed profile
- Smart slowdown
- Mechanical brake control
- Torque compensation

- Slowdown and Final limit switches
- Protection functions
- Rescue operation.

The purpose of each function is briefly introduced below. For more detailed information on the functions, see chapter *Program features*.

In addition to the lift control functions, the ACSM1 firmware covers the basic drive functions such as motor control, speed and torque control chains, protections, diagnostics and external interfaces.

Basic start/stop operation

The Basic start/stop operation functions take care of lift start/stop control and the interlocks related to basic lift start/stop operation.

When the drive is in external control, control location EXT1 is selected. For more information, see *External control* on page *22*.

Automatic fault reset

The Automatic fault reset function resets pre-defined drive faults to ensure the operation of the drive in temporary fault situations. In addition, faults can also be reset from an external source (see section *Manual fault reset* page *93*).

Lift operation modes

By default, the lift operates in the normal travel mode. In addition, there are three other operation modes:

- Releveling mode for bringing the lift back to the floor level in case it overshoots the floor
- Evacuation mode for lift car rescue operation in case the power supply fails
- Inspection mode for maintenance operations.

Speed reference selection and scaling

The Speed reference selection function calculates the final speed reference to be used by the lift in the different lift operation modes. The following speed references are available via basic parameters.

Speed reference available	Lift operation mode
Speed 1*, 2, or 3	Normal travel mode
Nominal speed	Normal travel mode
Medium speed	Normal travel mode
Leveling speed	Normal travel mode, when the leveling command is active
Releveling speed	Releveling mode
Inspection speed	Inspection mode or normal travel mode, depending on which mode is active
Evacuation speed	Evacuation mode

* The speed1 reference is fixed to a constant value 0 m/s. It can be used for stopping the lift.

The Speed reference scaling function converts the linear speed of the lift (m/s) to the rotation speed of the lift motor (rpm).

Speed profile

The Speed profile functions automatically select a set of acceleration, deceleration and jerks into use based on the lift operation mode. A total of seven different jerks are available for the different lift operation modes.

Smart slowdown

The Smart slowdown function optimizes the travel time of the lift by reducing the leveling path. That is, transition from the traveling speed (ie, nominal speed, medium speed, speed2 or speed 3) to the leveling speed is optimally delayed based on the knowledge of the physical leveling distance (ie, the distance between the leveling and stop switches). The function is useful in operation situations where the desired traveling speed is not reached before the leveling command is activated (for example, in case of short floor distance). The function can be used with estimated speed or with an encoder, in which case the actual position signal is utilized.

Mechanical brake control

The lift system is equipped with a mechanical brake that holds the lift car at standstill when the drive is stopped or not powered. The function also performs the following tasks:

- Torque proving checks
- Brake slip checks
- Brake open torque selection
- Actual load measurement
- Torque limiting while stopping.

Torque compensation

Torque compensation is a method for calculating beforehand the torque needed due to load and losses. Thus, it helps the speed controller to gain better control accuracy and performance. Torque compensation comprises the following calculations added to the final torque reference:

- Static friction compensation
- Dynamic friction compensation
- Inertia compensation required during acceleration and deceleration.

Slowdown and Final limit switches

The Slowdown function limits the speed reference while the lift car is operating in the slowdown area (typically the extreme top and extreme bottom of the lift operating area). Two modes, single-bit slowdown mode and multiple-bit slowdown mode, are available.

The Final limit switches function activates an emergency stop signal (OFF3) if either of the final limit switches gets activated while the lift car is operating on terminal floors, before coming into contact with the buffers. Two switches, upper limit switch and lower limit switch, can be configured to be used in upward and downward directions.

Protection functions

The following functions are used checking and ensuring proper operation of lift control in different operating conditions.

- The Speed match function checks that the motor actual speed follows the speed reference within the desired window during acceleration, deceleration and when running in a steady state. The function also ensures that the brake does not slip while the drive is in a stopped state with the brake closed.
- The Inverter overload function checks that the inverter is capable of providing sufficient current and torque and that the drive is operating within the inverter current and torque limits.

- The Motor stall function protects the motor in stall situations where torque level is about to rise too high at lower speeds, ie, it monitors that the motor torque stays within user-defined torque limits.
- The Leveling overtime stop function generates an emergency stop signal (OFF3) in situations where the stop command is not received on time after the leveling command due to an electrical or mechanical problem.

Rescue operation

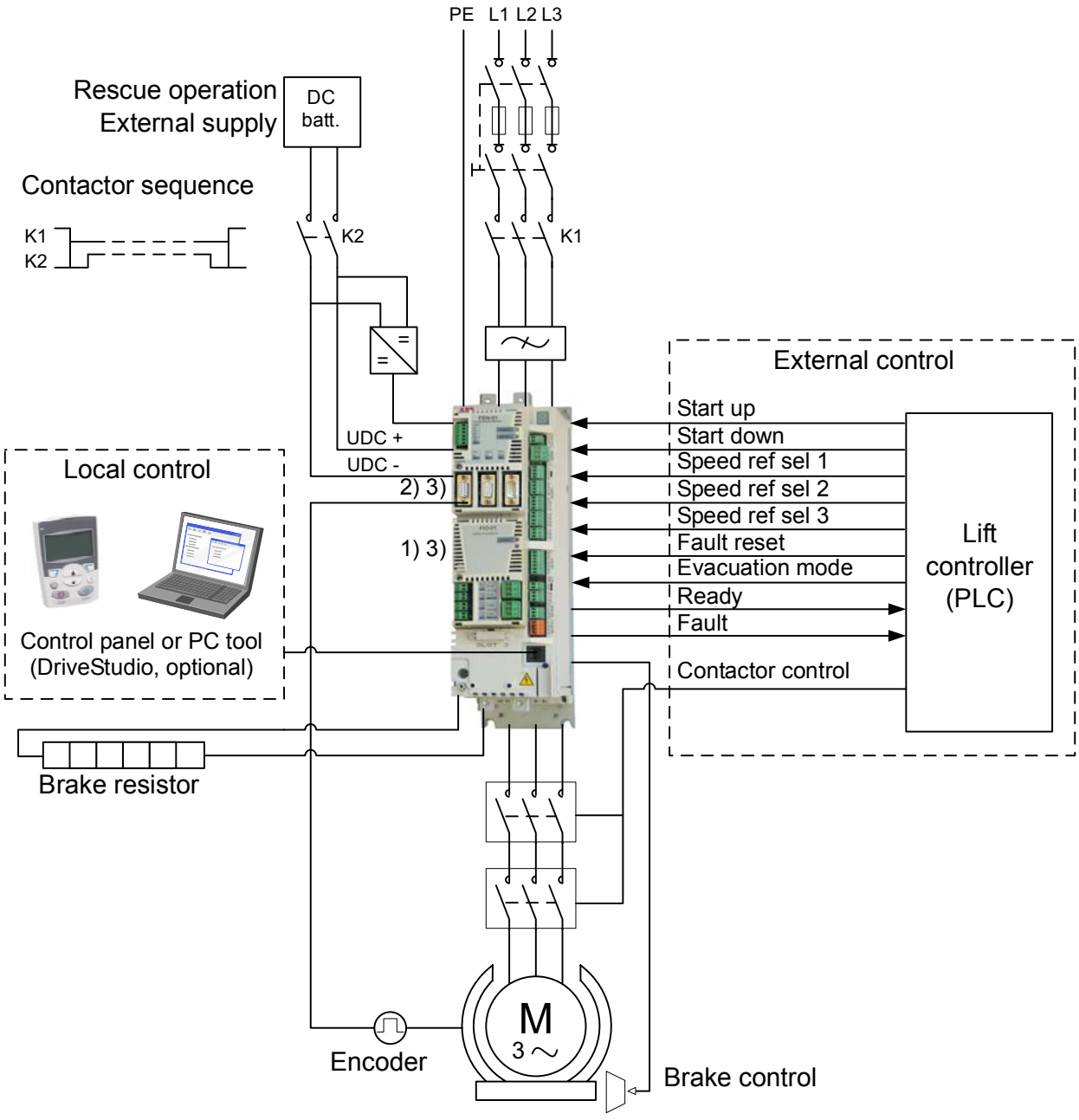
Rescue operation is used in emergency evacuation situations where the lift car has to be run to the next floor because of a power supply failure. In such a situation, the drive is supplied by an external emergency power supply and is, thereby, switched to the low voltage mode.

Due to derated power supply, the lift car traveling speed needs to be reduced. For this, the drive uses the evacuation mode (evacuation speed). Two evacuation options, automatic and manual evacuation, are available.

- In automatic evacuation, the drive searches the lighter load direction (up or down) and then automatically runs the lift car to that direction.
- In manual evacuation, the lift controller decides and issues the direction of travel.

Lift system configuration

The following figure shows an example of a lift system configuration with I/O control, two motor contactors and DC battery rescue operation.

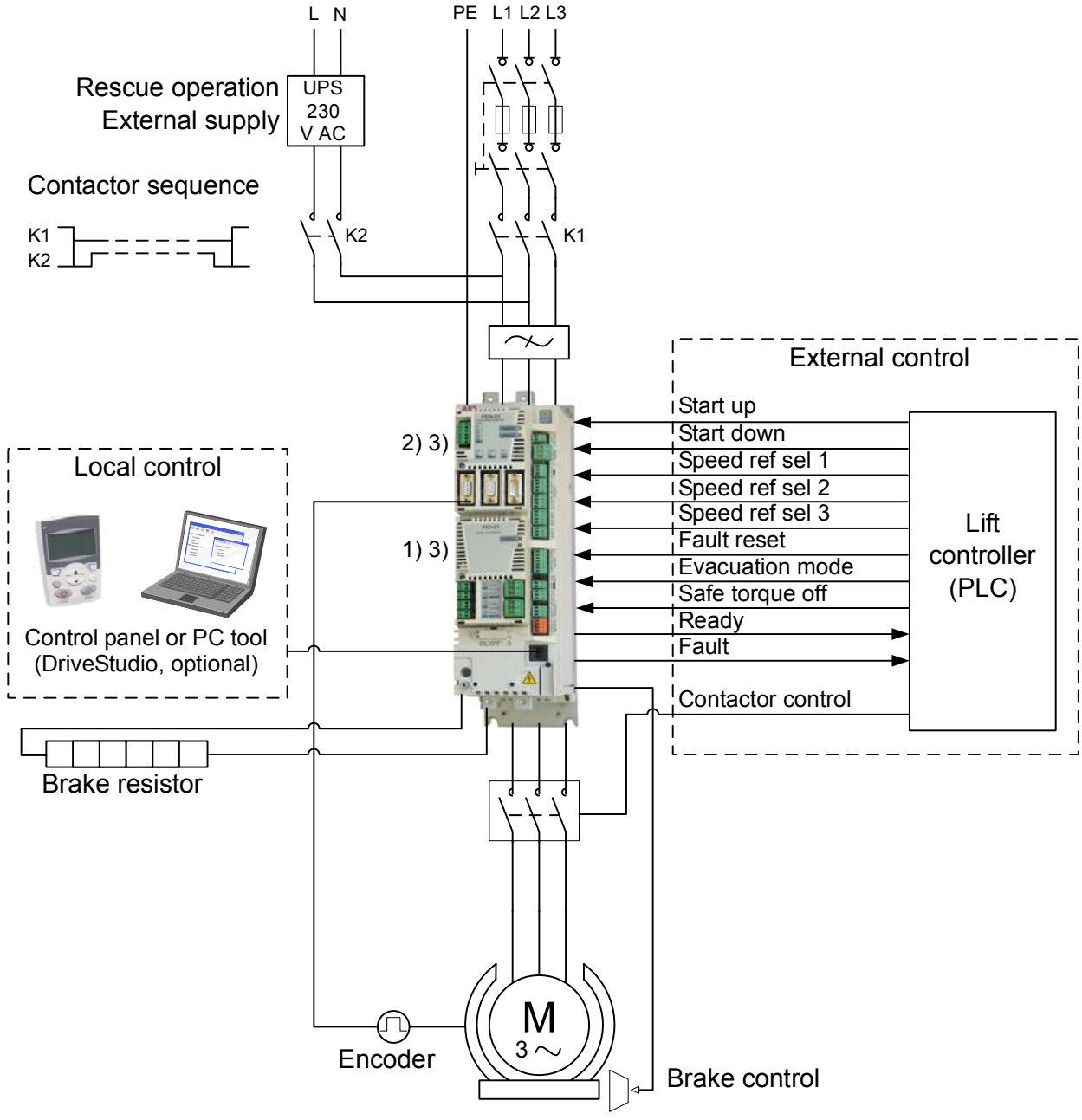


1) Extra inputs/outputs can be added by installing optional I/O extension modules (FIO-xx) in drive Slot 2.

2) Incremental or absolute encoder, or resolver interface module (FEN-xx) installed in drive Slot 1 or 2.

3) Two encoder/resolver interface modules or two I/O extension modules of the same type are not allowed.

The figure below shows an example of a lift system configuration with I/O control, one motor contactor and 1-phase 230 V AC UPS rescue operation. Safe torque off (STO) is used for removing the second motor contactor.



1) Extra inputs/outputs can be added by installing optional I/O extension modules (FIO-xx) in drive Slot 2.

2) Incremental or absolute encoder, or resolver interface module (FEN-xx) installed in drive Slot 1 or 2.

3) Two encoder/resolver interface modules or two I/O extension modules of the same type are not allowed.

Local control vs. external control

The drive has two main control locations: external and local. You can use the control locations to control the drive, read status data, and adjust parameters.

The control location is selected with the LOC/REM key on the control panel or with the PC tool (Take/Release button).

Local control

When the drive is in local control, the control commands are given from the control panel keypad or from a PC equipped with the DriveStudio PC tool.

Local control is mainly used during commissioning and maintenance. The control panel always overrides the external control signal sources when used in local control. Changing the control location to local can be disabled with parameter *16.01* LOCAL LOCK.

With parameter *46.03* LOCAL CTRL LOSS, you can select how the drive reacts to a control panel or PC tool communication break.

External control

When the drive is in external control, control commands (start/stop and reference) are given through the I/O terminals (digital inputs), optional I/O extension modules (digital inputs), or the fieldbus interface (via an optional fieldbus adapter module). For information on the use of the fieldbus interface, contact your local ABB representative.

External control location EXT1 is used for control signals (eg, start up/down and stop). The speed reference is selected based on the combined status of the three configurable bit pointer parameters *80.05* SPEED REF SEL1, *80.06* SPEED REF SEL2 and *80.07* SPEED REF SEL3.

Drive operation mode

The drive operates in the speed control mode, meaning that the motor rotates at a speed proportional to the speed reference given to the drive. The speed control mode can be used either with estimated speed used as feedback, or with an encoder or resolver for better speed accuracy. The mode is available in both local and external control.

A block diagram illustrating the control chain for speed control is presented in chapter *Control block diagrams*.

Safe torque off

The ACSM1 has an integrated Safe torque off (STO) function. The function disables the control voltage of the power semiconductors of the drive output stage, thus preventing the inverter from generating the voltage required to rotate the motor. By using the Safe torque off function, one of the two contactors interrupting the current to the motor in the lift machine may be left out. For more information, see *Safe torque off function for ACSM1, ACS850 and ACQ810 drives application guide (3AFE68929814 [English]).*

Drive programming

Even though the Lift control program is designed to be configured and used with basic parameters, its functionality can be easily extended and modified for various users' needs. This can be done by using a drive programming feature with the optional DriveSPC PC tool. You can create a tailor-made application program with the standard IEC 61131 function blocks and thereby adapt the drive to the lift system without additional hardware or software. For more information, contact your local ABB representative.

Backup and restore of drive contents

The drive offers a possibility of backing up numerous settings and configurations to external storage such as the internal memory of the drive control panel and a PC file (using the DriveStudio tool). These settings and configurations can then be restored to the drive, or a number of drives.

Backup using the control panel includes

- Parameter settings
- User parameter sets.

Backup using DriveStudio includes

- Parameter settings
- User parameter sets
- Lift control program.

For detailed instructions for performing the backup/restore, see chapter *ACSM1 control panel* or the DriveStudio documentation.

Limitations

A backup can be done without interfering with drive operation, but restoring a backup always resets and reboots the control unit, so restore is not possible with the drive running.

Restoring backup files from one firmware version to another is considered risky, so the results should be carefully observed and verified when done for the first time.

The parameters and application support are bound to change between firmware versions and backups are not always compatible with other firmware versions even if restore is allowed by the backup/restore tool. Before using the backup/restore functions between different firmware versions, refer to the release notes of each version.

Parameter restore

Parameters are divided into three different groups that can be restored together or individually:

- Motor configuration parameters and identification (ID) run results
- Encoder and fieldbus adapter settings
- Other parameters.

For example, retaining the existing ID run results in the drive will make a new ID run unnecessary.

Restore of individual parameters can fail for the following reasons:

- The restored value does not fall within the minimum and maximum limits of the drive parameter
- The type of the restored parameter is different from that in the drive
- The restored parameter does not exist in the drive (often the case when restoring the parameters of a new firmware version to a drive with an older version)
- The backup does not contain a value for the drive parameter (often the case when restoring the parameters of an old firmware version to a drive with a newer version).

In these cases, the parameter is not restored; the backup/restore tool will warn the user and offers a possibility to set the parameter manually.

User parameter sets

The drive has four user parameter sets that can be saved to the permanent memory and recalled using drive parameters. It is also possible to use digital inputs to switch between different user parameter sets. See the descriptions of parameters *16.09*…*16.12*.

A user parameter set contains all values of parameter groups 10 to 99 (except the fieldbus communication configuration settings).

As the motor settings are included in the user parameter sets, make sure the settings correspond to the motor used in the application before recalling a user set. In an application where different motors are used with one drive, the motor ID run needs to be performed with each motor and saved to different user sets. The appropriate set can then be recalled when the motor is switched.

3

ACSM1 control panel

What this chapter contains

This chapter describes the features and operation of the ACSM1 control panel.

The control panel can be used to control the drive, read status data, and adjust parameters.

Compatibility

This chapter is compatible with the ACSM1 drive control panel SW rev 3.07 and Flash rev 4.0 or later.

See page 33 for how to find out the control panel version.

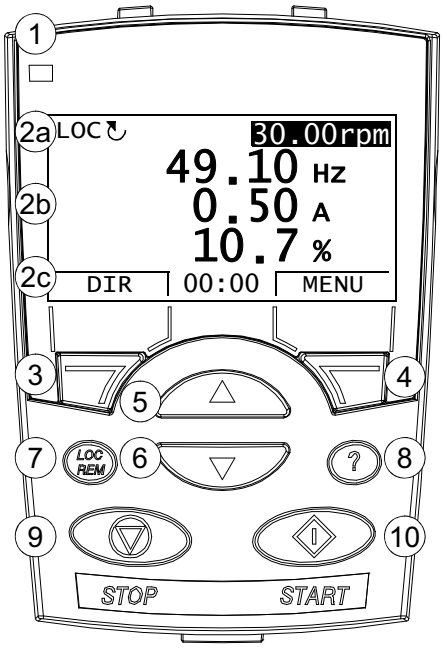
Features

The ACSM1 control panel features:

- alphanumeric control panel with an LCD display
- context sensitive help
- real time clock.

Overview

The following table summarizes the key functions and displays on the ACSM1 control panel.



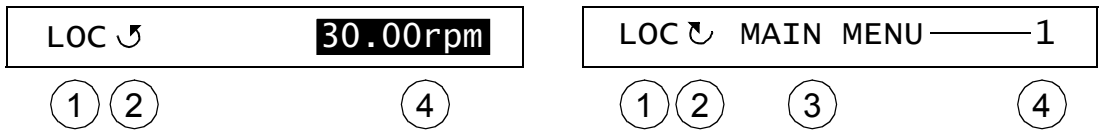
No.	Use
1	Status LED – Green for normal operation.
2	LCD display – Divided into three main areas: • 2a: Status line – variable, depending on the mode of operation, see section *Status line* on page *29*. • 2b: Center – variable; in general, shows signal and parameter values, menus or lists. Shows also faults and alarms. • 2c: Bottom line – shows current functions of the two soft keys and, if enabled, the clock display.
3	Soft key 1 – Function depends on the context. The text in the lower left corner of the LCD display indicates the function.
4	Soft key 2 – Function depends on the context. The text in the lower right corner of the LCD display indicates the function.
5	Up – • Scrolls up through a menu or list displayed in the center of the LCD display. • Increments a value if a parameter is selected. • Increments the reference value if the upper right corner is highlighted. • Holding the key down changes the value faster.
6	Down – • Scrolls down through a menu or list displayed in the center of the LCD display. • Decrements a value if a parameter is selected. • Decrements the reference value if the upper right corner is highlighted. • Holding the key down changes the value faster.
7	LOC/REM – Changes between local and remote control of the drive.
8	Help – Displays context sensitive information when the key is pressed. The information displayed describes the item currently highlighted in the center of the display.
9	STOP – Stops the drive in local control.
10	START – Starts the drive in local control.

Maintenance

Control panel battery must be replaced every 10 years. The battery is housed on the rear of the control panel. Replace it with a new CR 2032 battery.

Status line

The top line of the LCD display shows the basic status information of the drive.



No.	Field	Alternatives	Significance
1	Control location	LOC	Drive control is local, that is, from the control panel.
		REM	Drive control is remote, such as the drive I/O or fieldbus.
2	State	↻	Forward shaft direction
		↺	Reverse shaft direction
		Rotating arrow	Drive is running at setpoint.
		Dotted rotating arrow	Drive is running but not at setpoint.
		Stationary arrow	Drive is stopped.
		Dotted stationary arrow	Start command is present, but the motor is not running, eg, because start enable is missing.
3	Panel operation mode		• Name of the current mode • Name of the list or menu shown • Name of the operation state, eg, REF EDIT.
4	Reference value or number of the selected item		• Reference value in the Output mode • Number of the highlighted item, eg, mode, parameter group or fault.

Installation

For information on connecting the panel to the drive and mounting the panel, see *ACSM1 control panel user's guide* (3AUA0000020131) [English]).

Operation

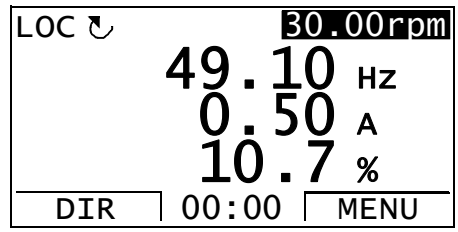
Basics of operation

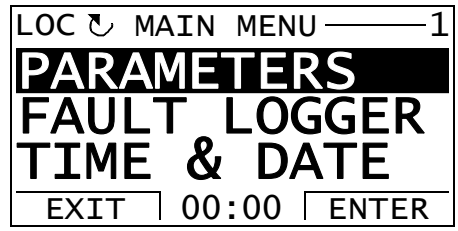
You operate the control panel with menus and keys. The keys include two context-sensitive soft keys, whose current function is indicated by the text shown in the display above each key.

You select an option, eg, operation mode or parameter, by entering the MENU state using soft key 2, and then by scrolling the ▲ and ▼ arrow keys until the option is highlighted, and then pressing the relevant soft key. With the right soft key you usually enter a mode, accept an option or save the changes. The left soft key is used to cancel the changes made and return to the previous operation level.

The ACSM1 Control Panel has six options in the Main menu: Parameters, Fault Logger, Time & Date, Parameter Backup, Reference Edit and Drive Info. In addition, the control panel has an Output mode, which is used as default. Also, when a fault or alarm occurs, the panel goes automatically to the Fault mode showing the fault or alarm. You can reset the fault in the Output or Fault mode. The operation in these modes and options is described in the following sections.

Initially, the panel is in the Output mode, where you can start, stop, change the direction, switch between local and remote control, modify the reference value and monitor up to three actual values. To do other tasks, first go to the Main menu and select the appropriate option on the menu. The status line (see section *Status line* on page *29*) shows the name of the current menu, mode, item or state.





List of tasks

The table below lists common tasks, the mode in which you can perform them, abbreviations of the options in the Main menu and the page number where the steps to do the task are described in detail.

Task	Mode / Main menu option	Abbreviations of the Main menu options *	Page
How to get help	Any	-	32
How to find out the panel version	Any	-	33
How to start and stop the drive	Output	-	34
How to switch between local and remote control	Any	-	34
How to change the direction of the motor rotation	Any	-	36
How to select the monitored signals	Parameters	PARAMETERS	36
How to set the speed reference in the Output mode	Output	-	37
How to adjust the display contrast	Output	-	37
How to change the value of a parameter	Parameters	PARAMETERS	38
How to change the value of value pointer parameters	Parameters	PARAMETERS	39
How to change the value of a bit pointer parameter to point to the value of a bit in another signal	Parameters	PARAMETERS	41
How to change the value of a bit pointer parameter to fixed 0 (FALSE) or 1 (TRUE)	Parameters	PARAMETERS	43
How to view faults	Fault Logger	FAULT LOGGER	45
How to reset faults and alarms	Fault Logger	FAULT LOGGER	45
How to show/hide the clock, change date and time formats, set the clock and enable/ disable automatic clock transitions according to the daylight saving changes	Time & Date	TIME & DATE	47
How to copy parameters from the drive to the control panel	Parameter Backup	PAR BACKUP	50
How to restore parameters from the control panel to the drive	Parameter Backup	PAR BACKUP	50
How to view backup information	Parameter Backup	PAR BACKUP	57
How to edit a reference value	Reference Edit	REF EDIT	58
How to view drive info	Drive Info	DRIVE INFO	59

* Main menu options actually shown in the control panel.

Help and panel version – Any mode

How to get help

Step	Action	Display
1.	Press ? to read the context-sensitive help text for the item that is highlighted. If help text exists for the item, it is shown on the display.	LOC ↻ TIME & DATE — 6 TIME FORMAT DATE FORMAT SET TIME SET DATE DAYLIGHT SAVING EXIT | 00:00 | SEL LOC ↻ HELP Use daylight saving to enable or disable automatic clock adjustment according to daylight saving EXIT | 00:00 |
2.	If the whole text is not visible, scroll the lines with keys ▲ and ▼.	LOC ↻ HELP to enable or disable automatic clock adjustment according to daylight saving changes EXIT | 00:00 |
3.	After reading the text, return to the previous display by pressing EXIT.	LOC ↻ TIME & DATE — 6 TIME FORMAT DATE FORMAT SET TIME SET DATE DAYLIGHT SAVING EXIT | 00:00 | SEL

How to find out the panel version

Step	Action	Display
1.	If the power is switched on, switch it off. • If the panel cable can be disconnected easily, unplug the panel cable from the control panel, OR • If the panel cable cannot be disconnected easily, switch off the control board or the drive.	
2.	Keep key (?) pressed down while you switch on the power and read the information. The display shows the following panel information: Panel SW: panel firmware version ROM CRC: panel ROM check sum Flash Rev: flash content version Flash content comment. When you release the (?) key, the panel goes to the Output mode.	PANEL VERSION INFO Panel SW: x.xx ROM CRC: xxxxxxxxxx Flash Rev: x.xx xxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxx

Basic operations – Any mode

How to start, stop and switch between local and remote control

You can start, stop and switch between local and remote control in any mode. To be able to start or stop the drive by using the control panel, the drive must be in local control.

Step	Action	Display
1.	• To switch between remote control (REM shown on the status line) and local control (LOC shown on the status line), press LOC REM. **Note:** Switching to local control can be disabled with parameter *16.01* LOCAL LOCK. The very first time the drive is powered up, it is in remote control (REM) and controlled through the drive I/O terminals. To switch to local control (LOC) and control the drive using the control panel, press LOC REM. The result depends on how long you press the key: • If you release the key immediately (the display flashes “Switching to the local control mode”), the drive stops. Set the local control reference as instructed on page *37*. • If you press the key for about two seconds, the drive continues running as before. The drive copies the current remote values for the run/stop status and the reference, and uses them as the initial local control settings.	LOC ↻ MESSAGE Switching to the local control mode. 00:00
	• To stop the drive in local control, press ▽.	The arrow (↻ or ↺) on the status line stops rotating.
	• To start the drive in local control, press ◁▷.	The arrow (↻ or ↺) on the status line starts rotating. It is dotted until the drive reaches the setpoint.

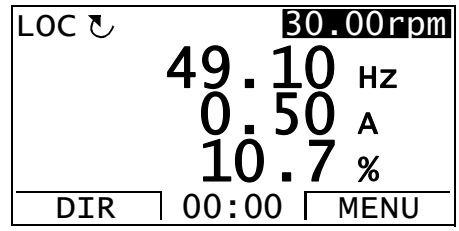
Output mode

In the Output mode, you can:

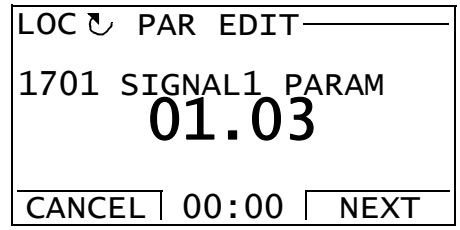
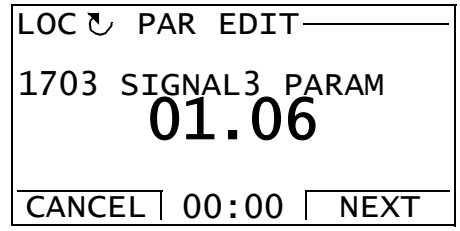
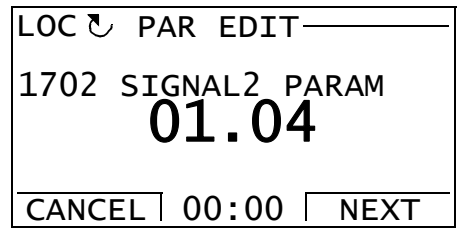
- monitor actual values of up to three signals
- change the direction of the motor rotation
- set the speed reference
- adjust the display contrast
- start, stop, change the direction and switch between local and remote control.

You get to the Output mode by pressing EXIT repeatedly.

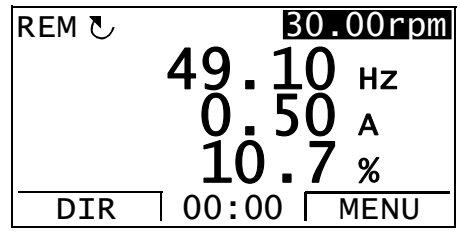
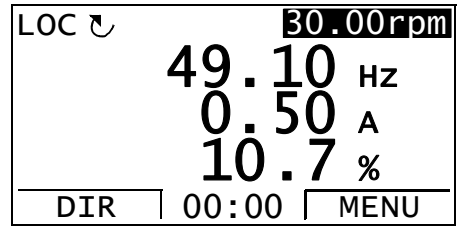
The top right corner of the display shows the reference value. The center can be configured to show up to three signal values or bar graphs; see page *36* for instructions on selecting and modifying the monitored signals.



How to select the monitored signals

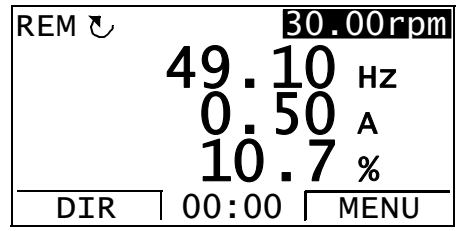
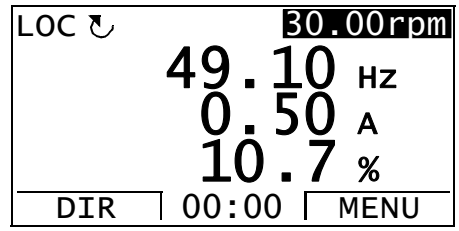
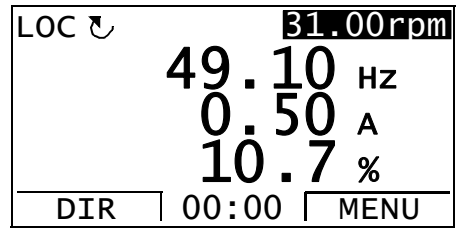
Step	Action	Display
1.	You can select which signals are monitored in the Output mode and how they are displayed with group *17 PANEL DISPLAY* parameters. See page *38* for detailed instructions on changing parameter values.	  

How to change the direction of the motor rotation

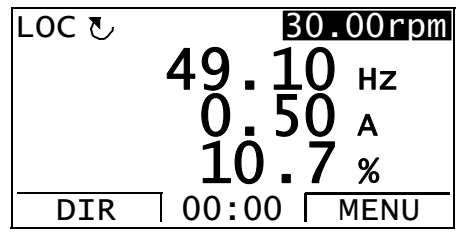
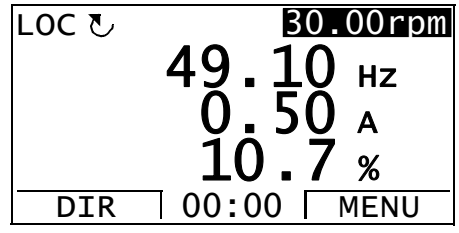
Step	Action	Display
1.	If you are not in the Output mode, press EXIT repeatedly until you get there.	
2.	If the drive is in remote control (REM shown on the status line), switch to local control by pressing LOC REM. The display briefly shows a message about changing the mode and then returns to the Output mode.	
3.	To change the direction from forward (↻ shown on the status line) to reverse (↺ shown on the status line), or vice versa, press DIR.	

How to set the speed reference in the Output mode

See also section *Reference Edit* on page *58*.

Step	Action	Display
1.	If you are not in the Output mode, press EXIT repeatedly until you get there.	
2.	If the drive is in remote control (REM shown on the status line), switch to local control by pressing LOC REM. The display briefly shows a message about changing the mode and then returns to the Output mode.	
3.	• To increase the highlighted reference value shown in the top right corner of the display, press ▲. The value changes immediately. It is stored in the permanent memory of the drive and restored automatically after power switch-off. • To decrease the value, press ▼.	

How to adjust the display contrast

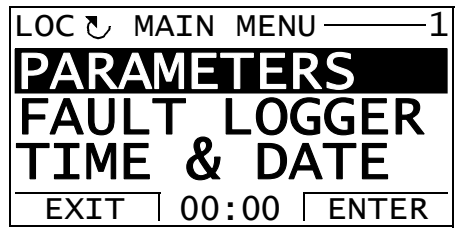
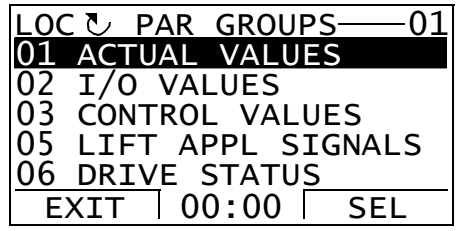
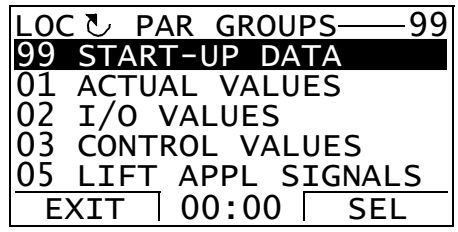
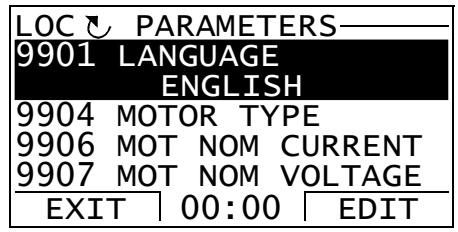
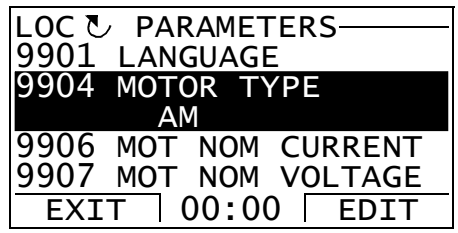
Step	Action	Display
1.	If you are not in the Output mode, press EXIT repeatedly until you get there.	
2.	• To increase the contrast, press keys MENU and ▲ simultaneously. • To decrease the contrast, press keys MENU and ▼ simultaneously.	

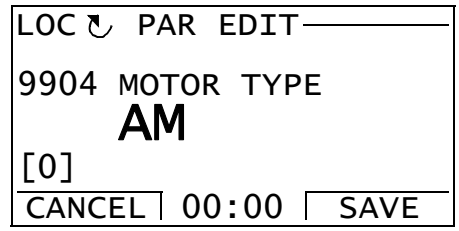
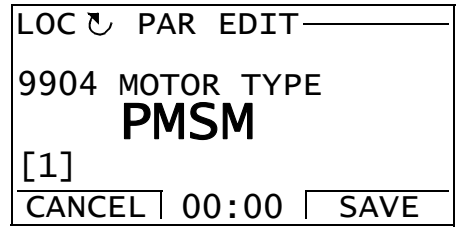
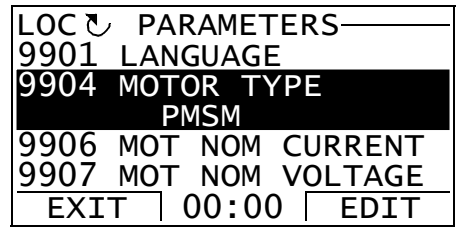
Parameters

In the Parameters option, you can:

- view and change parameter values
- start, stop, change the direction and switch between local and remote control.

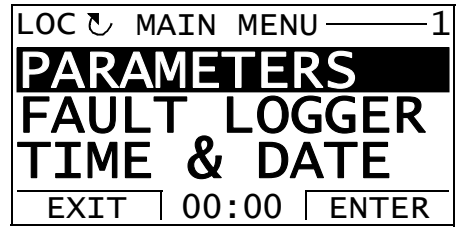
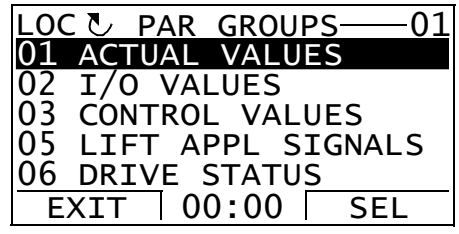
How to select a parameter and change its value

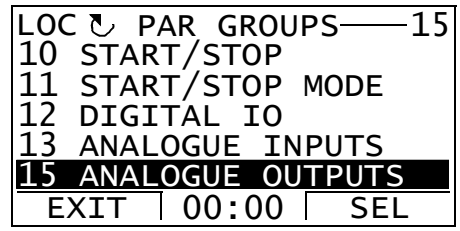
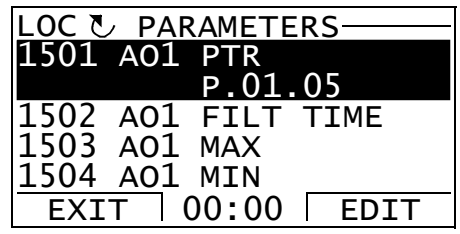
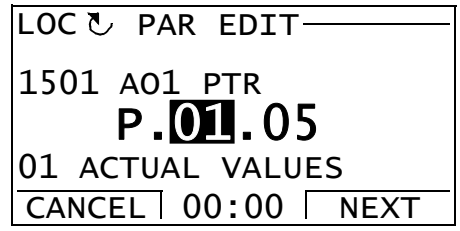
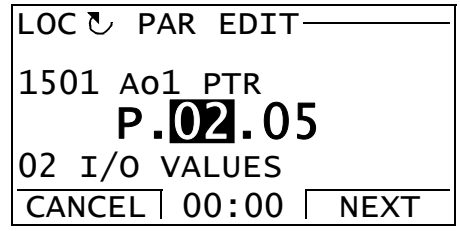
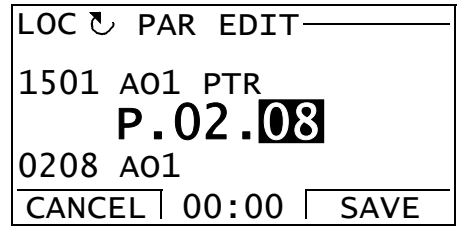
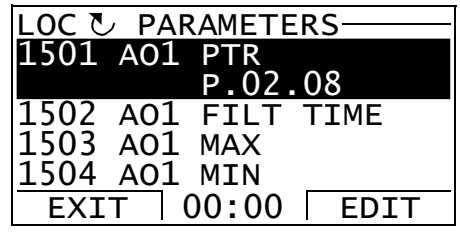
Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
2.	Go to the Parameters option by selecting PARAMETERS on the menu with keys ▲ and ▼, and pressing ENTER.	
3.	Select the appropriate parameter group with keys ▲ and ▼. Press SEL.	 
4.	Select the appropriate parameter with keys ▲ and ▼. The current value of the parameter is shown below the selected parameter.	

Step	Action	Display
	Press EDIT.	
5.	Specify a new value for the parameter with keys ▲ and ▼. Pressing the key once increments or decrements the value. Holding the key down changes the value faster. Pressing the keys simultaneously replaces the displayed value with the default value.	
6.	• To save the new value, press SAVE. • To cancel the new value and keep the original, press CANCEL.	

How to change the value of value pointer parameters

In addition to the parameters shown above, there are two kinds of pointer parameters; value pointer parameters and bit pointer parameters. The value pointer parameter points to the value of another parameter/signal. The source parameter is given in format **P.xx.yy**, where xx = Parameter group; yy = parameter index.

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
2.	Go to the Parameters option by selecting PARAMETERS on the menu with keys ▲ and ▼, and pressing ENTER.	

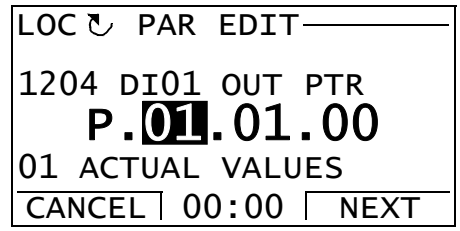
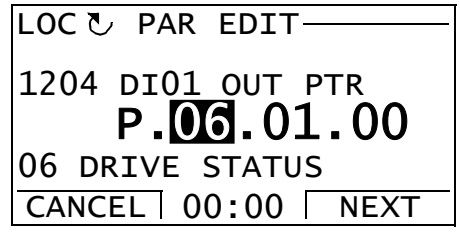
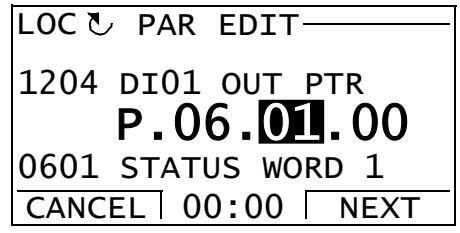
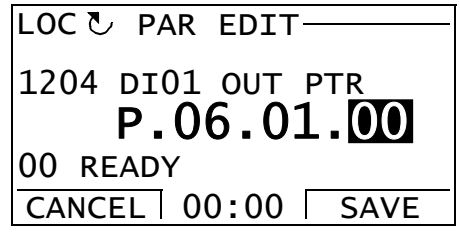
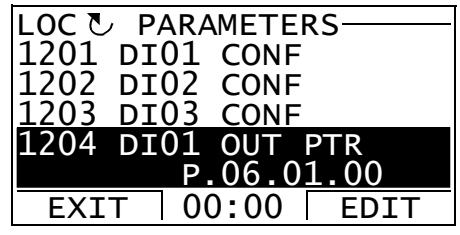
Step	Action	Display
3.	Select the appropriate parameter group with keys ▲ and ▼. Here the value pointer parameter *15.01* AO1 PTR is used as an example.	
4.	Press SEL to select the appropriate parameter group. Select the appropriate parameter with keys ▲ and ▼, the current value of each parameter is shown below it.	
5.	Press EDIT. The current value of the value pointer parameter is shown, as well as the parameter group it points to.	
6.	Specify a new parameter group for the value pointer parameter to point to with keys ▲ and ▼. The parameter group changes respectively.	
7.	• To continue, press NEXT. • To cancel the new value and keep the original, press CANCEL. Specify a new parameter for the value pointer parameter to point to with keys ▲ and ▼. The parameter changes respectively.	
8.	• To save the new value for the pointer parameter, press SAVE. • To cancel the new value and keep the original, press CANCEL. The new value is shown in the parameters list.	

How to change the value of a bit pointer parameter to point to the value of a bit in another signal

The bit pointer parameter points to the value of a bit in another signal, or can be fixed to 0 (FALSE) or 1 (TRUE). For the latter option, see page *43*. The bit pointer parameter points to a bit value (0 or 1) of one bit in a 32-bit signal. The first bit from the left is bit number 31, and the first bit from the right is bit number 0. For example, bit 01 stands for bit number 21 = 2, the second bit from the right, and number 00 stands for bit number 20 = 1, the first bit from the right.

When adjusting a bit pointer parameter on the control panel, POINTER is selected to define a source from another signal. A pointer value is given in format **P.xx.yy.zz**, where xx = Parameter group; yy = Parameter index, zz = Bit number.

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	LOC ↻ MAIN MENU ——— 1 **PARAMETERS** FAULT LOGGER TIME & DATE EXIT | 00:00 | ENTER
2.	Go to the Parameters option by selecting PARAMETERS on the menu with keys ▲ and ▼, and pressing ENTER.	LOC ↻ PAR GROUPS ——— 01 **01 ACTUAL VALUES** 02 I/O VALUES 03 CONTROL VALUES 05 LIFT APPL SIGNALS 06 DRIVE STATUS EXIT | 00:00 | SEL
3.	Select the appropriate parameter group with keys ▲ and ▼. Here the bit pointer parameter *12.04* DI01 OUT PTR is used as an example.	LOC ↻ PAR GROUPS ——— 12 **12 DIGITAL IO** 13 ANALOGUE INPUTS 15 ANALOGUE OUTPUTS 16 SYSTEM 17 PANEL DISPLAY EXIT | 00:00 | SEL
4.	Press SEL to select the appropriate parameter group. Select the appropriate parameter with keys ▲ and ▼. The current value of each parameter is shown below its name.	LOC ↻ PARAMETERS ——— 1201 DI01 CONF 1202 DI02 CONF 1203 DI03 CONF **1204 DI01 OUT PTR** **P.01.01.00** EXIT | 00:00 | EDIT
5.	Press EDIT.	LOC ↻ PAR EDIT ——— 1204 DI01 OUT PTR Pointer CANCEL | 00:00 | NEXT

Step	Action	Display
6.	Press NEXT. The current value of the bit pointer parameter is shown, as well as the parameter group it points to.	
7.	Specify a new parameter group for the bit pointer parameter to point to with keys ▲ and ▼. The parameter group changes respectively.	
8.	• To continue, press NEXT. • To cancel the new value and keep the original, press CANCEL. Specify a new parameter for the bit pointer parameter to point to with keys ▲ and ▼. The parameter name changes respectively.	
9.	• To continue, press NEXT. • To cancel the new value and keep the original, press CANCEL. Specify a new bit for the bit pointer parameter to point to with keys ▲ and ▼. The bit number and name (if defined) change respectively. Here bit 00 stands for bit number 2^0 = 1, the first bit from the right in a 32-bit signal.	
10.	• To save the new value for the bit pointer parameter, press SAVE. • To cancel the new value and keep the original, press CANCEL. The new value is shown in the parameters list.	

How to change the value of a bit pointer parameter to fixed 0 (FALSE) or 1 (TRUE)

The bit pointer parameter can be fixed to constant value of 0 (FALSE) or 1 (TRUE).

When adjusting a bit pointer parameter on the control panel, CONST is selected in order to fix the value to 0 (displayed as C.FALSE.) or 1 (C.TRUE.).

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	LOC ↻ MAIN MENU ——— 1 **PARAMETERS** FAULT LOGGER TIME & DATE EXIT | 00:00 | ENTER
2.	Go to the Parameters option by selecting PARAMETERS on the menu with keys ▲ and ▼, and pressing ENTER.	LOC ↻ PAR GROUPS ——— 01 **01 ACTUAL VALUES** 02 I/O VALUES 03 CONTROL VALUES 05 LIFT APPL SIGNALS 06 DRIVE STATUS EXIT | 00:00 | SEL
3.	Select the appropriate parameter group with keys ▲ and ▼. Here the bit pointer parameter *12.04* DI01 OUT PTR is used as an example.	LOC ↻ PAR GROUPS ——— 12 **12 DIGITAL IO** 13 ANALOGUE INPUTS 15 ANALOGUE OUTPUTS 16 SYSTEM 17 PANEL DISPLAY EXIT | 00:00 | SEL
4.	Press SEL to select the appropriate parameter group. Select the appropriate parameter with keys ▲ and ▼. The current value of each parameter is shown below its name.	LOC ↻ PARAMETERS ——— 1201 DI01 CONF 1202 DI02 CONF 1203 DI03 CONF **1204 DI01 OUT PTR** **P.06.02.02** EXIT | 00:00 | EDIT
5.	Press EDIT.	LOC ↻ PAR EDIT ——— 1204 DI01 OUT PTR Pointer CANCEL | 00:00 | NEXT

Step	Action	Display
	Select CONST with keys ▲ and ▼.	LOC ↻ PAR EDIT 1204 DI01 OUT PTR Const CANCEL 00:00 NEXT
6.	Press NEXT.	LOC ↻ PAR EDIT 1204 DI01 OUT PTR C.FALSE [0] CANCEL 00:00 SAVE
7.	Specify a new constant value (TRUE or FALSE) for the bit pointer parameter with keys ▲ and ▼.	LOC ↻ PAR EDIT 1204 DI01 OUT PTR C.TRUE [1] CANCEL 00:00 SAVE
8.	• To continue, press SAVE. • To cancel the new value and keep the original, press CANCEL. The new value is shown in the parameters list.	LOC ↻ PARAMETERS 1201 DI01 CONF 1202 DI02 CONF 1203 DI03 CONF 1204 DI01 OUT PTR C.TRUE EXIT 00:00 EDIT

Fault Logger

In the Fault Logger option, you can:

- view the drive fault history
- see the details of the most recent faults
- start, stop, change the direction and switch between local and remote control.

How to view faults

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	LOC ↻ MAIN MENU 2 PARAMETERS FAULT LOGGER TIME & DATE EXIT 00:00 ENTER
2.	Go to the Fault Logger option by selecting FAULT LOGGER on the menu with keys ▲ and ▼, and pressing ENTER. • If there are no faults in the fault history, the corresponding text will be shown. • If there is a fault history, the display shows the fault log starting with the most recent fault. The number on the row is the fault code according to which the causes and corrective actions are listed in chapter *Fault tracing*. • To see the details of a fault, select it with keys ▲ and ▼, and press DETAIL. • Scroll the text with keys ▲ and ▼. • After reading it, press EXIT to return to the previous display.	LOC ↻ MESSAGE No fault history found LOC ↻ FAULT LOGGER 1 36: LOCAL CTRL LOSS 29.04.08 10:45:58 EXIT 00:00 DETAIL LOC ↻ LOCAL CTRL LOSS TIME 10:45:58 FAULT CODE 36 FAULT CODE EXTENSION EXIT 00:00

How to reset faults

Step	Action	Display
1.	When a fault occurs, a text identifying the fault is shown. • To reset the fault, press RESET. • To return to the previous display, press EXIT.	LOC ↻ FAULT FAULT 36 LOCAL CTRL LOSS RESET EXIT

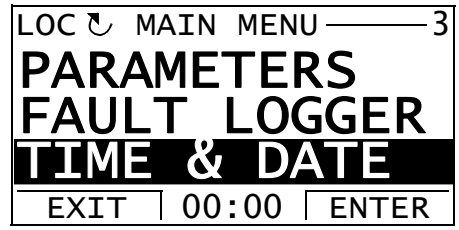
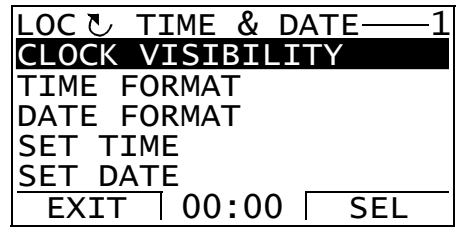
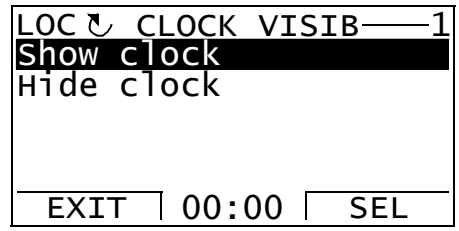
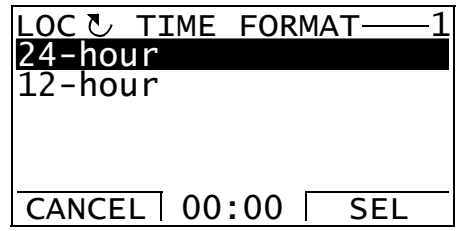
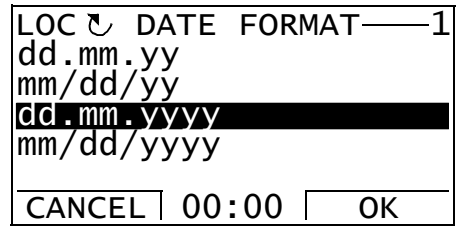
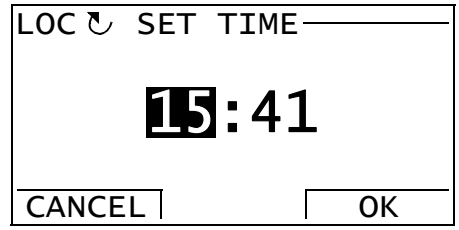
Time & Date

In the Time & Date option, you can:

- show or hide the clock
- change date and time display formats
- set the date and time
- enable or disable automatic clock transitions according to the daylight saving changes
- start, stop, change the direction and switch between local and remote control.

The ACSM1 control panel contains a battery to ensure the function of the clock when the panel is not powered by the drive.

How to show or hide the clock, change display formats, set the date and time and enable or disable clock transitions according to daylight saving changes

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
2.	Go to the Time & Date option by selecting TIME & DATE on the menu with keys ▲ and ▼, and pressing ENTER.	
3.	• To show (hide) the clock, select CLOCK VISIBILITY on the menu, press SEL, select Show clock (Hide clock) with keys ▲ and ▼ and press SEL, or, if you want to return to the previous display without making changes, press EXIT. • To specify the time format, select TIME FORMAT on the menu, press SEL and select a suitable format with keys ▲ and ▼. Press SEL to save or CANCEL to cancel your changes. • To specify the date format, select DATE FORMAT on the menu, press SEL and select a suitable format. Press OK to save or CANCEL to cancel your changes. • To set the time, select SET TIME on the menu and press SEL. Specify the hours with keys ▲ and ▼, and press OK. Then specify the minutes. Press OK to save or CANCEL to cancel your changes.	   

Step	Action	Display
	• To set the date, select SET DATE on the menu and press SEL. Specify the first part of the date (day or month depending on the selected date format) with keys ▲ and ▼, and press OK. Repeat for the second part. After specifying the year, press OK. To cancel your changes, press CANCEL. • To enable or disable the automatic clock transitions according to the daylight saving changes, select DAYLIGHT SAVING on the menu and press SEL. Pressing ? opens the help that shows the beginning and end dates of the period during which daylight saving time is used in each country or area whose daylight saving changes you can select to be followed. Scroll the text with keys ▲ and ▼. To return to the previous display, press EXIT. • To disable automatic clock transitions according to the daylight saving changes, select Off and press SEL. • To enable automatic clock transitions, select the country or area whose daylight saving changes are followed and press SEL. • To return to the previous display without making changes, press EXIT.	LOC ↻ SET DATE 19.03.2008 CANCEL | 00:00 | OK LOC ↻ DAYLIGHT SAV—1 Off EU US Aust 1: NSW,Vict.. Aust 2:Tasmania.. EXIT | 00:00 | SEL LOC ↻ HELP EU: On: Mar last Sunday Off: Oct last Sunday US: EXIT | 00:00 |

Parameter Backup

The Parameter Backup option is used to export parameters from one drive to another or to make a backup of the drive parameters. Uplading to the panel stores all drive parameters, including up to four user sets, to the control panel. Selectable subsets of the backup file can then be restored/downloaded from the control panel to the same drive or another drive of the same type.

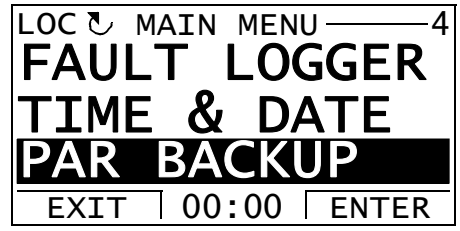
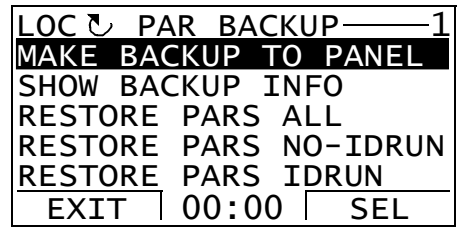
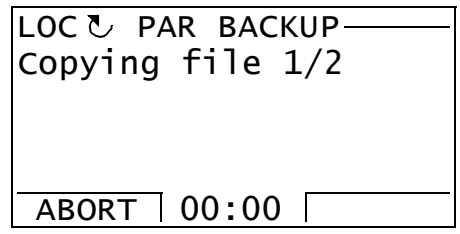
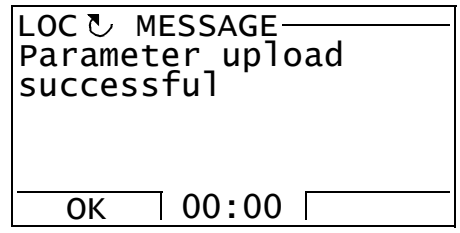
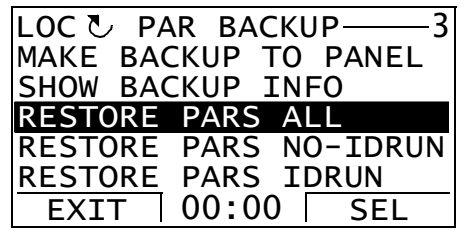
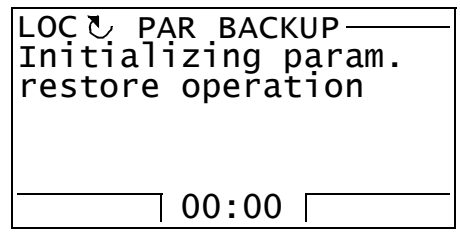
In the Parameter Backup option, you can:

- Copy all parameters from the drive to the control panel with MAKE BACKUP TO PANEL. This includes all defined user sets of parameters and internal (not adjustable by the user) parameters, such as those changed by the ID Run.
- View the information about the backup stored in the control panel with SHOW BACKUP INFO. This includes, for example, version information etc. of the current backup file in the panel. It is useful to check this information when you are going to restore the parameters to another drive with RESTORE PARS ALL to ensure that the drives are compatible.
- Restore the full parameter set from the control panel to the drive using the RESTORE PARS ALL command. This writes all parameters, including the internal non-user-adjustable motor parameters, to the drive. It does NOT include the user sets of parameters.

  Note: Use this function only to restore the parameters from a backup or to restore parameters to systems that are compatible.
- Restore all parameters, except motor data, to the drive with RESTORE PARS NO-IDRUN.
- Restore only motor data parameters to the drive with RESTORE PARS IDRUN.
- Restore all user sets to the drive with RESTORE ALL USER SETS.
- Restore only user set 1…4 to the drive with RESTORE USER SET 1…RESTORE USER SET 4.

How to backup and restore parameters

For all backup and restore functions available, see page 49.

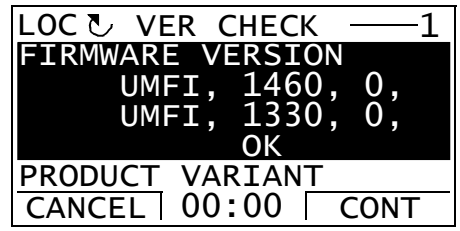
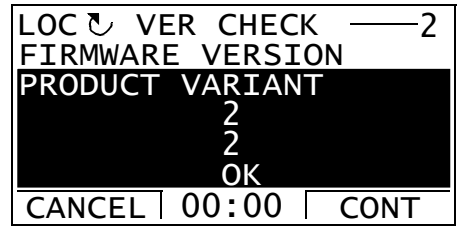
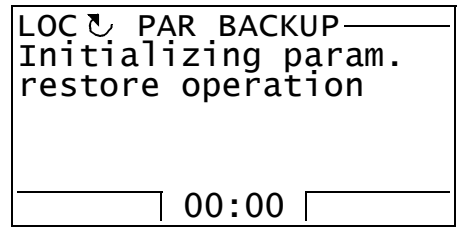
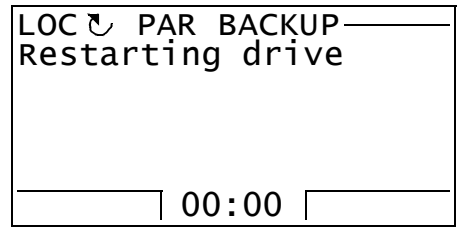
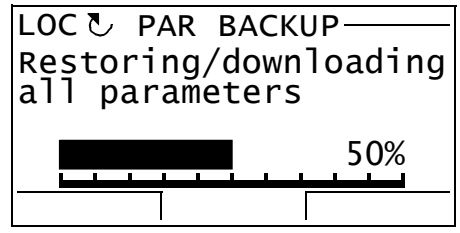
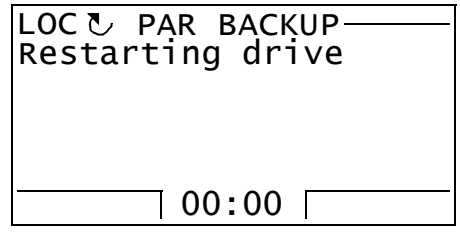
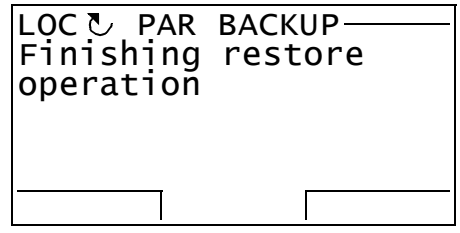
Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
2.	Go to the Parameter Backup option by selecting PAR BACKUP on the menu with keys ▲ and ▼, and pressing ENTER.	
3.	To copy all parameters (including user sets and internal parameters) from the drive to the control panel, select MAKE BACKUP TO PANEL on the Par Backup with keys ▲ and ▼, and press SEL. Operation starts. Press ABORT if you want to stop the operation. After the backup is completed, the display shows a message about the completion. Press OK to return to the Par Backup.	 
4.	To perform restore functions, select the appropriate operation (here RESTORE PARS ALL is used as an example) on the Par Backup with keys ▲ and ▼. • Press SEL. Restoring starts.	 

Step	Action	Display
	• Backup interface version is checked. Scroll the text with keys ▲ and ▼.	LOC VERSION CHECK 1 BACKUP INTERFACE VER 0.2 0.2 OK FIRMWARE VERSION CANCEL | 00:00 | CONT
	• If you want to continue, press CONT. Press CANCEL if you want to stop the operation. If the downloading is continued, the display shows a message about it.	LOC PAR BACKUP Initializing param. restore operation 00:00
	• Downloading continues, drive is being restarted.	LOC PAR BACKUP Restarting drive 00:00
	• The display shows the transfer status as a percentage of completion.	LOC PAR BACKUP Restoring/downloading all parameters 50%
	• Downloading finishes.	LOC PAR BACKUP Finishing restore operation

Parameter errors

If you try to backup and restore parameters between different firmware versions, the panel shows you the following parameter error information:

Step	Action	Display
1.	Restore operation starts normally.	LOC PAR BACKUP Initializing param. restore operation 00:00

Step	Action	Display
2.	Firmware version is checked. You can see on the panel that the firmware versions are not the same.	
	Scroll the text with keys ▲ and ▼. To continue, press CONT. Press CANCEL to stop the operation.	
3.	If the downloading is continued, the display shows a message about it.	
	• Downloading continues, drive is being restarted.	
	• The display shows the transfer status as a percentage of completion.	
	• Downloading continues.	
	• Downloading finishes.	

Step	Action	Display
4.	The panel shows a list of erroneous parameters. You can scroll the parameters with keys ▲ and ▼. The reason for parameter error is also shown.	LOC ↻ PAR ERRORS ——1 6005*POS UNIT 0 ? VALUE MISSING 6008*POS2 INT SCALE READY | 00:00 | EDIT LOC ↻ PAR ERRORS ——4 22114* 1313*AI SUPERVIS ACT 0000 bin INCORRECT VALUE TYPE READY | 00:00 | EDIT
5.	You can edit parameters by pressing EDIT when EDIT command is visible. Parameter *60.05* POS UNIT is used as an example. Edit the parameter as shown in section *Parameters* on page *38*.	LOC ↻ PAR EDIT 6005 POS UNIT Revolution [0] CANCEL | 00:00 | SAVE
6.	Press SAVE to save the new value. Press CANCEL to return to the list of erroneous parameters.	LOC ↻ PAR EDIT 6005 POS UNIT Degree [1] CANCEL | 00:00 | SAVE
7.	The parameter value you chose is visible under the parameter name. Press READY when you have edited parameters.	LOC ↻ PAR ERRORS ——1 6005*POS UNIT 1 ? VALUE MISSING 6008*POS2 INT SCALE READY | 00:00 | EDIT

Trying to restore a user set between different firmware versions

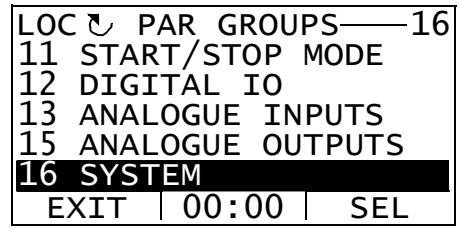
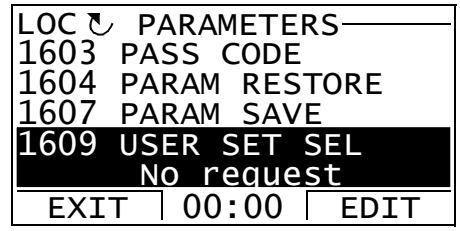
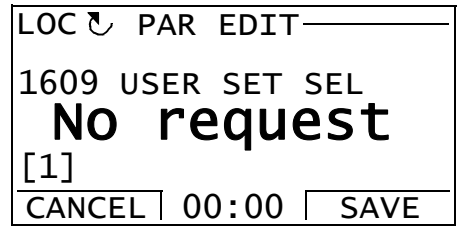
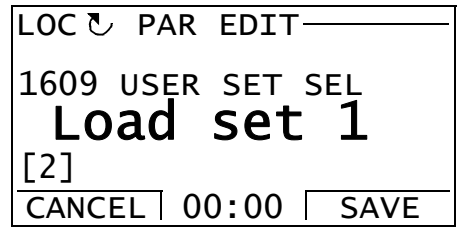
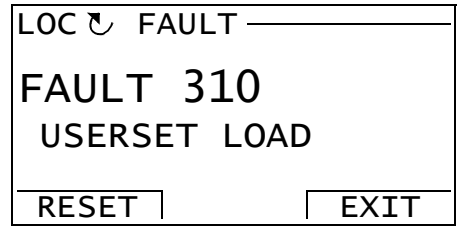
If you try to backup and restore a user set between different firmware versions, the panel shows you the following alarm information:

Step	Action	Display
1.	Restore operation starts normally.	LOC ↻ PAR BACKUP Initializing param. restore operation 00:00
2.	Version check is also OK. You can see on the panel that the firmware versions are not the same. You can scroll the text with keys ▲ and ▼.	LOC ↻ VER CHECK 1 FIRMWARE VERSION UMFI, 1460, 0, UMFI, 1330, 0, OK PRODUCT VARIANT CANCEL 00:00 CONT LOC ↻ VER CHECK 2 FIRMWARE VERSION PRODUCT VARIANT 2 2 OK CANCEL 00:00 CONT
3.	If the downloading is continued, the display shows a message about it. • Downloading continues, drive is being restarted. • The display shows the transfer status as a percentage of completion.	LOC ↻ PAR BACKUP Initializing param. restore operation 00:00 LOC ↻ PAR BACKUP Restarting drive 00:00 LOC ↻ PAR BACKUP Restoring/downloading user set 1 50%

Step	Action	Display
	• Downloading continues.	LOC ↻ PAR BACKUP Initializing param. restore operation 00:00
	• Downloading continues, drive is being restarted.	LOC ↻ PAR BACKUP Restarting drive 00:00
	• Downloading finishes.	LOC ↻ PAR BACKUP Finishing restore operation
4.	Panel shows a text identifying the alarm and returns to the Par Backup.	LOC ↻ ALARM ALARM 2036 RESTORE EXIT

Trying to load a user set between different firmware versions

If you try load a user set between different firmware versions, the panel shows you the following fault information:

Step	Action	Display
1.	Go to the Parameters option by selecting PARAMETERS on the main menu as shown in section *Parameters* on page *38*. A user set is loaded through parameter *16.09* USER SET SEL. Select parameter group *16 SYSTEM* with keys ▲ and ▼.	
2.	Press SEL to select the parameter group 16. Select parameter *16.09* USER SET SEL with keys ▲ and ▼. The current value of each parameter is shown below its name.	
3.	Press EDIT. Select the user set you want to load with keys ▲ and ▼. Press SAVE.	 
4.	Panel shows a text identifying the fault.	

How to view information about the backup

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	LOC ↻ MAIN MENU ———4 FAULT LOGGER TIME & DATE PAR BACKUP EXIT | 00:00 | ENTER
2.	Go to the Par Backup option by selecting PAR BACKUP on the menu with keys ▲ and ▼, and pressing ENTER.	LOC ↻ PAR BACKUP ———2 MAKE BACKUP TO PANEL SHOW BACKUP INFO RESTORE PARS ALL RESTORE PARS NO-IDRUN RESTORE PARS IDRUN EXIT | 00:00 | SEL
3.	Select SHOW BACKUP INFO on the Par Backup with keys ▲ and ▼, and press SEL. The display shows the following information about the drive from where the backup was made: BACKUP INTERFACE VER: Format version of the backup file FIRMWARE VERSION: Information on the firmware UMFI: Firmware of the ACSM1 drive 1330: Firmware version (eg, 1.330) 0: Firmware patch version PRODUCT VARIANT: 1: ACSM1 Speed 2: ACSM1 Motion You can scroll the information with keys ▲ and ▼.	LOC ↻ BACKUP INFO ——— BACKUP INTERFACE VER 0.2 0.2 FIRMWARE VERSION UMFI, 1330, 0, EXIT | 00:00 | LOC ↻ BACKUP INFO ——— FIRMWARE VERSION UMFI, 1330, 0, UMFI, 1330, 0, PRODUCT VARIANT 2 EXIT | 00:00 |
4.	Press EXIT to return to the Par Backup.	LOC ↻ PAR BACKUP ———1 MAKE BACKUP TO PANEL SHOW BACKUP INFO RESTORE PARS ALL RESTORE PARS NO-IDRUN RESTORE PARS IDRUN EXIT | 00:00 | SEL

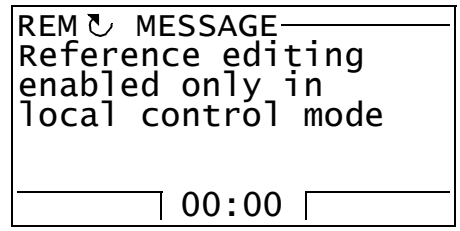
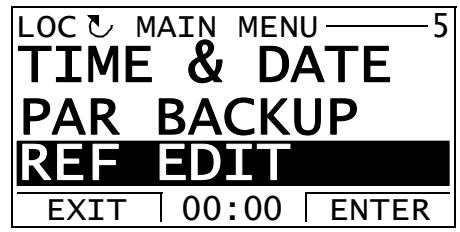
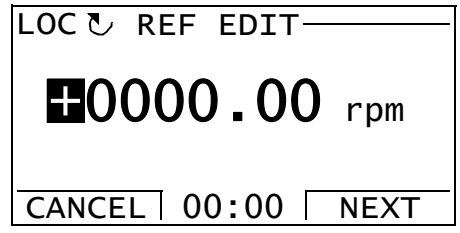
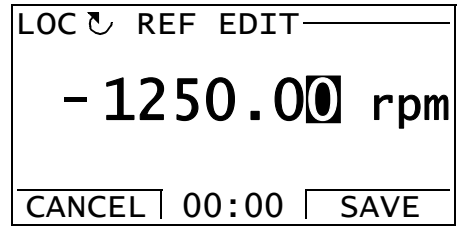
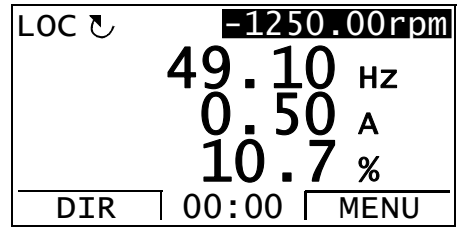
Reference Edit

In the Reference Edit option, you can:

- accurately control the local reference value,
- start, stop, change the direction and switch between local and remote control.

Editing is allowed only in the LOC state; the option always edits the local reference value.

How to edit a reference value

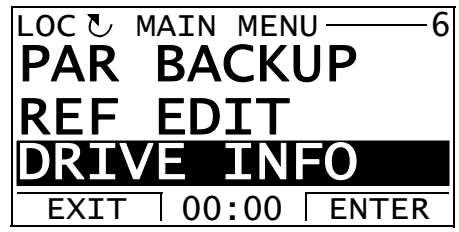
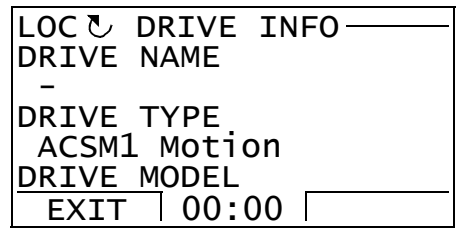
Step	Action	Display
1.	If the panel is in the remote control mode (REM shown on the status line), switch to local control (LOC shown on the status line) by pressing LOC/REM. Reference editing is not possible in the remote control mode. If you try to enter REF EDIT in the remote control mode, the display shows a message about that.	
2.	Otherwise, go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
3.	Go to the Reference Edit option by selecting REF EDIT on the menu with keys ▲ and ▼, and pressing ENTER.	
4.	Select the correct sign with keys ▲ and ▼, and press NEXT. Select the correct numbers with keys ▲ and ▼, and after each number is selected, press NEXT. If you do not select a number for a couple of seconds, the number you are editing moves on to the next one on the right.	
5.	After the last number is selected, press SAVE. Go to the Output mode by pressing EXIT. The selected reference value is shown in the status line.	

Drive Info

In the Drive Info option, you can:

- view information on the drive,
- start, stop, change the direction and switch between local and remote control.

How to view drive info

Step	Action	Display
1.	Go to the Main menu by pressing MENU if you are in the Output mode, otherwise by pressing EXIT repeatedly until you get to the Main menu.	
2.	Go to the Drive info option by selecting DRIVE INFO on the menu with keys ▲ and ▼, and pressing ENTER.	

Step	Action	Display
3.	The display shows information about the drive. You can scroll the information with keys ▲ and ▼. **Note:** The information shown may vary according to the firmware version of the drive. DRIVE NAME: Drive name defined as a text in DriveStudio commissioning and maintenance tool DRIVE TYPE: Product variant, eg, ACSM1 Speed or ACSM1 Motion DRIVE MODEL: Type code of the drive FW VERSION: See page *57*. SOLUTION PROGRAM: Information on the active solution program STANDARD LIBRARY: Version information of the standard library in the firmware TECHNOLOGY LIBRARY: Optional. Version information of the technology library POWER UNIT SERNO: Serial number of the power stage (JPU) MEM UNIT HW SERNO: Serial number in manufacturing the memory unit (JMU) MEM UNIT CONFIG SERNO: Serial number in configuring the memory unit (JMU). Press EXIT to return to the Main menu.	LOC ↻ DRIVE INFO FW VERSION UMFI, 1330, 0, SOLUTION PROGRAM - STANDARD LIBRARY EXIT | 00:00

4

Start-up

What this chapter contains

This chapter contains the following procedures:

- *How to start up the drive* outlines the basic tasks that you need to perform to start up an ACSM1 drive with the Lift control program. A minimum set of lift control functions required for operating a lift with the control program is included.
- *How to enable further lift control functions* includes the tasks that you need to perform if you want to take into use further lift control functions.

The drive can be started up from the control panel or using the DriveStudio PC tool program. The start-up procedures presented below use the control panel. For detailed instructions on using the panel, see chapter *ACSM1 control panel*. For instructions on using DriveStudio, see *DriveStudio user manual (3AFE68749026 [English])*.

How to start up the drive

This procedure includes tasks which need to be performed only when the drive is powered up for the first time (for example, entering the motor data). After the first start-up, the drive can be powered up without using these start-up tasks. The procedure can be repeated later if start-up data needs to be changed.

In addition to the drive power-up, the procedure includes the following tasks:

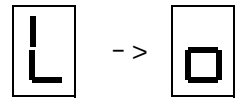
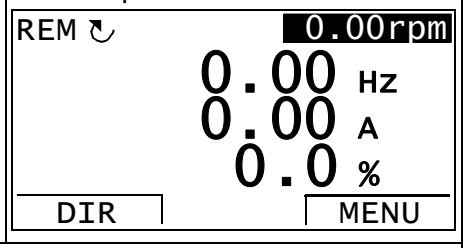
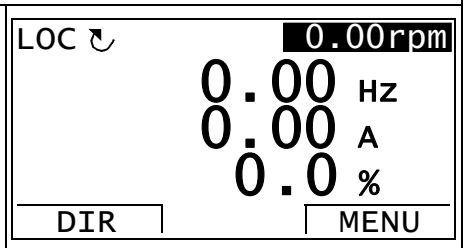
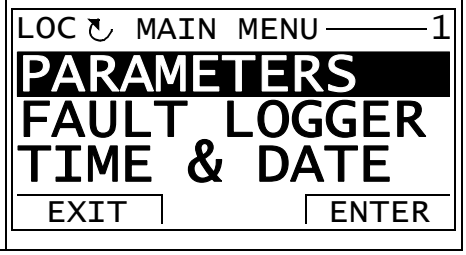
- entering the motor data and performing the motor identification run
- setting up the encoder/resolver communication
- checking the emergency stop and Safe torque off circuits
- setting up the voltage control
- setting the drive limits
- setting up the motor overtemperature protection

- setting up the following lift control functions:
  - Start/stop control
  - Mechanical brake control
  - Manual fault reset
  - Automatic fault reset
  - Speed reference scaling
  - Speed reference selection
  - Acceleration/deceleration selection
  - Jerk selection.

If an alarm or a fault is generated during the start-up, see chapter *Fault tracing* for the possible causes and remedies. If problems continue, disconnect the main power and wait 5 minutes for the intermediate circuit capacitors to discharge and check the drive and motor connections.

Before you start, ensure that you have the motor nameplate and encoder data (if needed) at your hand.

Safety	
	The start-up may only be carried out by a qualified electrician. The safety instructions must be followed during the start-up procedure. See the safety instructions on the first pages of the appropriate *Hardware manual*.
☐	Check the installation. See the installation checklist in the appropriate *Hardware manual*.
☐	Check that the starting of the motor does not cause any danger. **De-couple the motor from the lift system** if • a normal ID run (*99.13* IDRUN MODE = *Normal*) is required during the drive start-up, or • a reduced ID run (*99.13* IDRUN MODE= *Reduced*) is required during the drive start-up, or • rotating autophasing (*11.07* AUTOPHASING MODE = *Turning*) is required during the drive start-up.

Power up, control panel basics		
☐	Connect the control panel to the drive. For instructions, see the *Hardware manual*.	
☐	Power up the drive. After a few moments, the 7-segment display on the JCU Control Unit is activated and the panel shows the Output mode (right).	7-segment display:  Control panel: 
Note: The drive will indicate an alarm (2021 NO MOTOR DATA) until the motor data is entered later in this procedure. This is completely normal.		
☐	Switch to local control to ensure that external control is disabled by pressing the LOC/REM key on the control panel. Local control is indicated by the text “LOC” on the top row on the display. The two boxes at the bottom row of the display indicate the function of the two soft keys and . The contents of the boxes depend on the visible menu choices.	
☐	Press MENU to access the Main menu. Within any menu, the desired selection is highlighted. Press the and keys to make a new choice; activate by pressing ENTER.	

Adjusting parameter values		
☐	In the Main menu, highlight PARAMETERS and press ENTER. • Use the ▲ and ▼ keys to browse the list of parameter groups. Highlight the desired group and press SEL to display the parameters within that group. • Highlight a parameter and press EDIT to adjust the value. • Use ▲ and ▼ to adjust the value. (When adjusting pointer parameters, use the NEXT key to move between parameter group, index and bit settings.) • Press SAVE to accept the new parameter value, CANCEL to retain the old value. • At any point, press CANCEL or EXIT to return to the previous level.	
Notes: For more detailed instructions on adjusting parameter values, see the following sections: • *How to select a parameter and change its value* on page *38* • *How to change the value of value pointer parameters* on page *39* • *How to change the value of a bit pointer parameter to point to the value of a bit in another signal* on page *41* • *How to change the value of a bit pointer parameter to fixed 0 (FALSE) or 1 (TRUE)* on page *43*.		
Changing the language		
☐	By default, the language of the text shown is English. If desired, the language can be changed.	*99.01* LANGUAGE
Entering motor data		
☐	Select the motor type: asynchronous or permanent magnet motor.	*99.04* MOTOR TYPE
☐	Select the motor control mode. DTC is used for normal lift operation. Scalar control can be used for testing purposes.	*99.05* MOTOR CTRL MODE

☐ Enter the motor data from the motor nameplate.

Asynchronous motor nameplate example:

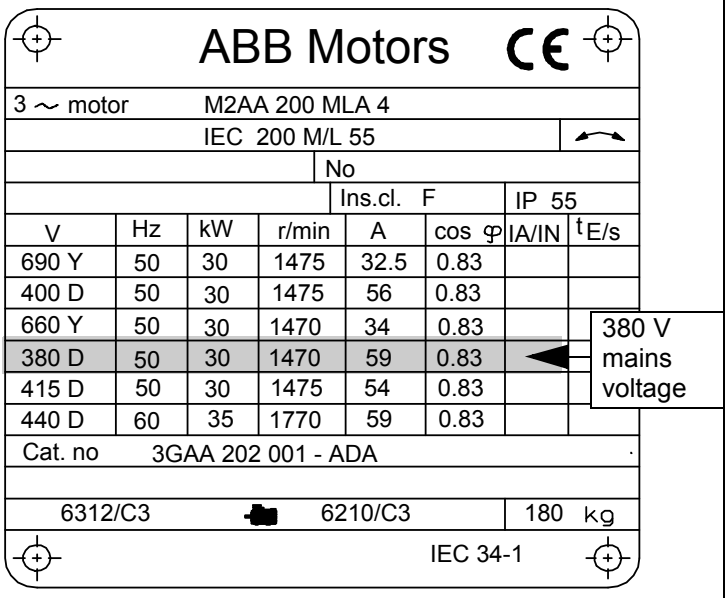


ABB Motors CE

3 ~ motor	M2AA 200 MLA 4						
	IEC 200 M/L 55						
		No					
			Ins.cl. F			IP 55	
V	Hz	kW	r/min	A	cos φ	IA/IN	tE/s
690 Y	50	30	1475	32.5	0.83		
400 D	50	30	1475	56	0.83		
660 Y	50	30	1470	34	0.83		
380 D	50	30	1470	59	0.83		
415 D	50	30	1475	54	0.83		
440 D	60	35	1770	59	0.83		
Cat. no	3GAA 202 001 - ADA						
6312/C3			6210/C3			180	kg
				IEC 34-1			

380 V mains voltage

Permanent magnet motor nameplate example:

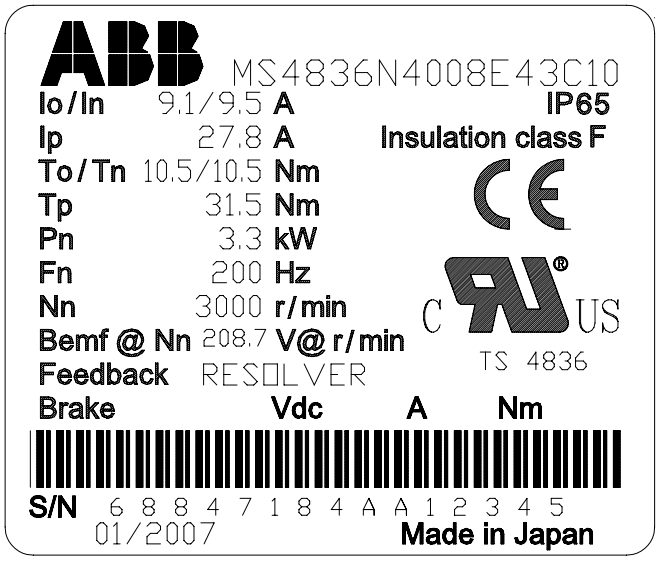


ABB MS4836N4008E43C10

Io/In 9.1/9.5 A IP65

Ip 27.8 A Insulation class F

To/Tn 10.5/10.5 Nm

Tp 31.5 Nm

Pn 3.3 kW

Fn 200 Hz

Nn 3000 r/min

Bemf @ Nn 208.7 V@ r/min

Feedback RESOLVER

Brake Vdc A Nm

S/N 6 8 8 4 7 1 8 4 A A 1 2 3 4 5

01/2007 Made in Japan

At least parameters *99.06*…*99.10* must be set with DTC control (*99.05* MOTOR CTRL MODE = *DTC*). Better control accuracy can be achieved by setting also parameters *99.11*…*99.12*.

Note: Set the motor data to exactly the same value as on the motor nameplate. For example, if the motor nominal speed is 1470 rpm on the nameplate, setting the value of parameter *99.09* MOT NOM SPEED to 1500 rpm results in wrong operation of the drive.

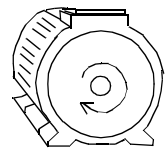
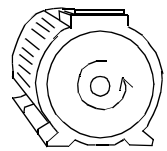
☐ • motor nominal current

Allowed range: approximately 1/6 · I_{2n} … 2 · I_{2n} of the drive (0…2 · I_{2nd} if parameter *99.05* MOTOR CTRL MODE = *Scalar*). With multimotor drives, see section *Multimotor drives* on page *67*.

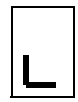
99.06 MOT NOM CURRENT

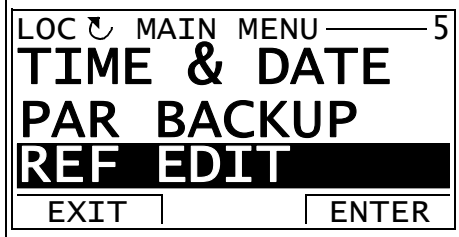
☐	• motor nominal voltage Allowed range: 1/6 · U_N … 2 · U_N of the drive. (U_N refers to the highest voltage in each nominal voltage range, that is 480 V AC for ACSM1-04). With permanent magnet motors: The nominal voltage is the BackEMF voltage (at motor nominal speed). If the voltage is given as voltage per rpm, eg, 60 V per 1000 rpm, the voltage for 3000 rpm nominal speed is 3 × 60 V = 180 V. Note that the nominal voltage is not equal to the equivalent DC motor voltage (E.D.C.M.) value given by some motor manufactures. The nominal voltage can be calculated by dividing the E.D.C.M. voltage by 1.7 (= square root of 3).	*99.07* MOT NOM VOLTAGE
☐	• motor nominal frequency Range: 5.0…500.0 Hz. With multimotor drives, see section *Multimotor drives* on page *67*. With permanent magnet motor: If the frequency is not given on the motor nameplate, it has to be calculated with the following formula: $f = n \times p / 60$ where p = number of pole pairs, n = motor nominal speed.	*99.08* MOT NOM FREQ
☐	• motor nominal speed Range: 0…30000 rpm. With multimotor drives, see section *Multimotor drives* on page *67*.	*99.09* MOT NOM SPEED
☐	• motor nominal power Range: 0.00…10000.00 kW. With multimotor drives, see section *Multimotor drives* on page *67*.	*99.10* MOT NOM POWER
☐	• motor nominal cosφ (not applicable to permanent magnet motors). This value can be set for better DTC control accuracy. If the value is not given by the motor manufacturer, use value 0 (ie, default value). Range: 0.00…1.00.	*99.11* MOT NOM COSFII
☐	• motor nominal shaft torque. This value can be set for better DTC control accuracy. If the value is not given by the motor manufacturer, use value 0 (ie, default value). Range: 0.000…2147483.647 N•m.	*99.12* MOT NOM TORQUE
☐	After the motor parameters have been set, alarm ID-RUN is generated to inform that the ID run needs to be performed.	Alarm: ID-RUN

Multimotor drives		
This section applies only to drive systems in which multiple motors are connected to the drive.		
☐	Check that the motors have the same relative slip (only for asynchronous motors), nominal voltage and number of poles. If the manufacturer motor data is insufficient, use the following formulas to calculate the slip and the number of poles: $p = Int\left(\frac{f_N \cdot 60}{n_N}\right)$ $n_s = \frac{f_N \cdot 60}{p}$ $s = \frac{n_S - n_N}{n_S} \cdot 100\%$ where p = number of pole pairs (= motor pole number / 2) f_N = motor nominal frequency in Hz n_N = motor nominal speed in rpm s = motor slip in % n_S = motor synchronous speed in rpm.	
☐	Set the sum of the motor nominal currents.	*99.06* MOT NOM CURRENT
☐	Set the nominal motor frequencies. The frequencies must be the same.	*99.08* MOT NOM FREQ
☐	Set the sum of the motor nominal powers. If the motor powers are close to each other or the same but the nominal speeds vary slightly, parameter *99.09* MOT NOM SPEED can be set to the average value of the motor speeds.	*99.10* MOT NOMT POWER *99.09* MOT NOM SPEED
External control unit power supply		
☐	If the control unit of the drive is powered from an external power supply (as specified in the *Hardware manual*), set parameter *95.01* CTRL UNIT SUPPLY to *External 24V*.	*95.01* CTRL UNIT SUPPLY
External mains choke		
☐	If the drive is equipped with an external choke (specified in the *Hardware manual*), set parameter *95.02* EXTERNAL CHOKE to *YES*.	*95.02* EXTERNAL CHOKE

Motor overtemperature protection (1)		
☐	Select how the drive reacts when motor overtemperature is detected.	*45.01* MOT TEMP PROT
☐	Select the motor temperature protection: motor thermal model or motor temperature measurement. For motor temperature measurement connections, see section *Temperature sensors* on page *122*.	*45.02* MOT TEMP SOURCE
ID RUN (motor identification run)		
	WARNING! With Normal or Reduced ID run the motor will run at up to approximately 50…100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	
Note: Ensure that possible safe torque off and emergency stop circuits are closed during the ID run.		
☐	Check the direction of rotation of the motor before starting the ID run. During the run (Normal or Reduced), the motor will rotate in the forward direction.	When drive output phases U2, V2 and W2 are connected to the corresponding motor terminals:  forward direction  reverse direction

☐	Select the motor identification method with parameter *99.13* IDRUN MODE. During the Motor ID run, the drive will identify the characteristics of the motor for optimum motor control. The ID run is performed at the next start of the drive. **Notes:** • The motor must be de-coupled from the lift system during the Normal or Reduced ID run as well as if rotating autophasing is required (that is, the motor shaft must NOT be locked and the load torque must be < 10% during the ID run). With permanent magnet motors this restriction applies also when the Standstill ID run is selected. • The drive will not control the mechanical brake of the motor open during the ID run. Ensure by some other means that the brake will be open if the Normal or Reduced ID run or rotating autophasing is required. • The ID run cannot be performed if parameter *99.05* MOTOR CTRL MODE = *Scalar*. **NORMAL ID** run should be selected whenever possible. **REDUCED ID** run should be selected instead of the Normal ID run if full flux is required to keep the motor brake open (conical motor). **STANDSTILL ID** run should be selected only if the Normal or Reduced ID run is not possible (the motor cannot be de-coupled from the lift system). **AUTOPHASING** can only be selected after the Normal/Reduced/Standstill ID run has been performed once. Autophasing is used when an absolute encoder or a resolver (or encoder with commutation signals) has been added/changed to a permanent magnet motor, but there is no need to perform the Normal/Reduced/Standstill ID run again. See parameter *11.07* AUTOPHASING MODE for information on autophasing modes and section *Autophasing* on page *130*.	*99.13* IDRUN MODE *11.07* AUTOPHASING MODE

☐	Check the drive limits. The following must apply to all ID run methods: • *20.05* MAXIMUM CURRENT > *99.06* MOT NOM CURRENT In addition, the following must apply to Reduced and Normal ID run: • *20.01* MAXIMUM SPEED > 50% of synchronous speed of the motor • *20.02* MINIMUM SPEED ≤ 0 • Supply voltage ≥ 66% of *99.07* MOT NOM VOLTAGE • *20.06* MAXIMUM TORQUE ≥ 100% (asynchronous machines with Normal ID run only) • *20.06* MAXIMUM TORQUE ≤ 30% (asynchronous machines with Reduced ID run, and permanent magnet motors). When the ID run has been successfully completed, set the limit values as required by the application.	
☐	Start the motor by pressing  (the START key) to activate the ID run. **Note:** The Run enable signal must be active. ID run is indicated by alarm ID-RUN on the panel display and by a rotating display on the 7-segment display.	*10.88* LIFT RUN ENABLE Alarm: ID-RUN 7-segment display:  rotating display
☐	If the ID run is not successfully completed, fault ID-RUN FAULT is generated.	Fault: ID-RUN FAULT
Speed measurement with encoder/resolver		
Encoder/resolver feedback can be used for more accurate motor control. Follow these instructions when encoder/resolver interface module FEN-xx is installed in drive option Slot 1 or 2. **Note:** Two encoder interface modules of the same type are not allowed.		
☐	Select the encoder/resolver to be used. For more information, see parameter group *90 ENC MODULE SEL* on page *218*.	*90.01* ENCODER 1 SEL *90.02* ENCODER 2 SEL
☐	Set other necessary encoder/resolver parameters: • Absolute encoder parameters (group 91, page *218*) • Resolver parameters (group 92, page *224*) • Pulse encoder parameters (group 93, page *224*).	*91.01*…*91.31* *92.01*…*92.03* *93.01*…*93.13*
☐	Save new parameters settings into the permanent memory by setting parameter *16.07* PARAM SAVE to value *Save*.	*16.07* PARAM SAVE

☐	Set parameter *90.10* ENC PAR REFRESH to *Configure* so that the new parameter settings take effect.	*90.10* ENC PAR REFRESH
Checking the encoder/resolver connection		
Follow these instructions when encoder/resolver interface module FEN-xx is installed in drive option Slot 1 or 2. **Note:** Two encoder interface modules of the same type are not allowed.		
☐	Set parameter *22.01* SPEED FB SEL to *Estimated*.	*22.01* SPEED FB SEL
☐	Enter a small speed reference value (for example 3% of the nominal motor speed). Reference can be entered on the control panel by selecting the REF EDIT option on the MAIN menu. Press CANCEL repeatedly until you get to the MAIN menu, then select REF EDIT and press ENTER. For detailed instructions, see section *How to edit a reference value* on page *58*.	
☐	Start the motor by pressing (the START key).	
☐	Go back to the PARAMETERS option. Select PARAMETERS on the MAIN menu and press ENTER. Check that the estimated (*01.14* SPEED ESTIMATED) and actual (*01.08* ENCODER1 SPEED / *01.10* ENCODER2 SPEED) speeds are equal. If the values differ, check the encoder/resolver parameter settings. **Hint:** If the actual speed (with an absolute or pulse encoder) differs from the reference value by a factor of 2, check the pulse number setting (*91.01* SINE COSINE NR / *93.01* ENC1 PULSE NR / *93.11* ENC2 PULSE NR).	*01.14* SPEED ESTIMATED *01.08* ENCODER1 SPEED *01.10* ENCODER2 SPEED

☐	If the direction of rotation is selected as forward, check that the actual speed (*01.08* ENCODER1 SPEED / *01.10* ENCODER2 SPEED) is positive: • If the actual direction of the rotation is forward and the actual speed negative, the phasing of the pulse encoder wires is reversed. • If the actual direction of the rotation is reverse and the actual speed negative, the motor cables are incorrectly connected. Changing the connection: Disconnect the main power, and wait for 5 minutes for the intermediate circuit capacitors to discharge. Do the necessary changes. Switch the power on and start the motor again. Check that the estimated and actual speed values are correct. If the direction of rotation is selected as reverse, the actual speed must be negative. **Note:** Resolver autotuning routines should always be performed after the resolver cable connection has been modified. Autotuning routines can be activated by adjusting parameter *92.02* EXC SIGNAL AMPL or *92.03* EXC SIGNAL FREQ, and then setting parameter *90.10* ENC PAR REFRESH to *Configure*. If the resolver is used with a permanent magnet motor, an AUTOPHASING ID run should be performed as well.	*01.08* ENCODER1 SPEED *01.10* ENCODER2 SPEED
☐	Stop the motor by pressing (the STOP key).	
☐	Set parameter *22.01* SPEED FB SEL to *Enc1 speed* or *Enc2 speed*. If the speed feedback cannot be used in motor control: In special applications parameter *40.06* FORCE OPEN LOOP must be set to *TRUE*.	*22.01* SPEED FB SEL
☐	**Note**: Speed filtering needs to be adjusted especially when the encoder pulse number is small. See section *Speed filtering* on page *74*.	
Emergency stop circuit		
☐	If there is an emergency stop circuit in use, check that the circuit is functioning (emergency stop signal OFF1 is connected to the digital input which is selected as the source for the emergency stop activation).	*10.11* EM STOP OFF1

Safe torque off		
The Safe torque off function disables the control voltage of the power semiconductors of the drive output stage, thus preventing the inverter from generating the voltage required to rotate the motor. For safe torque off wiring, see the appropriate *Hardware manual*.		
☐	If there is a safe torque off circuit in use, check that the circuit functions.	
☐	Select how the drive reacts when the Safe torque off function is active (that is, when the control voltage of the power semiconductors of the drive output stage is disabled). If the Safe torque off function is used for replacing one of the two main contactors between the drive and the motor, select *Alarm* or *No*.	*46.07* STO DIAGNOSTIC
Electrical braking and voltage control		
Electrical braking (a built-in brake chopper and brake resistor) is needed in lift applications to allow the drive to dissipate regenerative energy. The chopper connects the brake resistor to the intermediate circuit of the drive whenever the DC voltage exceeds the maximum limit. If the DC voltage drops due to input power cut off, the undervoltage controller will automatically decrease the motor torque in order to keep the voltage above the lower limit.		
☐	• Set the brake chopper and resistor settings. • Check that the connection is functioning. For more information on the brake resistor connection, see the appropriate *Hardware manual*.	*48.01*…*48.07*
☐	Check that the undervoltage controller is active.	*47.02* UNDERVOLT CTRL
Motor start function		
☐	Select the motor start function. By default, *11.01* START MODE is set to *Const time*. Setting *11.01* START MODE to *Automatic* selects a general-purpose start function. This setting also makes flying start (starting to a rotating motor) possible. The highest possible starting torque is achieved when *11.01* START MODE is set to *Fast* (automatic optimised DC magnetising) or *Const time* (constant DC magnetising with user-defined magnetising time). **Note:** When *11.01* START MODE is set to *Fast* or *Const time*, flying start (start to a rotating motor) is not possible.	*11.01* START MODE
Limits		
☐	Set the operation limits according to the process requirements.	*20.01*…*20.07*

Motor overtemperature protection (2)		
☐	Set the alarm and fault limits for the motor overtemperature protection.	*45.03* MOT TEMP ALM LIM *45.04* MOT TEMP FLT LIM
☐	Set the typical ambient temperature of the motor.	*45.05* AMBIENT TEMP
☐	When *45.02* MOT TEMP SOURCE is set to *ESTIMATED*, the motor thermal protection model must be configured as follows: • Set the maximum allowed operating load of the motor • Set the zero speed load. A higher value can be used if the motor has an external motor fan to boost the cooling. • Set the break point frequency of the motor load curve • Set the motor nominal temperature rise • Set the time within which the temperature has reached 63% of the nominal temperature.	*45.06* MOT LOAD CURVE *45.07* ZERO SPEED LOAD *45.08* BREAK POINT *45.09* MOTNOMTEMPRISE *45.10* MOT THERM TIME
☐	If possible, perform the motor ID run again at this point (see page *68*).	*99.13* IDRUN MODE
Speed filtering		
The measured speed always has a small ripple because of electrical and mechanical interferences, couplings and encoder resolution (ie, small pulse number). A small ripple is acceptable as long as it does not affect the speed control chain. The interferences in the speed measurement can be filtered with a speed error filter or with an actual speed filter. Reducing the ripple with filters may cause speed controller tuning problems. A long filter time constant and fast acceleration time contradict one another. A very long filter time results in unstable control.		
☐	If the used speed reference changes rapidly, use the speed error filter to filter the possible interferences in the speed measurement. In this case the speed error filter is more suitable than the actual speed filter: • Set the filter time constant.	*26.06* SPD ERR FTIME

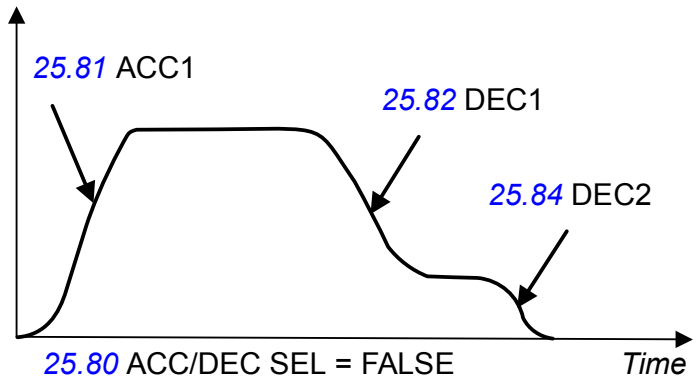
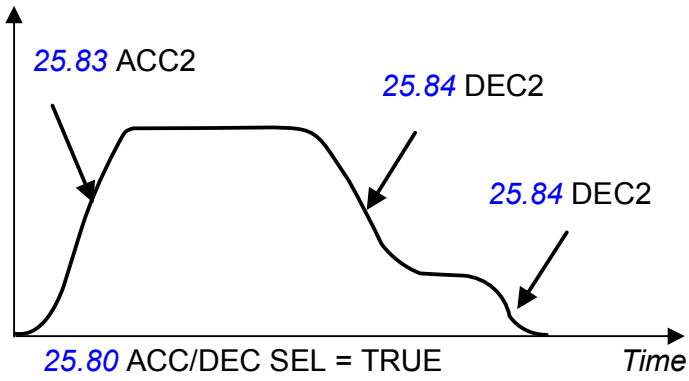
☐	If the used speed reference remains constant, use the actual speed filter to filter the possible interferences in the speed measurement. In this case the actual speed filter is more suitable than the speed error filter: • Set the filter time constant. If there are substantial interferences in the speed measurement, the filter time constant should be proportional to the total inertia of the load and motor, ie, approximately 10…30% of the mechanical time constant $t_{mech} = (n_{nom} / T_{nom}) \cdot J_{tot} \cdot 2pi/60$, where J_{tot}= total inertia of the load and motor (the gear ratio between the load and the motor must be taken into account) n_{nom} = motor nominal speed T_{nom} = motor nominal torque	*22.02* SPEED ACT FTIME
Start/stop control		
☐	Select the sources for the start/stop control in external control location EXT1 with parameters *10.01*, *10.02* and *10.03*. As a factory default, parameter *10.01* is set to *IN1 F IN2R* and bit pointer parameters *10.02* and *10.03* are set to point to DI1 (P.02.01.00) and DI2 (P.02.01.01), respectively. • Start up: DI1 active (= 1) • Start down: DI2 active (= 1) • The drive will not start if both DI1 and DI2 are active (= 1). If you want to change the default settings, first modify parameter *10.01*, then *10.02* and *10.03* to choose the sources of the start signal.	*10.01* EXT1 START FUNC *10.02* EXT1 START IN1 *10.03* EXT1 START IN2

Mechanical brake control		
☐	Select the brake control function: brake control with supervision or brake control without supervision.	*35.01* BRAKE CONTROL
☐	If you selected brake control with supervision, activate the supervision by selecting a source (eg, a digital input) for bit pointer parameter *35.02* BRAKE ACKNOWL.	*35.02* BRAKE ACKNOWL (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	Based on the mechanical brake opening delay, define the brake open delay.	*35.03* BRAKE OPEN DELAY
☐	Define the brake close delay.	*35.04* BRAKE CLOSE DELAY
☐	Define the brake close speed.	*35.05* BRAKE CLOSE SPEED
Manual fault reset		
☐	Select the source for the external fault reset signal. As a factory default, bit pointer parameter *46.80* is set to point to DIO1 (P.02.03.00).	*46.80* FAULT RESET
Automatic fault reset		
☐	Define the number of automatic fault resets allowed.	*46.81* AUTORESET TRIALS
☐	Define the trial time for automatic fault resets.	*46.82* AUTORST TRL TIME
☐	Define for how long the drive will wait after a fault before attempting a fault reset.	*46.83* AUTORESET DELAY
☐	Select the faults that are automatically reset.	*46.84* AUTORESET SEL
Speed reference scaling		
☐	Define the gear ratio.	*80.02* GEAR RATIO
☐	Define the sheave diameter in millimeters.	*80.03* SHEAVE DIAMETER
☐	Define the roping ratio.	*80.04* ROPING RATIO
Speed reference selection		
☐	Select the sources for the speed reference selection bit pointers *80.05*, *80.06* and *80.07*. As a factory default, *80.05* is set to point to DI4 (P.02.01.03), *80.06* to DI5 (P.02.01.04) and *80.07* to DI6 (P.02.01.05).	*80.05* SPEED REF SEL1 *80.06* SPEED REF SEL2 *80.07* SPEED REF SEL3

	Select the desired speed references to be used. For an overview of how the active speed reference is determined, see section *Speed reference selection* on page *95*.	
☐	Leveling speed: Define the leveling speed reference.	*80.09* LEVELING SPEED

☐	Releveling speed:
	• Select the source of the releveling speed reference with parameter *80.10* RELVL SPEED SEL.
	  • *02.05* AI1 SCALED
	  • *02.07* AI2 SCALED
	  • *80.11* RELEVELING SPEED
	• Depending on your selection, configure the analog inputs or define the releveling speed reference with parameter *80.11* RELEVELING SPEED.
		80.10 RELVL SPEED SEL
		80.11 RELEVELING SPEED

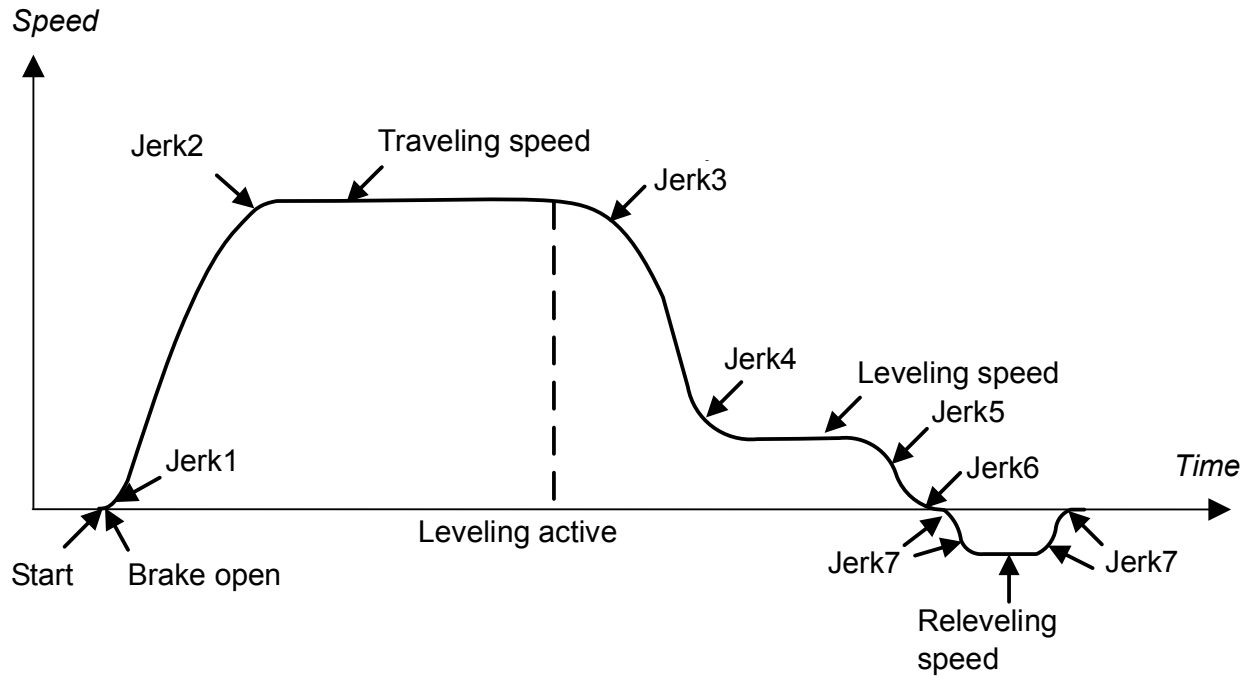
☐	Traveling speeds: Define the desired traveling speed references to be used in the normal travel mode. If the floor distance is short, the medium speed, speed2 or speed3 can be used instead of the nominal speed.	*80.01* NOMINAL SPEED *80.12* MEDIUM SPEED *80.15* SPEED2 *80.16* SPEED3
☐	**Note:** If you do not intend to activate the inspection mode (see section *Inspection mode* on page *81*), you can use the inspection speed for maintenance operations in the normal travel mode. In this case, define the inspection speed reference with parameter *80.13* INSPECTION SPEED.	*80.13* INSPECTION SPEED
Notes: As a factory-set zero speed, the speed1 reference (*80.08* SPEED1) is fixed to a constant value 0 m/s.		

Acceleration/deceleration selection		
☐	Select the acceleration/deceleration set to be used in the normal travel mode. • 0 (FALSE) = Acc/dec set 1 is used • 1 (TRUE) = Acc/dec set 2 is used As a factory default, bit pointer parameter *25.80* is fixed to FALSE. If you want to change the default setting, fix the selection to TRUE, or select the source from another parameter. Acceleration/deceleration sets 1 and 2 are used during the normal travel mode as shown below: *Speed*  *Speed*  	*25.80* ACC/DEC SEL
☐	Define set1 acceleration and deceleration.	*25.81* ACC1 *25.82* DEC1
☐	Define set2 acceleration and deceleration.	*25.83* ACC2 *25.84* DEC2
☐	Define the inspection mode acceleration and deceleration.	*25.85* INSPECT MODE ACC *25.86* INSPECT MODE DEC
☐	Define the releveling mode acceleration and deceleration.	*25.89* RELVL ACC/DEC

Notes:

Parameter *25.84* DEC2 is internally used as the stopping deceleration and it is independent of the status of parameter *25.80* ACC/DEC SEL.

Jerk selection



☐	As a factory default, bit pointer parameter *25.90* JERK DISABLE is fixed to 0 (FALSE), meaning that jerks are in use. Alternatively, you can select the source for jerk activation from another parameter. If you want to permanently disable the use of jerks, fix the selection to 1 (TRUE).	*25.90* JERK DISABLE
☐	Define acceleration start and end jerks with parameters *25.91* JERK1 and *25.92* JERK2, respectively.	*25.91* JERK1 *25.92* JERK2
☐	Define leveling deceleration start and end jerks with parameters *25.93* JERK3 and *25.94* JERK4, respectively.	*25.93* JERK3 *25.94* JERK4
☐	Define stopping start and end jerks with parameters *25.95* JERK5 and 25.96 JERK6, respectively.	*25.95* JERK5 *25.96* JERK6
☐	Define the releveling jerk with parameter *25.97* JERK7.	*25.97* JERK7

How to enable further lift control functions

This procedure includes the tasks that you need to perform if you want to take into use the following lift control functions:

- Evacuation mode
- Inspection mode
- Torque proving, Brake slip check, Brake open torque selection
- Actual load measurement
- Off-delays
- Smart slowdown
- Slowdown
- Final limit switches
- Static and dynamic friction
- Inertia compensation
- Inverter overload
- Speed match
- Motor stall.

Before you start, make sure that you have already carried out the procedure *How to start up the drive*.

For instructions on safety, control panel basics, adjusting parameter values and changing the language, see the corresponding tasks in *How to start up the drive*.

Evacuation mode		
☐	Select the source (eg, a digital input) for enabling the evacuation mode.	*10.89* EVACUATION MODE (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	Select manual or automatic evacuation. • 1 (TRUE) = Automatic evacuation is enabled. • 0 (FALSE) = Manual evacuation is enabled.	*10.90* EVACUATION AUTO
☐	If there is a separate floor limit switch coming directly to the drive, select the source (eg, a digital input) from which the Lift control program reads the floor limit signal.	*10.91* FLOOR LIM SWITCH

☐	Define the evacuation speed reference.	*80.14* EVACUATION SPEED
☐	Define the evacuation mode acceleration and deceleration.	*25.87* EVAC MODE ACC *25.88* EVAC MODE DEC
Notes: For information on the evacuation mode and rescue operation in general, see section *Rescue operation* on page *138*.		
Inspection mode		
☐	Select the source (eg, a digital input) for enabling the inspection mode.	*10.92* INSPECTION MODE (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	Select the source (eg, a digital input) for starting and stopping the lift in the inspection mode.	*10.93* INSPECTION UP *10.94* INSPECTION DOWN
☐	Define the inspection speed reference.	*80.13* INSPECTION SPEED
☐	Define the inspection mode acceleration and deceleration.	*25.85* INSPECT MODE ACC *25.86* INSPECT MODE DEC
Torque proving, Brake slip check and Brake open torque selection		
☐	Enable the Torque proving function by setting *35.82* TORQUE PROVING to *ENABLED*.	*35.82* TORQUE PROVING
☐	Select the source of the brake open torque with value pointer parameter *35.80* BRK OPEN TRQ SEL. Brake open torque can be used when a load sensor is available or with counterweightless lifts. • If you are using a load sensor, select one of the following: *02.05* AI1 SCALED, *02.07* AI2 SCALED or *05.04* LOAD ACT TORQ. • For a counterweightless lift, select *35.81* BRAKE OPEN TORQ and set it to such a value that, for example, when the lift is started with average load, the lift car does not jerk backwards when the mechanical brake is opened.	*35.80* BRK OPEN TRQ SEL
☐	Define the constant brake open torque.	*35.81* BRAKE OPEN TORQ
☐	Define the torque proving reference.	*35.83* TORQ PROVING REF

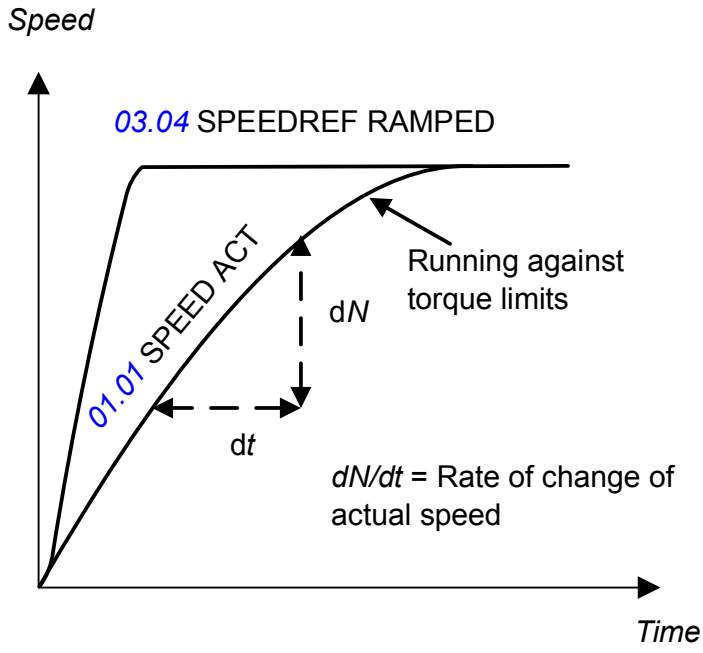
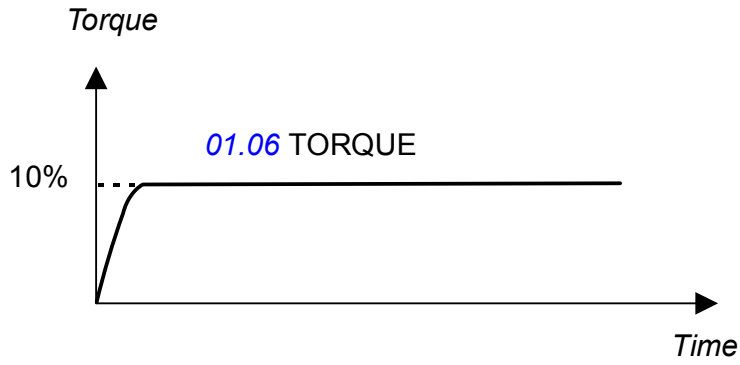
☐	Define the time delay for generating fault TORQUE PROVE.	*35.84* TRQ PROV FLT DLY
☐	Define the brake slip speed limit and the time delay for generating fault BRAKE SLIP.	*35.85* SLIP SPEED LIM *35.86* SLIP FAULT DLY
Actual load measurement		
☐	Select the source for the load weight signal with value pointer parameter *82.08* LOAD WEIGHT SEL. • *02.05* AI1 SCALED • *02.07* AI2 SCALED	*82.08* LOAD WEIGHT SEL
☐	Bring the car and counter weight at the same level.	
☐	Start the drive with 0 speed reference and no load.	
☐	Open the brakes and note down the no load torque from actual signal *01.06* TORQUE and the corresponding load weight signal from the source chosen above.	*01.06* TORQUE *02.05* AI1 SCALED *02.07* AI2 SCALED
☐	Set parameter *82.14* TORQUE NO LOAD to the no load torque value and parameter *82.11* WEIGHT NO LOAD to the AI-scaled value of the load weight signal obtained above.	*82.14* TORQUE NO LOAD *82.11* WEIGHT NO LOAD
☐	Repeat the procedure above with half and full load and set parameters *82.12* and *82.15* (for half load) and *82.13* and *82.16* (for full load).	*82.12* WEIGHT HALF LOAD *82.15* TORQUE HALF LOAD *82.13* WEIGHT FULL LOAD *82.16* TORQUE FULL LOAD
Off-delays		
☐	Define the off-delay speed limit.	*80.17* OFF DLY SPD LIM
☐	Define the off-delay for the speed2.	*80.18* SPEED2 OFF DLY
☐	Define the off-delay for the medium speed.	*80.19* MED SPD OFF DLY
☐	Define the off-delay for the nominal speed.	*80.20* NOM SPD OFF DLY
☐	Define the off-delay for the speed3.	*80.21* SPEED3 OFF DLY
Notes: Off-delays cannot be used for the inspection speed, leveling speed, releveling speed and speed1.		

Smart slowdown		
☐	Select the mode of the Smart slowdown function. • *NOT SEL* • *ESTIMATED* • *ENCODER*	*83.01* SMART SLOWDN SEL
☐ ☐	If you chose *ENCODER*, do the following tasks: Configure the encoder/resolver feedback. See section *Speed measurement with encoder/resolver* on page *70*. Calibrate the actual physical position to the position actual (*01.12* POS ACT) based on gear ratio, roping ratio and sheave diameter. • With parameter *60.01* POS ACT SEL, select encoder 1 or encoder 2 used for calculating the position actual (*01.12* POS ACT). • Select linear motion for the positioning axis mode by setting parameter *60.02* POS AXIS MODE to *Linear*. • Select the gear and roping ratios with parameters *60.03* LOAD GEAR MUL and *60.04* LOAD GEAR DIV. • Select meter as the position unit with parameter *60.05* POS UNIT. • Enter the value of sheave diameter (D) * pi as the feed constant numerator and denumerator. For example, if the sheave diameter is 1 m, the circumference D * pi is 3.142. Set parameter *60.06* FEED CONST NUM to value 3142 and *60.07* FEED CONST DEN to 1000. • Run the lift system between two floors and verify the position actual by reading *01.12* POS ACT against the actual floor position. If there are any errors, adjust parameters *60.03*, *60.04*, *60.06* and *60.07*.	*60.01* POS ACT SEL *60.02* POS AXIS MODE *60.03* LOAD GEAR MUL *60.04* LOAD GEAR DIV *60.05* POS UNIT *60.06* FEED CONST NUM *60.07* FEED CONST DEN
☐	Enter the distance between the leveling and stopping switches.	*83.02* LV STOP SWC DIST
☐	Define what percentage of the parameter *83.02* value is to be used as the safety distance. Safety distance is the distance which must be run with the steady state leveling speed.	*83.03* SAFETY MARGIN
Slowdown		
☐	Select the mode of the Slowdown function. • *SINGLE BIT* • *MULTIPLE BIT*	*10.80* SLOWDOWN SEL

☐	If you chose *SINGLE BIT*, select a source (eg, a digital input) for parameter *10.81* SLOWDOWN IN1. This parameter activates the slowdown command both in the upward and downward direction.	*10.81* SLOWDOWN1 (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	If you chose *MULTIPLE BIT*, select the sources (eg, digital inputs) for parameters *10.81* SLOWDOWN IN1 and *10.82* SLOWDOWN IN2. The former parameter activates the slowdown command in the upward direction; the latter activates it in the downward direction.	*10.81* SLOWDOWN IN1 *10.82* SLOWDOWN IN2
☐	Define the slowdown speed reference.	*10.85* SLOWDOWN SPEED
Final limit switches		
☐	Select the source (eg, a digital input) of the upper limit switch command.	*10.86* UPPER F LIM SWC (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	Select the source (eg, a digital input) of the lower limit switch command.	*10.87* LOWER F LIM SWC (A digital input is selected as the source by pointing to a bit in one of the following signals: • *02.01* DI STATUS • *02.03* DIO STATUS • *02.80* EXT DIO STATUS.)
☐	Define the emergency stop time.	*25.11* EM STOP TIME

Static and dynamic friction		
Note: Extra precautions must be taken when running the lift.		
☐	Run the lift in the forward direction near to a zero speed (eg, 0.01 m/s) and note down the corresponding torque from actual signal *01.06* TORQUE. Multiply the result by 0.8 and enter the result obtained to parameter *82.01* STATIC FRIC TRQ.	*01.06* TORQUE *82.01* STATIC FRIC TRQ
☐	Bring the car and counter weight at the same level with no load.	
☐	Define the three speed points needed for calculating the dynamic friction. You can freely select the speed reference for each point.	*82.02* DYN FRIC SPEED1 *82.03* DYN FRIC SPEED2 *82.04* DYN FRIC SPEED3
☐	Run the drive in the forward direction with the speed reference defined with parameter *82.02* DYN FRIC SPEED1 and note down the corresponding torque from actual signal *01.06* TORQUE.	*01.06* TORQUE
☐	Subtract the value of parameter *82.01* STATIC FRIC TORQ from the torque obtained above. Multiply the result by 0.8 and enter the result obtained to parameter *82.05* DYN FRIC TORQ1.	*82.05* DYN FRIC TORQ1
☐	Run the drive in the forward direction with the speed reference defined with parameter *82.03* DYN FRIC SPEED2 and note down the corresponding torque from actual signal *01.06* TORQUE.	*01.06* TORQUE
☐	Subtract the value of parameter *82.01* STATIC FRIC TORQ from the torque obtained above. Multiply the result by 0.8 and enter the result obtained to parameter *82.06* DYN FRIC TORQ2.	*82.06* DYN FRIC TORQ2
☐	Run the drive in the forward direction with the speed reference defined with parameter *82.04* DYN FRIC SPEED3 and note down the corresponding torque from actual signal *01.06* TORQUE.	*01.06* TORQUE
☐	Subtract the value of parameter *82.01* STATIC FRIC TORQ from the torque obtained above. Multiply the result by 0.8 and enter the result obtained to parameter *82.07* DYN FRIC TORQ3.	*82.07* DYN FRIC TORQ3

Inertia compensation		
☐	Enable the Inertia compensation function by setting parameter *82.09* INERTIA COMP EN to *ENABLED*.	*82.09* INERTIA COMP EN
The moment of inertia required for calculating the inertia compensation torque can be obtained in two ways: • by calculating an estimate of the lift load's moment of inertia • by calculating a more accurate lift system's moment of inertia based on a test run. Note that this option requires using the DriveStudio PC tool. Choose either option. You can find instructions for both options below.		
Option 1: Lift load's moment of inertia		
☐	Calculate an estimate of the lift load's moment of inertia using the following equation: $J = mr^2 / (GR)^2$ where J = moment of load inertia reflected to motor shaft (kgm^2) m = mass of lift system (car weight + counterweight + duty weight) r = sheave radius (diameter / 2) GR = gear ratio (motor rpm / load rpm)	
☐	Set parameter *82.10* MOMENT OF INERT to the value calculated above.	*82.10* MOMENT OF INERT
Option 2: Lift system's moment of inertia		
Note: Extra precautions must be taken when running the lift.		
☐	Set up the DriveStudio PC tool: • Install the DriveStudio PC tool to the PC. For instructions, see *DriveStudio user manual (3AFE68749026 [English]).* • Connect the drive to the PC: Connect the other end of the communication cable (OPCA-02, code: 68239745) to the panel link of the drive. Connect the other end of the communication cable via a USB adapter or directly to the PC serial port.	
☐	Set the maximum and minimum torque limits to a low value (for example, 10% or 20%).	*20.06* MAXIMUM TORQUE *20.07* MINIMUM TORQUE
☐	Balance the elevator (car in the middle position, car weight = counterweight).	
☐	Fix the selection of parameter *25.80* ACC/DEC SEL to 0 (= FALSE) and define the acceleration with parameter *25.81* ACC1 so that the inverter reaches the torque limits very fast.	*25.80* ACC/DEC SEL *25.81* ACC1

☐	Start from zero speed to nominal speed in the forward direction. Use the Monitor window in the DriveStudio PC tool to display the graph below. Then, monitor actual signal *01.01* SPEED ACT and note down the value for d*N*/d*t*, ie, the rate of change of the actual speed.  The graph below illustrates the torque limit of *20.06* MAXIMUM TORQUE = 10%.  	*01.01* SPEED ACT

☐	Calculate the lift system's moment of inertia using the following equation: $J_{tot} = T_{acc\_comp} / [(2pi/60) \cdot (dN/dt)]$ where J_{tot} = total moment of inertia as seen by the motor (kgm^2) dN = rate of change of speed in rpm dt = rate of change of speed in seconds T_{acc_comp} = torque limit in N•m **Example:** If the value of parameter *98.01* TORQ NOM SCALE is 117.272 N•m and the torque limits (*20.06* and *20.07*) are set to 10%, then T_{acc_comp} is 11.7272 N•m. And, if the speed change within one second is 225 rpm, then $J_{tot} = 11.7272 / [(2pi/60) \cdot (225/1)] = 0.498\ kgm^2$.	
☐	Set parameter *82.10* MOMENT OF INERT to the value calculated above.	*82.10* MOMENT OF INERT
Inverter overload		
☐	Define the inverter limit bits to be used for triggering fault INV OVERLOAD. The bits are: • Bit 0 MINIMUM TORQUE • Bit 1 MAXIMUM TORQUE • Bit 2 INTERNAL CURRENT • Bit 3 LOAD ANGLE • Bit 4 MOTOR PULLOUT	*81.01* INV OVERLOAD SEL
☐	Define the time delay for generating fault INV OVERLOAD.	*81.02* INV OVERLOAD DLY
Speed match		
☐	Enable the Speed match function by setting *81.03* SPEED MATCH to *ENABLED*.	*81.03* SPEED MATCH
☐	Define the steady state speed deviation level.	*81.04* SPD STD DEV LVL
☐	Define the ramp state speed deviation level.	*81.05* SPD RMP DEV LVL
☐	Define the time delay for generating fault SPEED MATCH.	*81.06* SPEED MATCH DLY
Motor stall		
☐	Define the maximum and minimum motor stall torque limits.	*81.07* STALL TORQ MAX *81.08* STALL TORQ MIN
☐	Define the motor stall speed limit.	*81.09* STALL SPEED LIM
☐	Define the time delay for generating fault MOTOR STALL.	*81.10* STALL FAULT DLY

5

Default connections

What this chapter contains

This chapter shows the default control connections of the Lift control program.

More information on the connectivity is given in the *Hardware manual* of the drive.

Notes:
*Total maximum current: 200 mA

1) Selected by par. *12.01* DIO1 CONF.
2) Selected by par. *12.02* DIO2 CONF.
3) Selected by par. *12.03* DIO3 CONF.
4) Selected by jumper J1.
5) Selected by jumper J2.

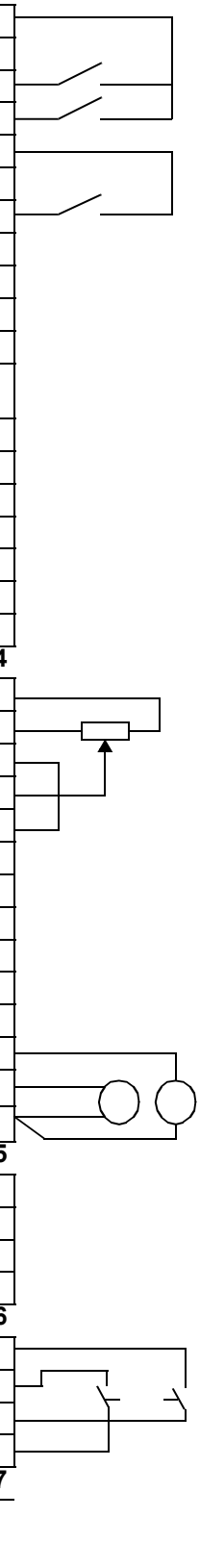
Current:

J1/2 ●● ○○

Voltage:

J1/2 ○○ ●●

X1		
External power input 24 V DC, 1.6 A		1 2
X2		
Relay output: Brake close/open 250 V AC / 30 V DC 2A	NO COM NC	1 2 3
X3		
+24 V DC*	+24VD	1
Digital I/O ground	DGND	2
Digital input 1: Start up (par. *10.02*)	DI1	3
Digital input 2: Start down (par. *10.03*)	DI2	4
+24 V DC*	+24VD	5
Digital I/O ground	DGND	6
Digital input 3	DI3	7
Digital input 4: Speed ref sel 1 (par. *80.05*)	DI4	8
+24 V DC*	+24VD	9
Digital I/O ground	DGND	10
Digital input 5: Speed ref sel 2 (par. *80.06*)	DI5	11
Digital input 6: Speed ref sel 3 (par. *80.07*)	DI6	12
+24 V DC*	+24VD	13
Digital I/O ground	DGND	14
Digital input/output 1 [1]: Fault reset (par. *46.80*)	DIO1	15
Digital input/output 2 [2]: Ready (par. *06.01* bit 0)	DIO2	16
+24 V DC*	+24VD	17
Digital I/O ground	DGND	18
Digital input/output 3 [3]: Fault (par. *06.01* bit 10)	DIO3	19
X4		
Reference voltage (+)	+VREF	1
Reference voltage (–)	–VREF	2
Ground	AGND	3
Analog input 1 (mA or V) [4]	AI1+ AI1–	4 5
Analog input 2 (mA or V) [5]	AI2+ AI2–	6 7
AI1 current/voltage selection		J1
AI2 current/voltage selection		J2
Thermistor input	TH	8
Ground	AGND	9
Analog output 1 (mA): Output current	AO1 (I)	10
Analog output 2 (V): Actual speed	AO2 (U)	11
Ground	AGND	12
X5		
Drive-to-drive link termination		J3
Drive-to-drive link	B A BGND	1 2 3
X6		
Safe torque off. Both circuits must be closed for the drive to start. See the appropriate *Hardware manual* of the drive.	OUT1 OUT2 IN1 IN2	1 2 3 4
Control panel connection		**X7**



6

Program features

What this chapter contains

This chapter describes the program features of the Lift control program. For each feature, there is a list of related user settings, actual signals, and fault and alarm messages.

Basic start/stop operation

The Basic start/stop operation functions take care of lift start/stop control and the interlocks related to basic lift start/stop operation.

Start/stop control

Start/stop control comprises the logic and commands for starting the lift in upward and downward directions. The source of the start, stop and direction commands is the external control location (EXT1). Parameter *10.01* EXT1 START FUNC selects the starting method. There are two basic methods:

- Selection *IN1 F IN2R* defines separate start signals for upward and downward directions. The source selected with *10.02* EXT1 START IN1 is the start up (forward) signal and the source selected with *10.03* EXT1 START IN2 is the start down (reverse) signal.
- Selection *IN1S IN2DIR* defines one signal for start and another signal for the direction of the lift. The source selected with *10.02* EXT1 START IN1 is the start signal and the source selected with *10.03* EXT1 START IN2 is the direction (0 = up, 1 = down).

Start/stop control operates in the normal travel mode, releveling mode and evacuation mode. The inspection mode has a start/stop control of its own. For more information, see section *Inspection mode* on page *94*.

Settings

Parameters	Additional information
10.01 EXT1 START FUNC	Selects the source for the start and stop control in external control location EXT1.
10.02 EXT1 START IN1	Selects the source 1 for the start and stop commands in external control location EXT1.
10.03 EXT1 START IN2	Selects the source 2 for the start and stop commands in external control location EXT1.

Start/stop interlocking

The Start/stop interlocking function stops or blocks the start command using parameter *10.88* LIFT RUN ENABLE without generating any fault or warning in the drive. When the signal configured with parameter *10.88* is switched off, the drive will not start, or if the drive is running, it will stop.

Settings

Parameters	Additional information
10.88 LIFT RUN ENABLE	Selects the source for the Run enable signal.

Automatic fault reset

The Automatic fault reset function resets pre-defined drive faults to ensure the operation of the drive in temporary fault situations. The function resets only those faults which you have selected with parameter *46.84* AUTORESET SEL out of the faults monitored by actual signal *05.02* LIFT FW.

When any one of the selected faults occurs, a trial time defined with parameter *46.82* AUTORST TRL TIME starts and a fault reset is generated. You can define the number of resets to be generated within the trial time with parameter *46.81* AUTORESET TRIALS. With parameter *46.83* AUTORESET DELAY, you can also define for how long the drive will wait after a fault before attempting a fault reset.

Settings

Parameters	Additional information
46.81 AUTORESET TRIALS	Defines the number of the automatic fault resets the drive performs within the time defined with parameter *46.82*.
46.82 AUTORST TRL TIME	Defines the time within which automatic fault resets are performed after the drive has tripped on a fault.
46.83 AUTORESET DELAY	Defines for how long the drive will wait after a fault before attempting an automatic fault reset.
46.84 AUTORESET SEL	Selects the faults to be automatically reset.

Diagnostics

Signals	Additional information
Actual signals	
05.02 LIFT FW	Lift fault status word with fault bits.

Manual fault reset

In addition to automatic fault reset, faults can also be reset from an external source selected with parameter *46.80* FAULT RESET.

Settings

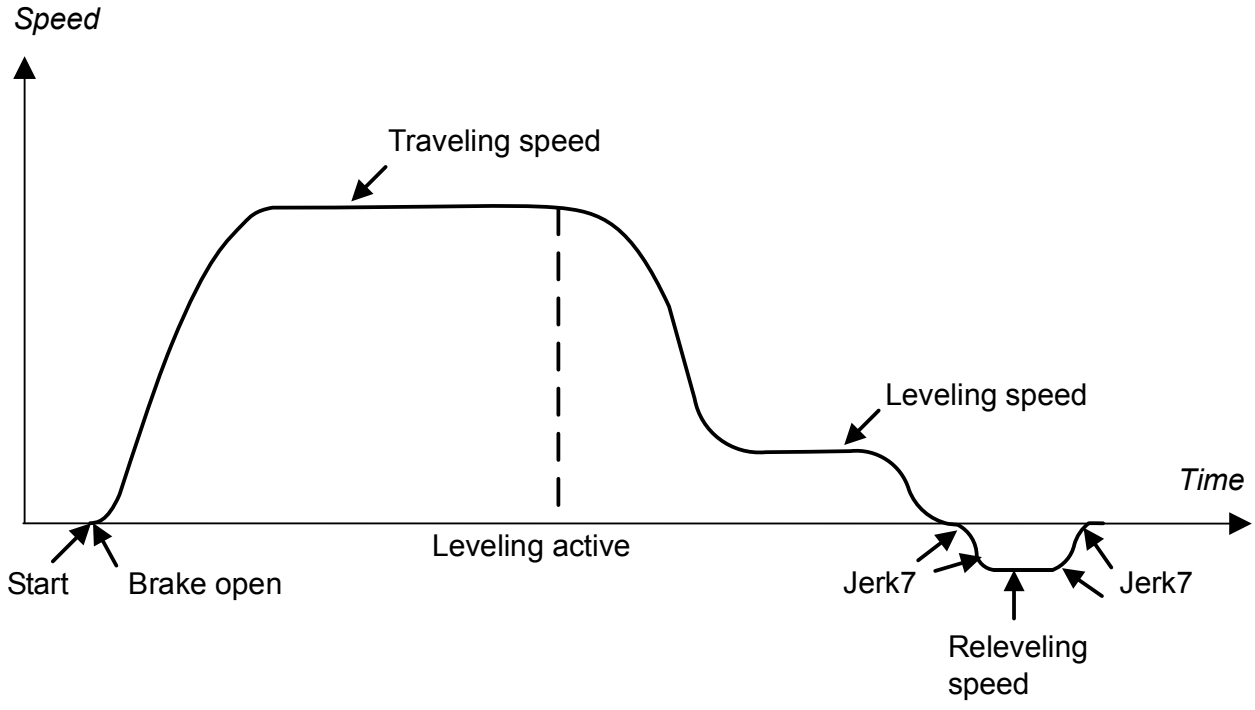
Parameters	Additional information
46.80 FAULT RESET	Selects the source for the fault reset signal.

Lift operation modes

By default, the lift operates in the normal travel mode. In addition, there are three other operation modes: releveling mode, evacuation mode and inspection mode. For an overview of the speed references available in each mode, see section *Speed reference selection and scaling* on page *95*.

Releveling mode

If the lift overshoots the floor, the releveling mode can be activated to bring it back to the floor level. Parameter *80.10* RELVL SPEED SEL selects the source of the releveling speed reference: *80.11* RELEVELING SPEED, *02.05* AI1 SCALED or *02.07* AI2 SCALED. The figure below illustrates releveling:



Settings

Parameters	Additional information
25.89 RELVL ACC/DEC	Defines the acceleration/deceleration used in the releveling mode.
80.10 RELVL SPEED SEL	Selects the source of the releveling speed reference.
80.11 RELEVELING SPEED	Defines the speed reference to be used during releveling when selected as the source of parameter *80.10*.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 7 (RELEVELING ACT)	Displays whether the releveling speed is the current speed reference used by the lift.

Evacuation mode

The evacuation mode is used for a lift car rescue operation in case the power supply fails. For a detailed description of the operation of this mode and rescue operation in general, see section *Rescue operation* on page *138*.

Inspection mode

The inspection mode is used for maintenance operations. You can enable it with parameter *10.92* INSPECTION MODE. In the inspection mode, the lift is operated with parameters *10.93* INSPECTION UP and *10.94* INSPECTION DOWN, as shown in the table below. The basic start up/down commands (see section *Start/stop control* on page *91*) are disabled.

Par. *10.93*	Par. *10.94*	Command
0	0	Stop
1	0	Inspection mode up
0	1	Inspection mode down
1	1	Stop

When the lift operates in the inspection mode, the drive uses parameter *80.13* INSPECTION SPEED as the speed reference and parameters *25.85* INSPECT MODE ACC and *25.86* INSPECT MODE DEC for acceleration and deceleration, respectively.

Besides the inspection mode, it is also possible to conduct maintenance operations while the lift is running at the inspection speed in the normal travel mode. In this case, the inspection speed is selected based on the combined status of parameters *80.05* SPEED REF SEL1, *80.06* SPEED REF SEL2 and *80.07* SPEED REF SEL3, and the lift travel is started with the basic start up/down commands. The inspection mode as well as the inspection mode up/down commands are disabled.

Jerks are disabled while the lift is running at the inspection speed.

Settings

Parameters	Additional information
10.92 INSPECTION MODE	Selects the source for enabling/disabling the inspection mode.
10.93 INSPECTION UP	Selects the source for starting the lift in the upward direction in the inspection mode.
10.94 INSPECTION DN	Defines the source for starting the lift in the downward direction in the inspection mode.
25.85 INSPECT MODE ACC	Defines the acceleration used in the inspection mode.
25.86 INSPECT MODE DEC	Defines the deceleration used in the inspection mode.
80.13 INSPECTION SPEED	Defines the speed reference used in the inspection mode. Can also be used in the normal travel mode if the inspection mode is not in use.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 10 (INSPECT SPD ACT)	Displays whether the inspection speed is the current speed reference used by the lift.

Speed reference selection and scaling

Speed reference selection

The Speed reference selection function calculates the final speed reference to be used by the lift in the different lift operation modes. The following speed references are available via basic parameters.

Speed reference available	Lift operation mode
Speed 1*, 2, or 3	Normal travel mode
Nominal speed	Normal travel mode
Medium speed	Normal travel mode
Leveling speed	Normal travel mode, when the leveling command is active
Releveling speed	Reveling mode
Inspection speed	Inspection mode or normal travel mode, depending on which mode is active
Evacuation speed	Evacuation mode

* The speed1 reference is fixed to a constant value 0 m/s. It can be used for stopping the lift.

The function selects the speed reference based on the lift operation mode as follows.

- If neither the evacuation mode nor the inspection mode is active, the speed reference is selected based on the combined status of parameters *80.05* SPEED REF SEL1, *80.06* SPEED REF SEL2 and *80.07* SPEED REF SEL3.
- If either the evacuation mode or the inspection mode is active, the speed reference is selected with parameter *80.14* EVACUATION SPEED or *80.13* INSPECTION SPEED, depending on which of the modes is active.
- If both the evacuation mode and the inspection mode are active, the evacuation mode has higher priority.

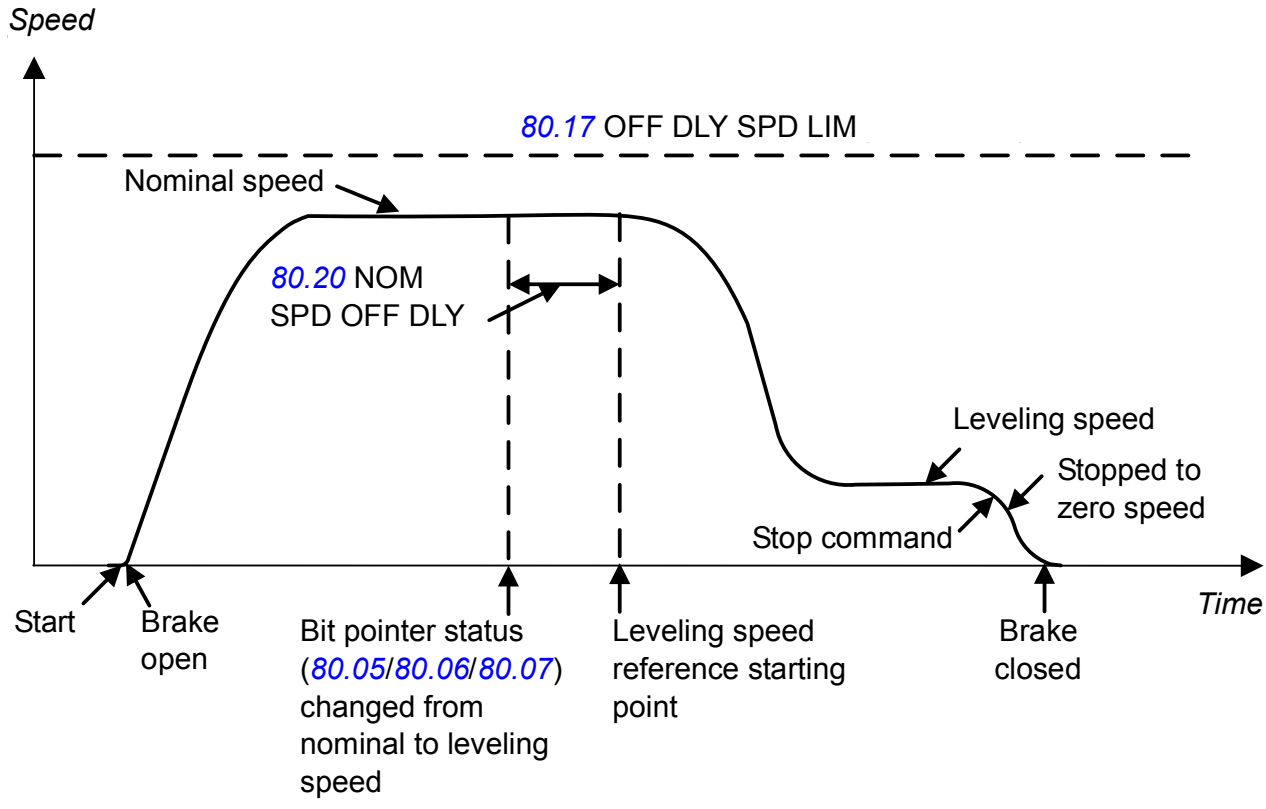
The table below further illustrates speed reference selection.

10.89 **EVACUATION MODE**	*10.92* **INSPECTION MODE**	*80.05* **SPEED REF SEL1**	*80.06* **SPEED REF SEL2**	*80.07* **SPEED REF SEL3**	*05.03* **LIFT SPEED SEL**
0	0	0	0	0	Speed1 (zero speed)
0	0	1	0	0	Nominal speed
0	0	0	1	0	Medium speed
0	0	1	1	0	Leveling speed
0	0	0	0	1	Releveling speed
0	0	1	0	1	Inspection speed
0	0	0	1	1	Speed2
0	0	1	1	1	Speed3
0	1	x	x	x	Inspection speed
1	x	x	x	x	Evacuation speed

Off-delays

Based on a set of so called off-delay parameters, the nominal, medium, speed2 and speed3 references, ie, the traveling speeds can be kept in use for a prolonged time period, despite a change in the status of the speed reference selection bits. The off-delay parameter set contains adjustable speed limit and delay periods for each traveling speed reference. The off-delays are used only when the lift speed is below the set speed limit.

The figure below illustrates the normal running sequence of a lift traveling from one floor to another and the use of off-delay for the nominal speed:



Settings

Parameters	Additional information
80.01 NOMINAL SPEED	Defines the nominal speed reference used in the normal travel mode.
80.05 SPEED REF SEL1	Selects the source for speed reference selection bit 1.
80.06 SPEED REF SEL2	Selects the source for speed reference selection bit 2.
80.07 SPEED REF SEL3	Selects the source for speed reference selection bit 3.
80.08 SPEED1	A factory-set zero speed reference, which can be used for stopping the lift in the normal travel mode.
80.09 LEVELING SPEED	Defines the speed reference to be used during leveling.
80.10 RELVL SPEED SEL	Selects the source of the releveling speed reference.
80.11 RELEVELING SPEED	Defines the speed reference to be used during releveling when selected as the source of parameter *80.10*.
80.12 MEDIUM SPEED	Defines an additional speed reference which can be used instead of the nominal speed based on the floor distance.
80.13 INSPECTION SPEED	Defines the speed reference used in the inspection mode. Can also be used in the normal travel mode if the inspection mode is not in use.
80.14 EVACUATION SPEED	Defines the speed reference used in the evacuation mode.
80.15 SPEED2	Defines an additional speed reference which can be used instead of the nominal speed based on the floor distance.
80.16 SPEED3	Defines an additional speed reference which can be used instead of the nominal speed based on the floor distance.

Parameters	Additional information
80.17 OFF DLY SPD LIM	Defines the lift speed limit for activating the extended off-delay time periods defined with parameters *80.18*…*80.21*.
80.18 SPEED2 OFF DLY	Defines the off-delay time for the speed2.
80.19 MED SPD OFF DLY	Defines the off-delay time for the medium speed.
80.20 NOM SPD OFF DLY	Defines the off-delay time for the nominal speed.
80.21 SPEED3 OFF DLY	Defines the off-delay time for the speed3.

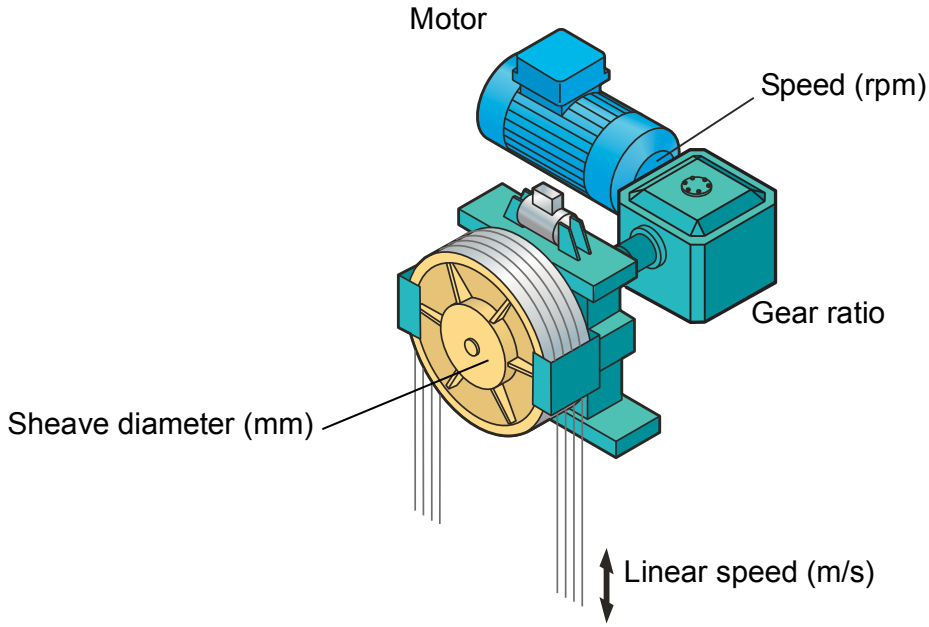
Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 5 (SPEED1 ACT)	Displays whether the speed1 is the current speed reference used by the lift.
05.01 LIFT SW bit 6 (LEVELING ACT)	Displays whether the leveling speed is the current speed reference used by the lift.
05.01 LIFT SW bit 7 (RELEVELING ACT)	Displays whether the releveling speed is the current speed reference used by the lift.
05.01 LIFT SW bit 8 (MEDIUM SPD ACT)	Displays whether the medium speed is the current speed reference used by the lift.
05.01 LIFT SW bit 9 (NOMINAL SPD ACT)	Displays whether the nominal speed is the current speed reference used by the lift.
05.01 LIFT SW bit 10 (INSPECTION SPD ACT)	Displays whether the inspection speed is the current speed reference used by the lift.
05.01 LIFT SW bit 12 (EVAC SPD ACT)	Displays whether the evacuation speed is the current speed reference used by the lift.
05.01 LIFT SW bit 13 (SPEED2 ACT)	Displays whether the speed2 is the current speed reference used by the lift.
05.01 LIFT SW bit 14 (SPEED3 ACT)	Displays whether the speed3 is the current speed reference used by the lift.
05.03 LIFT SPEED SEL	Displays the lift speed used based on the Speed reference selection function.
05.08 LIFT SPEED ACT	Displays the actual lift speed in m/s.

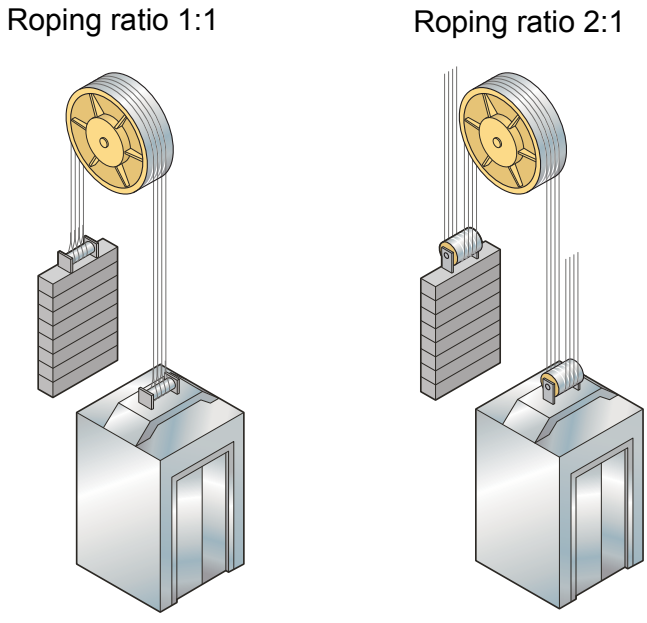
Speed reference scaling

The Speed reference scaling function converts the linear speed of the lift (m/s) to the rotation speed of the lift motor (rpm). To ensure correct operation of the function and the lift, you have to define calculation factors at the start-up of the lift drive. These factors (parameters) are: gear ratio, sheave diameter and roping ratio.

The figure below illustrates the components of the function.



The figure below illustrates common roping ratio alternatives.



The function calculates the speed reference in rpm using the following equation.

$$\text{Speed ref (rpm)} = \text{Speed ref (m/s)} \cdot \frac{80.02\ \text{GEAR RATIO} \cdot 80.04\ \text{ROPING RATIO} \cdot 60 \cdot 1000}{\text{Pi} \cdot 80.03\ \text{SHEAVE DIAMETER (mm)}}$$

The result of the calculation, motor rotational speed (rpm) corresponds to the lift nominal speed (m/s) and is shown as the value of parameter *25.02* SPEED SCALING.

Settings

Parameters	Additional information
25.02 SPEED SCALING	Shows the motor rotational speed (rpm), which corresponds to the lift nominal speed (m/s) defined with parameter *80.01* NOMINAL SPEED.
80.02 GEAR RATIO	Defines the gear box ratio.
80.03 SHEAVE DIAMETER	Defines the sheave diameter in millimeters.
80.04 ROPING RATIO	Defines the roping ratio.

Speed profile

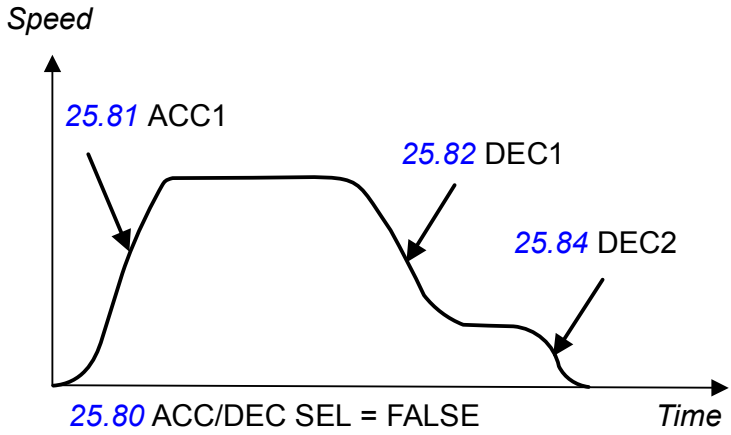
The Speed profile functions automatically select a set of acceleration, deceleration and jerks into use based on the lift operation mode.

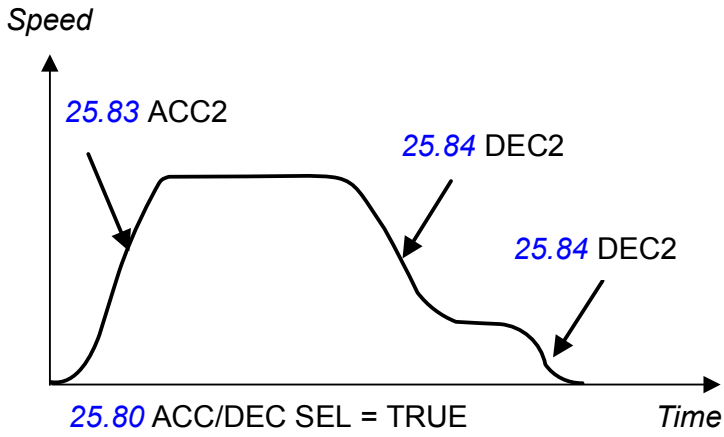
Acceleration/deceleration selection

The Acceleration/deceleration function selects the acceleration and deceleration used based on the lift operation mode as follows:

- When the evacuation mode is active, parameters *25.87* EVAC MODE ACC and *25.88* EVAC MODE DEC are used for acceleration and deceleration, respectively.
- When the inspection mode is active, parameters *25.85* INSPECT MODE ACC and *25.86* INSPECT MODE DEC are used for acceleration and deceleration, respectively.
- When the releveling mode is active, parameter *25.89* RELVL ACC/DEC is used for acceleration and deceleration.
- During the normal travel mode, either parameters *25.81* ACC1 / *25.82* DEC1 or *25.83* ACC2 / *25.84* DEC2 are used for acceleration and deceleration, depending on the selection made with parameter *25.80* ACC/DEC SEL.

Acceleration/deceleration sets 1 and 2 are used during the normal travel mode as shown below:





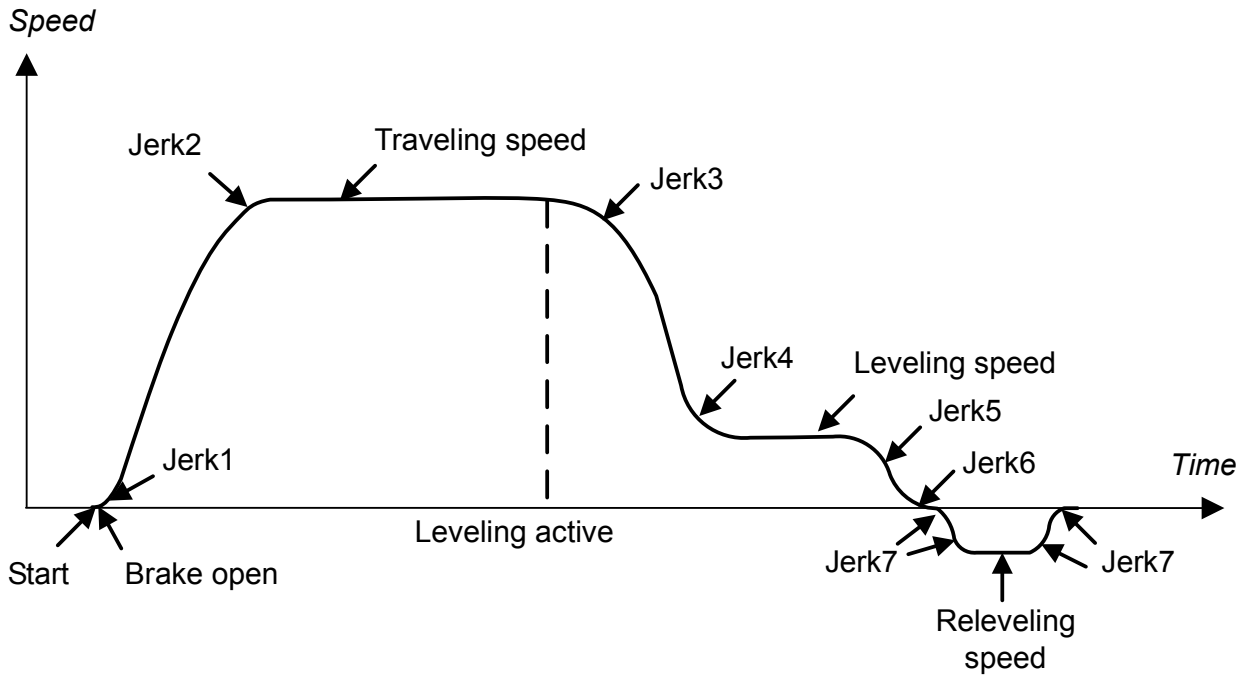
Jerk selection

The Jerk selection function selects an appropriate jerk into use based on the lift operation mode. The function allows you to:

- define different jerk values for the different lift operation modes
- enable or disable the use of jerks. When parameter *25.90* JERK DISABLE is activated, the jerks are internally set to a zero value.

You can obtain the acceleration transition time during a jerk by dividing the selected acceleration by the jerk value.

The figure below illustrates how the Lift control program uses the jerks.



Settings

Parameters	Additional information
25.80 ACC/DEC SEL	Selects the source for the acceleration/deceleration set 1 or acceleration/deceleration set 2 used in the normal travel mode.
25.81 ACC1	Defines the acceleration for set 1.
25.82 DEC1	Defines the deceleration for set 1.
25.83 ACC2	Defines the acceleration for set 2.
25.84 DEC2	Defines the deceleration for set 2.
25.85 INSPECT MODE ACC	Defines the acceleration used in the inspection mode.
25.86 INSPECT MODE DEC	Defines the deceleration used in the inspection mode.
25.87 EVAC MODE ACC	Defines the acceleration used in the evacuation mode.
25.88 EVACMODE DEC	Defines the deceleration used in the evacuation mode.
25.89 RELVL ACC/DEC	Defines the acceleration/deceleration used in the releveling mode.
25.90 JERK DISABLE	Selects the source for enabling/disabling all jerks.
25.91 JERK1	Defines the jerk used at the start of acceleration.
25.92 JERK2	Defines the jerk used at end of acceleration.
25.93 JERK3	Defines the jerk used at the start of leveling deceleration.
25.94 JERK4	Defines the jerk used at the end of leveling deceleration.
25.95 JERK5	Defines the jerk used at the start of stopping deceleration.
25.96 JERK6	Defines the jerk used at the end of stopping deceleration.
25.97 JERK7	Defines the jerk used during releveling.

Diagnostics

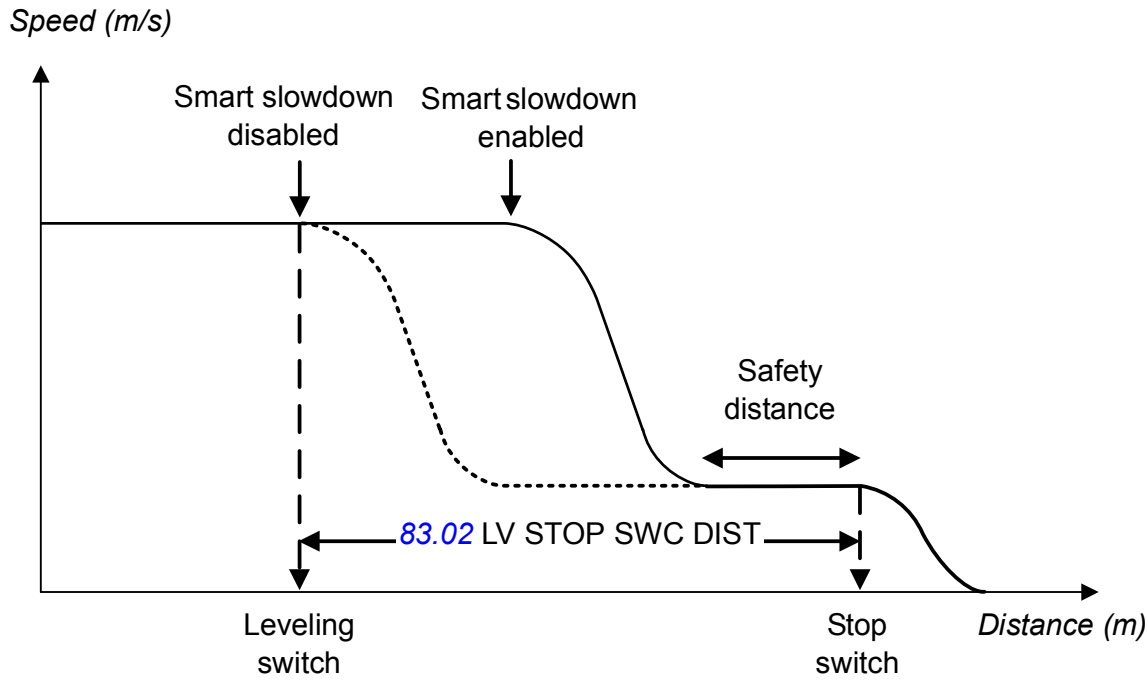
Signals	Additional information
Actual signals	
05.09 LIFT SPEED REF	Displays the ramped and shaped speed reference in m/s.

Smart slowdown

The Smart slowdown function optimizes the travel time of the lift by reducing the leveling path. That is, transition from the traveling speed (ie, nominal speed, medium speed, speed2 or speed 3) to the leveling speed is optimally delayed based on the knowledge of the physical leveling distance (ie, the distance between the leveling and stop switches).

The function is useful in operation situations where the desired traveling speed is not reached before the leveling command is activated (for example, in case of short floor distance). If the leveling command is activated while the drive is still accelerating, the achieved speed is maintained and no further acceleration is done.

The figure below illustrates the operation of the function.



Where
Safety distance = Distance traveled with the leveling speed (parameter *83.03* SAFETY MARGIN defines what percentage of parameter *83.02* LV STOP SWC DIST is used as the safety distance.)

You can enable the Smart slowdown function with estimated speed or with an encoder using parameter *83.01* SMART SLOWDN SEL.

- When the funtion is enabled with estimated speed, it measures the distance traveled by integrating the actual speed (m/s) in meters.
- When the function is enabled with an encoder, it uses actual signal *01.12* POS ACT to measure the distance traveled. In this case, the actual position is scaled in meters by means of parameter group *60 POS FEEDBACK*.

Settings

Parameters	Additional information
83.01 SMART SLOWDN SEL	Enables/disables the Smart slowdown function.
83.02 LV STOP SWC DIST	Defines the distance between leveling and stop switches.
83.03 SAFETY MARGIN	Defines what percentage of parameter *83.02* is used as the safety distance.

Diagnostics

Signals	Additional information
Actual signals	
01.12 POS ACT	Actual position of the encoder.
05.10 LVLING DIST ACT	Displays the actual leveling distance.
05.11 FLOOR DISTANCE	Displays the distance between two floors.
Alarms	
SMART SLOWDOWN CONFIG	Smart slowdown function is enabled with an encoder, but encoder/ resolver feedback is not configured.

Mechanical brake control

The lift system is equipped with a mechanical brake that holds the lift car at standstill when the lift drive is stopped or not powered. Typically, the drive controls the brake open or closed via a relay output. Alternatively, the brake can also be controlled by the lift controller.

Mechanical brake control (with or without acknowledgement) is activated with parameter *35.01* BRAKE CONTROL. The acknowledgement (supervision) signal can be connected to, for example, a digital input. The brake on/off value is reflected by *03.15* BRAKE COMMAND, which should be connected to a relay (or digital) output. The brake will open upon drive start after the delay *35.03* BRAKE OPEN DELAY has elapsed and the requested motor start torque (selected with *35.80* BRK OPEN TRQ SEL) is available. The brake will close after motor speed decreases below *35.05* BRAKE CLOSE SPD and the delay *35.04* BRAKE CLOSE DLY has elapsed. When the brake close command is issued, the motor torque is stored into *03.14* BRAKE TORQ MEM.

Note: The mechanical brake must be opened manually before the ID run.

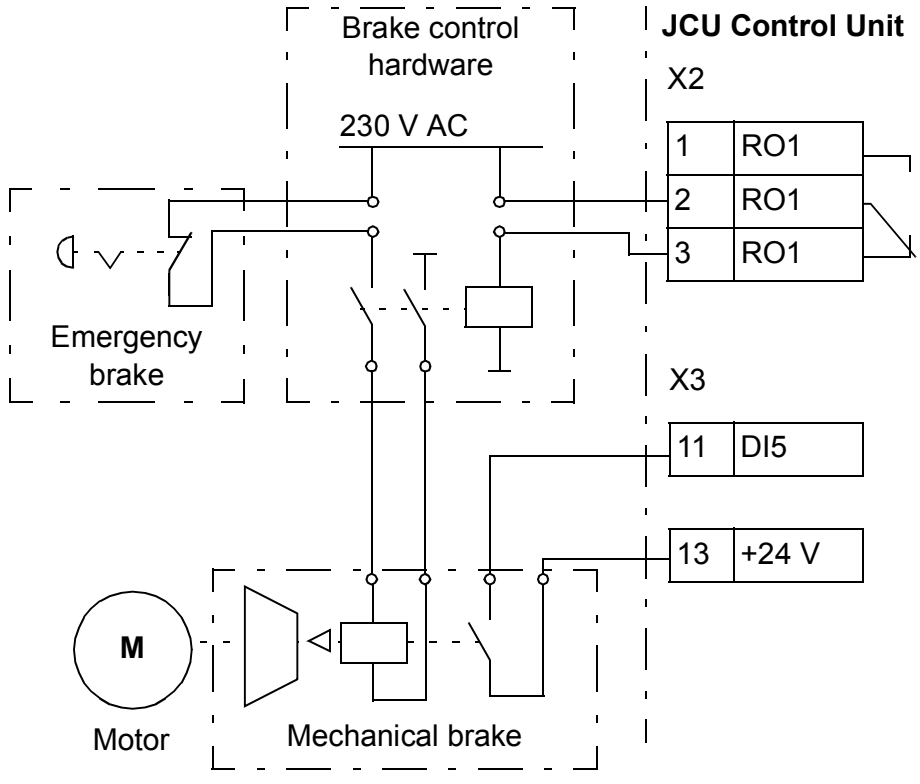
WARNING! Make sure that the machinery into which the drive with brake control function is integrated fulfils the personnel safety regulations. Note that the frequency converter (as defined in EN81-1), is not considered as a safety device mentioned in the European Lift Directive and related harmonised standards. If the Lift Directive is not applicable, note that the frequency converter (a Complete Drive Module or a Basic Drive Module, as defined in IEC 61800-2), is not considered as a safety device mentioned in the European Machinery Directive and related harmonised standards. Thus, the personnel safety of the complete machinery must not be based on a specific frequency converter feature (such as the brake control function), but it has to be implemented as defined in the application specific regulations.

An example of a brake control circuit is shown below.

The brake on/off is controlled via signal *03.15* BRAKE COMMAND. The source for the brake supervision is selected by parameter *35.02* BRAKE ACKNOWL.

The brake control hardware and wirings need to be done by the user.

- Brake on/off control through selected relay/digital output.
- Brake supervision through selected digital input.
- Emergency brake switch in the brake control circuit.
- Brake on/off control through relay output (ie, parameter *12.12* RO1 OUT PTR is set to P.03.15 = *03.15* BRAKE COMMAND).
- Brake supervision through selected digital input, eg, DI5 (ie, parameter *35.02* BRAKE ACKNOWL is set to P.02.01.04 = *02.01* DI STATUS bit 4)



The Mechanical brake control function also performs the following tasks:

- Torque proving checks
- Brake slip checks
- Brake open torque selection
- Actual load measurement
- Torque limiting while stopping.

Excluding torque limiting, the function executes these tasks in sequential order; the previous task must be executed before the next one can start.

Torque proving

The Torque proving function ensures that the drive is able to produce torque before it releases the brake and starts the lift operation. For this, the function performs an electrical lift system check.

Before opening the brake, the function compares the calculated actual torque of the drive with a reference torque (parameter *35.83* TORQ PROVING REF). If the torque proving is not successful, that is, the actual torque does not exceed the reference value during a proving delay (parameter *35.84* TRQ PROV FLT DLY), the function prevents the brake from opening, and the drive trips on fault TORQUE PROVE.

Settings

Parameters	Additional information
35.82 TORQUE PROVING	Enables/disables the Torque proving function.
35.83 TORQ PROVING REF	Defines the torque proving reference.
35.84 TRQ PROV FLT DLY	Defines the time delay for generating fault TORQUE PROVE.

Diagnostics

Signals	Additional information
Actual signals	
05.02 LIFT FW bit 1 (TORQUE PROVE)	Displays whether fault TORQUE PROVE has occured or not.
Faults	
TORQUE PROVE	The drive was not able to provide sufficient torque during a torque proving sequence.

Brake slip check

This function checks for any brake slips while torque proving is being performed with the brake closed. If the actual lift speed (*05.08* LIFT SPEED ACT) exceeds the defined speed limit (parameter *35.85* SLIP SPEED LIM) during torque proving and stays there for longer than defined with parameter *35.86* SLIP FAULT DELAY, the drive trips on fault BRAKE SLIP.

Settings

Parameters	Additional information
35.85 SLIP SPEED LIM	Defines the speed limit to be checked during torque proving.
35.86 SLIP FAULT DELAY	Defines the time delay for generating fault BRAKE SLIP.

Diagnostics

Signals	Additional information
Actual signals	
05.02 LIFT FW bit 2 (BRAKE SLIP)	Displays whether fault BRAKE SLIP has occured or not.
Faults	
BRAKE SLIP	The brake slipped while a torque proving sequence was taking place.

Brake open torque selection

The Brake open torque selection function ensures the right starting torque level after brake opening and, thus, prevents the speed from dropping. The function is in operation when torque proving is completed and the brake open command is triggered.

With parameter *35.80* BRK OPEN TRQ SEL, you can select the following sources for the brake open torque:

- *02.05* AI1 SCALED or *02.07* AI2 SCALED: brake open torque source as an AI-scaled value. Used when a load sensor is available.
- *05.04* LOAD ACT TORQ: brake open torque source defined with a load sensor. Used when a load sensor is available.
- *35.81* BRAKE OPEN TORQ: brake open torque source as a fixed value. Used with counterweightless lifts.

Settings

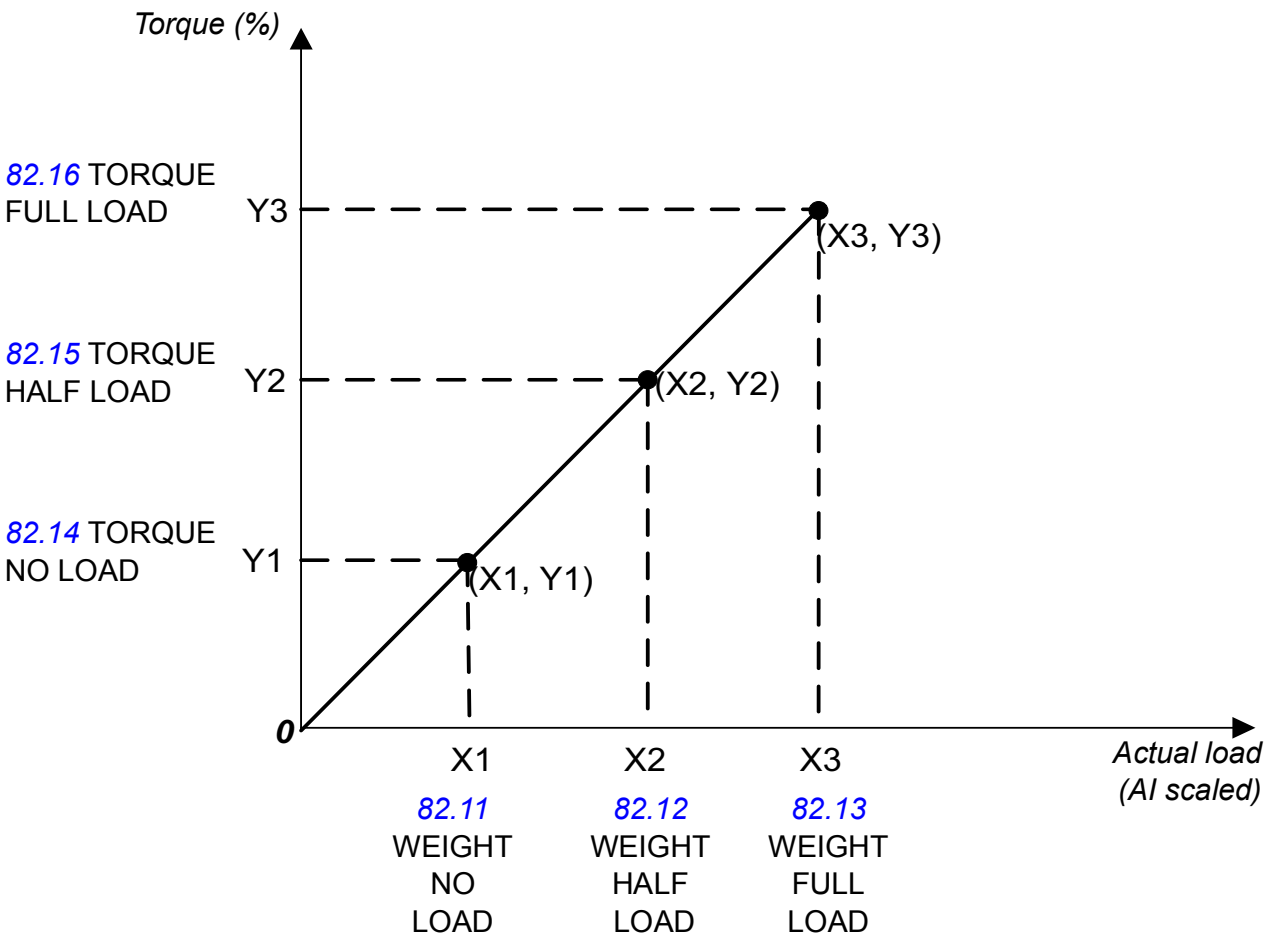
Parameters	Additional information
35.80 BRK OPEN TRQ SEL	Selects the source of the brake open torque to be used.
35.81 BRAKE OPEN TORQ	Defines the brake open torque value used when selected as the source of parameter *35.80*.

Actual load measurement

This function measures the actual load of the system and then calculates the torque needed when the mechanical brake is open (see also *Brake open torque selection* on page *107*). Actual signal *05.04* LOAD ACT TORQ displays the calculated torque in percentages.

Actual load is measured with a load sensor. Parameter *82.08* LOAD WEIGHT SEL selects the source of the load weight signal: *02.05* AI1 SCALED or *02.07* AI2 SCALED.

The function forms the actual torque value out of the measured actual load value by using the graph below. During the start-up, you have to feed in values for torque and actual load at three operating points: while operating the lift with no load, with half load and with full load. Actual signal *01.06* TORQUE indicates the torque values and *02.05* AI1 SCALED or *02.07* AI2 SCALED the actual load values needed at each point.



Settings

Parameters	Additional information
82.08 LOAD WEIGHT SEL	Selects the source for the load weight signal.
82.11 WEIGHT NO LOAD	Defines the value of the load weight signal at no load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08*).
82.12 WEIGHT HALF LOAD	Defines the value of the load weight signal at half load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08*).
82.13 WEIGHT FULL LOAD	Defines the value of the load weight signal at full load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08*).
82.14 TORQUE NO LOAD	Defines the torque used when the lift is running with no load (*01.06* TORQUE).
82.15 TORQUE HALF LOAD	Defines the torque used when the lift is running with half load (*01.06* TORQUE).
82.16 TORQUE FULL LOAD	Defines the torque used when the lift is running with full load (*01.06* TORQUE).

Diagnostics

Signals	Additional information
Actual signals	
05.04 LOAD ACT TORQUE	Displays the torque corresponding to the actual load based on the feedback from the load sensor.

Torque limiter while stopping

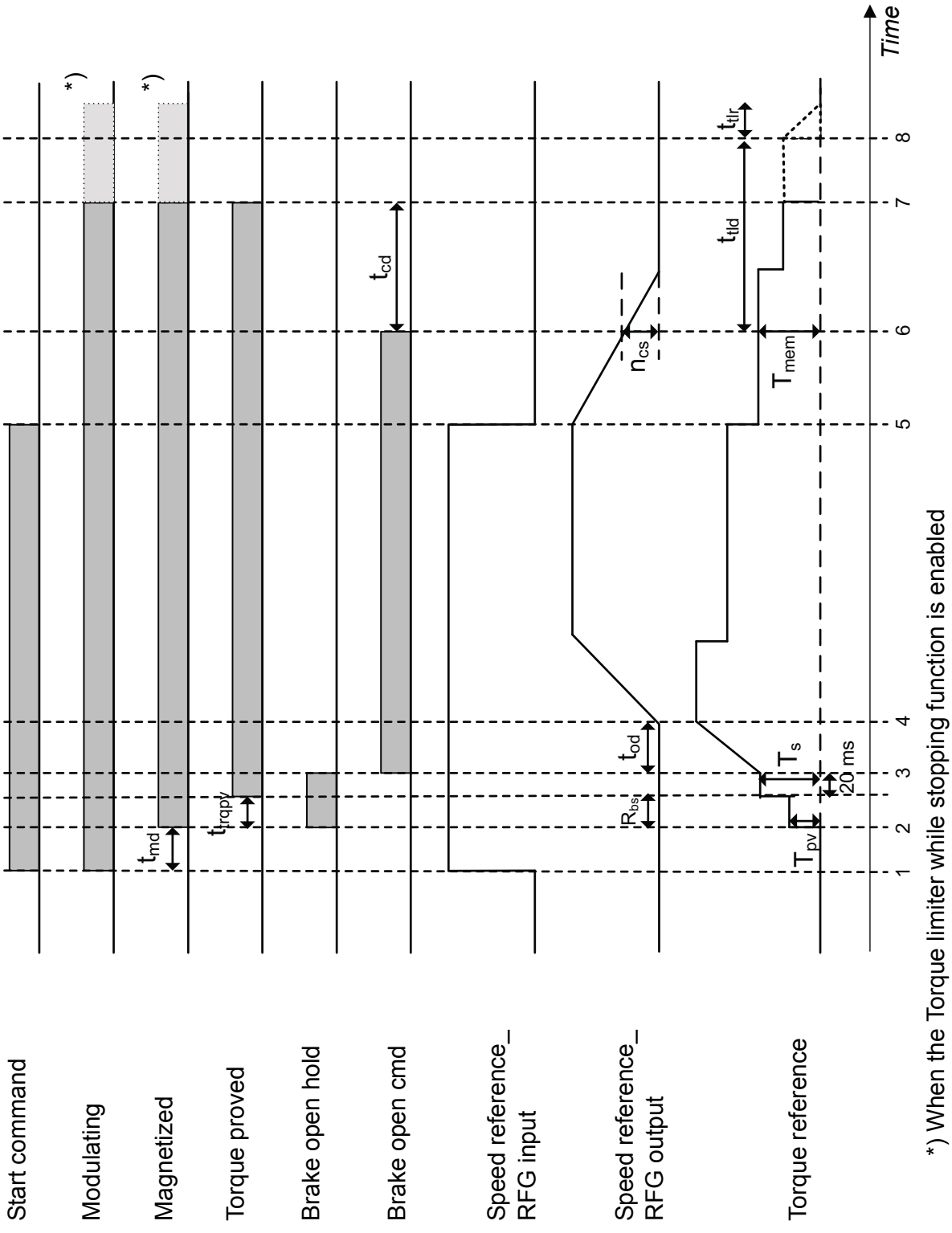
This function softens the "gong" sound which may, in some cases, be generated by the motor (typically, a permanent magnet gearless motor) after the mechanical brake has been closed and torque removed. The sound is generated by a back slash between the motor shaft and the mechanical brake. To reduce the sound, this function ramps down the torque as defined by parameter *35.89* TRQ LIMITER RAMP.

Settings

Parameters	Additional information
35.87 TORQUE LIMITER	Enables/disables the Torque limiter function.
35.88 TRQ LIMITER DLY	Defines the time delay for starting torque limiting after a brake close command.
35.89 TRQ LIMITER RAMP	Defines the torque limiting ramp time from nominal to zero torque.

Operation time scheme

The timing diagram below illustrates the operation time scheme of mechanical brake control.



*) When the Torque limiter while stopping function is enabled

T_s	Start torque at brake release (the source selected with parameter *35.80* BRK OPEN TRQ SEL)
T_{mem}	Stored torque value at brake close (actual signal *03.14* BRAKE TORQ MEM)
t_{md}	Motor magnetising delay (parameter *11.02* DC MAGN TIME)
t_{od}	Brake open delay (parameter *35.03* BRAKE OPEN DELAY)
n_{cs}	Brake close speed (parameter *35.05* BRAKE CLOSE SPD)
t_{cd}	Brake close delay (parameter *35.04* BRAKE CLOSE DLY)
t_{trqpv}	Torque proving time delay (parameter *35.84* TRQ PROV FLT DLY)*
T_{pv}	Torque proving reference (parameter *35.83* TORQ PROVING REF)
R_{bs}	Brake slip check region**
t_{tld}	Torque limiter delay (parameter *35.88* TRQ LIMITER DLY)
t_{tlr}	Torque limiter ramp (parameter *35.89* TRQ LIMITER RAMP)

*	If torque is not proved within the torque proving time delay, the drive trips on fault TORQUE PROVE.
**	If torque proving is in progress and *05.08* LIFT SPEED ACT is greater than *35.85* SLIP SPEED LIM for a longer period than defined with *35.86* SLIP FAULT DLY, the drive trips on fault BRAKE SLIP.

Torque compensation

Torque compensation is a method for calculating beforehand the torque needed due to load and losses. Thus, it helps the speed controller to gain better control accuracy and performance. Torque compensation comprises the following calculations added to the final torque reference:

- Static friction compensation
- Dynamic friction compensation
- Inertia compensation during acceleration and deceleration.

Static and dynamic friction

This function calculates compensation torques to overcome the the static and dynamic frictions caused by the gear box, mechanical shaft couplings and motor bearings.

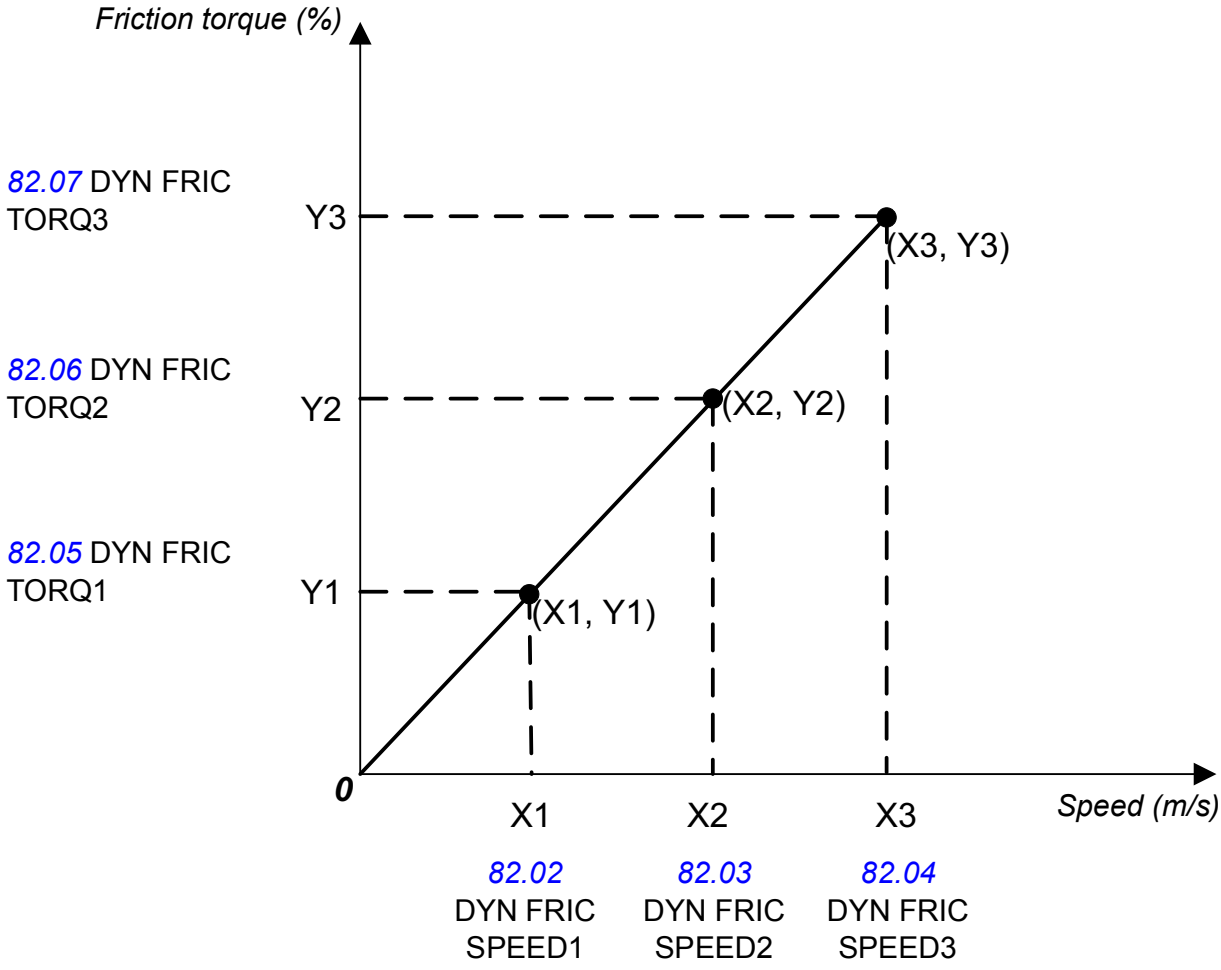
Static friction compensation

Static friction is fixed over all the operating ranges. Parameter *82.01* STATIC FRIC TRQ defines the static friction value in percentage of the motor nominal torque. To obtain this value, you need to run the lift near to a zero speed during the start-up and monitor actual signal *01.06* TORQUE.

The function then calculates the final static friction compensation torque (actual signal *05.06* STATIC FRIC TORQ) based on the static friction and the direction of motor rotation.

Dynamic friction compensation

The function calculates the dynamic friction by using the graph below. During the start-up, you have to feed in values for speed and torque at three operating points: low speed, medium speed and high speed. You can freely select the exact speed values at each point, while actual signal *01.06* TORQUE is used for obtaining the torque values.



The function then calculates the final dynamic friction compensation torque (*05.07* DYN FRIC TORQ) based on the interpolated value of the torque/speed points and the direction of motor rotation.

Settings

Parameters	Additional information
82.01 STATIC FRIC TRQ	Defines the static friction of the system in percentage of the motor nominal torque.
82.02 DYN FRIC SPEED1	Defines the value for speed point 1 for calculating the dynamic friction.

Parameters	Additional information
82.03 DYN FRIC SPEED2	Defines the value for speed point 2.
82.04 DYN FRIC SPEED3	Defines the value for speed point 3.
82.05 DYN FRIC TORQ1	Defines the value for friction torque 1 for calculating the dynamic friction.
82.06 DYN FRIC TORQ2	Defines the value for friction torque 2.
82.07 DYN FRIC TORQ3	Defines the value for friction torque 3.

Diagnostics

Signals	Additional information
Actual signals	
01.06 TORQUE	Displays the motor torque in percent of the motor nominal torque.
05.06 STATIC FRIC TORQ	Displays the static friction compensation torque calculated by the Static friction compensation function.
05.07 DYN FRIC TORQ	Displays the dynamic friction compensation torque calculated by the Dynamic friction compensation function.

Inertia compensation

This function eliminates speed overshoot or undershoot by compensating for inertia effects. The function calculates the inertia compensation torque (*05.05* ACC COMP TORQ) required during acceleration and deceleration based on the moment of inertia (parameter *82.10* MOMENT OF INERT) set by the user.

You can obtain a value for the moment of inertia in two ways during the lift start-up:

- by calculating an estimate based on basic knowledge of lift system mechanics (total mass, sheave diameter and gear ratio)
- by calculating a more accurate value based on a test run.

The former option gives an estimate of the lift load's moment of inertia, while the latter option results in a more accurate moment of inertia of the whole lift system.

You can enable the Inertia compensation function with parameter *82.09* INERTIA COMP EN.

Settings

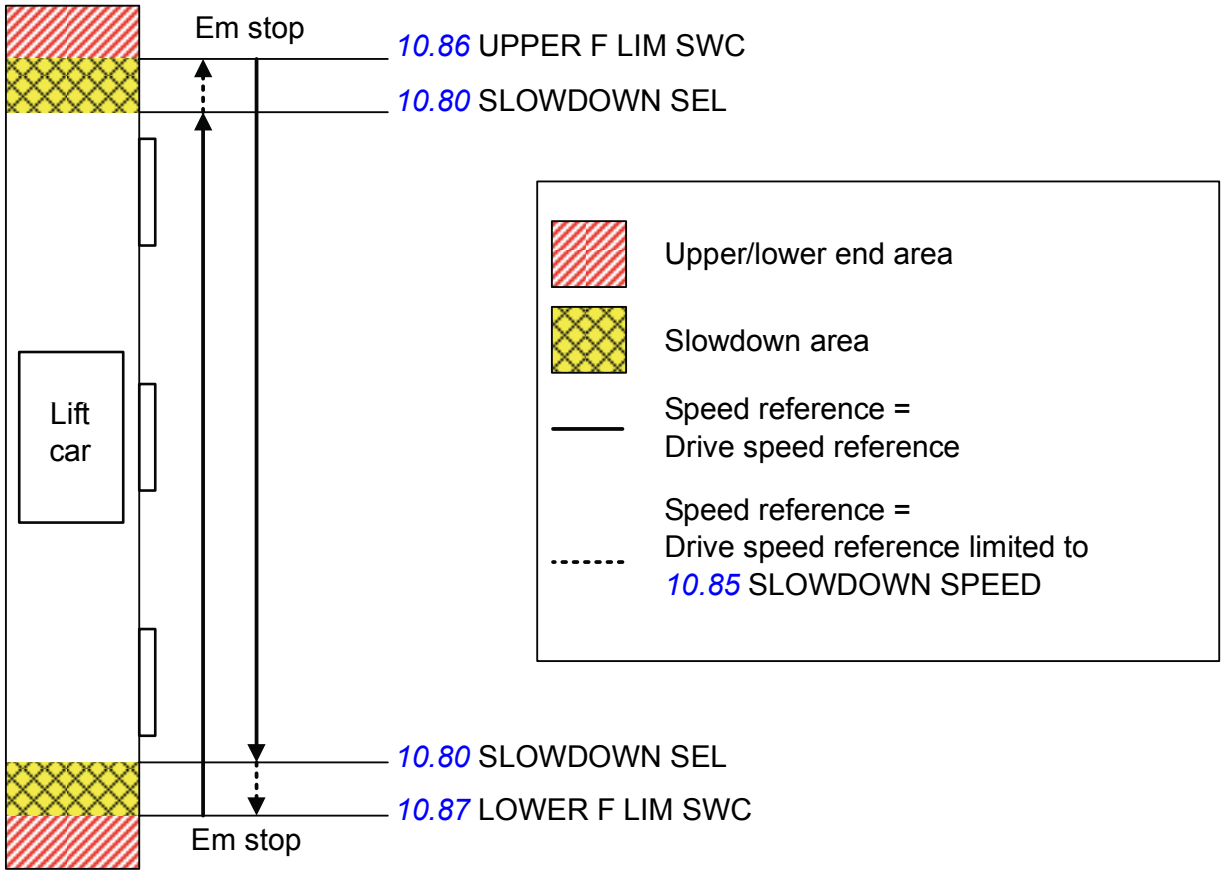
Parameters	Additional information
82.09 INERTIA COMP EN	Enables/disables the Inertia compensation function.
82.10 MOMENT OF INERT	Defines the lift system's or lift load's moment of inertia calculated during start-up.

Diagnostics

Signals	Additional information
Actual signals	
05.05 ACC COMP TORQ	Displays the inertia compensation torque calculated by the Inertia compensation function.

Slowdown and Final limit switches

The figure below illustrates the operation of the Slowdown and Final limit switches functions.



Slowdown

The Slowdown function limits the speed reference while the lift car is operating in the slowdown area. The slowdown area is typically the extreme top and extreme bottom of the lift operating area. The two modes of this function are described below.

Single-bit slowdown mode

You can select the single-bit slowdown mode by setting parameter *10.80* SLOWDOWN SEL to SINGLE BIT. The mode is enabled when the slowdown command is activated by parameter *10.81* SLOWDOWN IN1.

While the slowdown command is active, the speed reference is limited to the value of parameter *10.85* SLOWDOWN SPEED in the direction of the movement. However, the drive can be operated with full speed in the opposite direction.

If the slowdown command is active while the drive is stopped, the speed reference is limited in both directions to ensure safe operation. The same restriction applies if the slowdown command is active while the drive is being powered up.

Multiple-bit slowdown mode

You can select the multiple-bit mode by setting parameter *10.80* SLOWDOWN SEL to MULTIPLE BIT. With this mode, the speed reference is limited in the upward and downward directions separately. Parameter *10.81* SLOWDOWN IN1 activates the slowdown command in the upward direction, while parameter *10.82* SLOWDOWN IN2 activates it in the downward direction. When the command is active in either direction, the speed reference is limited to the value of parameter *10.85* SLOWDOWN SPEED.

Settings

Parameters	Additional information
10.80 SLOWDOWN SEL	Selects the mode of the Slowdown function.
10.81 SLOWDOWN IN1	Selects the source of the upward and downward slowdown command in the single-bit slowdown mode and the upward slowdown command in the multiple-bit slowdown mode.
10.82 SLOWDOWN IN2	Selects the source of the downward slowdown command in the multiple-bit slowdown mode.
10.85 SLOWDOWN SPEED	Defines the speed reference to be used when the slowdown command is active.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 0 (SLOWDOWN ACTIVE)	Displays whether the drive is operating in the slowdown area or not.
05.01 LIFT SW bit 1 (SLOWDOWN UP)	Displays the status of the slowdown command in the upward direction.
05.01 LIFT SW bit 2 (SLOWDOWN DN)	Displays the status of the slowdown command in the downward direction.
Alarms	
SLOWDOWN UP	Slowdown command is active in the upward direction based on the selection in parameter *10.80* SLOWDOWN SEL.
SLOWDOWN DN	Slowdown command is active in the downward direction based on the selection in parameter *10.80* SLOWDOWN SEL.

Final limit switches

This function activates an emergency stop signal (OFF3) if either of the final limit switches gets activated while the lift car is operating on terminal floors, before coming into contact with the buffers. Two switches, *10.86* UPPER F LIM SWC and *10.87* LOWER F LIM SWC, can be configured to be used in upward and downward directions.

The switches are independent of each other, and they are functional only when the motor is running in the respective direction. Both switches are used with active low logic: the upper final limit switch command is active when the source of parameter *10.86* UPPER F LIM SWC = 0, and inactive when its source = 1. The same applies to the lower final limit switch to ensure fail-safe logic.

If the upper final limit switch command gets activated while the drive is running in the upward direction, the function activates the emergency stop signal (OFF3). The drive then decelerates as defined with parameter *25.11* EM STOP TIME. The upper final limit switch command should be inactive for the drive to release a new start sequence in the upward direction. However, the drive can be run in the downward direction even if the upper final limit switch command is active. Upon the activation of the command, the drive generates alarm UPPER FINAL LIM SWC.

Similarly, if the lower final limit switch command gets activated while the drive is running in the downward direction, the function activates the emergency stop signal (OFF3). The drive then decelerates as defined with parameter *25.11* EM STOP TIME. The lower final limit switch command should be inactive for the drive to release a new start sequence in the downward direction. However, the drive can be run in the upward direction even if the lower final limit switch command is active. Upon the activation of the command, the drive generates alarm LOWER FINAL LIM SWC.

The function also blocks the speed reference limit only to a positive reference while the lower final limit switch command is active and only to a negative reference while the upper final limit switch command is active.

Settings

Parameters	Additional information
10.86 UPPER F LIM SWC	Selects the source for the upper final limit switch command.
10.87 LOWER F LIM SWC	Selects the source for the lower final limit switch command.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 3 (UPPER F LIM SWC)	Displays the status of the upper final limit switch command.
05.01 LIFT SW bit 4 (LOWER F LIM SWC)	Displays the status of the lower final limit switch command.
Alarms	
UPPER FINAL LIM SWC	Upper final limit switch command is active.
LOWER FINAL LIM SWC	Lower final limit switch command is active.

Protection functions

The following functions are used for checking and ensuring the proper operation of lift control in different operating conditions: Speed match, Inverter overload, Motor stall and Leveling overtime stop.

Other protection functions cover Thermal motor protection, DC voltage control and Programmable protection functions.

Speed match

The Speed match function checks that the motor actual speed (speed estimate or measured with an encoder, see parameter *22.01* SPEED FB SEL) follows the speed reference within the desired window during acceleration, deceleration and when running in a steady state (at set-point speed). The function also ensures that the brake does not slip while the drive is in a stopped state with the brake closed.

You can enable the Speed match function with parameter *81.03* SPEED MATCH. There are two parameters for defining the speed match deviation: *81.04* SPD STD DEV LVL is used for checking the deviation in a steady state, whereas *81.05* SPD RMP DEV LVL is used for checking the deviation during acceleration and deceleration.

While the drive is running, it trips on fault SPEED MATCH if the following conditions are met.

- The motor is running in a steady state and the difference of the motor actual speed and the ramped speed reference is greater than the value of parameter *81.04* SPD STD DEV LVL for a period longer than defined with parameter *81.06* SPEED MATCH DLY.

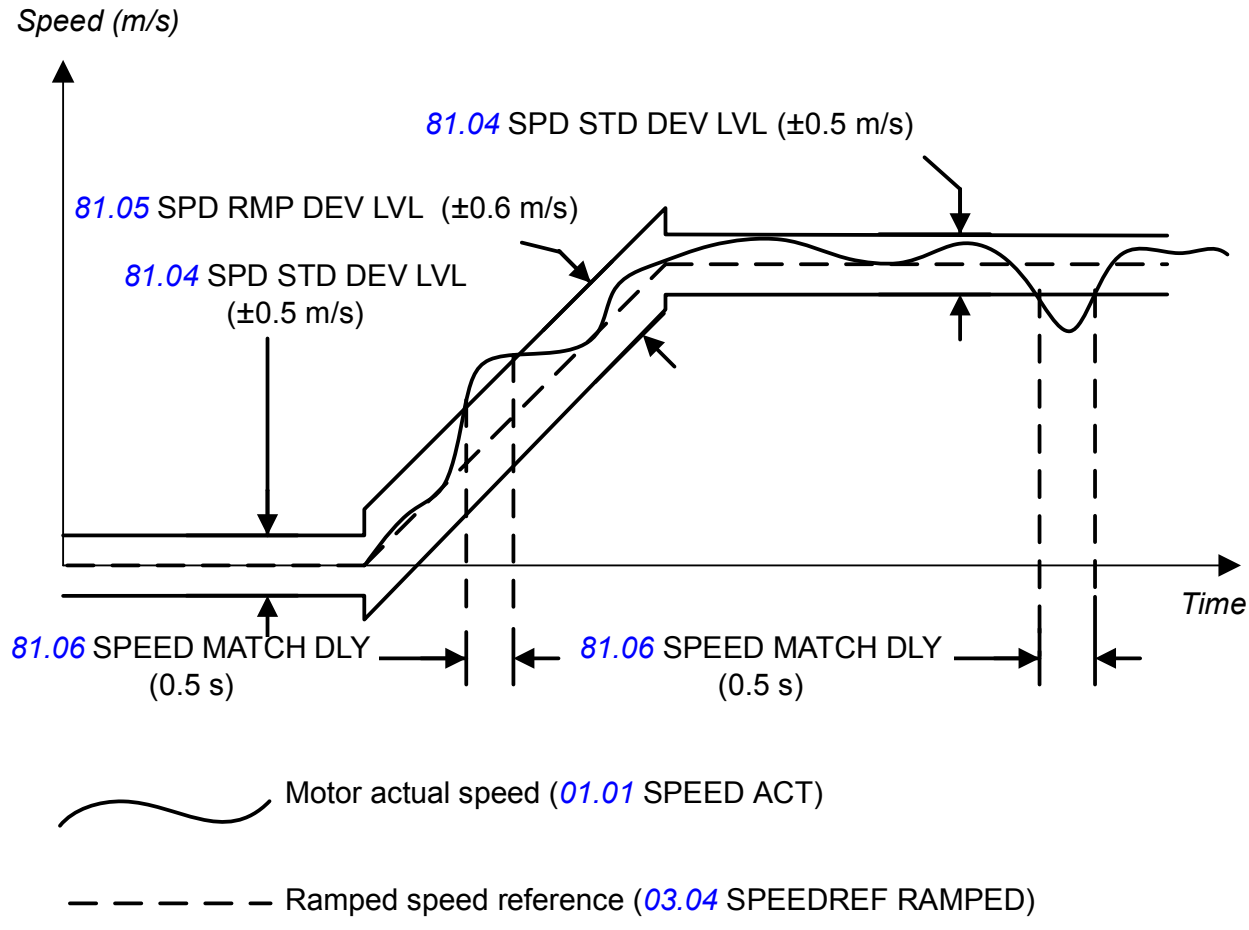
  Example: If parameter *81.04* SPD STD DEV LVL is set to 0.5 m/s, the drive will not trip on fault SPEED MATCH as long the difference of the motor actual speed and the speed reference does not exceed 0.5 m/s (that is, it does not go outside the enclosed area in the figure below) for a period longer than defined with parameter *81.06* SPEED MATCH DLY (0.5 s).

- The motor is accelerating/decelerating and the difference of the motor actual speed and the ramped speed reference is greater than the value of parameter *81.05* SPD RMP DEV LVL for a period longer than defined with parameter *81.06* SPEED MATCH DLY.

  Example: If parameter *81.05* SPD RMP DEV LVL is set to 0.6 m/s, the drive will not trip on fault SPEED MATCH during acceleration/deceleration as long as the difference of the motor actual speed and the ramped speed reference does not exceed 0.6 m/s (that is, it does not go outside the enclosed area in the figure below) for a period longer than defined with parameter *81.06* SPEED MATCH DLY (0.5 s).

When the mechanical brake is closed and the drive stopped, that is, brake control is active, the drive generates alarm BRAKE SLIP if the difference of the motor actual speed and the speed reference is greater than the value of parameter *81.04* SPD STD DEV LVL for a period longer than defined with parameter *81.06* SPEED MATCH DLY.

The figure below illustrates the operation of the Speed match function.



Settings

Parameters	Additional information
81.03 SPEED MATCH	Enables/disables the Speed match function.
81.04 SPD STD DEV LVL	Defines the speed matching steady state deviation.
81.05 SPD RMP DEV LVL	Defines the speed matching ramp state deviation.
81.06 SPEED MATCH DLY	Defines the time delay for generating fault SPEED MATCH.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 11 (BRAKE SLIP)	Displays whether alarm BRAKE SLIP has occurred or not.
05.02 LIFT FW bit 0 (SPEED MATCH)	Displays whether fault SPEED MATCH has occurred or not.
Alarms	
BRAKE SLIP	The brake is slipping while the motor is not running.
Faults	
SPEED MATCH	The speed error is higher than defined with parameter *81.04* SPD STD DEV LVL in the steady state or defined with parameter *81.05* SPD RMP DEV LVL in the ramp state, and the time delay defined with parameter *81.06* SPEED MATCH DLY has elapsed.

Inverter overload

The Inverter overload function checks that the inverter is capable of providing sufficient current and torque and that the drive is operating within the inverter current and torque limits.

To ensure that the inverter current and torque limits are not exceeded, the function monitors the corresponding status bits. The function is in operation while the motor is in the generating mode and generating more than 10% of the motor nominal power and running at an actual speed greater than 5% of the motor nominal speed. If the inverter current or torque limits are exceeded in this condition and the period defined with parameter *81.02* INV OVERLOAD DLY has elapsed, the drive trips on fault INV OVERLOAD, and the brake is applied for safety reasons.

The function monitors the following inverter current and torque limit status bits:

Signal *06.07* TORQ LIM STATUS:

- Bit 2 MINIMUM TORQUE
- Bit 3 MAXIMUM TORQUE
- Bit 4 INTERNAL CURRENT
- Bit 5 LOAD ANGLE
- Bit 6 MOTOR PULLOUT

To activate the status bit monitoring, you need to select the above-mentioned bits with the corresponding bits of parameter *81.01* INV OVERLOAD SEL. These bits are:

- Bit 0 MINIMUM TORQUE
- Bit 1 MAXIMUM TORQUE
- Bit 2 INTERNAL CURRENT
- Bit 3 LOAD ANGLE
- Bit 4 MOTOR PULLOUT

Settings

Parameters	Additional information
81.01 INV OVERLOAD SEL	Defines the inverter limit bits to be monitored by the Inverter overload function.
81.02 INV OVERLOAD DLY	Defines the time delay for generating fault INV OVERLOAD.

Diagnostics

Actual signals	Additional information
05.02 LIFT FW bit 3 (INV OVERLOAD)	Displays whether fault INV OVERLOAD has occurred or not.
Faults	
INV OVERLOAD	The drive has exceeded the inverter current or torque limits while the motor is in the generating mode and generating more than 10% of the motor nominal power and running at an actual speed greater than 5% of the motor nominal speed, and the time delay defined with parameter *81.02* INV OVERLOAD DLY has elapsed.

Motor stall

The Motor stall function protects the motor in stall situations where torque level is about to rise too high at lower speeds, ie, it monitors that the motor torque (*01.06* TORQUE) stays within user-defined torque limits.

You can define the torque limits with parameters *81.07* STALL TORQ MAX and *81.08* STALL TORQ MIN. If the motor torque exceeds these limits while the motor is running at a speed lower than defined with parameter *81.09* STALL SPEED LIM, the drive trips on fault MOTOR STALL after the period defined with parameter *81.10* STALL FAULT DLY.

The function is enabled when *81.09* STALL SPEED LIM is > 0.

Settings

Parameters	Additional information
81.07 STALL TORQ MAX	Defines the maximum torque limit for generating fault MOTOR STALL..
81.08 STALL TORQ MIN	Defines the minimum torque limit for generating fault MOTOR STALL.
81.09 STALL SPEED LIM	Defines the speed limit for the Motor stall function.
81.10 STALL FAULT DLY	Defines the time delay for generating fault MOTOR STALL.

Diagnostics

Signals	Additional information
05.02 LIFT FW bit 4 (MOTOR STALL)	Displays whether fault MOTOR STALL has occurred or not.
Faults	
MOTOR STALL	Motor actual speed is lower than defined with parameter *81.09* STALL SPEED LIM, the drive has exceeded the torque limits defined with parameters *81.07* STALL TORQ MAX and *81.08* STALL TORQ MIN, and the time delay defined with *81.10* STALL FAULT DLY has elapsed.

Leveling overtime stop

This function generates an emergency stop signal (OFF3) if the time the lift travels at the leveling speed exceeds the time defined with parameter *81.11* LVL MAX TIME. With this function, possible damage to the lift system can be avoided in situations where the stop command is not received on time after the leveling command due to an electrical or mechanical problem.

The function is enabled when *81.11* LVL MAX TIME is > 0.

Settings

Parameters	Additional information
81.11 LVL MAX TIME	Defines the maximum time the drive can run at the leveling speed.

Diagnostics

Alarms	Additional information
LVL TIME OVER	Leveling overtime stop function has been activated during the last run.

Thermal motor protection

With the parameters in group *45 MOT THERM PROT*, you can set up motor overtemperature protection and configure motor temperature measurement (if present). The parameters also cover the estimated and measured motor temperature.

The motor can be protected against overheating by

- the thermal motor protection model
- measuring the motor temperature with PTC or KTY84 sensors. This will result in a more accurate motor model.

Thermal motor protection model

The drive calculates the temperature of the motor on the basis of the following assumptions:

1. When power is applied to the drive for the first time, the motor is at ambient temperature (defined by parameter *45.05* AMBIENT TEMP). After this, when power is applied to the drive, the motor is assumed to be at the estimated temperature (value of *01.18* MOTOR TEMP EST, saved at power switch-off).
2. Motor temperature is calculated using the user-adjustable motor thermal time and motor load curve. The load curve should be adjusted in case the ambient temperature exceeds 30 °C.

It is possible to adjust the motor temperature supervision limits and select how the drive reacts when overtemperature is detected.

Note: The motor thermal model can be used when only one motor is connected to the inverter.

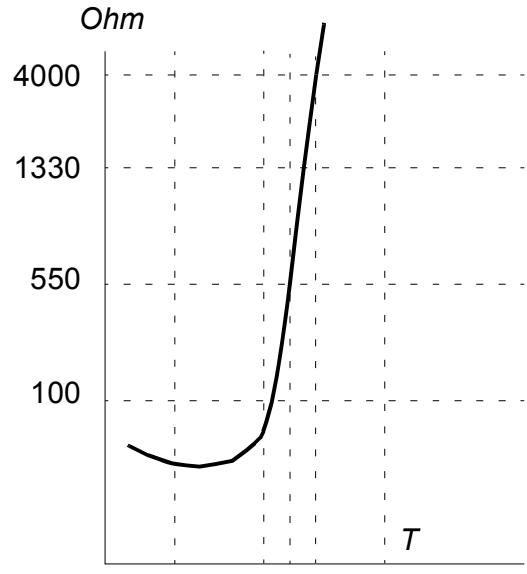
Temperature sensors

It is possible to detect motor overtemperature by connecting a motor temperature sensor to thermistor input TH of the drive or to optional encoder interface module FEN-xx.

Constant current is fed through the sensor. The resistance of the sensor increases as the motor temperature rises over the sensor reference temperature Tref, as does the voltage over the resistor. The temperature measurement function reads the voltage and converts it into ohms.

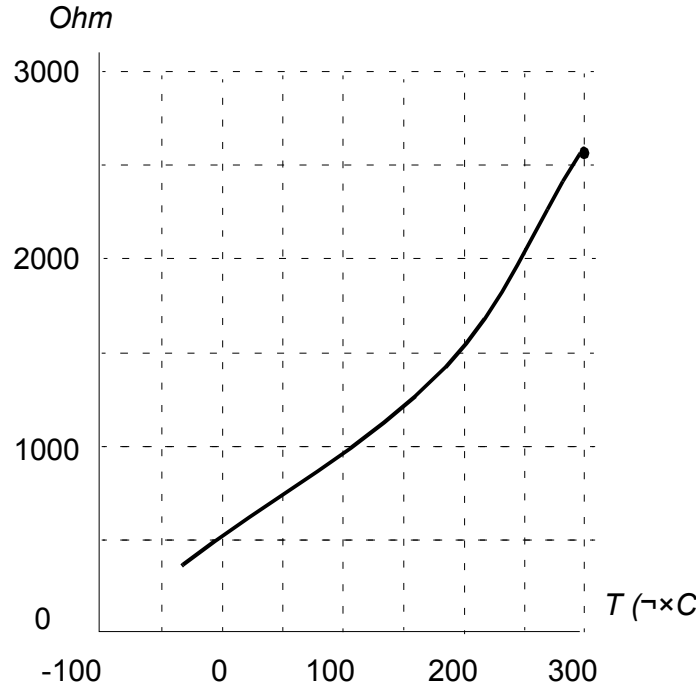
The figure below shows typical PTC sensor resistance values as a function of the motor operating temperature.

Temperature	PTC resistance
Normal	0…1.5 kohm
Excessive	≥ 4 kohm



The figure below shows typical KTY84 sensor resistance values as a function of the motor operating temperature.

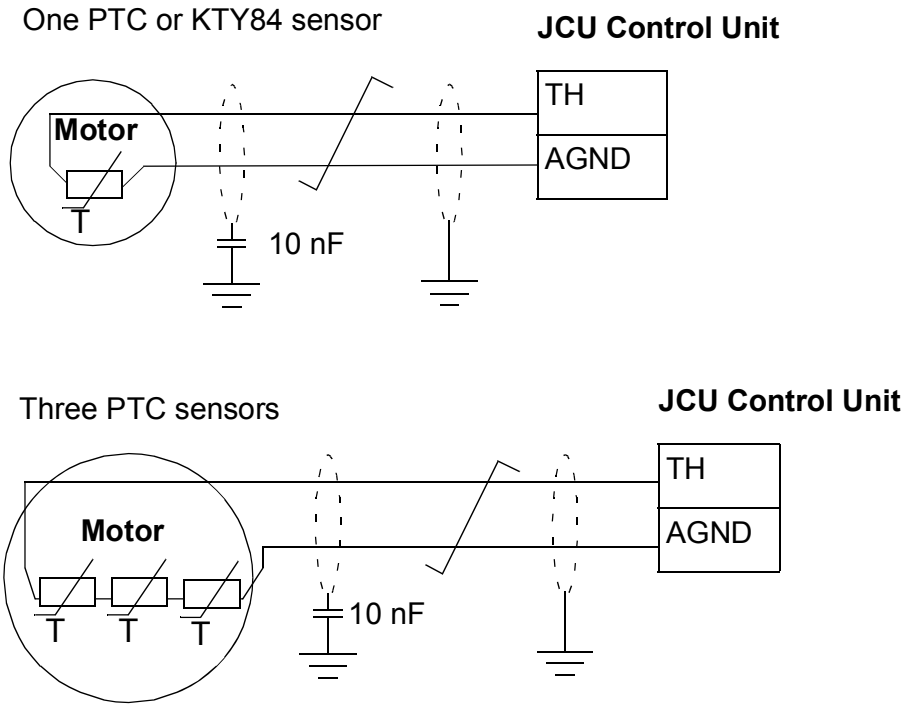
KTY84 scaling
90 °C = 936 ohm
110 °C = 1063 ohm
130 °C = 1197 ohm
150 °C = 1340 ohm



It is possible to adjust the motor temperature supervision limits and select how the drive reacts when overtemperature is detected.

WARNING! As the thermistor input on the JCU Control Unit is not insulated according to IEC 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfil the requirement,
-the I/O board terminals must be protected against contact and must not be connected to other equipment
or
-the temperature sensor must be isolated from the I/O terminals.

The figure below shows a motor temperature measurement when thermistor input TH is used.



For encoder interface module FEN-xx connection, see the *User's manual* of the appropriate encoder interface module.

Settings

Parameters	Additional information
45 MOT THERM PROT	Settings for thermal protection of the motor.

Diagnostics

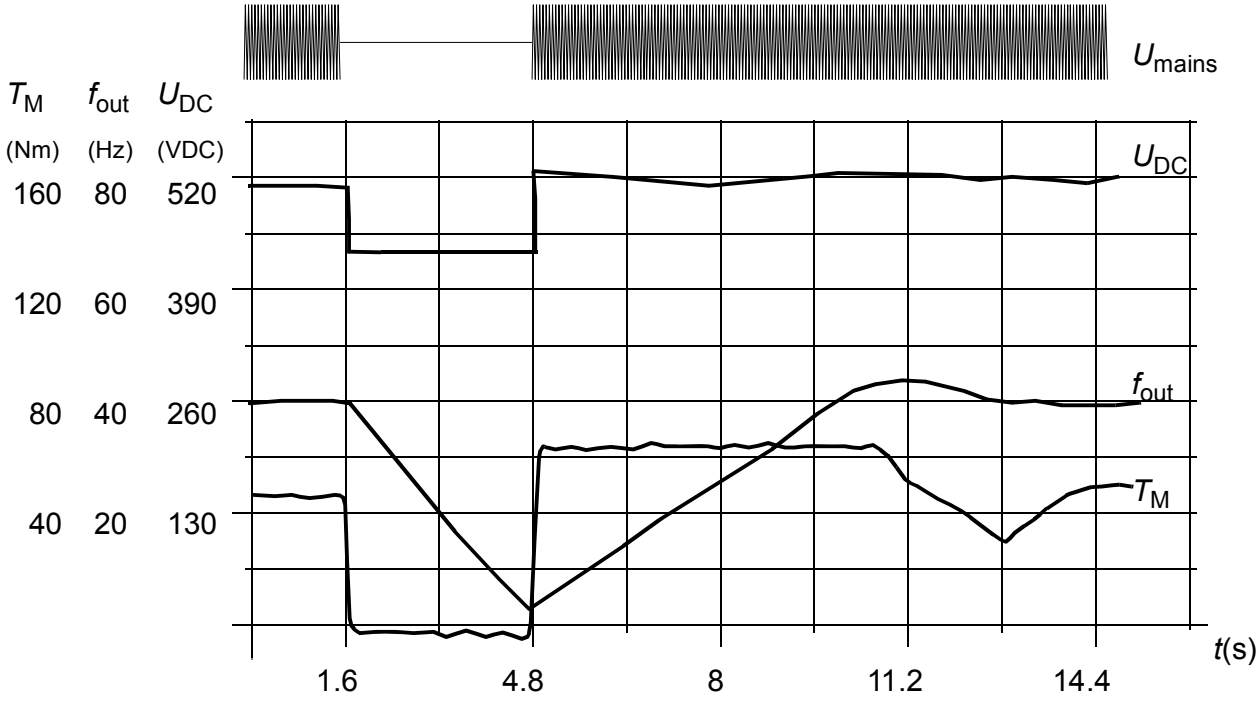
Actual signals	Additional information
01.18 MOTOR TEMP EST	Estimated motor temperature in Celsius.

DC voltage control

Undervoltage control

If the incoming supply voltage is cut off, the drive will continue to operate by utilising the kinetic energy of the rotating motor. The drive will be fully operational as long as the motor rotates and generates energy to the drive. The drive can continue the operation after the break if the main contactor remains closed.

Note: Units equipped with main contactor option must be equipped with a hold circuit (for example, UPS) which keeps the contactor control circuit closed during a short supply break.



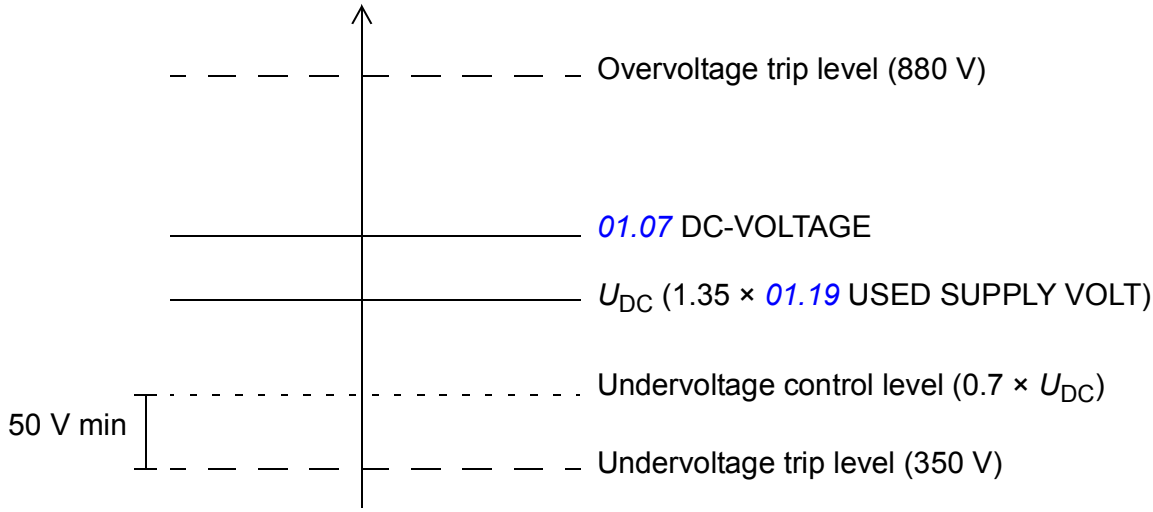
U_{DC}= intermediate circuit voltage of the drive, f_{out} = output frequency of the drive, T_M = motor torque

Loss of supply voltage at nominal load (f_{out} = 40 Hz). The intermediate circuit DC voltage drops to the minimum limit. The controller keeps the voltage steady as long as the mains is switched off. The drive runs the motor in generator mode. The motor speed falls but the drive is operational as long as the motor has enough kinetic energy.

Voltage control and trip limits

The control and trip limits of the intermediate DC voltage regulator are relative either to a supply voltage value provided by the user or to an automatically determined supply voltage. The actual voltage used is shown by parameter *01.19* USED SUPPLY VOLT. The nominal DC voltage (U_{DC}) equals this value 1.35 times.

Automatic identification of the supply voltage is performed every time the drive is powered. Automatic identification can be disabled by parameter *47.03* SUPPLVOLTAUTO-ID; the user can define the voltage manually at parameter *47.04* SUPPLY VOLTAGE.



The intermediate DC circuit is charged over an internal resistor which is bypassed when the correct level (80% of U_{DC}) is reached and voltage is stabilised.

Brake chopper

The built-in brake chopper of the drive can be used to handle the energy generated by a decelerating motor.

When the brake chopper control is enabled and a resistor connected, the chopper will start conducting when the DC link voltage of the drive reaches 780 V. The maximum braking power is achieved at 840 V.

For the parameters related to the brake chopper and brake resistor, see parameter group *48 BRAKE CHOPPER*. For more information on the brake resistor connection, see the appropriate *Hardware manual*.

Settings

Parameters	Additional information
47.02 UNDERVOLT CTRL	Enables the undervoltage control of the intermediate DC link.
47.03 SUPPLVOLTAUTO-ID	Enables the auto-identification of the supply voltage.
47.04 SUPPLY VOLTAGE	Defines the nominal supply voltage. Used if auto-identification of the supply voltage is not enabled with parameter *47.03*.
48 BRAKE CHOPPER	Configuration of the internal brake chopper.

Diagnostics

Actual signals	Additional information
01.07 DC-VOLTAGE	Measured intermediate circuit voltage in V.
01.19 USED SUPPLY VOLT	Either the nominal supply voltage defined with parameter *47.04* SUPPLY VOLTAGE or the automatically determined supply voltage if auto-identification is enabled with parameter *47.03* SUPPLVOLTAUTO-ID.
05.02 LIFT FW bit 11 UNDERVOLTAGE	Displays the status of the intermediate circuit DC voltage.

Programmable protection functions

The programmable protection functions are implemented with the following parameters.

- *46.01* EXTERNAL FAULT: Selects a source for an external fault signal. When the signal is lost, a fault is generated.
- *46.03* LOCAL CTRL LOSS: Selects how the drive reacts to a control panel or PC tool or communication break.
- *46.04* MOT PHASE LOSS: Selects how the drive reacts whenever a motor phase loss is detected.
- *46.05* EARTH FAULT: Selects how the drive reacts when an earth fault or current unbalance is detected in the motor or the motor cable. The earth fault detection is based on sum current measurement. Note that

  - an earth fault in the supply cable does not activate the protection

  - in a grounded supply, the protection activates in 200 milliseconds

  - in an ungrounded supply, the supply capacitance should be 1 microfarad or more

  - the capacitive currents caused by shielded motor cables up to 300 metres will not activate the protection

  - the protection is deactivated when the drive is stopped.
- *46.06* SUPPL PHS LOSS: Selects how the drive reacts whenever a supply phase loss is detected.
- *46.07* STO DIAGNOSTIC: The drive monitors the status of the Safe torque off input. For more information on the Safe torque off function, see *Safe torque off function for ACSM1, ACS850 and ACQ810 drives application guide (3AFE68929814 [English])*.
- *46.08* CROSS CONNECTION: The drive can detect if the supply and motor cables have accidentally been switched (for example, if the supply is connected to the motor connection of the drive). The parameter selects whether a fault is generated or not.

Inputs and outputs

When the drive is in external control, the following analog and digital inputs/outputs can be used to control the drive.

Analog inputs

The drive has two programmable analog inputs, AI1 and AI2. Both inputs can be used either as a voltage input or current input (-11…11 V or -22…22 mA). Both inputs can be filtered and scaled. The input type is selected with jumpers J1 and J2 on the JCU Control Unit, respectively. The inaccuracy of the analog inputs is 1% of the full scale range and the resolution is 11 bits (+ sign). The hardware filter time constant is approximately 0.25 ms.

Settings

Parameters	Additional information
13 ANALOGUE INPUTS	Settings for the analog inputs.

Diagnostics

Actual signals	Additional information
02.04 AI1	Analog input AI1 value in V or mA.
02.05 AI1 SCALED	Scaled value of analog input AI1.
02.06 AI2	Analog input AI2 value in V or mA.
02.07 AI2 SCALED	Scaled value of analog input AI2.

Analog outputs

The drive has two programmable analog outputs: one current output AO1 (0…20 mA) and one voltage output AO2 (-10…10 V). Both outputs can be filtered and scaled. The resolution of the analog outputs is 11 bits (+ sign) and the inaccuracy is 2% of the full scale range. The analog output signals can be proportional to, eg, motor speed, process speed (scaled motor speed), output frequency, output current, motor torque, and motor power. It is also possible to write a value to an analog output through a serial communication link (eg, a fieldbus link).

Settings

Parameters	Additional information
15 ANALOGUE OUTPUTS	Settings for the analog outputs.

Diagnostics

Actual signals	Additional information
02.08 AO1	Analog output AO1 value in mA.
02.09 AO2	Analog output AO2 value in V.

Digital inputs and outputs

The drive has six digital inputs (DI1, DI2, DI3, DI4 , DI5 and DI6) and three digital inputs/outputs (DIO1, DIO2 and DIO3). One of the digital inputs/outputs can be used as a frequency input, one as a frequency output. The six digital inputs can be inverted.

The number of digital inputs/outputs can be increased by using an FIO-01 I/O extension (activated with parameter *12.80* EXT IO SEL). In addition, if installed to the drive, the encoder module FEN-xx provides two additional digital inputs.

For more information on the I/O extension, see *FIO-01 digital I/O extension user's manual* (3AFE68784921 [English]). For the default digital inputs/outputs, see chapter *Default connections*.

Settings

Parameters	Additional information
12.80 EXT IO SEL	Activates an I/O extension installed into Slot 2.
12.81 EXT IO DIO1 CONF	Selects whether extension DIO1 is used as a digital input or as a digital output.
12.82 EXT IO DIO2 CONF	Selects whether extension DIO2 is used as a digital input or as a digital output.
12.83 EXT IO DIO3 CONF	Selects whether extension DIO3 is used as a digital input or as a digital output.
12.84 EXT IO DIO4 CONF	Selects whether extension DIO4 is used as a digital input or as a digital output.
12.85 EXT DIO1 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO1.
12.86 EXT DIO2 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO2.
12.87 EXT DIO3 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO3.
12.88 EXT DIO4 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO4.

Diagnostics

Actual signals	Additional information
02.01 DI STATUS	Status word of the digital inputs.
02.03 DIO STATUS	Status word of the digital inputs/outputs.
02.16 FEN DI STATUS	Status of digital inputs of FEN-xx encoder interfaces in drive option Slots 1 and 2.
02.80 EXT DIO STATUS	Status of the extended digital inputs/outputs.

Relay outputs

The drive has one relay output. Two additional relay outputs can be added by using an FIO-01 I/O extension (enabled with parameter *12.80* EXT IO SEL). For more information on the I/O extension, see *FIO-01 digital I/O extension user's manual* (3AFE68784921 [English]).

Settings

Parameters	Additional information
12.12 RO1 OUT PTR	Selects a drive signal to be connected to relay output RO1.
12.80 EXT IO SEL	Activates an I/O extension installed into Slot 2.
12.89 EXT RO1 OUT PTR	Selects a drive signal to be connected to extended relay output EXT RO1.
12.90 EXT RO2 OUT PTR	Selects a drive signal to be connected to extended relay output EXT RO2.

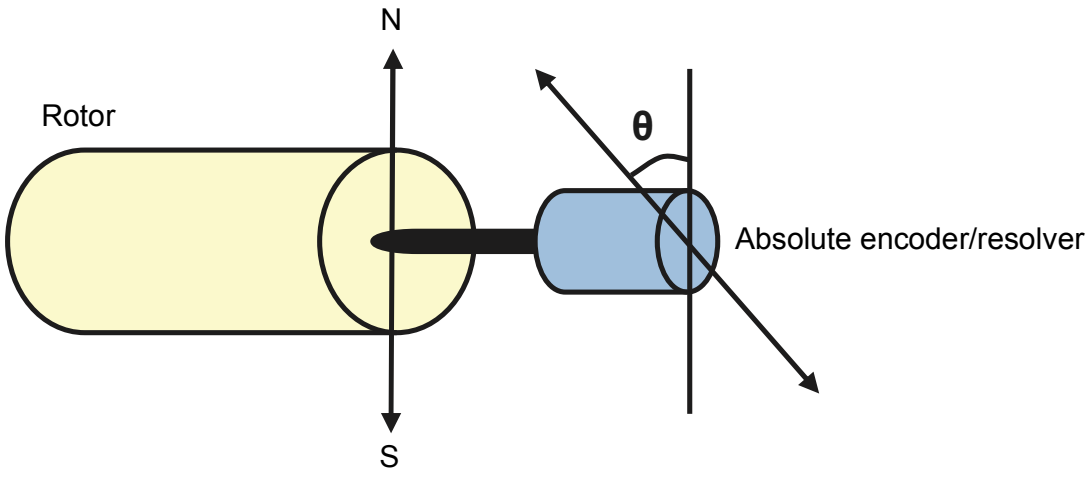
Diagnostics

Actual signals	Additional information
02.02 RO STATUS	Status of the relay output.
02.81 EXT RO STATUS	Status of the extended relay outputs.

Autophasing

Autophasing is an automatic measurement routine to determine the angular position of the magnetic flux of a permanent magnet synchronous motor. The motor control requires the absolute position of the rotor flux in order to control motor torque accurately.

Sensors like absolute encoders and resolvers indicate the rotor position at all times after the offset between the zero angle of rotor and that of the sensor has been established. On the other hand, a standard pulse encoder determines the rotor position when it rotates but the initial position is not known. However, a pulse encoder can be used as an absolute encoder if it is equipped with Hall sensors, albeit with coarse initial position accuracy. The Hall sensors generate so-called commutation pulses that change their state six times during one revolution, so it is only known within which 60° sector of a complete revolution the initial position is.



Autophasing is performed with permanent magnet synchronous motors in the following cases:

1. One-time measurement of the rotor and encoder position difference when an absolute encoder or resolver (one pole pair) is used
2. At every power-up when an incremental encoder is used
3. With open-loop motor control, repetitive measurement of the rotor position at every start.

Several autophasing modes are available (see parameter *11.07* AUTOPHASING MODE).

The turning mode is recommended especially with case 1, as it is the most robust and accurate method. In the turning mode, the motor shaft is turned back and forward (±360/polepairs)° in order to determine the rotor position. In case 2 (open-loop control), the shaft is turned only in one direction and the angle is smaller.

The standstill modes can be used if the motor cannot be turned (for example, when the load is connected). As the characteristics of motors and loads differ, testing must be done to find out the most suitable standstill mode.

The drive is also capable of determining the rotor position when started to a running motor in open-loop or closed-loop modes. In this situation, the setting of *11.07* AUTOPHASING MODE has no effect.

Settings

Parameters	Additional information
11.07 AUTOPHASING MODE	Selects the way autophasing is performed during the ID run.

Drive-to-drive link

The drive-to-drive link is a daisy-chained RS-485 transmission line that allows basic master/follower communication with one master drive and multiple followers.

The wiring of the drive-to-drive link is presented in the *Hardware manual* of the drive.

For information on the use of the drive-to-drive link, contact your local ABB representative.

Settings

Parameters	Additional information
57 D2D COMMUNICATION	Drive-to-drive communication settings.

Emergency stop

Note: The user is responsible for installing the emergency stop devices and all the additional devices needed for the emergency stop to fulfil the required emergency stop category classes.

Two emergency stops are available:

- Emergency stop OFF1: The emergency stop signal is connected to the digital input which is selected as the source for the emergency stop activation (parameter *10.11* EM STOP OFF1). The drive is stopped within the active deceleration time.
- Emergency stop OFF3: The emergency stop signal is activated by the Final limit switches function (see page *116*) and the Leveling overtime stop function (see page *121*). The drive is stopped within the time defined with parameter *25.11* EM STOP TIME.

Note: When an emergency stop signal is detected, the emergency stop cannot be cancelled, even though the signal is cancelled.

For more information, see *Functional safety solutions with ACSM1 drives application guide* (3AUA0000031517 [English]).

Settings

Parameters	Additional information
10.11 EM STOP OFF1	Selects the source for the emergency stop OFF1.
25.11 EM STOP TIME	Defines the time within which the drive is stopped if an emergency stop OFF3 is activated.

Diagnostics

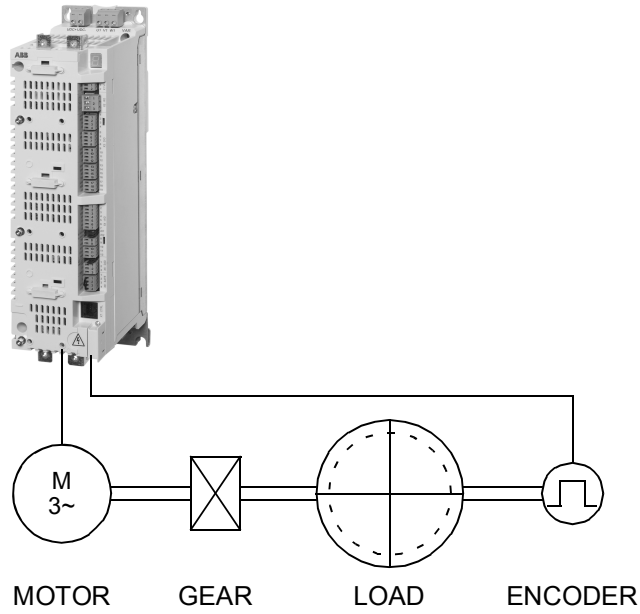
Actual signals	Additional information
06.01 STATUS WORD 1 bit 5 (EM STOP (OFF3)	Displays whether emergency stop OFF3 is active or not.
06.02 STATUS WORD 2 bit 6 (OFF1)	Displays whether emergency stop OFF1 is active or not.

Motor encoder gear

The drive provides the Motor encoder gear function for compensating of mechanical gears between the motor shaft, the encoder and the load.

Motor encoder gear application example:

Speed control uses the motor speed. If no encoder is mounted on the motor shaft, the Motor encoder gear function must be applied in order to calculate the actual motor speed on the basis of the measured load speed.



The motor encoder gear parameters *22.03* MOTOR GEAR MUL and *22.04* MOTOR GEAR DIV are set as follows:

$$\frac{\textit{22.03}\ \text{MOTOR GEAR MUL}}{\textit{22.04}\ \text{MOTOR GEAR DIV}} = \frac{\text{Actual speed}}{\text{Encoder 1/2 speed}}$$

Note: If the motor gear ratio differs from 1, the motor model uses an estimated speed instead of the speed feedback value.

Settings

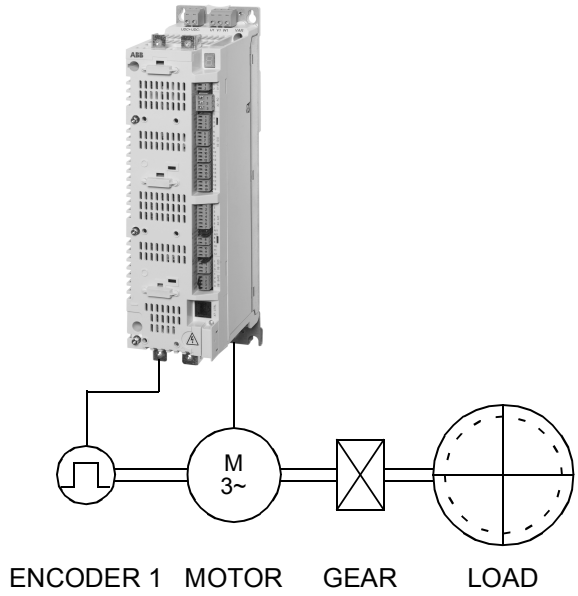
Parameters	Additional information
22.03 MOTOR GEAR MUL	Defines the motor gear numerator for the Motor encoder gear function.
22.04 MOTOR GEAR DIV	Defines the motor gear denominator for the Motor encoder gear function.

Load encoder gear

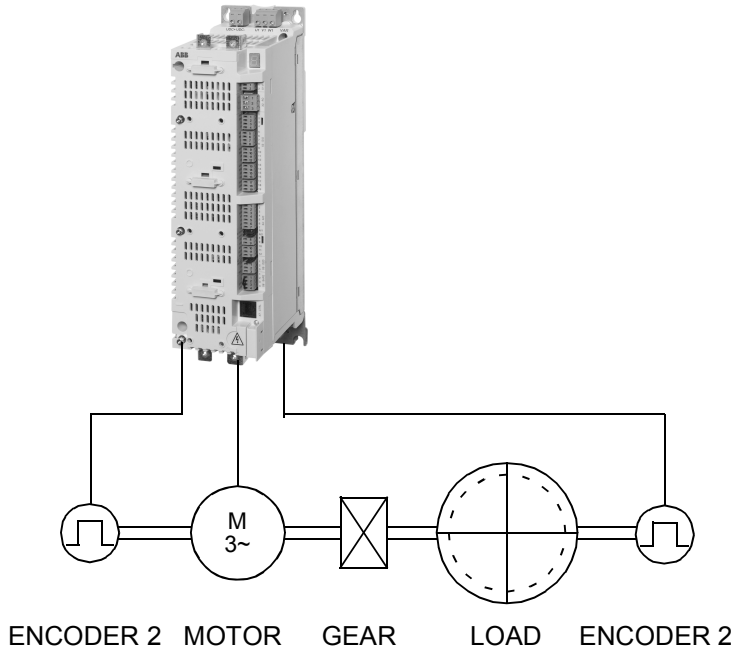
Positioning uses the measured speed and position of the load. The Load encoder gear function calculates the actual load position on the basis of the measured motor shaft position.

Load encoder gear application examples:

Positioning uses the measured speed and position of the load. If no encoder is mounted on the load side, the Load encoder gear function must be applied in order to calculate the actual load position on the basis of the measured motor shaft position.



A second encoder (encoder 2) mounted on the load side is used as the source for the actual position value. (**Note**: Inverted gear ratio is considered when the position control output (speed reference) is produced).



The load encoder gear parameters *60.03* LOAD GEAR MUL and *60.04* LOAD GEAR DIV are set as follows:

$$\frac{\textit{60.03}\ \text{LOAD GEAR MUL}}{\textit{60.04}\ \text{LOAD GEAR DIV}} = \frac{\text{Load speed}}{\text{Encoder 1/2 speed}}$$

Note: The sign of the programmed gear ratio has to match the sign of the mechanical gear ratio.

Settings

Parameters	Additional information
60.03 LOAD GEAR MUL	Defines the numerator for the Load encoder gear function.
60.04 LOAD GEAR DIV	Defines the denominator for the Load encoder gear function.

Encoder support

Encoder module selection

Encoder module selection covers the settings for encoder activation, emulation, TTL echo, and encoder cable fault detection.

The firmware supports two encoders, encoder 1 and 2 (but only one FEN-21 resolver interface module). Revolution counting is only supported for encoder 1. The following optional interface modules are available:

- TTL Encoder interface Module FEN-01: two TTL inputs, TTL output (for encoder emulation and echo), two digital inputs for position latching, PTC temperature sensor connection
- Absolute Encoder interface Module FEN-11: absolute encoder input, TTL input, TTL output (for encoder emulation and echo), two digital inputs for position latching, PTC/KTY temperature sensor connection
- Resolver interface Module FEN-21: resolver input, TTL input, TTL output (for encoder emulation echo), two digital inputs for position latching, PTC/KTY temperature sensor connection
- HTL Encoder interface Module FEN-31: HTL encoder input, TTL output (for encoder emulation and echo), two digital inputs for position latching, PTC/KTY temperature sensor connection

The interface module is connected to drive option Slot 1 or 2. **Note:** Two encoder interface modules of the same type are not allowed.

Note: Configuration data is written into the logic registers of the interface module once after the power-up. If parameter values are changed, save values into the permanent memory using parameter *16.07* PARAM SAVE. The new settings will take effect when the drive is powered up again, or after re-configuration is forced using parameter *90.10* ENC PAR REFRESH.

For encoder/resolver configuration, see parameter groups *91 ABSOL ENC CONF* (page *218*), *92 RESOLVER CONF* (page *224*) and *93 PULSE ENC CONF* (page *224*).

Settings

Parameters	Additional information
90 ENC MODULE SEL	Settings for encoder activation, emulation, TTL echo, and communication fault detection.

Absolute encoder configuration

Absolute encoder configuration is used when parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL is set to *FEN-11 ABS*.

The optional FEN-11 Absolute Encoder interface Module supports the following absolute encoders:

- Incremental sin/cos encoders with or without zero pulse and with or without sin/cos commutation signals
- Endat 2.1/2.2 with incremental sin/cos signals (partially without sin/cos incremental signals*)
- Hiperface encoders with incremental sin/cos signals
- SSI (Synchronous Serial Interface) with incremental sin/cos signals (partially without sin/cos incremental signals*).
- Tamagawa 17/33-bit digital encoders (the resolution of position data within one revolution is 17 bits; multiturn data includes a 16-bit revolution count).

* EnDat and SSI encoders without incremental sin/cos signals are partially supported only as encoder 1: Speed is not available and the time instant of the position data (delay) depends on the encoder.

See also parameter group *90 ENC MODULE SEL* on page *218*, and *FEN-11 absolute encoder interface user's manual* (3AFE68784841 [English]).

Note: Configuration data is written into the logic registers of the interface module once after the power-up. If parameter values are changed, save values into the permanent memory using parameter *16.07* PARAM SAVE. The new settings will take effect when the drive is powered up again, or after re-configuration is forced using parameter *90.10* ENC PAR REFRESH.

Settings

Parameters	Additional information
91 ABSOL ENC CONF	Absolute encoder configuration.

Resolver configuration

Resolver configuration is used when parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL is set to *FEN-21 RES*.

The optional FEN-21 resolver interface module is compatible with resolvers which are excited by sinusoidal voltage (to the rotor winding) and which generate sine and cosine signals proportional to the rotor angle (to stator windings).

Note: Configuration data is written into the logic registers of the adapter once after the power-up. If parameter values are changed, save values into the permanent memory by parameter *16.07* PARAM SAVE. The new settings will take effect when the drive is powered up again, or after re-configuration is forced by parameter *90.10* ENC PAR REFRESH.

Resolver autotuning is performed automatically whenever the resolver input is activated after changes to parameters *92.02* EXC SIGNAL AMPL or *92.03* EXC SIGNAL FREQ. Autotuning must be forced after any changes in the resolver cable connection. This can be done by setting either *92.02* EXC SIGNAL AMPL or *92.03* EXC SIGNAL FREQ to its already existing value, and then setting parameter *90.10* ENC PAR REFRESH to *Configure*.

If the resolver (or absolute encoder) is used for feedback from a permanent magnet motor, an AUTOPHASING ID run should be performed after replacement or any parameter changes. See parameter *99.13* IDRUN MODE and section *Autophasing* on page *130*.

See also parameter group *90 ENC MODULE SEL* on page *218*, and *FEN-21 resolver interface user's manual* (3AFE68784859 [English]).

Settings

Parameters	Additional information
92 RESOLVER CONF	Resolver configuration.

Pulse encoder configuration

Pulse encoder configuration is used for TTL/HTL input and TTL output configuration.

Parameters *93.01* ENC1 PULSE NR…*93.06* ENC1 OSC LIM are used when a TTL/HTL encoder is used as encoder 1 (see parameter *90.01* ENCODER 1 SEL).

Parameters *93.11* ENC2 PULSE NR…*93.16* ENC2 OSC LIM are used when a TTL/HTL encoder is used as encoder 2 (see parameter *90.02* ENCODER 2 SEL).

Typically, only parameter 93.01/93.11 needs to be set for TTL/HTL encoders.

Note: Configuration data is written into the logic registers of the adapter once after the power-up. If parameter values are changed, save values into the permanent memory by parameter *16.07* PARAM SAVE. The new settings will take effect when the drive is powered up again, or after re-configuration is forced by parameter *90.10* ENC PAR REFRESH.

See also parameter group *90 ENC MODULE SEL* on page *218*, and the appropriate encoder extension module manual.

Settings

Parameters	Additional information
93 PULSE ENC CONF	TTL/HTL input and TTL output configuration.

Rescue operation

Rescue operation is used in emergency evacuation situations where the lift car has to be run to the next floor because of a power supply failure. In such a situation, the drive is supplied by an external emergency power supply and is, thereby, switched to the low voltage mode. The lift controller takes care of switching between the mains supply and the low voltage supply.

Due to derated power supply, the lift car traveling speed needs to be reduced during a rescue operation. For this, the drive uses the evacuation mode (evacuation speed). Two evacuation options, automatic and manual evacuation, are available.

- In automatic evacuation, the drive searches the lighter load direction (up or down) and then automatically runs the lift car to that direction.
- In manual evacuation, the lift controller decides and issues the direction of travel.

The operation sequence during a rescue operation is as follows:

1. Power failure occurs and the drive trips.
2. Lift controller detects a power failure.
3. Lift controller cancels the normal operation commands.
4. Lift controller disconnects the mains supply to the drive.
5. Lift controller connects the low voltage supply to the drive.
6. Lift controller activates the low voltage and evacuation modes (precondition: the drive is ready to run).
7. Lift controller issues a start up or start down command.
8. Drive finds the lighter load travel direction (if automatic evacuation is selected).
9. Drive starts to operate at the evacuation speed.
10. Drive stops when the floor limit switch is activated (or when the start command is removed).

Switching back to normal mains supply is carried out as follows:

1. Drive is at a stopped state.
2. Lift controller deactivates the evacuation mode.
3. Lift controller disconnects the low voltage supply to the drive.
4. Lift controller reconnects the mains supply to the drive.

Evacuation mode

During a rescue operation, the drive uses the evacuation mode (evacuation speed).

You can enable the evacuation mode with parameter *10.89* EVACUATION MODE. Before enabling the evacuation mode, make sure that the lift car is stopped. With parameter *10.90* EVACUATION AUTO, you can select whether the evacuation of the lift car is manual or fully automatic.

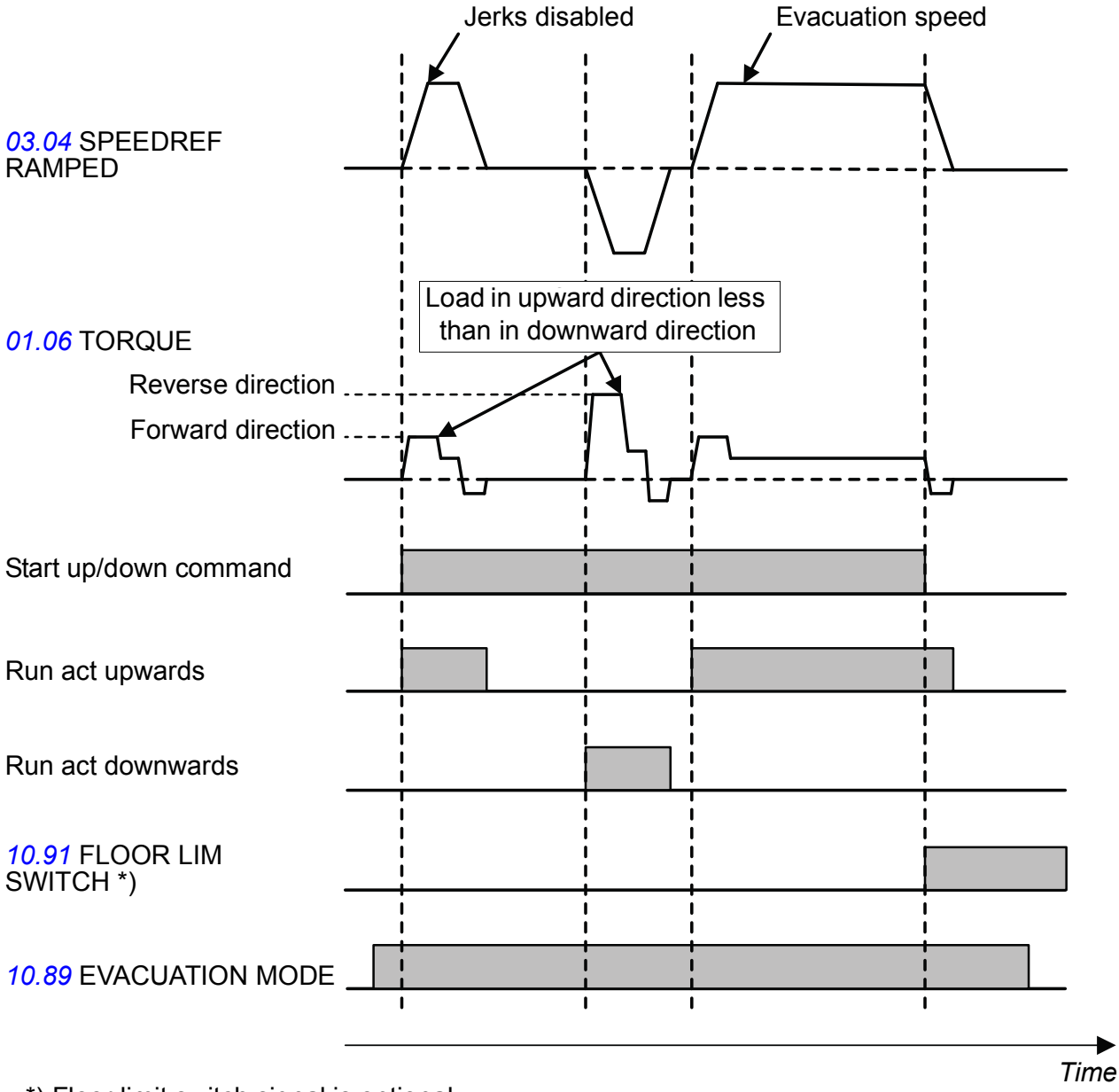
- In manual evacuation, the drive first waits for the lift controller to give the start up or start down signal. The evacuation travel is then conducted in the corresponding direction.
- In automatic evacuation:

1. Drive waits for the lift controller to give the start up or start down signal.
2. Drive activates a start command in the upward direction for 2 seconds and checks the actual torque.
3. Drive is stopped for 2 seconds.
4. Drive activates the start command in the downward direction.
5. Drive monitores and stores the downward operation torque.
6. Drive compares the torque in both directions and automatically issues a start command in the direction of the lighter load.

When the lift operates in the evacuation mode, the drive uses parameter *80.14* EVACUATION SPEED as the speed reference and parameters *25.87* EVAC MODE ACC and *25.88* EVAC MODE DEC for acceleration and deceleration, respectively.

Jerks are disabled in the evacuation mode. When evacuation travel starts, the torque value stored when the mechanical brake close command was activated is used automatically as the brake open torque to provide a comfortable start.

The simplified timing diagram below illustrates the operation of automatic evacuation when load in the upward direction is less than in the downward direction.



*) Floor limit switch signal is optional

Settings

Parameters	Additional information
10.89 EVACUATION MODE	Selects the source for enabling/disabling the evacuation mode.
10.90 EVACUATION AUTO	Selects the source for enabling manual or automatic evacuation.
10.91 FLOOR LIM SWITCH	Defines the source from which the Lift control program reads the floor limit switch signal.
25.87 EVAC MODE ACC	Defines the acceleration used in the evacuation mode.
25.88 EVAC MODE DEC	Defines the deceleration used in the evacuation mode.
80.14 EVACUATION SPEED	Defines the speed reference used in the evacuation mode.

Diagnostics

Signals	Additional information
Actual signals	
05.01 LIFT SW bit 12 (EVAC SPD ACT)	Displays whether the evacuation speed is the current speed reference used by the lift.
05.12 EVACUATION DIR	Displays the direction of the lighter load measured during automatic evacuation.

Low voltage mode

When an external emergency power supply is connected to the drive instead of the normal mains supply, the drive is switched to the low voltage mode based on the evacuation mode signal from the lift controller.

Note: Before the drive can be connected to the external emergency power supply, it must be at a stopped state and the normal mains supply must be disconnected.

The low voltage mode supports supply voltages in the ranges of

- 48…115 V DC
- 208…240 V AC (3-phase)
- 230 V AC (1-phase).

You can enable the low voltage mode with parameter *47.05* LOW VOLT MOD ENA. Typically, the evacuation mode signal (eg, a hardwired digital input) is connected to this parameter.

The low voltage mode also introduces parameters *47.06* LOW VOLT DC MIN and *47.07* LOW VOLT DC MAX for adjustment of minimum and maximum DC voltages, respectively. The following rules apply:

- *47.06* LOW VOLT DC MIN = 250 to 450 V
- *47.06* LOW VOLT DC MAX = 350 to 810 V
- *47.06* LOW VOLT DC MAX > 47.06 LOW VOLT DC MIN + 50 V.

The value of parameter *47.08* EXT PU SUPPLY or its source should be set to 1 (TRUE) when a low-voltage DC supply - such as a battery - is used. With an AC supply, the value should be set to 0 (FALSE).

Parameters *47.06*…*47.08* are effective only when the low voltage mode is active, that is, the value of parameter *47.05* LOW VOLT MOD ENA (or its source) is 1.

In the low voltage mode, the default voltage control and trip levels as well as the brake chopper operation levels (see sections *Voltage control and trip limits* on page *125* and *Brake chopper* on page *126*) are changed as follows:

Level	Value of parameter *47.08* EXT PU SUPPLY	
	FALSE	TRUE
Supply voltage range	200…240 V AC ±10% 270…324 V DC ±10%	*48…270 V DC ±10%
Overvoltage trip level	Unaffected	Unaffected
Overvoltage control level	*47.07* LOW VOLT DC MAX	*47.07* LOW VOLT DC MAX
Undervoltage control level	*47.06* LOW VOLT DC MIN	Disabled
Undervoltage trip level	*47.06* LOW VOLT DC MIN - 50 V	Disabled
Brake chopper activation level	*47.07* LOW VOLT DC MAX - 30 V	*47.07* LOW VOLT DC MAX - 30 V
Brake chopper maximum power level	*47.07* LOW VOLT DC MAX + 30 V	*47.07* LOW VOLT DC MAX + 30 V
*Requires additional DC power supply JPO-01		

Different system configurations are detailed in *ACSM1 system engineering manual* (3AFE68978297 [English]).

Settings

Parameters	Additional information
47.05 LOW VOLT MOD ENA	Selects a signal source that enables/disables the low voltage mode.
47.06 LOW VOLT DC MIN	Minimum DC voltage for the low voltage mode.
47.07 LOW VOLT DC MAX	Maximum DC voltage for the low voltage mode.
47.08 EXT PU SUPPLY	Selects a signal source that enables/disables external power unit supply, used with low DC supply voltages such as a battery.

Diagnostics

Signals	Additional information
Alarms	
LOW VOLT MOD CON	Low voltage mode has been activated but the parameter settings are outside allowable limits.

7

Parameters

What this chapter contains

The chapter describes the parameters, including actual signals, of the Lift control program.

Terms and abbreviations

Term	Definition
Actual signal	Type of parameter that is the result of a measurement or calculation by the drive. Actual signals can be monitored, but not adjusted, by the user. Parameter groups 01…09 contain actual signals.
Value parameter	A value parameter has a fixed set of choices or a setting range. Example 1: Motor phase loss supervision is activated by selecting *Fault* from the selection list of parameter *46.06* MOT PHASE LOSS. Example 2: The motor nominal power (kW) is set by writing/selecting the appropriate value for parameter *99.10* MOT NOM POWER, eg, 10.
Bit pointer	A parameter that points to the value of a bit in another parameter (usually an actual signal), or that can be fixed to 0 (FALSE) or 1 (TRUE). In addition, bit pointer parameters may have other pre-selected choices. When adjusting a bit pointer setting on the optional control panel, “CONST” is selected in order to fix the value to 0 (displayed as “C.FALSE”) or 1 (“C.TRUE”). “POINTER” is selected to define a source from another parameter. The source parameter and bit is freely selectable. A pointer value is given in the format **P.xx.yy.zz**, where **xx** = parameter group, **yy** = parameter index, **zz** = bit number. Pointing to a nonexisting bit will be interpreted as 0 (FALSE). Example: Digital input DI5 status, *02.01* DI STATUS bit 4, is used for brake supervision by setting parameter *35.02* BRAKE ACKNOWL to value P.02.01.04.
FbEq	Fieldbus equivalent. The scaling between the value shown on the panel and the integer used in serial communication.
p.u.	Per unit

Term	Definition
Value pointer	A parameter that points to the value of another actual signal or parameter. Value pointer parameters may have a set of pre-selected choices. A pointer value is given in the format **P.xx.yy**, where **xx** = parameter group, **yy** = parameter index. Example: Motor current signal, *01.05* CURRENT PERC, is connected to analog output AO1 by setting parameter *15.01* AO1 PTR to value P.01.05.

Setting parameters

Parameters can be set via the drive control panel (keypad), DriveStudio or the fieldbus interface. All parameter settings are stored automatically to the permanent memory of the drive. However, it is highly recommended to force a save by using parameter *16.07* PARAM SAVE before powering down the drive immediately after any parameter changes. Values are restored after the power switch-off. If necessary, the default values can be restored by parameter *16.04* PARAM RESTORE.

Parameter groups 01…09

No.	Name/Value	Description	FbEq
01 ACTUAL VALUES		Basic signals for monitoring the drive.	
01.01	SPEED ACT	Filtered actual speed in rpm. Used speed feedback is defined by parameter *22.01* SPEED FB SEL. Filter time constant can be adjusted by parameter *22.02* SPEED ACT FTIME.	100 = 1 rpm
01.02	SPEED ACT PERC	Actual speed in percent of the motor synchronous speed.	100 = 1%
01.03	FREQUENCY	Estimated drive output frequency in Hz.	100 = 1 Hz
01.04	CURRENT	Measured motor current in A.	100 = 1 A
01.05	CURRENT PERC	Motor current in percent of the nominal motor current.	10 = 1%
01.06	TORQUE	Motor torque in percent of the motor nominal torque.	10 = 1%
01.07	DC-VOLTAGE	Measured intermediate circuit voltage in V.	100 = 1 V
01.08	ENCODER 1 SPEED	Encoder 1 speed in rpm.	100 = 1 rpm
01.09	ENCODER 1 POS	Actual position of encoder 1 within one revolution.	100000000 = 1 rev
01.10	ENCODER 2 SPEED	Encoder 2 speed in rpm.	100 = 1 rpm
01.11	ENCODER 2 POS	Actual position of encoder 2 within one revolution.	100000000 = 1 rev
01.12	POS ACT	Actual position of the encoder. The unit depends on parameter *60.05* POS UNIT selection.	1000 = 1 m
01.13	POS 2ND ENC	Actual position of the encoder 2. The unit depends on parameter *60.05* POS UNIT selection.	1000 = 1 m
01.14	SPEED ESTIMATED	Estimated motor speed in rpm.	100 = 1 rpm
01.15	TEMP INVERTER	Measured temperature of the heatsink in % of the maximum allowed temperature.	10 = 1 %
01.16	TEMP BC	Brake chopper IGBT temperature in % of the maximum allowed temperature.	10 = 1 %
01.17	MOTOR TEMP	Measured motor temperature in Celsius when a KTY sensor is used. (With a PTC sensor, the value is always 0.)	10 = 1 °C
01.18	MOTOR TEMP EST	Estimated motor temperature in Celsius.	1 = 1 °C
01.19	USED SUPPLY VOLT	Either the user-given supply voltage (parameter *47.04* SUPPLY VOLTAGE), or, if auto-identification is enabled by parameter *47.03* SUPPLVOLTAUTO-ID, the automatically determined supply voltage.	10 = 1 V
01.20	BRAKE RES LOAD	Estimated temperature of the brake resistor. The value is given in percent of the temperature the resistor reaches when loaded with the power defined by parameter *48.04* BR POWER MAX CNT.	1 = 1%
01.21	CPU USAGE	Microprocessor load in percent.	1 = 1%
01.22	INVERTER POWER	Drive output power in kilowatts.	100 = 1 kW
01.26	ON TIME COUNTER	This counter runs when the drive is powered. The counter can be reset using the DriveStudio tool.	100 = 1 h

No.	Name/Value	Description	FbEq
01.27	RUN TIME COUNTER	Motor run time counter. The counter runs when the drive modulates. The counter can be reset using the DriveStudio tool.	100 = 1 h
01.28	FAN ON-TIME	Running time of the drive cooling fan. Can be reset by entering 0.	100 = 1 h

02 I/O VALUES		Input and output signals of the drive.	
02.01	DI STATUS	Status word of the digital inputs. Example: 000001 = DI1 is on, DI2 to DI6 are off.	1 = 1
02.02	RO STATUS	Status of the relay output. 1 = RO is energized.	1 = 1
02.03	DIO STATUS	Status word of digital inputs/outputs DIO1…3. Example: 001 = DIO1 is on, DIO2 and DIO3 are off.	1 = 1
02.04	AI1	Analog input AI1 value in V or mA. The type is selected with jumper J1 on the JCU Control Unit.	1000 = 1 V / mA
02.05	AI1 SCALED	Scaled value of analog input AI1. See parameters *13.04* AI1 MAX SCALE and *13.05* AI1 MIN SCALE.	1000 = 1
02.06	AI2	Analog input AI2 value in V or mA. The type is selected with jumper J2 on the JCU Control Unit.	1000 = 1 V / mA
02.07	AI2 SCALED	Scaled value of analog input AI2. See parameters *13.09* AI2 MAX SCALE and *13.10* AI2 MIN SCALE.	1000 = 1
02.08	AO1	Analog output AO1 value in mA.	1000 = 1 mA
02.09	AO2	Analog output AO2 value in V.	1000 = 1 V
02.10	DIO2 FREQ IN	Frequency input value in Hz when DIO2 is used as frequency input (*12.02* DIO2 CONF is set to *Freq input*).	1000 = 1 Hz
02.11	DIO3 FREQ OUT	Frequency output value in Hz when DIO3 is used as frequency output (*12.03* DIO3 CONF is set to *Freq output*).	1000 = 1 Hz

No.	Name/Value	Description	FbEq
02.12	FBA MAIN CW	Control Word for fieldbus communication. Log. = Logical combination (ie, Bit AND/OR Selection parameter). Par. = Selection parameter.	1 = 1

Bit	Name	Value	Information	Log.	Par.
0	STOP*	1	Stop according to the stop mode selected by *11.03* STOP MODE or according to the requested stop mode (bits 2…6). **Note:** Simultaneous stop and start commands result in a stop command.	OR	*10.02*, *10.03*
		0	No action.		
1	START	1	Start. **Note:** Simultaneous stop and start commands result in a stop command.	OR	*10.02*, *10.03*
		0	No action.		
2	STPMODE EM OFF*	1	Emergency OFF2 (bit 0 must be 1): Drive is stopped by cutting off the motor power supply (the inverter IGBTs are blocked). The motor coasts to stop. The drive will restart only with the next rising edge of the start signal when the Run enable signal is on.	AND	–
		0	No action.		
3	STPMODE EM STOP*	1	Emergency stop OFF3 (bit 0 must be 1). Stop within the time defined by *25.11* EM STOP TIME.	AND	–
		0	No action.		
4	STPMODE OFF1*	1	Emergency stop OFF1 (bit 0 must be 1). Stop along the currently active deceleration ramp.	AND	*10.11*
		0	No action.		
5	STPMODE RAMP*	1	Stop along the currently active deceleration ramp.	–	*11.03*
		0	No action.		
6	STPMODE COAST*	1	Coast to stop.	–	*11.03*
		0	No action.		
7	RUN ENABLE	1	Activate Run enable.	AND	–
		0	Activate Run disable.		
8	RESET	0 -> 1	Fault reset if an active fault exists.	OR	–
		other	No action.		
9	JOGGING 1**	1	Activate jogging function 1.	OR	–
		0	Jogging function 1 disabled.		
10	JOGGING 2**	1	Activate jogging function 2.	OR	–
		0	Jogging function 2 disabled.		
11	REMOTE CMD	1	Fieldbus control enabled.	–	–
		0	Fieldbus control disabled.		
12	RAMP OUT 0	1	Force output of Ramp Function Generator to zero. The drive ramps to a stop (current and DC voltage limits are in force).	–	–
		0	No action.		

(continued)

* If all stop mode bits 2…6 are 0, stop mode is selected by *11.03* STOP MODE. Coast stop (bit 6) overrides the emergency stop (bits 2/3/4). Emergency stop overrides the normal ramp stop (bit 5).

** Internally used for evacuation and inspection mode operation.

No.	Name/Value	Description	FbEq

Bit	Name	Value	Information	Log.	Par.
(continued)					
13	RAMP HOLD	1	Halt ramping (Ramp Function Generator output held).	–	–
		0	No action.		
14	RAMP IN 0	1	Force Ramp Function Generator input to zero.	–	–
		0	No action.		
15	EXT1 / EXT2	1	Not used.	OR	–
		0	Switch to external control location EXT1.		
16	REQ STARTINH	1	Activate start inhibit.	–	–
		0	No start inhibit.		
17	LOCAL CTL	1	Request local control for Control Word. Used when the drive is controlled via PC tool or panel or through local fieldbus. • Local fieldbus: Transfer to fieldbus local control (control via fieldbus Control Word or reference). Fieldbus steals the control. • Panel or PC tool: Transfer to local control.	–	–
		0	Request external control.		
18	FBLOCAL REF	1	Request fieldbus local control.	–	–
		0	No fieldbus local control.		
19	ABS POSIT	1	Not used.		
		0	Not used.		
20	POS START MODE	1	Not used.		
		0	Not used.		
21	POSITION-ING ENA	1	Not used.		
		0	Not used.		
22	PO REF LIM ENA	1	Not used.		
		0	Not used.		
23	Not used				
24	CHG SET IMMED	1	Not used.		
		0	Not used.		
25	POS START	1	Not used.		
		0	Not used.		
26	START HOMING	1	Not used.		
		0	Not used		
27	Not used				
28	CW B28		Freely programmable control bits.	-	-
29	CW B29				
30	CW B30				
31	CW B31				

No.	Name/Value	Description	FbEq
02.13	FBA MAIN SW	Status Word for fieldbus communication.	1 = 1

Bit	Name	Value	Information
0	READY	1	Drive is ready to receive start command.
		0	Drive is not ready.
1	ENABLED	1	External run enable signal is received.
		0	No external run enable signal is received.
2	RUNNING	1	Drive is modulating.
		0	Drive is not modulating.
3	REF RUNNING	1	Normal operation is enabled. Drive is running and following given reference.
		0	Normal operation is disabled. Drive is not following given reference (for example, modulating during magnetization).
4	EM OFF (OFF2)	1	Emergency OFF2 is active.
		0	Emergency OFF2 is inactive.
5	EM STOP (OFF3)	1	Emergency stop OFF3 (ramp stop) is active.
		0	Emergency stop OFF3 is inactive.
6	ACK STARTINH	1	Start inhibit is active.
		0	Start inhibit is inactive.
7	ALARM	1	An alarm is active. See chapter *Fault tracing*.
		0	No alarm is active.
8	AT SETPOINT	1	Drive is at setpoint. Actual value equals reference value (ie, the difference between the actual speed and the speed reference is within the speed window defined by *26.07* SPEED WINDOW.
		0	Drive has not reached setpoint.
9	LIMIT	1	Operation is limited by torque limit (any torque limit).
		0	Operation is within torque limits.
10	ABOVE LIMIT	1	Actual speed exceeds the defined limit, *22.07* ABOVE SPEED LIM.
		0	Actual speed is within the defined limits.
11	EXT2 ACT	1	Not used.
		0	Not used.
12	LOCAL FB	1	Fieldbus local control is active.
		0	Fieldbus local control is inactive.
13	ZERO SPEED	1	Drive speed is below limit set by par. *22.05* ZERO SPEED LIMIT.
		0	Drive has not reached zero speed limit.

(continued)

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td></td><td colspan="2">
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Information</th></tr>
<tr><td colspan="4">(continued)</td></tr>
<tr><td>14</td><td>REV ACT</td><td>1</td><td>Drive is running in reverse direction.</td></tr>
<tr><td></td><td></td><td>0</td><td>Drive is running in forward direction.</td></tr>
<tr><td>15</td><td colspan="3">Not used</td></tr>
<tr><td>16</td><td>FAULT</td><td>1</td><td>Fault is active. See chapter Fault tracing.</td></tr>
<tr><td></td><td></td><td>0</td><td>No fault is active.</td></tr>
<tr><td>17</td><td>LOCAL PANEL</td><td>1</td><td>Local control is active, ie, drive is controlled from PC tool or control panel.</td></tr>
<tr><td></td><td></td><td>0</td><td>Local control is inactive.</td></tr>
<tr><td>18</td><td>FOLLOWING ERROR</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>19</td><td>TGT REACHED</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>20</td><td>HOMING DONE</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>21</td><td>TRAV TASK ACK</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>22</td><td>MOVING</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>23</td><td>IP MODE ACTIVE</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>24</td><td>REG LEVEL</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>25</td><td>POSITIVE LIMIT</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>26</td><td>NEGATIVE LIMIT</td><td>1</td><td>Not used.</td></tr>
<tr><td></td><td></td><td>0</td><td>Not used.</td></tr>
<tr><td>27</td><td>REQUEST CTL</td><td>1</td><td>Control word is requested from fieldbus.</td></tr>
<tr><td></td><td></td><td>0</td><td>Control word is not requested from fieldbus.</td></tr>
<tr><td>28</td><td>SW B28</td><td></td><td rowspan="4">Programmable status bits (unless fixed by the used profile). See parameters 50.08…50.11 and the user manual of the fieldbus adapter.</td></tr>
<tr><td>29</td><td>SW B29</td><td></td></tr>
<tr><td>30</td><td>SW B30</td><td></td></tr>
<tr><td>31</td><td>SW B31</td><td></td></tr>
</table>
</td><td></td></tr>
<tr><td>02.14</td><td>FBA MAIN REF1</td><td>Scaled fieldbus reference 1. See parameter 50.04 FBA REF1 MODESEL.</td><td>1 = 1</td></tr>
<tr><td>02.15</td><td>FBA MAIN REF2</td><td>Scaled fieldbus reference 2. See parameter 50.05 FBA REF2 MODESEL.</td><td>1 = 1</td></tr>
<tr><td>02.16</td><td>FEN DI STATUS</td><td>Status of digital inputs of FEN-xx encoder interfaces in drive option Slots 1 and 2. Examples:
000001 (01h) = DI1 of FEN-xx in Slot 1 is ON, all others are OFF.
000010 (02h) = DI2 of FEN-xx in Slot 1 is ON, all others are OFF.
010000 (10h) = DI1 of FEN-xx in Slot 2 is ON, all others are OFF.
100000 (20h) = DI2 of FEN-xx in Slot 2 is ON, all others are OFF.</td><td>1 = 1</td></tr>
</table>

No.	Name/Value	Description	FbEq
02.17	D2D MAIN CW	Drive-to-drive control word received through the drive-to-drive link. See also actual signal *02.18* below.	1 = 1

Bit	Information
0	Stop.
1	Start.
2…6	Reserved.
7	Run enable. By default, not connected in a follower drive.
8	Reset. By default, not connected in a follower drive.
9…14	Freely assignable through bit pointer parameters.
15	EXT1/EXT2 selection. 0 = EXT1 active, 1 = Not used. By default, not connected in a follower drive.

02.18	D2D FOLLOWER CW	Drive-to-drive control word sent to the followers by default.	1 = 1

Bit	Information
0	Stop.
1	Start.
2...6	Reserved.
7	Run enable.
8	Reset.
9...14	Reserved.
15	EXT1/EXT2 selection. 0 = EXT1 active, 1 = Not used.

02.19	D2D REF1	Drive-to-drive reference 1 received through the drive-to-drive link.	1 = 1
02.20	D2D REF2	Drive-to-drive reference 2 received through the drive-to-drive link.	1 = 1
02.80	EXT DIO STATUS	Status of the extended digital inputs/outputs EXT DIO1…DIO4. Example: 0000001001 = DIO1 and DIO4 are on, DIO2 and DIO3 are off. **Note:** If an FIO-01 extension is installed, the status of its digital input/output is indicated by this signal.	1 = 1
02.81	EXT RO STATUS	Status of the extended relay outputs. 1 = EXT RO is energized. Example: 010 = EXT RO2 is energized. **Note:** If an FIO-01 extension is installed, the status of its relay outputs is indicated by this signal.	1 = 1

03 CONTROL VALUES		Speed control, torque control, and other values.	
03.02	SPEED REF2	Speed reference 2 in rpm.	100 = 1 rpm
03.03	SPEEDREF RAMP IN	Used speed reference ramp input in rpm.	100 = 1 rpm
03.04	SPEEDREF RAMPED	Ramped and shaped speed reference in rpm.	100 = 1 rpm
03.05	SPEEDREF USED	Used speed reference in rpm (reference before the speed error calculation).	100 = 1 rpm
03.06	SPEED ERROR FILT	Filtered speed error value in rpm.	100 = 1 rpm
03.07	ACC COMP TORQ	Output of the acceleration compensation (torque in %).	10 = 1 %

No.	Name/Value	Description	FbEq
03.08	TORQ REF SP CTRL	Limited speed controller output torque in %.	10 = 1%
03.13	TORQ REF TO TC	Torque reference in % for the torque control. When *99.05* MOTOR CTRL MODE is set to *Scalar*, this value is forced to 0.	10 = 1%
03.14	BRAKE TORQ MEM	Torque value (in %) stored when the mechanical brake close command is issued.	10 = 1%
03.15	BRAKE COMMAND	Brake on/off command. 0 = Close. 1 = Open. For brake on/off control, connect this signal to a relay output (or a digital output). See section *Mechanical brake control* on page *104*.	1 = 1
03.16	FLUX REF USED	Used flux reference in percent.	1 = 1%
03.17	TORQUE REF USED	Used/limited torque reference in percent.	10 = 1%

No.	Name/Value	Description	FbEq
05 LIFT CTRL SIGNALS		Signals for monitoring the lift control functions.	
05.01	LIFT SW	Lift control status word.	1 = 1

Bit	Name	Value	Information
0	SLOWDOWN ACTIVE	1	Slowdown command is active either in the upward or downward direction based on parameter *10.80* SLOWDOWN SEL.
		0	Slowdown command is inactive both in the upward and downward direction based on parameter *10.80* SLOWDOWN SEL.
1	SLOWDOWN UP	1	Slowdown command is inactive in the upward direction based on parameter *10.80* SLOWDOWN SEL.
		0	Slowdown command is active in the upward direction based on parameter *10.80* SLOWDOWN SEL.
2	SLOWDOWN DN	1	Slowdown command is inactive in the downward direction based on parameter *10.80* SLOWDOWN SEL.
		0	Slowdown command is active in the downward direction based on parameter *10.80* SLOWDOWN SEL.
3	UPPER F LIM SWC	1	Upper final limit switch command (parameter *10.86* UPPER F LIM SWC) is inactive.
		0	Upper final limit switch command (parameter *10.86* UPPER F LIM SWC) is active.
4	LOWER F LIM SWC	1	Lower final limit switch command (parameter *10.87* LOWER F LIM SWC) is inactive.
		0	Lower final limit switch command (parameter *10.87* LOWER F LIM SWC) is active.
5	SPEED1 ACT	1	Speed1 (parameter *80.08*) is the current speed reference used by the lift.
		0	Speed1 (parameter *80.08*) is not the current speed reference used by the lift.
6	LEVELING ACT	1	Leveling speed (parameter *80.09*) is the current speed reference used by the lift.
		0	Leveling speed (parameter *80.09*) is not the current speed reference used by the lift.
7	RELEVELING ACT	1	Releveling speed (parameter *80.11*) is the current speed reference used by the lift.
		0	Releveling speed (parameter *80.11*) is not the current speed reference used by the lift.
8	MEDIUM SPD ACT	1	Medium speed (parameter *80.12*) is the current speed reference used by the lift.
		0	Medium speed (parameter *80.12*) is not the current speed reference used by the lift.
9	NOMINAL SPD ACT	1	Nominal speed (parameter *80.01*) is the current speed reference used by the lift.
		0	Nominal speed (parameter *80.01*) is not the current speed reference used by the lift.

(continued)

No.	Name/Value	Description	FbEq

Bit	Name	Value	Information
(continued)			
10	INSPECT SPD ACT	1	Inspection speed (parameter *80.13*) is the current speed reference used by the lift.
		0	Inspection speed (parameter *80.13*) is not the current speed reference used by the lift.
11	BRAKE SLIP ALARM	1	Brake is slipping while the motor is not running.
		0	Brake is not slipping (No BRAKE SLIP alarm active).
12	EVAC SPD ACT	1	Evacuation speed (parameter *80.14*) is the current speed reference used by the lift.
		0	Evacuation speed (parameter *80.14*) is not the current speed reference used by the lift.
13	SPEED2 ACT	1	Speed2 (parameter *80.15*) is the current speed reference used by the lift.
		0	Speed 2 (parameter *80.15*) is not the current speed reference used by the lift.
14	SPEED3 ACT	1	Speed3 (parameter *80.16*) is the current speed reference used by the lift.
		0	Speed3 (parameter *80.16*) is not the current speed reference used by the lift.
15	RDY CLS SPLYCONT	1	Ready to close the supply contactor. Safe torque off function is inactive.
		0	Not ready to close the supply contactor. Safe torque off function is active.

No.	Name/Value	Description	FbEq
05.02	LIFT FW	Lift fault status word with fault bits.	1 = 1

Bit	Name	Value	Information
0	SPEED MATCH	1	The speed error is higher than defined with parameter *81.04* SPD STD DEV LVL in the steady state or defined with parameter *81.05* SPD RMP DEV LVL in the ramp state, and the time delay defined with parameter *81.06* SPEED MATCH DLY has elapsed.
		0	The speed error is within the defined limits (no SPEED MATCH fault active).
1	TORQUE PROVE	1	The drive was not able to provide sufficient torque during a torque proving sequence.
		0	Torque proving successfully accomplished or torque proving disabled (no TORQUE PROVE fault active).
2	BRAKE SLIP	1	The brake slipped while a torque proving sequence was taking place.
		0	No brake slip detected during torque proving (no BRAKE SLIP fault active).
3	INV OVERLOAD	1	The drive has hit the inverter overload limit bits and the period of time defined with parameter *81.02* INV OVERLOAD DLY has elapsed.
		0	No INV OVERLOAD fault active.
4	MOTOR STALL	1	The drive has hit the maximum or minimum stall torque limits, the actual speed is lower than the value of parameter *81.09* STALL SPEED LIM, and the time period defined with parameter *81.10* STALL FAULT DLY has elapsed.
		0	No MOTOR STALL fault active.
5…8	Not used		
9	OVERCURRENT	1	Output current has exceeded the internal limit.
		0	Output current is within the internal limit.
10	OVERVOLTAGE	1	Excessive intermediate circuit DC voltage.
		0	Intermediate circuit DC voltage is sufficient.
11	UNDERVOLTAGE	1	Intermediate circuit DC voltage is not sufficient.
		0	Intermediate circuit DC voltage is sufficient.
12	EXTERNAL FAULT	1	Fault in the external device.
		0	No fault in the external device.
13…15	Not used		

05.03	LIFT SPEED SEL	Displays the lift speed used based on the Speed reference selection function. This is the final speed reference used by the lift system in m/s.	100 = 1 m/s
05.04	LOAD ACT TORQ	Displays the torque corresponding to the actual load based on the feedback from the load sensor. Calculated by the Actual load measurement function.	100 = 1%
05.05	ACC COMP TORQ	Displays the inertia compensation torque calculated by the Inertia compensation function. This value is used by the lift system torque loop for torque compensation based on system inertia.	100 = 1%
05.06	STATIC FRIQ TORQ	Displays the static friction compensation torque calculated by the Static friction compensation function.	100 = 1%
05.07	DYN FRIC TORQ	Displays the dynamic friction compensation torque calculated by the Dynamic friction compensation function.	100 = 1%
05.08	LIFT SPEED ACT	Displays the actual lift speed in m/s.	100 = 1 m/s

No.	Name/Value	Description	FbEq
05.09	LIFT SPEED REF	Displays the ramped and shaped speed reference in m/s.	100 = 1 m/s
05.10	LVLING DIST ACT	Displays the distance travelled by the lift during leveling.	100 = 1 m
05.11	FLOOR DISTANCE	Displays the distance between two floors.	100 = 1 m
05.12	EVACUATION DIR	Displays the direction of the lighter load measured during automatic evacuation. 0 = Down. 1= Up.	1 = 1

06 DRIVE STATUS		Drive status words.	
06.01	STATUS WORD 1	Status word 1.	1 = 1

Bit	Name	Value	Information
0	READY	1	Drive is ready to receive start command.
		0	Drive is not ready.
1	ENABLED	1	External run enable signal is received.
		0	No external run enable signal is received.
2	STARTED	1	Drive has received start command.
		0	Drive has not received start command.
3	RUNNING	1	Drive is modulating.
		0	Drive is not modulating.
4	EM OFF (OFF2)	1	Emergency OFF2 is active.
		0	Emergency OFF2 is inactive.
5	EM STOP (OFF3)	1	Emergency stop OFF3 (ramp stop) is active.
		0	Emergency stop OFF3 is inactive.
6	ACK STARTINH	1	Start inhibit is active.
		0	Start inhibit is inactive.
7	ALARM	1	An alarm is active. See chapter *Fault tracing*
		0	No alarm.
8	EXT2 ACT	1	Not used.
		0	External control EXT1 is active.
9	LOCAL FB	1	Fieldbus local control is active.
		0	Fieldbus local control is inactive.
10	FAULT	1	A fault is active. See chapter *Fault tracing*.
		0	No fault.
11	LOCAL PANEL	1	Local control is active, ie, drive is controlled from PC tool or control panel.
		0	Local control is inactive.
12	NOT FAULTED	1	No fault.
		0	A fault is active. See chapter *Fault tracing*.
13...15	Reserved		

No.	Name/Value	Description	FbEq
06.02	STATUS WORD 2	Status word 2.	1 = 1

Bit	Name	Value	Information
0	START ACT	1	Drive start command is active.
		0	Drive start command is inactive.
1	STOP ACT	1	Drive stop command is active.
		0	Drive stop command is inactive.
2	READY RELAY	1	Ready to function: run enable signal on, no fault, emergency stop signal off, no ID run inhibition.
		0	Not ready to function.
3	MODULAT-ING	1	Modulating: IGBTs are controlled, ie, the drive is RUNNING.
		0	No modulation: IGBTs are not controlled.
4	REF RUNNING	1	Normal operation is enabled. Running. Drive follows the given reference.
		0	Normal operation is disabled, Drive is not following the given reference (eg, in magnetisation phase drive is modulating).
5	JOGGING*	1	Jogging function 1 or 2 is active.
		0	Jogging function is inactive.
6	OFF1	1	Emergency stop OFF1 is active.
		0	Emergency stop OFF1 is inactive.
7	START INH MASK	1	Maskable (by par *10.12* START INHIBIT) start inhibit is active.
		0	No start inhibit (maskable)
8	START INH NOMASK	1	Non-maskable start inhibit is active.
		0	No start inhibit (non-maskable)
9	CHRG REL CLOSED	1	Charging relay is closed.
		0	Charging relay is open.
10	STO ACT	1	Safe torque off function is active. See parameter *46.07* STO DIAGNOSTIC.
		0	Safe torque off function is inactive.
11	Not used		
12	RAMP IN 0	1	Ramp Function Generator input is forced to zero.
		0	Normal operation.
13	RAMP HOLD	1	Ramp Function Generator output is held.
		0	Normal operation.
14	RAMP OUT 0	1	Ramp Function Generator output is forced to zero.
		0	Normal operation.
15	DATA LOGGER ON	1	The drive data logger is on and has not been triggered.
		0	The drive data logger is off, or its post-trigger time has not yet elapsed. See the DriveStudio user manual.
* Internally used for evacuation and inspection mode operation.			

No.	Name/Value	Description	FbEq
06.03	SPEED CTRL STAT	Speed control status word.	1 = 1

Bit	Name	Value	Information
0	SPEED ACT NEG	1	Actual speed is negative.
1	ZERO SPEED	1	Actual speed has reached the zero speed limit (*22.05* ZERO SPEED LIMIT).
2	ABOVE LIMIT	1	Actual speed has exceeded the supervision limit (*22.07* ABOVE SPEED LIM).
3	AT SETPOINT	1	The difference between the actual speed and the unramped speed reference is within the speed window (*26.07* SPEED WINDOW).
4	BAL ACTIVE	1	Speed controller output balancing is active while the Torque limiter while stopping function is enabled.
5	PI TUNE ACTIVE	1	Not used.
		0	Not used.
6	PI TUNE REQ	1	Not used.
		0	Not used.
7	PI TUNE DONE	1	Not used.
		0	Not used.
8...15	Reserved		

No.	Name/Value	Description	FbEq
06.05	LIMIT WORD 1	Limit word 1.	1 = 1

Bit	Name	Value	Information
0	TORQ LIM	1	Drive torque is being limited by the motor control (undervoltage control, overvoltage control, current control, load angle control or pull-out control), or by parameter *20.06* MAXIMUM TORQUE or *20.07* MINIMUM TORQUE.
1	SPD CTL TLIM MIN	1	Speed controller output minimum torque limit is active. The limit is defined by parameter *28.10* MIN TORQ SP CTRL.
2	SPD CTL TLIM MAX	1	Speed controller output maximum torque limit is active. The limit is defined by parameter *28.11* MAX TORQ SP CTRL.
3	TORQ REF MAX	1	Not used.
4	TORQ REF MIN	1	Not used.
5	TLIM MAX SPEED	1	Torque reference maximum value is limited by the rush control, because of maximum speed limit *20.01* MAXIMUM SPEED.
6	TLIM MIN SPEED	1	Torque reference minimum value is limited by the rush control, because of minimum speed limit *20.02* MINIMUM SPEED.
7...15	Reserved		

No.	Name/Value	Description	FbEq
06.07	TORQ LIM STATUS	Torque controller limitation status word	1 = 1

Bit	Name	Value	Information
0	UNDER-VOLTAGE	1	Intermediate circuit DC undervoltage. *
1	OVER-VOLTAGE	1	Intermediate circuit DC overvoltage. *
2	MINIMUM TORQUE	1	Torque reference minimum limit is active. The limit is defined by parameter *20.07* MINIMUM TORQUE. *
3	MAXIMUM TORQUE	1	Torque reference maximum limit is active. The limit is defined by parameter *20.06* MAXIMUM TORQUE. *
4	INTERNAL CURRENT	1	An inverter current limit is active. The limit is identified by bits 8…11.
5	LOAD ANGLE	1	For permanent magnet motor only: Load angle limit is active, ie, the motor cannot produce more torque.
6	MOTOR PULLOUT	1	For asynchronous motor only: Motor pull-out limit is active, ie, the motor cannot produce more torque.
7	Reserved		
8	THERMAL	1	Bit 4 = 0: Input current is limited by main circuit thermal limit. Bit 4 = 1: Output current is limited by main circuit thermal limit.
9	I2MAX CURRENT	1	Inverter output current limit is active. **
10	USER CURRENT	1	Maximum inverter output current limit is active. The limit is defined by parameter *20.05* MAXIMUM CURRENT. **
11...15	Reserved		

* Only one of bits 0…3 can be on simultaneously. The bit typically indicates the limit that is exceeded first.
** Only one of bits 9…11 can be on simultaneously. The bit typically indicates the limit that is exceeded first.

No.	Name/Value	Description	FbEq
06.14	SUPERV STATUS	Supervision status word. See also parameter group *33 SUPERVISION*.	1 = 1

Bit	Name	Value	Information
0	SUPERV FUNC1 STA	1	Supervision function 1 is active (below low limit or over high limit).
1	SUPERV FUNC2 STA	1	Supervision function 2 is active (below low limit or over high limit).
2	SUPERV FUNC3 STA	1	Supervision function 3 is active (below low limit or over high limit).
3...15	Reserved		

08 ALARMS & FAULTS		Signals containing alarm and fault information.	
08.01	ACTIVE FAULT	Fault code of the latest (active) fault.	1 = 1
08.02	LAST FAULT	Fault code of the 2nd latest fault.	1 = 1
08.03	FAULT TIME HI	Time (real time or power-on time) at which the active fault occurred in format dd.mm.yy (=day.month.year).	1 = 1
08.04	FAULT TIME LO	Time (real time or power-on time) at which the active fault occurred in format hh.mm.ss (hours.minutes.seconds).	1 = 1

No.	Name/Value	Description	FbEq
08.05	ALARM WORD 1	Alarm word 1. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0	BRAKE START TORQ
1	BRAKE NOT CLOSED
2	BRAKE NOT OPEN
3	SAFE TORQUE OFF
4	STO MODE CHANGE
5	MOTOR TEMP
6	EMERGENCY OFF
7	RUN ENABLE
8	ID-RUN
9	EMERGENCY STOP
10	POSITION SCALING
11	BR OVERHEAT
12	BC OVERHEAT
13	DEVICE OVERTEMP
14	INTBOARD OVERTEM
15	BC MOD OVERTEMP

08.06	ALARM WORD 2	Alarm word 2. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0	IGBT OVERTEMP
1	FIELDBUS COMM
2	LOCAL CTRL LOSS
3	AI SUPERVISION
4	Reserved
5	NO MOTOR DATA
6	ENCODER 1 FAIL
7	ENCODER 2 FAIL
8	LATCH POS 1 FAIL
9	LATCH POS 2 FAIL
10	ENC EMUL FAILURE
11	FEN TEMP FAILURE
12	ENC MAX FREQ
13	ENC REF ERROR
14	RESOLVER ERROR
15	ENCODER 1 CABLE

No.	Name/Value	Description	FbEq
08.07	ALARM WORD 3	Alarm word 3. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0	ENCODER 2 CABLE
1	D2D COMM
2	D2D BUFF OVLOAD
3	PS COMM
4	RESTORE
5	CUR MEAS CALIB
6	AUTOPHASING
7	EARTH FAULT
8	Reserved
9	MOTOR NOM VALUE
10	D2D CONFIG
11…14	Reserved
15	SPEED FEEDBACK

08.08	ALARM WORD 4	Alarm word 4. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0	OPTION COMM LOSS
1…8	Reserved
9	DC NOT CHARGED
10	SPEED TUNE FAIL
11…15	Reserved

08.09	ALARM WORD 5	Alarm word 5. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0…15	Reserved

08.10	ALARM WORD 6	Alarm word 6. For possible causes and remedies, see chapter *Fault tracing*.	1 = 1

Bit	Alarm
0…1	Reserved
2	LOW VOLT MOD CON
3…15	Reserved

No.	Name/Value	Description	FbEq
09 SYSTEM INFO		Drive type, program revision and option slot occupation information.	
09.01	DRIVE TYPE	Displays the drive application type.	1 = 1
09.02	DRIVE RATING ID	Displays the inverter type of the drive. **(0)** UNCONFIGURED, **(1)** ACSM1-xxAx-02A5-4, **(2)** ACSM1-xxAx-03A0-4, **(3)** ACSM1-xxAx-04A0-4, **(4)** ACSM1-xxAx-05A0-4, **(5)** ACSM1-xxAx-07A0-4, **(6)** ACSM1-xxAx-09A5-4, **(7)** ACSM1-xxAx-012A-4, **(8)** ACSM1-xxAx-016A-4, **(9)** ACSM1-xxAx-024A-4, **(10)** ACSM1-xxAx-031A-4, **(11)** ACSM1-xxAx-040A-4, **(12)** ACSM1-xxAx-046A-4, **(13)** ACSM1-xxAx-060A-4, **(14)** ACSM1-xxAx-073A-4, **(15)** ACSM1-xxAx-090A-4, **(20)** ACSM1-xxAx-110A-4, **(21)** ACSM1-xxAx-135A-4, **(22)** ACSM1-xxAx-175A-4, **(23)** ACSM1-xxAx-210A-4, **(24)** ACSM1-xxCx-024A-4, **(25)** ACSM1-xxCx-031A-4, **(26)** ACSM1-xxCx-040A-4, **(27)** ACSM1-xxCx-046A-4, **(28)** ACSM1-xxCx-060A-4, **(29)** ACSM1-xxCx-073A-4, **(30)** ACSM1-xxCx-090A-4	1 = 1
09.03	FIRMWARE ID	Displays the firmware name. Eg, UMFI.	1 = 1
09.04	FIRMWARE VER	Displays the version of the firmware package in the drive, eg, 0x1510.	1 = 1
09.05	FIRMWARE PATCH	Displays the version of the firmware patch in the drive.	1 = 1
09.10	INT LOGIC VER	Displays the version of the logic in the power unit interface.	1 = 1
09.20	OPTION SLOT 1	Displays the type of the optional module in option Slot 1. **(0)** NO OPTION, **(1)** NO COMM, **(2)** UNKNOWN, **(3)** FEN-01, **(4)** FEN-11, **(5)** FEN-21, **(6)** FIO-01, **(7)** FIO-11, **(8)** FPBA-01, **(9)** FPBA-02, **(10)** FCAN-01, **(11)** FDNA-01, **(12)** FENA-01, **(13)** FENA-02, **(14)** FLON-01, **(15)** FRSA-00, **(16)** FMBA-01, **(17)** FFOA-01, **(18)** FFOA-02, **(19)** FSEN-01, **(20)** FEN-31, **(21)** FIO-21, **(22)** FSCA-01, **(23)** FSEA-21	1 = 1
09.21	OPTION SLOT 2	Displays the type of the optional module in option Slot 2. See *09.20* OPTION SLOT 1.	1 = 1
09.22	OPTION SLOT 3	Displays the type of the optional module in option Slot 3. See *09.20* OPTION SLOT 1.	1 = 1

Parameter groups 10…99

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td colspan="2">10 START/STOP</td><td>Start/stop/direction, slowdown and end limits source selections.</td><td></td></tr>
<tr><td>10.01</td><td>EXT1 START FUNC</td><td>Selects the source for the start and stop control in external control location EXT1.
Note: This parameter cannot be changed while the drive is running.</td><td></td></tr>
<tr><td></td><td>Not sel</td><td>No source selected.</td><td>0</td></tr>
<tr><td></td><td>In1</td><td>Source of the start and stop commands is selected by parameter 10.02 EXT1 START IN1. The start/stop is controlled as follows:
<table><tr><th>Par. 10.02</th><th>Command</th></tr><tr><td>0 -> 1</td><td>Start</td></tr><tr><td>1 -> 0</td><td>Stop</td></tr></table></td><td>1</td></tr>
<tr><td></td><td>3-wire</td><td>Source of the start and stop commands is selected by parameters 10.02 EXT1 START IN1 and 10.03 EXT1 START IN2. The start/stop is controlled as follows:
<table><tr><th>Par. 10.02</th><th>Par. 10.03</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>1 -> 0</td><td>Stop</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table></td><td>2</td></tr>
<tr><td></td><td>FBA</td><td>Start and stop control from the source selected by parameter 10.13 FB CW USED.</td><td>3</td></tr>
<tr><td></td><td>D2D</td><td>Start and stop control from another drive via D2D Control Word.</td><td>4</td></tr>
<tr><td></td><td>IN1 F IN2R</td><td>The source selected by 10.02 EXT1 START IN1 is the forward start signal, the source selected by 10.03 EXT1 START IN2 is the reverse start signal.
<table><tr><th>Par. 10.02</th><th>Par. 10.03</th><th>Command</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>1</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table></td><td>5</td></tr>
<tr><td></td><td>IN1S IN2DIR</td><td>The source selected by 10.02 EXT1 START IN1 is the start signal (0 = stop, 1 = start), the source selected by 10.03 EXT1 START IN2 is the direction signal (0 = forward, 1 = reverse).</td><td>6</td></tr>
<tr><td>10.02</td><td>EXT1 START IN1</td><td>Selects the source 1 for the start and stop commands in external control location EXT1. See parameter 10.01 EXT1 START FUNC selections In1 and 3-wire.
Note: This parameter cannot be changed while the drive is running.</td><td></td></tr>
<tr><td></td><td></td><td>Bit pointer: CONST or POINTER (See Terms and abbreviations on page 143.)</td><td></td></tr>
</table>

No.	Name/Value	Description	FbEq
10.03	EXT1 START IN2	Selects the source 2 for the start and stop commands in external control location EXT1. See parameter *10.01* EXT1 START FUNC selection *3-wire*. **Note:** This parameter cannot be changed while the drive is running.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.07	JOG1 START	Internally used. Cannot be set by the user.	
10.08	FAULT RESET SEL	Internally used. Cannot be set by the user.	
10.09	RUNENABLE	Internally used. Cannot be set by the user.	
10.10	EM STOP OFF3	Internally used. Cannot be set by the user.	
10.11	EM STOP OFF1	Selects the source for the emergency stop OFF1. 0 = OFF1 active: The drive is stopped with the active deceleration time. See section *Emergency stop* on page *132*. **Note:** This parameter cannot be changed while the drive is running.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.12	START INHIBIT	Enables the start inhibit function. The start inhibit function prevents drive restart (ie, protects against unexpected start) if • drive trips on a fault and fault is reset. • run enable signal activates while the start command is active. See parameter *10.88* LIFT RUN ENABLE. • control changes from local to remote. An active start inhibit can be reset with a stop command.	
	Disabled	Start inhibit function disabled.	0
	Enabled	Start inhibit function enabled.	1
10.13	FB CW USED	Selects the source for the control word when fieldbus (FBA) is selected as the external start and stop control location (see parameter *10.01* EXT1 START FUNC). By default, the source is parameter *02.12* FBA MAIN CW. **Note:** This parameter cannot be changed while the drive is running.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
10.14	JOG2 START	Internally used. Cannot be set by the user.	
10.15	JOG ENABLE	Internally used. Cannot be set by the user.	
10.16	D2D CW USED	Selects the source for the control word for drive-to-drive communication. By default, the source is parameter *02.17* D2D MAIN CW.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
10.17	START ENABLE	Internally used. Cannot be set by the user.	
10.80	SLOWDOWN SEL	Selects the mode of the Slowdown function. When the slowdown command is active, the drive limits the speed reference to the value defined with parameter *10.85* SLOWDOWN SPEED. Signal *05.01* LIFT SW bits 0, 1 and 2 can be used to monitor the status of the slowdown command. For more information, see section *Slowdown* on page *114*.	
	NOT SEL	Slowdown function not selected.	0

No.	Name/Value	Description	FbEq
	SINGLE BIT	Slowdown function using the single-bit slowdown mode selected. Parameter *10.81* SLOWDOWN 1 is used for issuing a slowdown command both in the upward and downward direction.	1
	MULTIPLE BIT	Slowdown function using the multiple-bit slowdown mode selected. Parameter *10.81* SLOWDOWN 1 is used for issuing a slowdown command in the upward direction and parameter *10.82* SLOWDOWN 2 for issuing a slowdown command in the downward direction.	2
10.81	SLOWDOWN IN1	Selects the source for the slowdown command when the single-bit slowdown mode is selected. This parameter also activates a slowdown command in the upward direction when the multiple-bit slowdown mode is selected. 1 = Slowdown command inactive. 0 = Slowdown command active. When the slowdown command is active, the drive limits the speed reference to the value defined with parameter *10.85* SLOWDOWN SPEED.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.82	SLOWDOWN IN2	Selects the source for the slowdown command in the downward direction when the multiple-bit slowdown mode is selected. 1 = Slowdown command inactive. 0 = Slowdown command active. When the slowdown command is active, the drive limits the speed reference to the value defined with parameter *10.85* SLOWDOWN SPEED.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.85	SLOWDOWN SPEED	Defines the speed reference to be used when the slowdown command is active. This is an absolute value. The polarity of the speed reference limit is determined based on the motor direction.	
	0.00…25.00 m/s	Slowdown speed reference.	100 = 1 m/s
10.86	UPPER F LIM SWC	Selects the source for the upper final limit switch command. 1 = Upper final limit switch command is inactive. 0 = Upper final limit switch command is active. The command is considered a normally closed logic according to the selection in the pointer value. When the command is active, an emergency stop in the upward direction is issued, and the drive stops within the time defined with parameter *25.11* EM STOP TIME. Signal *05.01* LIFT SW bit 3 can be used to monitor the status of the command. For more information, see section *Final limit switches* on page *116*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

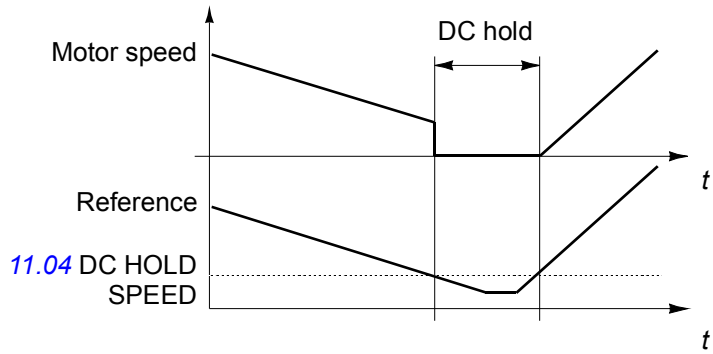
No.	Name/Value	Description	FbEq
10.87	LOWER F LIM SWC	Selects the source for the lower final limit switch command. 1 = Lower final limit switch command is inactive. 0 = Lower final limit switch command is active. The command is considered a normally closed logic according to the selection in the pointer value. When the command is active, an emergency stop in the downward direction is issued, and the drive stops within the time defined with parameter *25.11* EM STOP TIME. Signal *05.01* LIFT SW bit 4 can be used to monitor the status of the command. For more information, see section *Final limit switches* on page *116*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.88	LIFT RUN ENABLE	Selects the source for the Run enable signal. 1 = Run enable. When the Run enable signal is switched off, the drive will not start, or if the drive is running, it will stop. **Note:** This parameter cannot be changed while the drive is running.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.89	EVACUATION MODE	Selects the source for enabling/disabling the evacuation mode. 1 = Evacuation mode is enabled. 0 = Evacuation mode is disabled. The evacuation mode is used for a lift car rescue operation in case the power supply fails. For more information, see section *Rescue operation* on page *138*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.90	EVACUATION AUTO	Selects the source for enabling manual or automatic evacuation when the evacuation mode is enabled. 1 = Automatic evacuation is enabled. 0 = Manual evacuation is enabled. When automatic evacuation is enabled, the drive measures the direction of the lighter load and selects the evacuation direction accordingly.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.91	FLOOR LIM SWITCH	Selects the source from which the Lift control program reads the floor limit switch signal. This signal is activated when the lift reaches any of the floors and when any of the floor limit switches is hit. 1 = Lift has reached the floor position. 0 = Lift is not in the floor position.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.92	INSPECTION MODE	Selects the source for enabling/disabling the inspection mode. 1 = Inspection mode is enabled. 0 = Inspection mode is disabled. Enabling the inspection mode also enables parameters *10.93* INSPECTION UP and *10.94* INSPECTION DOWN. For more information, see section *Inspection mode* on page *94*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

No.	Name/Value	Description	FbEq
10.93	INSPECTION UP	Selects the source for starting the lift in the upward direction when the inspection mode is enabled with parameter *10.92* INSPECTION MODE. 1 = Lift is started in the upward direction. 0 = Lift is not moving in the upward direction.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.94	INSPECTION DOWN	Selects the source for starting the lift in the downward direction when the inspection mode is enabled with parameter *10.92* INSPECTION MODE. 1 = Lift is started in the downward direction. 0 = Lift is not moving in the downward direction.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
10.95	LIFT CW	Lift control word for fieldbus control.	

Bit	Name	Value	Information
0	START UP	1	Start command is active in the upward direction.
		0	Start command is inactive in the upward direction.
1	START DOWN	1	Start command is active in the downward direction.
		0	Start command is inactive in the downward direction.
2	INSPECT START UP	1	Inspection mode is enabled in the upward direction.
		0	Inspection mode is disabled in the upward direction.
3	INSPECT START DN	1	Inspection mode is enabled in the downward direction.
		0	Inspection mode is disabled in the downward direction.
4	SPEED REF SEL1	1	Speed selection bit 1 is enabled.
		0	Speed selection bit 1 is disabled.
5	SPEED REF SEL2	1	Speed selection bit 2 is enabled.
		0	Speed selection bit 2 is disabled.
6	SPEED REF SEL3	1	Speed selection bit 3 is enabled.
		0	Speed selection bit 3 is disabled.
7	RUN ENABLE	1	Run enable signal is active.
		0	Run enable signal is inactive.
8	SLOWDOWN IN1	1	Slowdown command is inactive.
		0	Slowdown command is active.
9	SLOWDOWN IN2	1	Slowdown command is inactive in the downward direction in the multiple-bit slowdown mode.
		0	Slowdown command is active in the downward direction in the multiple-bit slowdown mode.
10	FAULT RESET	1	Fault reset signal is active.
		0	Fault reset signal is inactive.
11…15	Not used		

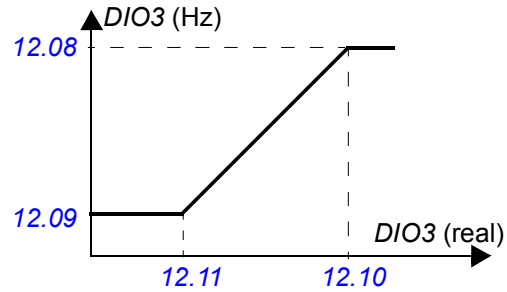
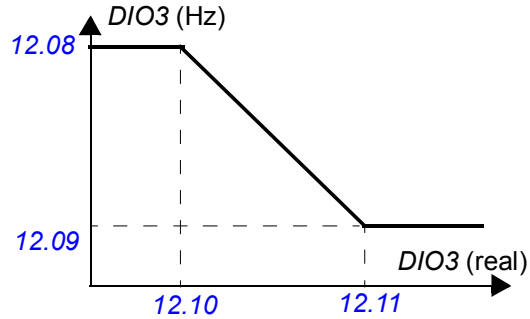
	0x000…0xFFFF		1 = 1

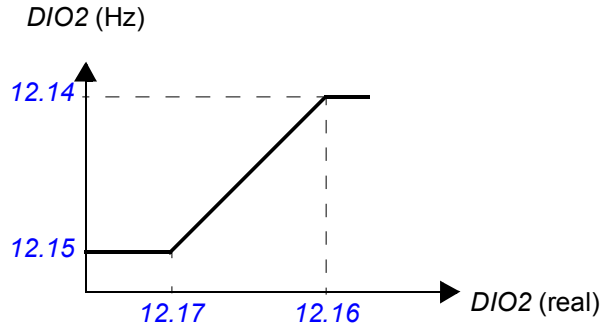
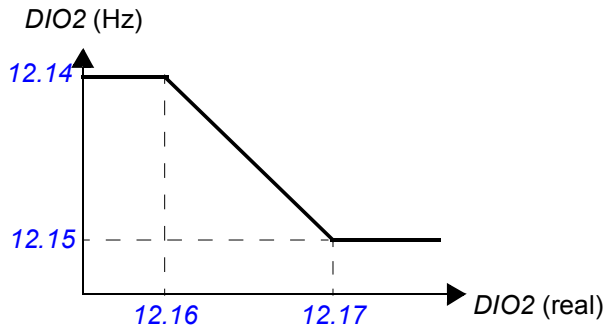
<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td colspan="2">11 START/STOP MODE</td><td>Start, stop, magnetization etc. settings.</td><td></td></tr>
<tr><td>11.01</td><td>START MODE</td><td>Selects the motor start function.
Notes:
• This parameter has no effect if 99.05 MOTOR CTRL MODE is set to Scalar.
• Starting to a rotating machine is not possible when DC magnetising is selected (Fast or Const time).
• With permanent magnet motors, automatic start must be used.
• This parameter cannot be changed while the drive is running.</td><td></td></tr>
<tr><td></td><td>Fast</td><td>DC magnetising should be selected if a high break-away torque is required. The drive pre-magnetises the motor before the start. The pre-magnetising time is determined automatically, being typically 200 ms to 2 s depending on the motor size.</td><td>0</td></tr>
<tr><td></td><td>Const time</td><td>Constant DC magnetising should be selected instead of FAST DC magnetising if constant pre-magnetising time is required (eg, if the motor start must be simultaneous with a mechanical brake release). This selection also guarantees the highest possible break-away torque when the pre-magnetising time is set long enough. The pre-magnetising time is defined by parameter 11.02 DC MAGN TIME.
WARNING! The drive will start after the set magnetising time has passed, even if motor magnetisation is not completed. In applications where a full break-away torque is essential, ensure that the constant magnetising time is long enough to allow generation of full magnetisation and torque.</td><td>1</td></tr>
<tr><td></td><td>Automatic</td><td>Automatic start guarantees optimal motor start in most cases. It includes the flying start function (starting to a rotating machine) and the automatic restart function (the stopped motor can be restarted immediately without waiting the motor flux to die away). The drive motor control program identifies the flux as well as the mechanical state of the motor and starts the motor instantly under all conditions.</td><td>2</td></tr>
<tr><td>11.02</td><td>DC MAGN TIME</td><td>Defines the constant DC magnetising time. See parameter 11.01 START MODE. After the start command, the drive automatically premagnetises the motor the set time.
To ensure full magnetising, set this value to the same value as or higher than the rotor time constant. If not known, use the rule-of-thumb value given in the table below:
<table><tr><th>Motor rated power</th><th>Constant magnetising time</th></tr><tr><td>< 1 kW</td><td>≥ 50 to 100 ms</td></tr><tr><td>1 to 10 kW</td><td>≥ 100 to 200 ms</td></tr><tr><td>10 to 200 kW</td><td>≥ 200 to 1000 ms</td></tr><tr><td>200 to 1000 kW</td><td>≥ 1000 to 2000 ms</td></tr></table>Note: This parameter cannot be changed while the drive is running.</td><td></td></tr>
<tr><td></td><td>0…10000 ms</td><td>DC magnetising time.</td><td>1 = 1 ms</td></tr>
</table>

No.	Name/Value	Description	FbEq
11.03	STOP MODE	Selects the motor stop function.	
	Coast	Stop by cutting of the motor power supply. The motor coasts to a stop. **WARNING!** If the mechanical brake is used, ensure it is safe to stop the drive by coasting. For more information on the Mechanical brake control function, see parameter group *35 MECH BRAKE CTRL*.	1
	Ramp	Stop along ramp. See parameter group *25 SPEED REF RAMP*.	2
11.04	DC HOLD SPEED	Defines the DC hold speed. See parameter *11.06* DC HOLD.	
	0.0…1000.0 rpm	DC hold speed.	10 = 1 rpm
11.05	DC HOLD CUR REF	Defines the DC hold current in percent of the motor nominal current. See parameter *11.06* DC HOLD.	
	0…100%	DC hold current.	1 = 1%
11.06	DC HOLD	Enables the DC hold function. The function makes it possible to lock the rotor at zero speed. When both the reference and the speed drop below the value of parameter *11.04* DC HOLD SPEED, the drive will stop generating sinusoidal current and start to inject DC into the motor. The current is set by parameter *11.05* DC HOLD CUR REF. When the reference speed exceeds parameter *11.04* DC HOLD SPEED, normal drive operation continues.  **Notes:** • The DC hold function has no effect if the start signal is switched off. • The DC hold function can only be activated in the speed control mode. • The DC hold function cannot be activated if parameter *99.05* MOTOR CTRL MODE is set to *Scalar*. • Injecting DC current into the motor causes the motor to heat up. In applications where long DC hold times are required, externally ventilated motors should be used. If the DC hold period is long, the DC hold cannot prevent the motor shaft from rotating if a constant load is applied to the motor.	
	Disabled	DC hold function disabled.	0
	Enabled	DC hold function enabled.	1

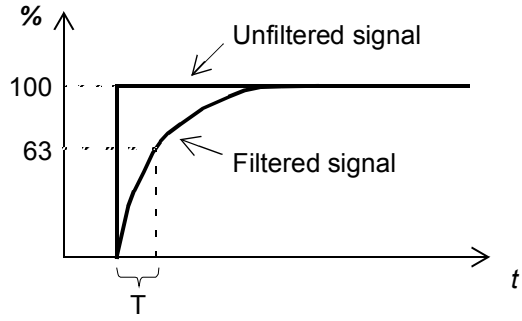
No.	Name/Value	Description	FbEq
11.07	AUTOPHASING MODE	Selects the way the autophasing routine is performed. See also section *Autophasing* on page *130*.	
	Turning	This mode gives the most accurate autophasing result. This mode can be used, and is recommended, if it is allowed for the motor to rotate and the start-up is not time-critical. **Note:** This mode will cause the motor to rotate during the ID run.	0
	Standstill 1	Faster than the turning mode, but not as accurate. The motor will not rotate.	1
	Standstill 2	An alternative standstill autophasing mode that can be used if the turning mode cannot be used, and the standstill 1 mode gives erratic results. However, this mode is considerably slower than standstill 1.	2

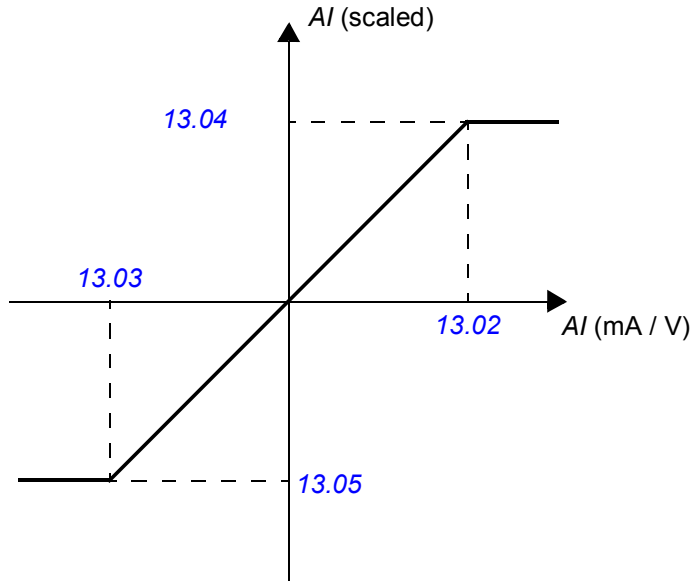
12 DIGITAL IO		Settings for the digital inputs and outputs, and the relay output.	
12.01	DIO1 CONF	Selects whether DIO1 is used as a digital input or as a digital output.	
	Output	DIO1 is used as a digital output.	0
	Input	DIO1 is used as a digital input.	1
12.02	DIO2 CONF	Selects whether DIO2 is used as a digital input, as a digital output or as a frequency input.	
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
	Freq input	DIO2 is used as a frequency input.	2
12.03	DIO3 CONF	Selects whether DIO3 is used as a digital input, as a digital output or as a frequency output.	
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
	Freq output	DIO2 is used as a frequency output.	2
12.04	DIO1 OUT PTR	Selects a drive signal to be connected to digital output DIO1 (when *12.01* DIO1 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.05	DIO2 OUT PTR	Selects a drive signal to be connected to digital output DIO2 (when *12.02* DIO2 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.06	DIO3 OUT PTR	Selects a drive signal to be connected to digital output DIO3 (when *12.03* DIO3 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.07	DIO3 F OUT PTR	Selects a drive signal to be connected to frequency output (when *12.03* DIO3 CONF is set to *Freq output*).	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
12.08	DIO3 F MAX	Defines the maximum value for frequency output (when *12.03* DIO3 CONF is set to *Freq output*).	
	3…32768 Hz	Maximum DIO3 output frequency.	1 = 1 Hz

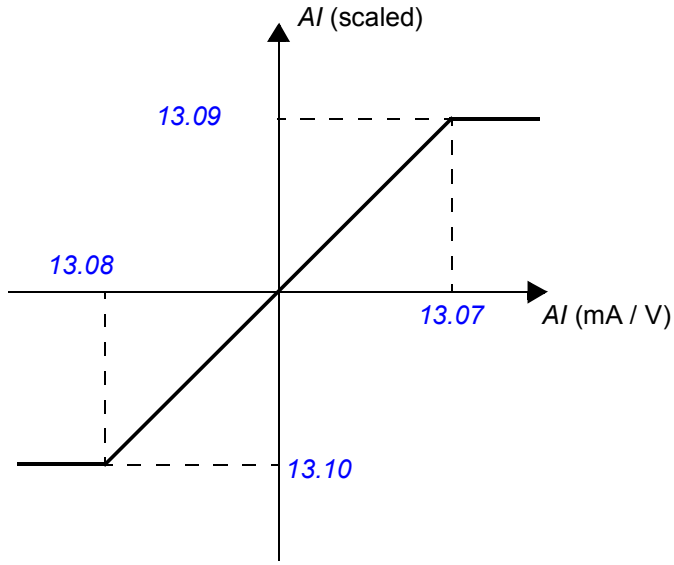
No.	Name/Value	Description	FbEq
12.09	DIO3 F MIN	Defines the minimum value for frequency output (when *12.03* DIO3 CONF is set to *Freq output*).	
	3…32768 Hz	Minimum DIO3 output frequency.	1 = 1 Hz
12.10	DIO3 F MAX SCALE	Defines the real value that corresponds to the maximum frequency output value defined by parameter *12.08* DIO3 F MAX.   	
	0…32768	Real value corresponding to the value of parameter *12.08*.	1 = 1
12.11	DIO3 F MIN SCALE	Defines the real value that corresponds to the minimum frequency output value defined by parameter *12.09* DIO3 F MIN. See parameter *12.10* DIO3 F MAX SCALE.	
	0…32768	Real value corresponding to the value of parameter *12.09*.	1 = 1
12.12	RO1 OUT PTR	Selects a drive signal to be connected to relay output RO1.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.13	DI INVERT MASK	Inverts status of digital inputs as reported by *02.01* DI STATUS. For example, a value of 0b000100 inverts the status of DI3 in the signal.	
	0b000000… 0b111111	DI status inversion mask.	1 = 1
12.14	DIO2 F MAX	Defines the maximum value for frequency input (when *12.02* DIO2 CONF is set to *Freq input*).	
	3…32768 Hz	Maximum DIO2 input frequency.	1 = 1 Hz
12.15	DIO2 F MIN	Defines the minimum value for frequency input (when *12.02* DIO2 CONF is set to *Freq input*).	
	3…32768 Hz	Minimum DIO2 input frequency.	1 = 1 Hz

No.	Name/Value	Description	FbEq
12.16	DIO2 F MAX SCALE	Defines the real value that corresponds to the maximum frequency input value defined by parameter *12.14* DIO2 F MAX.  	
	-32768…32768	Real value corresponding to the value of parameter *12.04*.	1 = 1
12.17	DIO2 F MIN SCALE	Defines the real value that corresponds to the minimum frequency input value defined by parameter *12.15* DIO2 F MIN. See parameter *12.16* DIO2 F MAX SCALE.	
	-32768…32768	Real value corresponding to the value of parameter *12.15*.	1 = 1
12.80	EXT IO SEL	Activates an I/O extension installed into Slot 2.	
	None	No extension installed into Slot 2.	0
	FIO-01	FIO-01 extension installed into Slot 2.	1
12.81	EXT IO DIO1 CONF	Selects whether extension DIO1 is used as a digital input or as a digital output in a FIO-01 digital I/O extension module.	
	Input	Extension DIO1 is used as a digital input.	0
	Output	Extension DIO1 is used as a digital output.	1
12.82	EXT IO DIO2 CONF	Selects whether extension DIO2 is used as a digital input or as a digital output in a FIO-01 digital I/O extension module.	
	Input	Extension DIO2 is used as a digital input.	0
	Output	Extension DIO2 is used as a digital output.	1
12.83	EXT IO DIO3 CONF	Selects whether extension DIO3 is used as a digital input or as a digital output in a FIO-01 digital I/O extension module.	
	Input	Extension DIO3 is used as a digital input.	0
	Output	Extension DIO3 is used as a digital output.	1
12.84	EXT IO DIO4 CONF	Selects whether extension DIO4 is used as a digital input or as a digital output in a FIO-01 digital I/O extension module.	
	Input	Extension DIO4 is used as a digital input.	0
	Output	Extension DIO4 is used as a digital output.	1

No.	Name/Value	Description	FbEq
12.85	EXT DIO1 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO1 (when *12.81* EXT IO DIO1 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.86	EXT DIO2 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO2 (when *12.82* EXT IO DIO2 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.87	EXT DIO3 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO3 (when *12.83* EXT IO DIO3 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.88	EXT DIO4 OUT PTR	Selects a drive signal to be connected to extended digital output EXT DIO4 (when *12.84* EXT IO DIO4 CONF is set to *Output*).	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.89	EXT RO1 OUT PTR	Selects a drive signal to be connected to extended relay output EXT RO1.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
12.90	EXT RO2 OUT PTR	Selects a drive signal to be connected to extended relay output EXT RO2.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

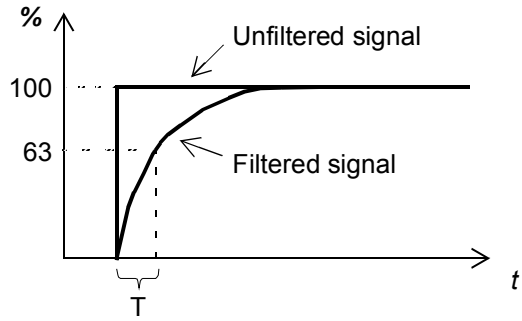
No.	Name/Value	Description	FbEq
13 ANALOGUE INPUTS		Settings for the analog inputs.	
13.01	AI1 FILT TIME	Defines the filter time constant for analog input AI1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.	
	0.000…30.000 s	Filter time constant for AI1.	1000 = 1 s
13.02	AI1 MAX	Defines the maximum value for analog input AI1. The type is selected with jumper J1 on the JCU Control Unit.	
	-11.000…11.000 V / -22.000…22.000 mA	Maximum AI1 input value.	1000 = 1 V / mA
13.03	AI1 MIN	Defines the minimum value for analog input AI1. The type is selected with jumper J1 on the JCU Control Unit.	
	-11.000…11.000 V / -22.000…22.000 mA	Minimum AI1 input value.	1000 = 1 V / mA

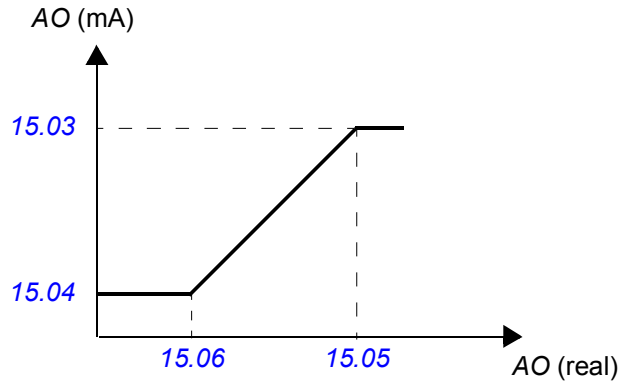
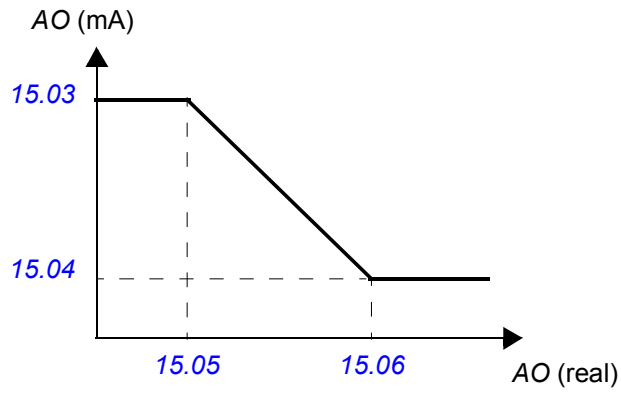
No.	Name/Value	Description	FbEq
13.04	AI1 MAX SCALE	Defines the real value that corresponds to the maximum analog input value defined by parameter *13.02* AI1 MAX.  	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *13.02*.	1000 = 1
13.05	AI1 MIN SCALE	Defines the real value that corresponds to the minimum analog input value defined by parameter *13.03* AI1 MIN. See parameter *13.04* AI1 MAX SCALE.	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *13.03*.	1000 = 1
13.06	AI2 FILT TIME	Defines the filter time constant for analog input AI2. See parameter *13.01* AI1 FILT TIME.	
	0.000…30.000 s	Filter time constant for AI2.	1000 = 1 s
13.07	AI2 MAX	Defines the maximum value for analog input AI2. The type is selected with jumper J2 on the JCU Control Unit.	
	-11.000…11.000 V / -22.000…22.000 mA	Maximum AI2 input value.	1000 = 1 V / mA
13.08	AI2 MIN	Defines the minimum value for analog input AI2. The type is selected with jumper J2 on the JCU Control Unit.	
	-11.000…11.000 V / -22.000…22.000 mA	Minimum AI2 input value.	1000 = 1 V / mA

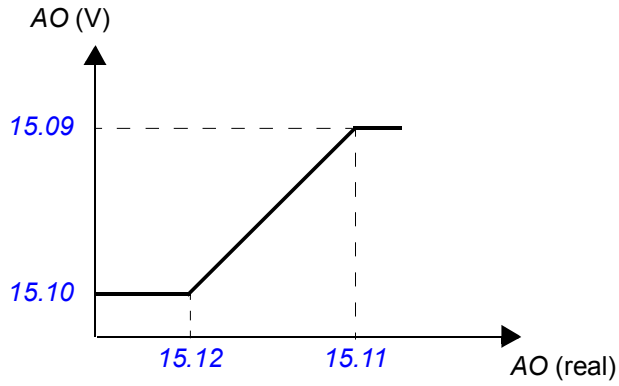
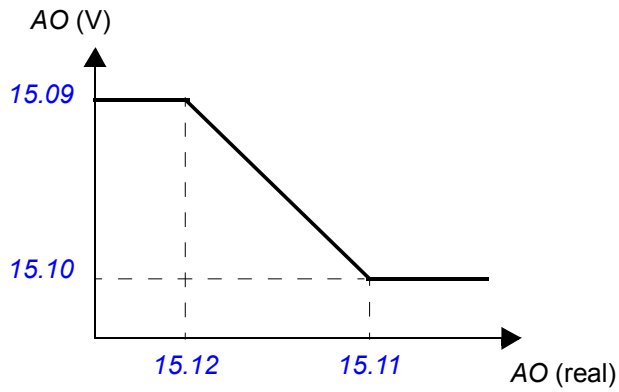
No.	Name/Value	Description	FbEq
13.09	AI2 MAX SCALE	Defines the real value that corresponds to the maximum analog input value defined by parameter *13.07* AI2 MAX. 	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *13.07*.	1000 = 1
13.10	AI2 MIN SCALE	Defines the real value that corresponds to the minimum analog input value defined by parameter *13.08* AI2 MIN. See parameter *13.09* AI2 MAX SCALE.	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *13.08*.	1000 = 1
13.11	AITUNE	Triggers the AI tuning function. Connect the signal to the input and select the appropriate tuning function.	
	No action	AI tune is not activated.	0
	AI1 min tune	Current analog input AI1 signal value is set as minimum value for AI1, parameter *13.03* AI1 MIN. The value reverts back to *No action* automatically.	1
	AI2 max tune	Current analog input AI1 signal value is set as maximum value for AI1, parameter *13.02* AI1 MAX. The value reverts back to *No action* automatically.	2
	AI2 min tune	Current analog input AI2 signal value is set as minimum value for AI2, parameter *13.08* AI2 MIN. The value reverts back to *No action* automatically.	3
	AI2 max tune	Current analog input AI2 signal value is set as maximum value for AI2, parameter *13.07* AI2 MAX. The value reverts back to *No action* automatically.	4
13.12	AI SUPERVISION	Selects how the drive reacts when analog input signal limit is reached. The limit is selected by parameter *13.13* AI SUPERVIS ACT.	
	No	No action taken.	0
	Fault	The drive trips on fault AI SUPERVISION.	1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td></td><td>Spd ref safe</td><td>The drive generates alarm AI SUPERVISION and sets the speed to the speed defined by parameter 46.02 SPEED REF SAFE.
 
WARNING! Make sure that it is safe to continue operation in case of a communication break.</td><td>2</td></tr>
<tr><td></td><td>Last speed</td><td>The drive generates alarm AI SUPERVISION and freezes the speed to the level the drive was operating at. The speed is determined by the average speed over the previous 10 seconds.
 
WARNING! Make sure that it is safe to continue operation in case of a communication break.</td><td>3</td></tr>
<tr><td>13.13</td><td>AI SUPERVIS ACT</td><td>Selects the analog input signal supervision limit.

<table><tr><th>Bit</th><th></th><th>Supervision selected by parameter 13.12 AI SUPERVISION is activated if</th></tr><tr><td>0</td><td>AI1<min</td><td>AI1 signal value falls below the value defined by equation: par. 13.03 AI1 MIN - 0.5 mA or V</td></tr><tr><td>1</td><td>AI1>max</td><td>AI1 signal value exceeds the value defined by equation: par. 13.02 AI1 MAX + 0.5 mA or V</td></tr><tr><td>2</td><td>AI2<min</td><td>AI2 signal value falls below the value defined by equation: par. 13.08 AI2 MIN - 0.5 mA or V</td></tr><tr><td>3</td><td>AI2>min</td><td>AI1 signal value exceeds the value defined by equation: par. 13.07 AI2 MAX + 0.5 mA or V</td></tr></table>
Example: If the parameter value is set to 0010 (bin), bit 1 AI1>max is selected.</td><td></td></tr>
<tr><td></td><td>0b0000…0b1111</td><td>AI1/AI2 signal supervision selection.</td><td>1 = 1</td></tr>
</table>

No.	Name/Value	Description	FbEq
15 ANALOGUE OUTPUTS		Settings for the analog outputs.	
15.01	AO1 PTR	Selects a drive signal to be connected to analog output AO1.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
15.02	AO1 FILT TIME	Defines the filtering time constant for analog output AO1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	
	0.000…30.000 s	Filter time constant for AO1.	1000 = 1 s
15.03	AO1 MAX	Defines the maximum value for analog output AO1.	
	0.000…22.700 mA	Maximum AO1 output value.	1000 = 1 mA
15.04	AO1 MIN	Defines the minimum value for analog output AO1.	
	0.000…22.700 mA	Minimum AO1 output value.	1000 = 1 mA

No.	Name/Value	Description	FbEq
15.05	AO1 MAX SCALE	Defines the real value that corresponds to the maximum analog output value defined by parameter *15.03* AO1 MAX.  	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *15.03*.	1000 = 1
15.06	AO1 MIN SCALE	Defines the real value that corresponds to the minimum analog output value defined by parameter *15.04* AO1 MIN. See parameter *15.05* AO1 MAX SCALE.	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *15.04*.	1000 = 1
15.07	AO2 FILT TIME	Selects a drive signal to be connected to analog output AO2.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
15.08	AO2 FILT TIME	Defines the filtering time constant for analog output AO2. See parameter *15.02* AO1 FILT TIME.	
	0.000…30.000 s	Filter time constant for AO2.	1000 = 1 s
15.09	AO2 MAX	Defines the maximum value for analog output AO2.	
	-10.000…10.000 V	Maximum AO2 output value.	1000 = 1 V
15.10	AO2 MIN	Defines the minimum value for analog output AO2.	
	-10.000…10.000 V	Minimum AO2 output value.	1000 = 1 V

No.	Name/Value	Description	FbEq
15.11	AO2 MAX SCALE	Defines the real value that corresponds to the maximum analog output value defined by parameter *15.09* AO2 MAX.  	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *15.09*.	1000 = 1
15.12	AO2 MIN SCALE	Defines the real value that corresponds to the minimum analog output value defined by parameter *15.10* AO2 MIN. See parameter *15.11* AO2 MAX SCALE.	
	-32768.000 …32768.000	Real value corresponding to the value of parameter *15.10*.	1000 = 1

16 SYSTEM		Local control and parameter access settings, restoration of default parameter values and saving of parameters into permanent memory.	
16.01	LOCAL LOCK	Selects the source for disabling local control (Take/Release button on the PC tool, LOC/REM key of the panel). 1 = Local control disabled. 0 = Local control enabled. **WARNING!** Before activating, ensure that the control panel is not needed for stopping the drive!	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

No.	Name/Value	Description	FbEq
16.02	PARAMETER LOCK	Selects the state of the parameter lock. The lock prevents parameter changing. **Note:** This parameter can only be adjusted after the correct pass code has been entered at parameter *16.03* PASS CODE.	
	Locked	Locked. Parameter values cannot be changed from the control panel.	0
	Open	The lock is open. Parameter values can be changed.	1
	Not saved	The lock is open. Parameter values can be changed, but the changes will not be stored at power switch off.	2
16.03	PASS CODE	Selects the pass code for the parameter lock (see parameter *16.02* PARAMETER LOCK). After entering 358 at this parameter, parameter *16.02* PARAMETER LOCK can be adjusted. The value reverts back to 0 automatically.	
	0…2147483647	Pass code for parameter lock.	1 = 1
16.04	PARAM RESTORE	Restores the original settings of the application, ie, parameter factory default values. **Note:** This parameter cannot be changed while the drive is running.	
	Done	Restoration is completed.	0
	Restore defs	All parameter values are restored to default values, except motor data, ID run results, and fieldbus, drive-to-drive link and encoder configuration data.	1
	Clear all	All parameter values are restored to default values, including motor data, ID run results and fieldbus and encoder configuration data. PC tool communication is interrupted during the restoration. Drive CPU is re-booted after the restoration is completed.	2
16.07	PARAM SAVE	Saves the valid parameter values to the permanent memory. See also section *Setting parameters* on page *144*.	
	Done	Save completed.	0
	Save	Save in progress.	1
16.09	USER SET SEL	Enables the save and restoration of up to four custom sets of parameter settings. The set that was in use before powering down the drive is in use after the next power-up. **Note:** Any parameter changes made after loading a user set are not automatically stored into the loaded set – they must be saved using this parameter.	
	No request	Load or save operation complete; normal operation.	1
	Load set 1	Load user parameter set 1.	2
	Load set 2	Load user parameter set 2.	3
	Load set 3	Load user parameter set 3.	4
	Load set 4	Load user parameter set 4.	5
	Save set 1	Save user parameter set 1.	6
	Save set 2	Save user parameter set 2.	7
	Save set 3	Save user parameter set 3.	8
	Save set 4	Save user parameter set 4.	9

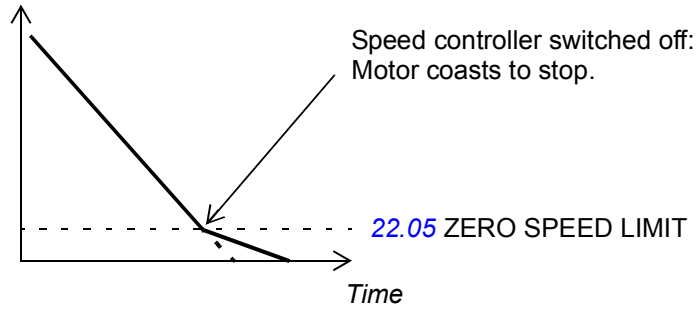
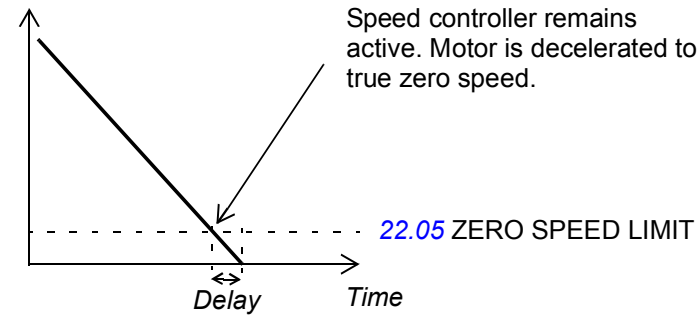
<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td></td><td>IO mode</td><td>Load user parameter set using parameters 16.11 and 16.12.</td><td>10</td></tr>
<tr><td>16.10</td><td>USER SET LOG</td><td>Shows the status of the user parameter sets (see parameter 16.09 USER SET SEL). Read-only.</td><td></td></tr>
<tr><td></td><td>N/A</td><td>No user sets have been saved.</td><td>0</td></tr>
<tr><td></td><td>Loading</td><td>A user set is being loaded.</td><td>1</td></tr>
<tr><td></td><td>Saving</td><td>A user set is being saved.</td><td>2</td></tr>
<tr><td></td><td>Faulted</td><td>Invalid or empty parameter set.</td><td>4</td></tr>
<tr><td></td><td>Set1 IO act</td><td>User parameter set 1 has been selected by parameters 16.11 and 16.12.</td><td>8</td></tr>
<tr><td></td><td>Set2 IO act</td><td>User parameter set 2 has been selected by parameters 16.11 and 16.12.</td><td>16</td></tr>
<tr><td></td><td>Set3 IO act</td><td>User parameter set 3 has been selected by parameters 16.11 and 16.12.</td><td>32</td></tr>
<tr><td></td><td>Set4 IO act</td><td>User parameter set 4 has been selected by parameters 16.11 and 16.12.</td><td>64</td></tr>
<tr><td></td><td>Set1 par act</td><td>User parameter set 1 has been loaded using parameter 16.09.</td><td>128</td></tr>
<tr><td></td><td>Set2 par act</td><td>User parameter set 2 has been loaded using parameter 16.09.</td><td>256</td></tr>
<tr><td></td><td>Set3 par act</td><td>User parameter set 3 has been loaded using parameter 16.09.</td><td>512</td></tr>
<tr><td></td><td>Set4 par act</td><td>User parameter set 4 has been loaded using parameter 16.09.</td><td>1024</td></tr>
<tr><td>16.11</td><td>USER IO SET LO</td><td>Together with parameter 16.12 USER IO SET HI, selects the user parameter set when parameter 16.09 USER SET SEL is set to IO mode. The status of the source defined by this parameter and parameter 16.12 selects the user parameter set as follows:
<table>
<tr><th>Status of source defined by par. 16.11</th><th>Status of source defined by par. 16.12</th><th>User parameter set selected</th></tr>
<tr><td>FALSE</td><td>FALSE</td><td>Set 1</td></tr>
<tr><td>TRUE</td><td>FALSE</td><td>Set 2</td></tr>
<tr><td>FALSE</td><td>TRUE</td><td>Set 3</td></tr>
<tr><td>TRUE</td><td>TRUE</td><td>Set 4</td></tr>
</table></td><td></td></tr>
<tr><td></td><td></td><td>Bit pointer: CONST or POINTER (See Terms and abbreviations on page 143.)</td><td></td></tr>
<tr><td>16.12</td><td>USER IO SET HI</td><td>See parameter 16.11 USER IO SET LO.</td><td></td></tr>
<tr><td></td><td></td><td>Bit pointer: CONST or POINTER (See Terms and abbreviations on page 143.)</td><td></td></tr>
<tr><td>16.13</td><td>TIME SOURCE PRIO</td><td>Selects which real-time clock source is adopted by the drive as the master real-time clock. Some selections specify multiple sources that are in order of priority.</td><td></td></tr>
<tr><td></td><td>FB_D2D_MMI</td><td>Fieldbus (highest priority); drive-to-drive link; man-machine interface (control panel or PC).</td><td>0</td></tr>
<tr><td></td><td>D2D_FB_MMI</td><td>Drive-to-drive link (highest priority); fieldbus; man-machine interface (control panel or PC).</td><td>1</td></tr>
</table>

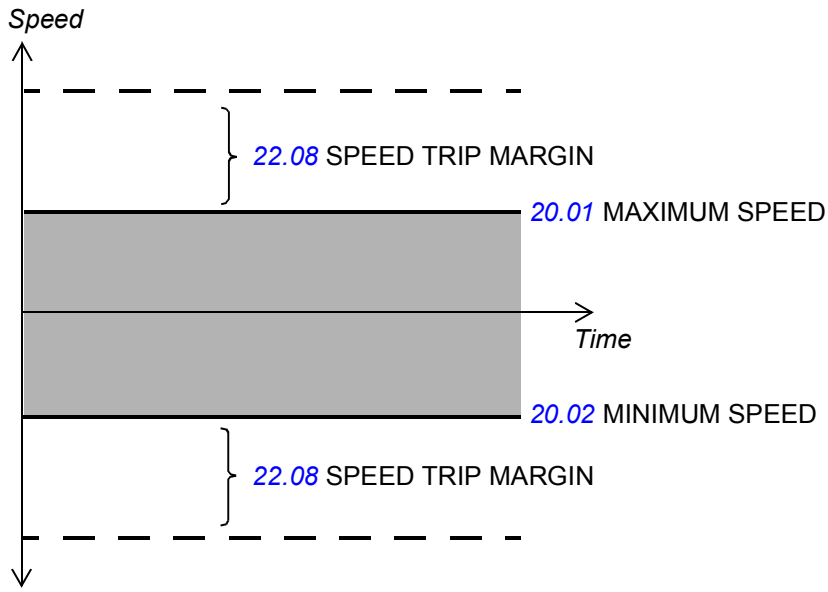
No.	Name/Value	Description	FbEq
	FB_D2D	Fieldbus (highest priority); drive-to-drive link.	2
	D2D_FB	Drive-to-drive link (highest priority); fieldbus.	3
	FB only	Fieldbus only.	4
	D2D only	Drive-to-drive link only.	5
	MMI_FB_D2D	Man-machine interface (control panel or PC) (highest priority); fieldbus; drive-to-drive link.	6
	MMI only	Man-machine interface (control panel or PC) only.	7
	Internal	No external sources are used as master real-time clock.	8

17 PANEL DISPLAY		Selection of signals to be displayed on the control panel.	
17.01	SIGNAL1 PARAM	Selects the first signal to be displayed on the control panel. The default signal is *05.08* LIFT SPEED ACT.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
17.02	SIGNAL2 PARAM	Selects the second signal to be displayed on the control panel. The default signal is *05.09* LIFT SPEED REF.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
17.03	SIGNAL3 PARAM	Selects the third signal to be displayed on the control panel. The default signal is *01.06* TORQUE.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	

20 LIMITS		Drive operation limits.	
20.01	MAXIMUM SPEED	Defines the allowed maximum speed. See also parameter *22.08* SPEED TRIPMARGIN.	
	0…30000 rpm	Allowed maximum speed.	1 = 1 rpm
20.02	MINIMUM SPEED	Defines the allowed minimum speed. See also parameter *22.08* SPEED TRIPMARGIN.	
	-30000…0 rpm	Allowed minimum speed.	1 = 1 rpm
20.03	POS SPEED ENA	Internally used. Cannot be set by the user.	
20.04	NEG SPEED ENA	Internally used. Cannot be set by the user.	
20.05	MAXIMUM CURRENT	Defines the allowed maximum motor current.	
	0.00…30000.00 A	Maximum allowed motor current.	100 = 1 A
20.06	MAXIMUM TORQUE	Defines the maximum torque limit for the drive (in percent of the motor nominal torque).	
	0.0…1600.0%	Maximum torque limit.	10 = 1%
20.07	MINIMUM TORQUE	Defines the minimum torque limit for the drive (in percent of the motor nominal torque).	
	-1600.0…0.0%	Minimum torque limit.	10 = 1%
20.08	THERM CURR LIM	Enables the thermal current limitation. Thermal current limit is calculated by the inverter thermal protection function.	
	Disable	The calculated thermal limit is not used. If the inverter output current is excessive, alarm IGBT OVERTEMP is generated and eventually the drive trips on fault IGBT OVERTEMP.	0
	Enable	The calculated thermal current value limits the inverter output current (ie, motor current).	1

No.	Name/Value	Description	FbEq
22 SPEED FEEDBACK		Settings for speed feedback selection, zero speed selection, actual speed supervision, etc.	
22.01	SPEED FB SEL	Selects the speed feedback value used in control.	
	Estimated	Calculated speed estimate.	0
	Enc1 speed	Actual speed measured with encoder 1. The encoder is selected by parameter *90.01* ENCODER 1 SEL.	1
	Enc2 speed	Actual speed measured with encoder 2. The encoder is selected by parameter *90.02* ENCODER 2 SEL.	2
22.02	SPEED ACT FTIME	Defines the time constant of the actual speed filter, that is, the time within the actual speed has reached 63% of the nominal speed (filtered speed = *01.01* SPEED ACT). If the used speed reference remains constant, the possible interferences in the speed measurement can be filtered with the actual speed filter. Reducing the ripple with the filter may cause speed controller tuning problems. A long filter time constant and fast acceleration time contradict one another. A very long filter time results in unstable control. If there are substantial interferences in the speed measurement, the filter time constant should be proportional to the total inertia of the load and motor, in this case 10…30% of the mechanical time constant $t_{mech} = (n_{nom} / T_{nom}) \times J_{tot} \times 2\pi / 60$, where J_{tot} = total inertia of the load and motor (the gear ratio between the load and motor must be taken into account) n_{nom} = motor nominal speed T_{nom} = motor nominal torque See also parameter *26.06* SPD ERR FTIME.	
	0.000 …10000.000 ms	Time constant for actual speed filter.	1000 = 1 ms
22.03	MOTOR GEAR MUL	Defines the motor gear numerator for the motor encoder gear function. $\frac{\text{22.03 MOTOR GEAR MUL}}{\text{22.04 MOTOR GEAR DIV}} = \frac{\text{Actual speed}}{\text{Input speed}}$ where input speed is encoder 1/2 speed (*01.08* ENCODER 1 SPEED / *01.10* ENCODER 2 SPEED) or speed estimate (*01.14* SPEED ESTIMATED). **Note:** If the motor gear ratio differs from 1, the motor model uses an estimated speed instead of the speed feedback value. See also section *Motor encoder gear* on page *133*.	
	-2147483647 …2147483647	Numerator for motor encoder gear. **Note:** A setting of 0 is changed internally to 1.	1 = 1
22.04	MOTOR GEAR DIV	Defines the motor gear denominator for the motor encoder gear function. See parameter *22.03* MOTOR GEAR MUL.	
	1 ……2147483647	Denominator for motor encoder gear.	1 = 1
22.05	ZERO SPEED LIMIT	Defines the zero speed limit. The motor is stopped along a speed ramp until the defined zero speed limit is reached. After the limit, the motor coasts to stop. **Note:** Too low a setting may result in the drive not stopping at all.	
	0.00… 30000.00 rpm	Zero speed limit.	100 = 1 rpm

No.	Name/Value	Description	FbEq
22.06	ZERO SPEED DELAY	Defines the delay for the zero speed delay function. The function is useful in applications where a smooth and quick restart is essential. During the delay the drive accurately knows the rotor position. **No Zero Speed Delay** The drive receives a stop command and decelerates along a ramp. When the motor actual speed falls below the value of parameter *22.05* ZERO SPEED LIMIT, the speed controller is switched off. The inverter modulation is stopped and the motor coasts to standstill. *Speed*  **With Zero Speed Delay** The drive receives a stop command and decelerates along a ramp. When the actual motor speed falls below the value of parameter *22.05* ZERO SPEED LIMIT, the zero speed delay function activates. During the delay the function keeps the speed controller live: the inverter modulates, the motor is magnetised and the drive is ready for a quick restart. *Speed*  	
	0…30000 ms	Zero speed delay.	1 = 1 ms
22.07	ABOVE SPEED LIM	Defines the supervision limit for the actual speed. See also *02.13* FBA MAIN SW, bit 10.	
	0…30000 rpm	Supervision limit for actual speed.	1 = 1 rpm

No.	Name/Value	Description	FbEq
22.08	SPEED TRIPMARGIN	Defines, together with *20.01* MAXIMUM SPEED and *20.02* MINIMUM SPEED, the maximum allowed speed of the motor (overspeed protection). If the actual speed (*01.01* SPEED ACT) exceeds the speed limit defined by parameter *20.01* or *20.02* by more than *22.08* SPEED TRIPMARGIN, the drive trips on fault OVERSPEED. Example: If the maximum speed is 1420 rpm and speed trip margin is 300 rpm, the drive trips at 1720 rpm. 	
	0.0…10000.0 rpm	Speed trip margin.	10 = 1 rpm
22.09	SPEED FB FAULT	Selects the action in case of speed feedback data loss. **Note:** If this parameter is set to *Warning* or *No*, a loss of feedback will cause an internal faulted state. To clear the internal fault and to reactivate speed feedback, use parameter *90.10* ENC PAR REFRESH.	
	Fault	Drive trips on a fault (OPTION COMM LOSS, ENCODER 1/2 FAILURE, ENCODER 1/2 CABLE or SPEED FEEDBACK depending on the type of problem).	0
	Warning	Drive continues operation with open loop control and generates an alarm (OPTION COMM LOSS, ENCODER 1/2 FAILURE or SPEED FEEDBACK depending on the type of problem).	1
	No	Drive continues operation with open loop control. No faults or alarms are generated.	2

24 SPEED REF MOD		Speed reference selection settings. These parameters need to be set only if the speed reference is coming from a fieldbus module or an analog input.	
24.02	SPEED REF2 SEL	Used for fieldbus reference. Selects the source for speed reference 2 (*03.02* SPEED REF2).	
	ZERO	Zero reference.	0
	AI1	Analog input AI1.	1
	AI2	Analog input AI2.	2
	FBA REF1	Fieldbus reference 1.	3

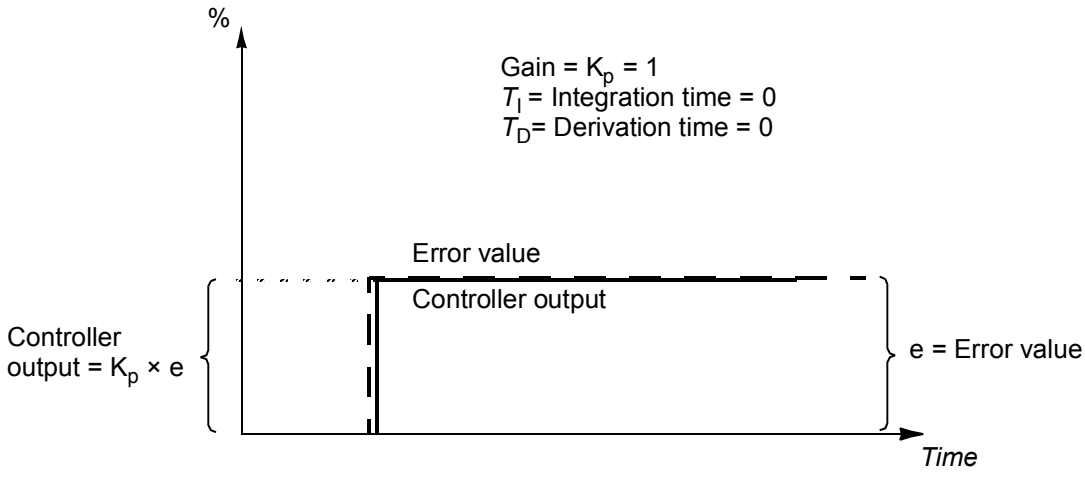
No.	Name/Value	Description	FbEq
	FBA REF2	Fieldbus reference 2.	4
	D2D REF1	Drive to drive reference 1.	5
	D2D REF2	Drive to drive reference 2.	6
	ENC1 SPEED	Encoder 1 (*01.08* ENCODER 1 SPEED).	7
	ENC2 SPEED	Encoder 2 (*01.10* ENCODER 2 SPEED).	8
24.03	SPEED REF1 IN	Internally used. Cannot be set by the user.	
24.04	SPEED REF2 IN	Selects the source for speed reference 2 (overrides the setting of parameter *24.02* SPEED REF2 SEL). The default value is P.3.2, ie, 03.02 SPEED REF2.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
24.05	SPEED REF 1/ 2SEL	Used for fieldbus reference. Selects between speed reference 1 or 2. Reference 1/2 source is defined by parameter *24.03* SPEED REF1 IN / *24.04* SPEED REF2 IN. 0 = Speed reference 1.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

25 SPEED REF RAMP		Speed reference ramp settings.	
25.01	SPEED RAMP IN	Internally used. Cannot be set by the user.	
25.02	SPEED SCALING	Internally used. Cannot be set by the user. Shows the motor rotational speed (rpm), which corresponds to the lift nominal speed (m/s) defined with parameter *80.01* NOMINAL SPEED. The parameter value is calculated based on the lift nominal speed, gear ratio, roping ratio and sheave diameter. See also section *Speed reference scaling* on page *99*.	1 = 1 rpm
25.11	EM STOP TIME	Defines the time within which the drive is stopped if an emergency stop OFF3 is activated (ie, the time required for the speed to change from the speed value defined by parameter *25.02* SPEED SCALING to zero). The emergency stop OFF3 is activated if the Final limit switches or Leveling overtime stop function becomes active. See also section *Emergency stop* on page *132*. Emergency stop OFF1 uses the active ramp time.	
	0.000…1800.000 s	Emergency stop OFF3 deceleration time.	1000 = 1 s
25.80	ACC/DEC SEL	Selects the source for the acceleration/deceleration set 1 or acceleration/deceleration set 2 used in the normal travel mode. 1 = Acc/dec set 2 is used. 0 = Acc/dec set 1 is used. For more information, see section *Acceleration/deceleration selection* on page *100*.	
25.81	ACC1	Defines the acceleration for acc/dec set 1.	
	0.01…25.00 m/s^2	Acc/dec set 1 acceleration.	100 = 1 m/s^2
25.82	DEC1	Defines the deceleration for acc/dec set 1.	
	0.01…25.00 m/s^2	Acc/dec set 1 deceleration.	100 = 1 m/s^2
25.83	ACC2	Defines the acceleration for acc/dec set 2.	
	0.01…25.00 m/s^2	Acc/dec set 2 acceleration.	100 = 1 m/s^2
25.84	DEC2	Defines the deceleration for acc/dec set 2.	
	0.01…25.00 m/s^2	Acc/dec set 2 deceleration.	100 = 1 m/s^2

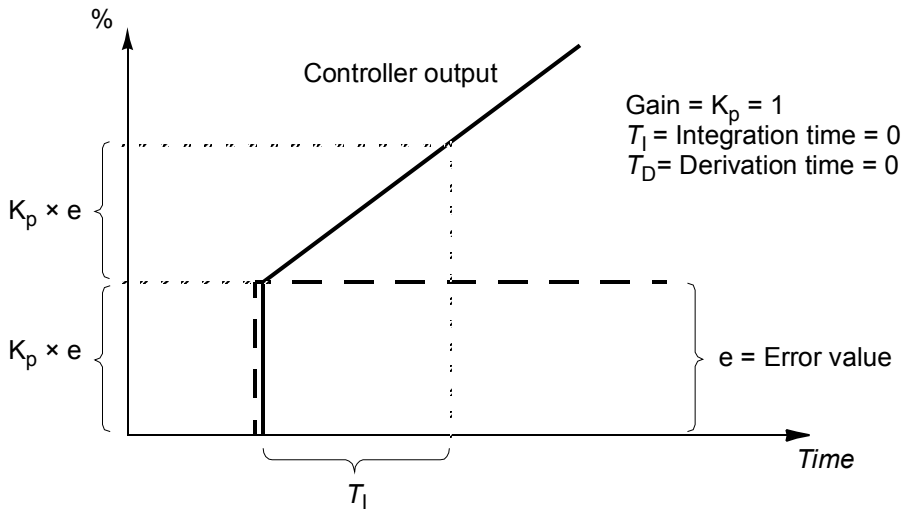
No.	Name/Value	Description	FbEq
25.85	INSPECT MODE ACC	Defines the acceleration used when the inspection mode is active.	
	0.01…25.00 m/s^2	Acceleration used in the inspection mode.	100 = 1 m/s^2
25.86	INSPECT MODE DEC	Defines the deceleration used when the inspection mode is active.	
	0.01…25.00 m/s^2	Deceleration used in the inspection mode.	100 = 1 m/s^2
25.87	EVAC MODE ACC	Defines the acceleration used when the evacuation mode is active.	
	0.01…25.00 m/s^2	Acceleration used in the evacuation mode.	100 = 1 m/s^2
25.88	EVAC MODE DEC	Defines the deceleration used when the evacuation mode is active.	
	0.01…25.00 m/s^2	Deceleration used in the evacuation mode.	100 = 1 m/s^2
25.89	RELVL ACC/DEC	Defines the acceleration/deceleration used when the releveling mode is active.	
	0.01…25.00 m/s^2	Acceleration/deceleration used in the releveling mode.	100 = 1 m/s^2
25.90	JERK DISABLE	Selects the source for enabling/disabling all the jerks defined with parameters *25.91* JERK1…*25.97* JERK7. 1 = All jerks are disabled and not used. 0 = All jerks are enabled and used. For more information, see section *Jerk selection* on page *101*.	
25.91	JERK1	Defines the jerk used at the start of acceleration from zero speed to traveling speed when the start command is given.	
	0.01…100.00 m/s^3	Jerk used at the start of acceleration.	100 = 1 m/s^3
25.92	JERK2	Defines the jerk used at the end of acceleration from zero speed to traveling speed when the start command is given.	
	0.01…100.00 m/s^3	Jerk used at the end of acceleration.	100 = 1 m/s^3
25.93	JERK3	Defines the jerk used at the start of deceleration from traveling speed to leveling speed.	
	0.01…100.00 m/s^3	Jerk used at the start of leveling deceleration.	100 = 1 m/s^3
25.94	JERK4	Defines the jerk used at the end of deceleration from traveling speed to leveling speed.	
	0.01…100.00 m/s^3	Jerk used at the end of leveling deceleration.	100 = 1 m/s^3
25.95	JERK5	Defines the jerk used at the start of stopping deceleration when the stop command is given.	
	0.01…100.00 m/s^3	Jerk used at the start of stopping deceleration.	100 = 1 m/s^3
25.96	JERK6	Defines the jerk used at the end of stopping deceleration when the stop command is given.	
	0.01…100.00 m/s^3	Jerk used at the end of stopping deceleration.	100 = 1 m/s^3
25.97	JERK7	Defines the jerk used during releveling.	
	0.01…100.00 m/s^3	Jerk used during releveling.	100 = 1 m/s^3

26 SPEED ERROR		Speed error calculation settings.	
26.05	SPEED STEP	Defines an additional speed step given to the input of the speed controller (added to the speed error value).	
	-30000.00 …30000.00 rpm	Speed step.	100 = 1 rpm

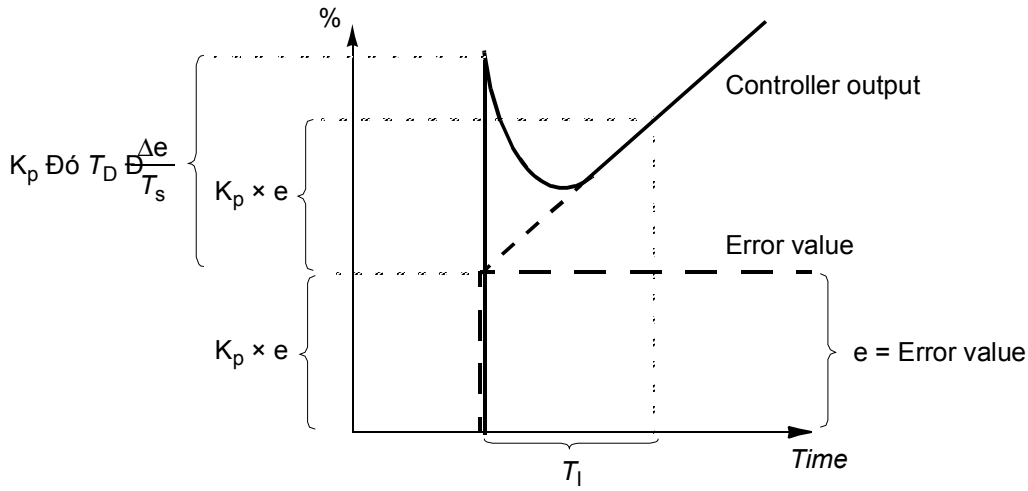
No.	Name/Value	Description	FbEq
26.06	SPD ERR FTIME	Defines the time constant of the speed error low pass filter. If the used speed reference changes rapidly (servo application), the possible interferences in the speed measurement can be filtered with the speed error filter. Reducing the ripple with the filter may cause speed controller tuning problems. A long filter time constant and fast acceleration time contradict one another. A very long filter time results in unstable control. See also parameter *22.02* SPEED ACT FTIME.	
	0.0…1000.0 ms	Time constant for speed error low pass filter. 0 ms = filtering disabled.	10 = 1 ms
26.07	SPEED WINDOW	Defines the absolute value for the motor speed window supervision, ie, the absolute value for the difference between the actual speed and the unramped speed reference (*01.01* SPEED ACT - *03.03* SPEEDREF RAMP IN). When the motor speed is within the limits defined by this parameter, signal *02.13* bit 8 (AT_SETPOINT) value is 1. If the motor speed is not within the defined limits, bit 8 value is 0.	
	0…30000 rpm	Absolute value for motor speed window supervision.	1 = 1 rpm

28 SPEED CONTROL		Speed controller settings.	
28.01	SPEED ERR NCTRL	Selects the source for the speed error (reference - actual). The default value is P.3.6, ie, signal *03.06* SPEED ERROR FILT. **Note:** This parameter has been locked, ie, no user setting is possible.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
28.02	PROPORT GAIN	Defines the proportional gain (Kp) of the speed controller. Too great a gain may cause speed oscillation. The figure below shows the speed controller output after an error step when the error remains constant.  If gain is set to 1, a 10% change in error value (reference - actual value) causes the speed controller output to change by 10%.	
	0.00…200.00	Proportional gain for speed controller.	100 = 1

No.	Name/Value	Description	FbEq
28.03	INTEGRATION TIME	Defines the integration time of the speed controller. The integration time defines the rate at which the controller output changes when the error value is constant and the proportional gain of the speed controller is 1. The shorter the integration time, the faster the continuous error value is corrected. Too short integration time makes the control unstable. If the parameter value is set to zero, the I-part of the controller is disabled. Anti-windup stops the integrator if the controller output is limited. See *06.05* LIMIT WORD 1. The figure below shows the speed controller output after an error step when the error remains constant.	
	0.000…600.000 s	Integration time for speed controller.	1000 = 1 s



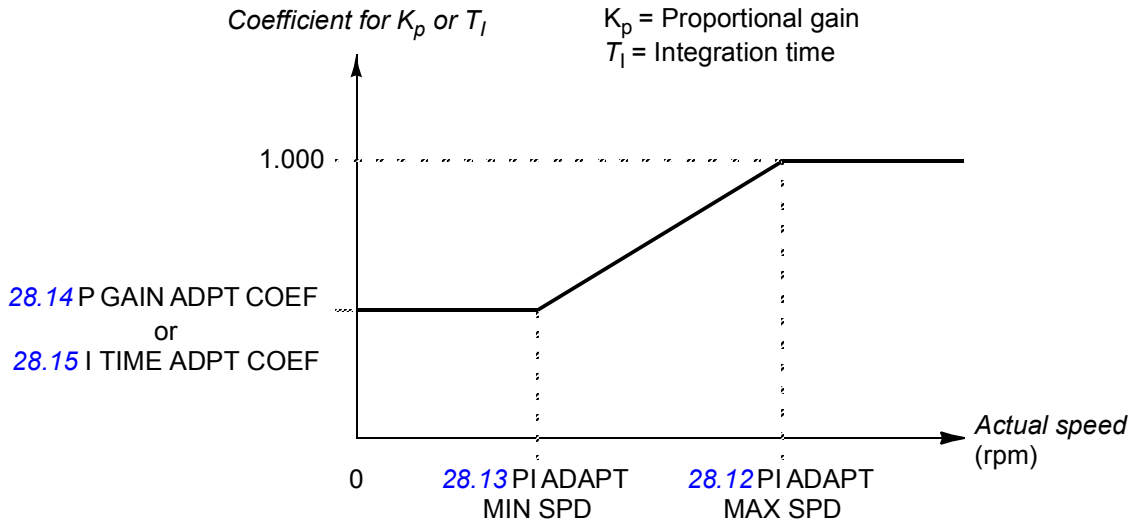
No.	Name/Value	Description	FbEq
28.04	DERIVATION TIME	Defines the derivation time of the speed controller. Derivative action boosts the controller output if the error value changes. The longer the derivation time, the more the speed controller output is boosted during the change. If the derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller. The derivation makes the control more responsive to disturbances. The speed error derivative must be filtered with a low pass filter to eliminate disturbances. The figure below shows the speed controller output after an error step when the error remains constant.	



Gain = K_p = 1
T_I = Integration time > 0
T_D= Derivation time > 0
T_s= Sample time period = 250 µs
Δe = Error value change between two samples

		Note: Changing this parameter value is recommended only if a pulse encoder is used.	
	0.000…10.000 s	Derivation time for speed controller.	1000 = 1 s
28.05	DERIV FILT TIME	Defines the derivation filter time constant.	
	0.0…1000.0 ms	Derivation filter time constant.	10 = 1 ms
28.06	ACC COMPENSATION	Internally used. Cannot be set by the user.	
28.09	SPEEDCTRL BAL EN	Internally used. Cannot be set by the user.	
28.10	MIN TORQ SP CTRL	Defines the minimum speed controller output torque.	
	-1600.0…1600.0%	Minimum speed controller output torque.	10 = 1%
28.11	MAX TORQ SP CTRL	Defines the maximum speed controller output torque.	
	-1600.0…1600.0%	Maximum speed controller output torque.	10 = 1%

No.	Name/Value	Description	FbEq
28.12	PI ADAPT MAX SPD	Maximum actual speed for speed controller adaptation. Speed controller gain and integration time can be adapted according to actual speed. This is done by multiplying the gain (*28.02* PROPORT GAIN) and integration time (*28.03* INTEGRATION TIME) by coefficients at certain speeds. The coefficients are defined individually for both gain and integration time. When the actual speed is below or equal to *28.13* PI ADAPT MIN SPD, *28.02* PROPORT GAIN and *28.03* INTEGRATION TIME are multiplied by *28.14* P GAIN ADPT COEF and *28.15* I TIME ADPT COEF, respectively. When the actual speed is equal to or exceeds *28.12* PI ADAPT MAX SPD, no adaptation takes place; in other words, *28.02* PROPORT GAIN and *28.03* INTEGRATION TIME are used as such. Between *28.13* PI ADAPT MIN SPD and *28.12* PI ADAPT MAX SPD, the coefficients are calculated linearly on the basis of the breakpoints.	



	0…30000 rpm	Maximum actual speed for speed controller adaptation.	1 = 1 rpm
28.13	PI ADAPT MIN SPD	Minimum actual speed for speed controller adaptation. See parameter *28.12* PI ADAPT MAX SPD.	
	0…30000 rpm	Minimum actual speed for speed controller adaptation.	1 = 1 rpm
28.14	P GAIN ADPT COEF	Proportional gain coefficient. See parameter *28.12* PI ADAPT MAX SPD.	
	0.000 … 10.000	Proportional gain coefficient.	1000 = 1
28.15	I TIME ADPT COEF	Integration time coefficient. See parameter *28.12* PI ADAPT MAX SPD.	
	0.000 … 10.000	Integration time coefficient.	1000 = 1

No.	Name/Value	Description	FbEq
33 SUPERVISION		Configuration of signal supervision.	
33.01	SUPERV1 FUNC	Selects the mode of supervision 1.	
	Disabled	Supervision 1 not in use.	0
	Low	When the signal selected by parameter *33.02* SUPERV1 ACT falls below the value of parameter *33.04* SUPERV1 LIM LO, bit 0 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must exceed the value of parameter *33.03* SUPERV1 LIM HI.	1
	High	When the signal selected by parameter *33.02* SUPERV1 ACT exceeds the value of parameter *33.03* SUPERV1 LIM HI, bit 0 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must fall below the value of parameter *33.04* SUPERV1 LIM LO.	2
	Abs Low	When the absolute value of the signal selected by parameter *33.02* SUPERV1 ACT falls below the value of parameter *33.04* SUPERV1 LIM LO, bit 0 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must exceed the value of parameter *33.03* SUPERV1 LIM HI.	3
	Abs High	When the absolute value of the signal selected by parameter *33.02* SUPERV1 ACT exceeds the value of parameter *33.03* SUPERV1 LIM HI, bit 0 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must fall below the value of parameter *33.04* SUPERV1 LIM LO.	4
33.02	SUPERV1 ACT	Selects the signal to be monitored by supervision 1. See parameter *33.01* SUPERV1 FUNC.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
33.03	SUPERV1 LIM HI	Sets the upper limit for supervision 1. See parameter *33.01* SUPERV1 FUNC.	
	-32768.00 …32768.00	Upper limit for supervision 1.	100 = 1
33.04	SUPERV1 LIM LO	Sets the lower limit for supervision 1. See parameter *33.01* SUPERV1 FUNC.	
	-32768.00 …32768.00	Lower limit for supervision 1.	100 = 1
33.05	SUPERV2 FUNC	Selects the mode of supervision 2.	
	Disabled	Supervision 2 not in use.	0
	Low	When the signal selected by parameter *33.06* SUPERV2 ACT falls below the value of parameter *33.08* SUPERV2 LIM LO, bit 1 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must exceed the value of parameter *33.07* SUPERV2 LIM HI.	1
	High	When the signal selected by parameter *33.06* SUPERV2 ACT exceeds the value of parameter *33.07* SUPERV2 LIM HI, bit 1 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must fall below the value of parameter *33.08* SUPERV2 LIM LO.	2
	Abs Low	When the absolute value of the signal selected by parameter *33.06* SUPERV2 ACT falls below the value of parameter *33.08* SUPERV2 LIM LO, bit 1 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must exceed the value of parameter *33.07* SUPERV2 LIM HI.	3

No.	Name/Value	Description	FbEq
	Abs High	When the absolute value of the signal selected by parameter *33.06* SUPERV2 ACT exceeds the value of parameter *33.07* SUPERV2 LIM HI, bit 1 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must fall below the value of parameter *33.08* SUPERV2 LIM LO.	4
33.06	SUPERV2 ACT	Selects the signal to be monitored by supervision 2. See parameter *33.05* SUPERV2 FUNC.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
33.07	SUPERV2 LIM HI	Sets the upper limit for supervision 2. See parameter *33.05* SUPERV2 FUNC.	
	-32768.00 …32768.00	Upper limit for supervision 2.	100 = 1
33.08	SUPERV2 LIM LO	Sets the lower limit for supervision 2. See parameter *33.05* SUPERV2 FUNC.	
	-32768.00 …32768.00	Lower limit for supervision 2.	100 = 1
33.09	SUPERV3 FUNC	Selects the mode of supervision 3.	
	Disabled	Supervision 3 not in use.	0
	Low	When the signal selected by parameter *33.10* SUPERV3 ACT falls below the value of parameter *33.12* SUPERV3 LIM LO, bit 2 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must exceed the value of parameter *33.11* SUPERV3 LIM HI.	1
	High	When the signal selected by parameter *33.10* SUPERV3 ACT exceeds the value of parameter *33.11* SUPERV3 LIM HI, bit 2 of *06.14* SUPERV STATUS is activated. To clear the bit, the signal must fall below the value of parameter *33.12* SUPERV3 LIM LO.	2
	Abs Low	When the absolute value of the signal selected by parameter *33.10* SUPERV3 ACT falls below the value of parameter *33.12* SUPERV3 LIM LO, bit 2 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must exceed the value of parameter *33.11* SUPERV3 LIM HI.	3
	Abs High	When the absolute value of the signal selected by parameter *33.10* SUPERV3 ACT exceeds the value of parameter *33.11* SUPERV3 LIM HI, bit 2 of *06.14* SUPERV STATUS is activated. To clear the bit, the absolute value of the signal must fall below the value of parameter *33.12* SUPERV3 LIM LO.	4
33.10	SUPERV3 ACT	Selects the signal to be monitored by supervision 3. See parameter *33.09* SUPERV3 FUNC.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
33.11	SUPERV3 LIM HI	Sets the upper limit for supervision 3. See parameter *33.09* SUPERV3 FUNC.	
	-32768.00 …32768.00	Upper limit for supervision 3	100 = 1
33.12	SUPERV3 LIM LO	Sets the lower limit for supervision 3. See parameter *33.09* SUPERV3 FUNC.	
	-32768.00 …32768.00	Lower limit for supervision 3.	100 = 1

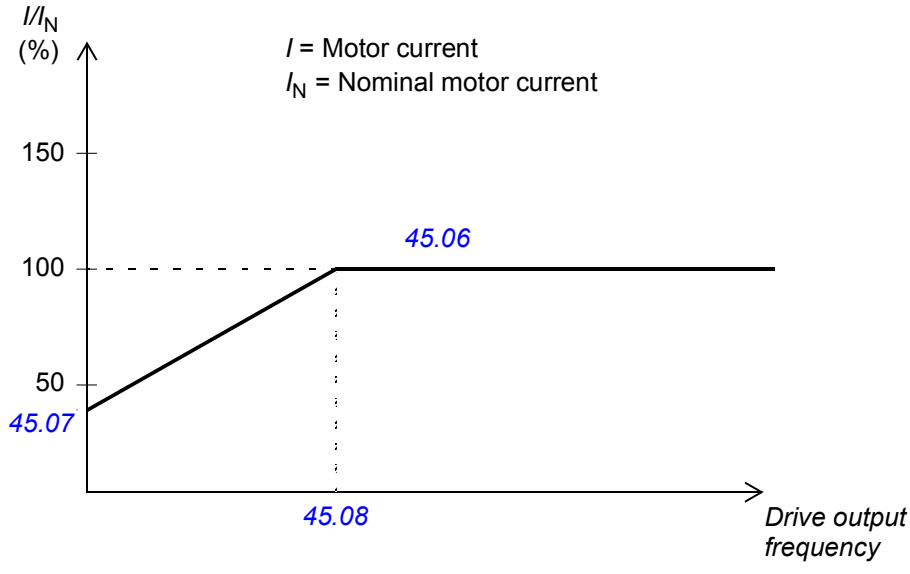
No.	Name/Value	Description	FbEq
35 MECH BRAKE CTRL		Settings for the control of the mechanical brake, torque proving, brake slip, brake open torque and torque limiter while stopping. See also section *Mechanical brake control* on page *104*.	
35.01	BRAKE CONTROL	Activates the brake control function with or without supervision. **Note:** This parameter cannot be changed while the drive is running.	
	NO	Inactive.	0
	WITH ACK	Brake control with supervision (supervision is activated by parameter *35.02* BRAKE ACKNOWL).	1
	NO ACK	Brake control without supervision.	2
35.02	BRAKE ACKNOWL	Selects the source for the external brake on/off supervision activation (when parameter *35.01* BRAKE CONTROL = *WITH ACK*). The use of the external on/off supervision signal is optional. 1 = The brake is open. 0 = The brake is closed. Brake supervision is usually controlled with a digital input. It can also be controlled with an external control system. When a brake control error is detected, the drive reacts as defined by parameter *35.09* BRAKE FAULT FUNC. **Note:** This parameter cannot be changed while the drive is running.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
35.03	BRAKE OPEN DELAY	Defines the brake open delay (= the delay between the internal open brake command and the release of the motor speed control). The delay counter starts when the drive has magnetised the motor and risen the motor torque to the level required at the brake release (parameter *35.81* BRK OPEN TRQ). Simultaneously with the counter start, the brake function energises the relay output controlling the brake and the brake starts opening. Set the delay the same as the mechanical opening delay of the brake specified by the brake manufacturer.	
	0.00…5.00 s	Brake open delay.	100 = 1 s
35.04	BRAKE CLOSE DLY	Defines the brake close delay. The delay counter starts when the motor actual speed has fallen below the set level (parameter *35.05* BRAKE CLOSE SPD) after the drive has received the stop command. Simultaneously with the counter start, the brake control function de-energises the relay output controlling the brake and the brake starts closing. During the delay, the brake function keeps the motor live preventing the motor speed from falling below zero. Set the delay time to the same value as the mechanical make-up time of the brake (= operating delay when closing) specified by the brake manufacturer.	
	0.00…60.00 s	Brake close delay.	100 = 1 s
35.05	BRAKE CLOSE SPD	Defines the brake close speed (an absolute value). See parameter *35.04* BRAKE CLOSE DLY.	
	0.0…1000.0 rpm	Brake close speed.	10 = 1 rpm

No.	Name/Value	Description	FbEq
35.07	BRAKE CLOSE REQ	Selects the source for the brake close (open) request. 1 = Brake close request. 0 = Brake open request. **Note:** This parameter cannot be changed while the drive is running.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
35.08	BRAKE OPEN HOLD	Internally used. Cannot be set by the user.	
35.09	BRAKE FAULT FUNC	Defines how the drive reacts in case of a mechanical brake control error. If brake control supervision has not been activated by parameter *35.01* BRAKE CONTROL, this parameter is disabled.	
	FAULT	The drive trips on fault BRAKE NOT CLOSED / BRAKE NOT OPEN if the status of the optional external brake acknowledgement signal does not meet the status presumed by the brake control function. The drive trips on fault BRAKE START TORQUE if the required motor starting torque at brake release is not achieved.	0
	ALARM	The drive generates alarm BRAKE NOT CLOSED / BRAKE NOT OPEN if the status of the optional external brake acknowledgement signal does not meet the status presumed by the brake control function. The drive generates alarm BRAKE START TORQUE if the required motor starting torque at brake release is not achieved.	1
	OPEN FLT	The drive generates fault BRAKE NOT CLOSED / BRAKE NOT OPEN if the status of the optional external brake acknowledgement signal does not match the status presumed by the brake control function. The drive trips on fault BRAKE START TORQUE if the required motor start torque at brake release is not achieved.	2
35.80	BRK OPEN TRQ SEL	Selects the source of the brake open torque to be used. The source can be any of the following parameters: • *02.05* AI1 SCALED • *02.07* AI2 SCALED • *05.04* LOAD ACT TORQ • *35.81* BRAKE OPEN TORQ	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
35.81	BRAKE OPEN TORQ	Defines the brake open torque value used when selected as the source of parameter *35.80* BRK OPEN TRQ SEL.	
	0.0...300.0%	Constant brake open torque.	10 = 1%
35.82	TORQUE PROVING	Enables/disables the Torque proving function.	
	DISABLED	Torque proving function is disabled.	0
	ENABLED	Torque proving function is enabled.	1
35.83	TORQ PROVING REF	Defines the torque proving reference. The Torque proving function compares the calculated actual torque of the drive with this reference value.	
	0.0…100.0%	Torque proving reference in percentage of the motor nominal torque.	10 = 1%

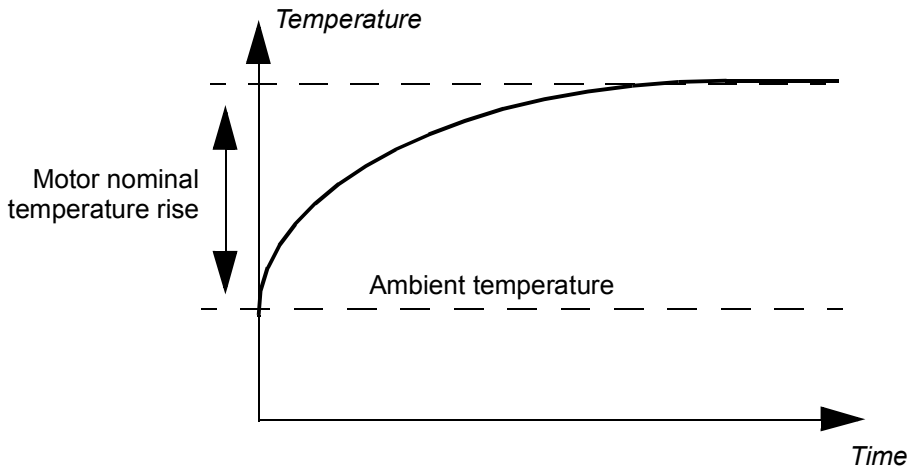
No.	Name/Value	Description	FbEq
35.84	TRQ PROV FLT DLY	Defines the time delay for generating fault TORQUE PROVE. The drive trips on fault TORQUE PROVE if torque proving has not succeeded by the end of this period.	
	0.0…10.0 s	Time delay for generating fault TORQUE PROVE.	10 = 1 s
35.85	SLIP SPEED LIM	Defines the speed limit for the brake slip during torque proving. The drive trips on fault BRAKE SLIP if the actual lift speed exceeds this limit during torque proving and stays there for a longer period than defined with parameter *35.87* SLIP FAULT DELAY.	
	0.00…5.00 m/s	Brake slip speed limit in m/s.	100 = 1 m/s
35.86	SLIP FAULT DELAY	Defines the time delay for generating fault BRAKE SLIP.	
	0.0…10.0 s	Time delay for generating fault BRAKE SLIP.	10 = 1 s
35.87	TORQUE LIMITER	Enables/disables the Torque limiter while stopping function.	
	DISABLED	Torque limiter while stopping function is disabled.	0
	ENABLED	Torque limiter while stopping function is enabled.	1
35.88	TRQ LIMITER DLY	Defines the time delay for starting torque limiting after a brake close command.	
	0.1…2.0 s	Time delay for starting torque limiting.	10 = 1 s
35.89	TRQ LIMITER RAMP	Defines the torque limiting ramp time from nominal to zero torque. The actual torque is ramped to zero with the slope defined by this ramp time.	
	0.0…2.0 s	Torque limiting ramp time.	10 = 1 s

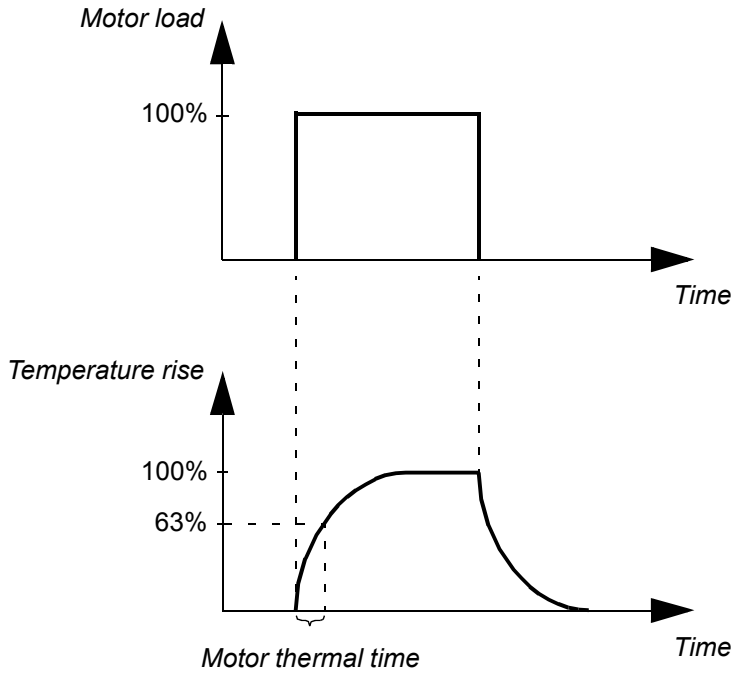
40 MOTOR CONTROL		Motor control settings.	
40.02	SF REF	Defines the switching frequency of the drive. When the switching frequency exceeds 4 kHz, the allowed drive output current is limited. See switching frequency derating in the appropriate *Hardware manual*.	
	1/2/3/4/5/8/16 kHz	Switching frequency.	1 = 1 kHz
40.03	SLIP GAIN	Defines the slip gain which is used to improve the estimated motor slip. 100% means full slip gain; 0% means no slip gain. The default value is 100%. Other values can be used if a static speed error is detected despite of the full slip gain. Example (with nominal load and nominal slip of 40 rpm): A 1000 rpm constant speed reference is given to the drive. Despite of the full slip gain (= 100%), a manual tachometer measurement from the motor axis gives a speed value of 998 rpm. The static speed error is 1000 rpm - 998 rpm = 2 rpm. To compensate the error, the slip gain should be increased. At the 105% gain value, no static speed error exists (2 rpm / 40 rpm = 5%).	
	0…200%	Slip gain.	1 = 1%
40.06	FORCE OPEN LOOP	Defines the speed/position information used by the motor model.	
	FALSE	Motor model uses the speed feedback selected by parameter *22.01* SPEED FB SEL.	0
	TRUE	Motor model uses the internal speed estimate (even when parameter *22.01* SPEED FB SEL setting is *Enc1 speed* / *Enc2 speed*).	1

No.	Name/Value	Description	FbEq
45 MOT THERM PROT		Settings for thermal protection of the motor. See also section *Thermal motor protection* on page *121*.	
45.01	MOT TEMP PROT	Selects how the drive reacts when motor overtemperature is detected.	
	No	Inactive.	0
	Alarm	The drive generates alarm MOTOR TEMPERATURE when the temperature exceeds the alarm level defined by parameter *45.03* MOT TEMP ALM LIM.	1
	Fault	The drive generates alarm MOTOR TEMPERATURE or trips on fault MOTOR OVERTEMP when the temperature exceeds the alarm/fault level defined by parameter *45.03* MOT TEMP ALM LIM / *45.04* MOT TEMP FLT LIM.	2
45.02	MOT TEMP SOURCE	Selects the motor temperature protection. When overtemperature is detected, the drive reacts as defined by parameter *45.01* MOT TEMP PROT. ***Note:** If one FEN-xx module is used, parameter setting must be either *KTY 1st FEN* or *PTC 1st FEN*. The FEN-xx module can be in either Slot 1 or Slot 2.	
	ESTIMATED	The temperature is supervised based on the motor thermal protection model, which uses the motor thermal time constant (parameter *45.10* MOT THERM TIME) and the motor load curve (parameters *45.06*…*45.08*). User tuning is typically needed only if the ambient temperature differs from the normal operating temperature specified for the motor. The motor temperature increases if it operates in the region above the motor load curve. The motor temperature decreases if it operates in the region below the motor load curve (if the motor is overheated). **WARNING!** The model does not protect the motor if it does not cool properly due to dust and dirt.	0
	KTY JCU	The temperature is supervised using a KTY84 sensor connected to drive thermistor input TH.	1
	KTY 1st FEN	The temperature is supervised using a KTY84 sensor connected to encoder interface module FEN-xx installed in drive Slot 1/2. If two encoder interface modules are used, encoder module connected to Slot 1 is used for the temperature supervision. **Note:** This selection does not apply to FEN-01. *	2
	KTY 2nd FEN	The temperature is supervised using a KTY84 sensor connected to encoder interface module FEN-xx installed in drive Slot 1/2. If two encoder interface modules are used, encoder module connected to Slot 2 is used for the temperature supervision. **Note:** This selection does not apply to FEN-01. *	3
	PTC JCU	The temperature is supervised using 1…3 PTC sensors connected to drive thermistor input TH.	4
	PTC 1st FEN	The temperature is supervised using a PTC sensor connected to encoder interface module FEN-xx installed in drive Slot 1/2. If two encoder interface modules are used, encoder module connected to Slot 1 is used for the temperature supervision. *	5

No.	Name/Value	Description	FbEq
	PTC 2nd FEN	The temperature is supervised using a PTC sensor connected to encoder interface module FEN-xx installed in drive Slot 1/2. If two encoder interface modules are used, encoder module connected to Slot 2 is used for the temperature supervision. *	6
45.03	MOT TEMP ALM LIM	Defines the alarm limit for the motor overtemperature protection (when parameter *45.01* MOT TEMP PROT = *Alarm* / *Fault*).	
	0…200 °C	Motor overtemperature alarm limit.	1 = 1 °C
45.04	MOT TEMP FLT LIM	Defines the fault limit for the motor overtemperature protection (when parameter *45.01* MOT TEMP PROT = *Fault*).	
	0…200 °C	Motor overtemperature fault limit.	1 = 1 °C
45.05	AMBIENT TEMP	Defines the ambient temperature for the thermal motor protection mode.	
	-60…100 °C	Ambient temperature.	1 = 1 °C
45.06	MOT LOAD CURVE	Defines the load curve together with parameters *45.07* ZERO SPEED LOAD and *45.08* BREAK POINT. The value is given in percent of nominal motor current. When the parameter is set to 100%, the maximum load is equal to the value of the parameter *99.06* MOT NOM CURRENT (higher loads heat up the motor). The load curve level should be adjusted if the ambient temperature differs from the nominal value. The load curve is used by the motor thermal protection model when parameter *45.02* MOT TEMP SOURCE is set to *ESTIMATED*.	
			
	50…150%	Motor current above breakpoint.	1 = 1%

No.	Name/Value	Description	FbEq
45.07	ZERO SPEED LOAD	Defines the load curve together with parameters *45.06* MOT LOAD CURVE and *45.08* BREAK POINT. Defines the maximum motor load at zero speed of the load curve. A higher value can be used if the motor has an external motor fan to boost the cooling. See the motor manufacturer's recommendations. The value is given in percent of nominal motor current. The load curve is used by the motor thermal protection model when parameter *45.02* MOT TEMP SOURCE is set to *ESTIMATED*.	
	50…150%	Motor current at zero speed.	1 = 1%
45.08	BREAK POINT	Defines the load curve together with parameters *45.06* MOT LOAD CURVE and *45.07* ZERO SPEED LOAD. Defines the break point frequency of the load curve, ie, the point at which the motor load curve begins to decrease from the value of parameter *45.06* MOT LOAD CURVE to the value of parameter *45.07* ZERO SPEED LOAD. The load curve is used by the motor thermal protection model when parameter *45.02* MOT TEMP SOURCE is set to *ESTIMATED*.	
	0.01…500.00 Hz	Load curve breakpoint.	100 = 1 Hz
45.09	MOTNOM TEMP RISE	Defines the temperature rise of the motor when the motor is loaded with nominal current. See the motor manufacturer's recommendations. The temperature rise value is used by the motor thermal protection model when parameter *45.02* MOT TEMP SOURCE is set to *ESTIMATED*.	
	0…300 °C	Motor temperature rise.	1 = 1 °C



No.	Name/Value	Description	FbEq
45.10	MOT THERM TIME	Defines the thermal time constant for the motor thermal protection model (ie, the time within which the temperature has reached 63% of the nominal temperature). See the motor manufacturer's recommendations. The motor thermal protection model is used when parameter *45.02* MOT TEMP SOURCE is set to *ESTIMATED*.  	
	100…10000 s	Motor thermal time.	1 = 1 s

46 FAULT FUNCTIONS		Definition of drive behaviour upon a fault situation. An alarm or a fault message indicates abnormal drive status.	
46.01	EXTERNAL FAULT	Selects an interface for an external fault signal. 0 = External fault trip. 1 = No external fault.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
46.02	SPEED REF SAFE	Defines the fault speed. Used as a speed reference when an alarm occurs when parameter *13.12* AI SUPERVISION / *46.03* LOCAL CTRL LOSS / *50.02* COMM LOSS FUNC setting is *Spd ref safe*.	
	-30000…30000 rpm	Fault speed.	1 = 1 rpm
46.03	LOCAL CTRL LOSS	Selects how the drive reacts to a control panel or PC tool communication break.	
	No	No action.	0
	Fault	Drive trips on LOCAL CTRL LOSS fault.	1
	Spd ref safe	The drive generates alarm LOCAL CTRL LOSS and sets the speed to the speed defined by parameter *46.02* SPEED REF SAFE. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	2

No.	Name/Value	Description	FbEq
	Last speed	The drive generates alarm LOCAL CTRL LOSS and freezes the speed to the level the drive was operating at. The speed is determined by the average speed over the previous 10 seconds.  **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	3
46.04	MOT PHASE LOSS	Selects how the drive reacts when a motor phase loss is detected.	
	No	No action.	0
	Fault	Drive trips on MOTOR PHASE fault.	1
46.05	EARTH FAULT	Selects how the drive reacts when an earth fault or current unbalance is detected in the motor or the motor cable.	
	No	No action.	0
	Warning	Drive generates alarm EARTH FAULT.	1
	Fault	Drive trips on EARTH FAULT.	2
46.06	SUPPL PHS LOSS	Selects how the drive reacts when a supply phase loss is detected.	
	No	No reaction.	0
	Fault	Drive trips on SUPPLY PHASE fault.	1
46.07	STO DIAGNOSTIC	Selects how the drive reacts when it detects the absence of one or both Safe torque off (STO) signals. **Note:** This parameter is for supervision only. The Safe torque off function can activate even when this parameter is set to NO. For general information on the Safe torque off function, see the *Hardware manual* of the drive.	
	Fault	The drive trips on SAFE TORQUE OFF when one or both of the Safe torque off signals are lost.	1
	Alarm	Drive running: The drive trips on SAFE TORQUE OFF when one or both of the STO signals is lost. Drive stopped: The drive generates a SAFE TORQUE OFF alarm if both STO signals are absent. If only one of the signals is lost, the drive trips on STO1 LOST or STO2 LOST.	2
	No	Drive running: The drive trips on SAFE TORQUE OFF when one or both of the STO signals is lost. Drive stopped: No action if both STO signals are absent. If only one of the signals is lost, the drive trips on STO1 LOST or STO2 LOST.	3
	Only Alarm	The drive generates a SAFE TORQUE OFF alarm if both STO signals are absent. If only one of the signals is lost, the drive trips on STO1 LOST or STO2 LOST.	
46.08	CROSS CONNECTION	Selects how the drive reacts to an incorrect input power and motor cable connection (ie, an input power cable is connected to a drive motor connection).	
	No	No reaction.	0
	Fault	Drive trips on CABLE CROSS CON fault.	1

No.	Name/Value	Description	FbEq
46.80	FAULT RESET	Selects the source for the external fault reset signal. The signal resets the drive after a fault trip if the cause of the fault no longer exists. 1 = Fault reset.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
46.81	AUTORESET TRIALS	Defines the number of automatic fault resets the drive performs within the trial time defined with parameter *46.82* AUTORST TRL TIME. The faults to be reset are defined with parameter *46.84* AUTORESET SEL. For more information on the Automatic fault reset function, see section *Automatic fault reset* on page *95*.	
	0…5	The number of the automatic fault resets allowed.	1 = 1
46.82	AUTORST TRL TIME	Defines the time within which automatic fault resets are performed after the drive has tripped on a fault.	
	1.0…600.0 s	Trial time for automatic fault resets.	10 = 1 s
46.83	AUTORESET DELAY	Defines for how long the drive will wait after a fault before attempting an automatic fault reset.	
	0.0…120.0 s	Resetting delay.	10 = 1 s
46.84	AUTORESET SEL	Selects the faults that are automatically reset. The parameter is a 16-bit word with each bit corresponding to a fault type. Whenever a bit is set to 1, the corresponding fault is automatically reset. The bits of the binary number correspond to the following faults monitored by *05.02* LIFT FW.	

Bit	Fault
0	SPEED MATCH
1	TORQUE PROVE
2	BRAKE SLIP
3	INV OVERLOAD
4	MOTOR STALL
5…8	Not used
9	OVERCURRENT
10	OVERVOLTAGE
11	UNDERVOLTAGE
12	EXTERNAL FAULT
13…15	Not used

	0x0000…0xFFFF	The faults that are automatically reset.	1 = 1

No.	Name/Value	Description	FbEq
47 VOLTAGE CTRL		Settings for undervoltage control, supply voltage and the low voltage mode.	
47.02	UNDERVOLT CTRL	Enables the undervoltage control of the intermediate DC link. If the DC voltage drops due to an input power cutoff, the undervoltage controller will automatically decrease the motor torque in order to keep the voltage above the lower limit. By decreasing the motor torque, the inertia of the load will cause regeneration back to the drive, keeping the DC link charged and preventing an undervoltage trip until the motor coasts to stop. This will act as a power-loss ride-through functionality in systems with high inertia, such as a centrifuge or a fan.	
	Disable	Undervoltage control disabled.	0
	Enable	Undervoltage control enabled.	1
47.03	SUPPLVOLTAUTO-ID	Enables the auto-identification of the supply voltage. See also *Voltage control and trip limits* on page *125*.	
	Disable	Auto-identification of supply voltage disabled.	0
	Enable	Auto-identification of supply voltage enabled.	1
47.04	SUPPLY VOLTAGE	Defines the nominal supply voltage. Used if auto-identification of the supply voltage is not enabled by parameter *47.03* SUPPLVOLTAUTO-ID.	
	0.0…1000.0 V	Nominal supply voltage.	10 = 1 V
47.05	LOW VOLT MOD ENA	Selects a signal source that enables/disables the low voltage mode. 0 = Low voltage mode disabled, 1 = Low voltage mode enabled. See section *Rescue operation* on page *138*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
47.06	LOW VOLT DC MIN	Minimum DC voltage for the low voltage mode. See section *Rescue operation* on page *138*.	
	250.0…450.0 V	Minimum DC voltage for the low voltage mode.	1 = 1
47.07	LOW VOLT DC MAX	Maximum DC voltage for the low voltage mode. See section *Rescue operation* on page *138*. **Note:** The value of this parameter must be higher than (*47.06* LOW VOLT DC MIN + 50 V).	
	350.0…810.0 V	Maximum DC voltage for the low voltage mode.	1 = 1
47.08	EXT PU SUPPLY	Selects a signal source that enables/disables external power unit supply, used with low DC supply voltages such as a battery. 0 = External power unit supply disabled, 1 = External power unit supply enabled. See section *Rescue operation* on page *138*.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

48 BRAKE CHOPPER		Configuration of the internal brake chopper.	
48.01	BC ENABLE	Enables brake chopper control. **Note:** Before enabling brake chopper control, ensure that the brake resistor is installed. The drive has a built-in brake chopper.	
	Disable	Brake chopper control disabled.	0
	EnableTherm	Enable brake chopper control with resistor overload protection.	1

No.	Name/Value	Description	FbEq
	Enable	Enable brake chopper control without resistor overload protection. This setting can be used, for example, if the resistor is equipped with a thermal circuit breaker that is wired to stop the drive if the resistor overheats.	2
48.02	BC RUN-TIME ENA	Selects the source for quick run-time brake chopper control. 0 = Brake chopper IGBT pulses are cut off. 1 = Normal brake chopper IGBT modulation. The overvoltage control is automatically switched off. This parameter can be used to program the chopper control to function only when the drive is operating in the generating mode.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
48.03	BRTHERMTIMECONST	Defines the thermal time constant of the brake resistor for overload protection.	
	0…10000 s	Brake resistor thermal time constant.	1 = 1 s
48.04	BR POWER MAX CNT	Defines the maximum continuous braking power which will raise the resistor temperature to the maximum allowed value. The value is used in the overload protection.	
	0.0…10000.0 kW	Maximum continuous braking power.	10000 = 1 kW
48.05	R BR	Defines the resistance value of the brake resistor. The value is used for brake chopper protection.	
	0.1…1000.0 Ohm	Resistance.	10000 = 1 Ohm
48.06	BR TEMP FAULTLIM	Selects the fault limit for the brake resistor temperature supervision. The value is given in percent of the temperature the resistor reaches when loaded with the power defined by parameter *48.04* BR POWER MAX CNT. When the limit is exceeded, the drive trips on fault BR OVERHEAT.	
	0…150%	Resistor temperature fault limit.	1 = 1%
48.07	BR TEMP ALARMLIM	Selects the alarm limit for the brake resistor temperature supervision. The value is given in percent of the temperature the resistor reaches when loaded with the power defined by parameter *48.04* BR POWER MAX CNT. When the limit is exceeded, the drive generates alarm BR OVERHEAT.	
	0…150%	Resistor temperature alarm limit.	1 = 1%
50 FIELDBUS		Basic settings for fieldbus communication. These parameters need to be set only if a fieldbus adapter module is installed.	
50.01	FBA ENABLE	Enables communication between the drive and fieldbus adapter.	
	Disable	No communication.	0
	Enable	Communication between drive and fieldbus adapter enabled.	1
50.02	COMM LOSS FUNC	Selects how the drive reacts in a fieldbus communication break. The time delay is defined by parameter *50.03* COMM LOSS T OUT.	
	No	Communication break detection disabled.	0

No.	Name/Value	Description	FbEq
	Fault	Communication break detection active. Upon a communication break, the drive trips on fault FIELDBUS COMM and coasts to stop.	1
	Spd ref safe	Communication break detection active. Upon a communication break, the drive generates alarm FIELDBUS COMM and sets the speed to the value defined by parameter *46.02* SPEED REF SAFE. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	2
	Last speed	Communication break detection active. Upon a communication break, the drive generates alarm FIELDBUS COMM and freezes the speed to the level the drive was operating at. The speed is determined by the average speed over the previous 10 seconds. **WARNING**! Make sure that it is safe to continue operation in case of a communication break.	3
50.03	COMM LOSS T OUT	Defines the time delay before the action defined by parameter *50.02* COMM LOSS FUNC is taken. Time count starts when the link fails to update the message.	
	0.3…6553.5 s	Delay for fieldbus communication loss function.	10 = 1 s
50.04	FBA REF1 MODESEL	Selects the fieldbus reference FBA REF1 scaling and the actual value, which is sent to the fieldbus (FBA ACT1).	
	Raw data	No scaling (ie, data is transmitted without scaling). The source for the actual value, which is sent to the fieldbus, is selected by parameter *50.06* FBA ACT1 TR SRC.	0
	Torque	Fieldbus adapter module uses torque reference scaling. Torque reference scaling is defined by the used fieldbus profile (eg, with ABB Drives Profile, integer value 10000 corresponds to 100% torque value). Signal *01.06* TORQUE is sent to the fieldbus as an actual value. See the *User's manual* of the appropriate fieldbus adapter module.	1
	Speed	Fieldbus adapter module uses speed reference scaling. Speed reference scaling is defined by the used fieldbus profile (eg, with ABB Drives Profile, integer value 20000 corresponds to the value of parameter *25.02* SPEED SCALING). Signal *01.01* SPEED ACT is sent to the fieldbus as an actual value. See the *User's manual* of the appropriate fieldbus adapter module.	2
50.05	FBA REF2 MODESEL	Selects the fieldbus reference FBA REF2 scaling.	
		See parameter *50.04* FBA REF1 MODESEL.	
50.06	FBA ACT1 TR SRC	Selects the source for fieldbus actual value 1 when parameter *50.04* FBA REF1 MODESEL / *50.05* FBA REF2 MODESEL is set to *Raw data*.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
50.07	FBA ACT2 TR SRC	Selects the source for fieldbus actual value 2 when parameter *50.04* FBA REF1 MODESEL / *50.05* FBA REF2 MODESEL is set to *Raw data*.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	

No.	Name/Value	Description	FbEq
50.08	FBA SW B12 SRC	Selects the source for freely programmable fieldbus status word bit 28 (*02.13* FBA MAIN SW bit 28). Note that this functionality may not be supported by the fieldbus communication profile.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
50.09	FBA SW B13 SRC	Selects the source for freely programmable fieldbus status word bit 29 (*02.13* FBA MAIN SW bit 29). Note that this functionality may not be supported by the fieldbus communication profile.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
50.10	FBA SW B14 SRC	Selects the source for freely programmable fieldbus status word bit 30 (*02.13* FBA MAIN SW bit 30). Note that this functionality may not be supported by the fieldbus communication profile.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
50.11	FBA SW B15 SRC	Selects the source for freely programmable fieldbus status word bit 31 (*02.13* FBA MAIN SW bit 31). Note that this functionality may not be supported by the fieldbus communication profile.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

51 FBA SETTINGS		Further fieldbus communication configuration. These parameters need to be set only if a fieldbus adapter module is installed.	
51.01	FBA TYPE	Displays the fieldbus protocol on the basis of the adapter module installed.	
	(Fieldbus protocol)	Fieldbus adapter for the stated protocol installed.	
51.02	FBA PAR2	...	
51.26	FBA PAR26	Parameters *51.02*…*51.26* are adapter module-specific. For more information, see the *User's manual* of the fieldbus adapter module. Note that not all of these parameters are necessarily used.	1 = 1
51.27	BA PAR REFRESH	Validates any changed adapter module configuration parameter settings. After refreshing, the value reverts automatically to *DONE*. **Note:** This parameter cannot be changed while the drive is running.	
	DONE	Refreshing done.	0
	REFRESH	Refreshing.	1
51.28	PAR TABLE VER	Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive. In format xyz, where x = major revision number; y = minor revision number; z = correction number.	
	0x0000...0xFFFF	Parameter table revision.	1 = 1
51.29	DRIVE TYPE CODE	Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.	
	0...65535	Drive type code of fieldbus adapter module mapping file.	1 = 1

No.	Name/Value	Description	FbEq
51.30	MAPPING FILE VER	Displays the fieldbus adapter module mapping file revision stored in the memory of the drive. In hexadecimal format. Example: 0x107 = revision 1.07.	
	0...65535	Mapping file revision.	1 = 1
51.31	D2FBA COMM STA	Displays the status of the fieldbus adapter module communication.	
	IDLE	Adapter not configured.	0
	EXEC. INIT	Adapter initializing.	1
	TIME OUT	A timeout has occurred in the communication between the adapter and the drive.	2
	CONFIG ERROR	Adapter configuration error – the major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module (see par. *51.32* FBA COMM SW VER), or mapping file upload has failed more than three times.	3
	OFF-LINE	Adapter is off-line.	4
	ON-LINE	Adapter is on-line.	5
	RESET	Adapter is performing a hardware reset.	6
51.32	FBA COMM SW VER	Displays the common program revision of the adapter module. In format axyz, where a = major revision number, xy = minor revision numbers. z = correction letter. Example: 190A = revision 1.90A.	
	0x0000...0xFFFF	Common program revision of the adapter module	1 = 1
51.33	FBA APPL SW VER	Displays the application program revision of the adapter module. In format axyz, where: a = major revision number, xy = minor revision numbers, z = correction letter. Example: 190A = revision 1.90A.	
	0x0000...0xFFFF	Application program revision of the adapter module	1 = 1

52 FBA DATA IN		Selection of the data to be sent by the drive to the fieldbus controller. These parameters need to be set only if a fieldbus adapter module is installed.	
52.01	FBA DATA IN1	Selects data to be transferred from the drive to the fieldbus controller.	
	0	Not used.	0
	4	Status Word (16 bits).	4
	5	Actual value 1 (16 bits).	5
	6	Actual value 2 (16 bits).	6
	14	Status Word (32 bits).	14
	15	Actual value 1 (32 bits).	15
	16	Actual value 2 (32 bits).	16
	101…9999	Parameter index.	101…9999
52.02	FBA DATA IN2	...	...
52.12	FBA DATA IN12	See *52.01* FBA DATA IN1.	1 = 1

No.	Name/Value	Description	FbEq
53 FBA DATA OUT		Selection of the data to be sent by the fieldbus controller to the drive. These parameters need to be set only if a fieldbus adapter module is installed.	
53.01	FBA DATA OUT1	Selects data to be transferred from the fieldbus controller to the drive.	
	0	Not used.	0
	1	Control Word (16 bits).	1
	2	Reference REF1 (16 bits).	2
	3	Reference REF2 (16 bits).	3
	11	Control Word (32 bits).	11
	12	Reference REF1 (32 bits).	12
	13	Reference REF2 (32 bits).	13
	1001…9999	Parameter index.	1001…9999
53.02	FBA DATA OUT2	...	...
53.12	FBA DATAOUT12	See *53.01* DATA OUT1.	1 = 1
55 COMMUNICATION TOOL		Settings for an RS-485 network implemented using optional JPC-01 Network communication adapters. The network enables the use of a single PC or control panel to control multiple drives. For more information, see *JPC-01 network communication adapter user's manual* (3AUA0000072233 [English]).	
55.01	MDB STATION ID	Defines the ID of the drive on the RS-485 network. Each drive must have a dedicated ID number.	
	1…247	ID number. For drives, use a number between 1 and 31. (DriveStudio uses ID number 247.)	1 = 1
55.02	MDB BAUD RATE	Sets the baud rate on the network. **Note:** This parameter must be set to AUTO if a control panel is used as the controlling device.	
	Auto	Baud rate is determined automatically. At start-up, and after a communication break, the initial rate is 9600 baud.	0
	9600	9600 baud	1
	19200	19200 baud	2
	38400	38400 baud	3
	57600	57600 baud	4
55.03	MDB PARITY	Defines the use of parity bits. The same setting must be used in all on-line stations.	
	0…3	Number of parity bits.	1= 1
57 D2D COMMUNICATION		Drive-to-drive communication settings. See also section *Drive-to-drive link* on page *131*.	
57.01	LINK MODE	Activates the drive-to-drive connection.	
	Disabled	Drive-to-drive connection disabled.	0
	Follower	The drive is a follower on the drive-to-drive link.	1
	Master	The drive is the master on the drive-to-drive link. Only one drive can be the master at a time.	2

No.	Name/Value	Description	FbEq
57.02	COMM LOSS FUNC	Selects how the drive acts when an erroneous drive-to-drive configuration or a communication break is detected.	
	No	Protection inactive.	0
	Alarm	The drive generates an alarm.	1
	Fault	The drive trips on a fault.	2
57.03	NODE ADDRESS	Sets the node address for a follower drive. Each follower must have a dedicated node address. **Note**: If the drive is set to be the master on the drive-to-drive link, this parameter has no effect (the master is automatically assigned node address 0).	
	1…62	No address.	1 = 1
57.04	FOLLOWER MASK 1	On the master drive, selects the followers to be polled. If no response is received from a polled follower, the action selected by parameter *57.02* COMM LOSS FUNC is taken. The least significant bit represents follower with node address 1, while the most significant bit represents follower 31. When a bit is set to 1, the corresponding node address is polled. For example, followers 1 and 2 are polled when this parameter is set to the value of 0x3.	
	0x00000000… 0xFFFFFFFF	Follower mask 1.	1 = 1
57.05	FOLLOWER MASK 2	On the master drive, selects the followers to be polled. If no response is received from a polled follower, the action selected by parameter *57.02* COMM LOSS FUNC is taken. The least significant bit represents follower with node address 32, while the most significant bit represents follower 62. When a bit is set to 1, the corresponding node address is polled. For example, followers 32 and 33 are polled when this parameter is set to the value of 0x3.	
	0x00000000… 0xFFFFFFFF	Follower mask 2.	1 = 1
57.06	REF 1 SRC	Selects the source of D2D reference 1 sent to the followers. The parameter is effective on the master drive, as well as submasters (*57.03* NODE ADDRESS = *57.12* REF1 MC GROUP) in a multicast message chain (see parameter *57.11* REF 1 MSG TYPE). The default value is P.03.04, ie, *03.04* SPEEDREF RAMPED.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
57.07	REF 2 SRC	On the master drive, selects the source of D2D reference 2 broadcast to all followers. The default value is P.03.13, ie, *03.13* TORQ REF TO TC.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
57.08	FOLLOWER CW SRC	Selects the source of the D2D control word sent to the followers. The parameter is effective on the master drive, as well as submasters in a multicast message chain (see parameter *57.11* REF 1 MSG TYPE). The default value is P.02.18, ie, *02.18* D2D FOLLOWER CW.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
57.09	KERNEL SYNC MODE	Determines which signal the time levels of the drive are synchronised with. An offset can be defined by parameter *57.10* KERNEL SYNC OFFS if desired.	
	NoSync	No synchronisation.	0

No.	Name/Value	Description	FbEq
	D2DSync	If the drive is the master on a drive-to-drive link, it broadcasts a synchronisation signal to the follower(s). If the drive is a follower, it synchronises its firmware time levels to the signal received from the master.	1
	FBsync	The drive synchronises its firmware time levels to a synchronisation signal received through a fieldbus adapter.	2
	FBToD2DSync	If the drive is the master on a drive-to-drive link, it synchronises its firmware time levels to a synchronisation signal received from a fieldbus adapter, and broadcasts the signal on the drive-to-drive link. If the drive is a follower, this setting has no effect.	3
57.10	KERNEL SYNC OFFS	Defines an offset between the synchronisation signal received and the time levels of the drive. With a positive value, the drive time levels will lag behind the synchronisation signal; with a negative value, the drive time levels will lead.	
	-4.999…5.000 ms	Synchronisation offset.	1000 = 1 ms
57.11	REF 1 MSG TYPE	By default, in drive-to-drive communication, the master broadcasts the drive-to-drive control word and references 1 and 2 to all followers. This parameter enables multicasting, ie, sending the drive-to-drive control word and reference 1 to a certain drive or group of drives. The message can then be further relayed to another group of drives to form a multicast chain. In the master, as well as any submaster (ie, follower relaying the message to other followers), the sources for the control word and reference 1 are selected by parameters *57.08* FOLLOWER CW SRC and *57.06* REF 1 SRC respectively. **Note**: Reference 2 is broadcast to all followers.	
	Broadcast	The control word and reference 1 are sent by the master to all followers. If the master has this setting, the parameter has no effect in the followers.	0
	Ref1 MC Grps	The drive-to-drive control word and reference 1 are only sent to the drives in the multicast group specified by parameter *57.13* NEXT REF1 MC GRP. This setting can also used in submasters (followers in which parameters *57.03* NODE ADDRESS and *57.12* REF1 MC GROUP are set to the same value) to form a multicast chain.	1
57.12	REF1 MC GROUP	Selects the multicast group the drive belongs to. See parameter *57.11* REF 1 MSG TYPE.	
	0…62	Multicast group (0 = none).	1 = 1
57.13	NEXT REF1 MC GRP	Specifies the next multicast group of drives the multicast message is relayed to. See parameter *57.11* REF 1 MSG TYPE. This parameter is effective only in the master or in submasters (followers in which parameters *57.03* NODE ADDRESS and *57.12* REF1 MC GROUP are set to the same value).	
	0…62	Next multicast group in message chain.	1 = 1
57.14	NR REF1 MC GRPS	Sets the number of drives sending messages in the message chain. The value is typically equal to the number of multicast groups in the chain assuming that the last drive is NOT sending an acknowledgement to the master. See parameter *57.11* REF 1 MSG TYPE. **Note:** This parameter is only effective in the master.	
	1…62	Total number of links in multicast message chain.	1 = 1

No.	Name/Value	Description	FbEq
57.15	D2D COMM PORT	Defines the hardware to which the drive-to-drive link is connected. In special cases (such as harsh operating conditions), the galvanic isolation provided by the RS-485 interface of the FMBA module may make for more robust communication than the standard drive-to-drive connection.	
	on-board	Connector X5 on the JCU Control Unit is used.	0
	Slot 1	An FMBA module installed in JCU option slot 1 is used.	1
	Slot 2	An FMBA module installed in JCU option slot 2 is used.	2
	Slot 3	An FMBA module installed in JCU option slot 3 is used.	3

60 POS FEEDBACK		Configuration of drive position feedback.	
60.01	POS ACT SEL	Selects the source for the actual position value.	
	ENC1	Encoder 1. Inverted gear ratio is considered when the position control output (speed reference) is produced.	0
	ENC2	Encoder 2. Inverted gear ratio is considered when the position control output (speed reference) is produced.	1
60.02	POS AXIS MODE	Selects the positioning axis. **Note:** This parameter cannot be changed while the drive is running.	
	Linear	Linear motion.	0
	Rollover	Rotating motion.	1
60.03	LOAD GEAR MUL	Defines the numerator for the load encoder gear function. See also sections *Motor encoder gear* on page *133* and *Load encoder gear* on page *134*. $\frac{\text{60.03 LOAD GEAR MUL}}{\text{60.04 LOAD GEAR DIV}} = \frac{\text{Load speed}}{\text{Encoder 1/2 speed}}$	
	-2147483647 …2147483647	Numerator for load encoder gear.	1 = 1
60.04	LOAD GEAR DIV	Defines the denominator for the load encoder gear function. See parameter *60.03* LOAD GEAR MUL.	
	1…2147483647	Denominator for load encoder gear.	1 = 1
60.05	POS UNIT	Selects the unit and scaling for the position parameters. The scaling factor is equal to one revolution. **Note:** If translatory (m, inch) unit is selected, the range also depends on parameter *60.06* FEED CONST NUM and *60.07* FEED CONST DEN settings.	
	Revolution	Unit: revolution. Scaling factor: 1.	0
	Degree	Unit: degree. Scaling factor: 360.	1
	Meter	Unit: meter. Scaling factor: according to parameters *60.06* FEED CONST NUM and *60.07* FEED CONST DEN.	2
	Inch	Unit: inch. Scaling factor: according to parameters *60.06* FEED CONST NUM and *60.07* FEED CONST DEN.	3

No.	Name/Value	Description	FbEq
60.06	FEED CONST NUM	Defines, together with parameter *60.07* FEED CONST DEN, the feed constant for the position calculation: $\frac{\text{60.06 FEED CONST NUM}}{\text{60.07 FEED CONST DEN}}$ The feed constant converts rotational motion into translatory motion. The feed constant is the distance the load moves during one turn of the motor shaft (2pr), when linear positioning has been selected with *60.05* POS UNIT (ie, parameter is set to *Meter* or *Inch*). **Note:** Parameters *60.05* POS UNIT, *60.06* FEED CONST NUM and *60.07* FEED CONST DEN also affect the positioning parameters. If the feed constant is changed, positioning references are re-calculated and the limits are changed. However, the internal motor shaft references remain unchanged.	
	1…2147483647	Feed constant numerator.	1 = 1
60.07	FEED CONST DEN	Defines, together with parameter *60.06* FEED CONST NUM, the feed constant for the position calculation.	
	1…2147483647	Feed constant denominator.	1 = 1

80 LIFT SPEED REF		Parameters related to speed reference selection and scaling. See also section *Speed reference selection and scaling* on page *95*.	
80.01	NOMINAL SPEED	Defines the nominal speed reference used in the normal travel mode. See also parameter *25.02* SPEED SCALING.	
	0.0…25.00 m/s	Nominal speed.	100 = 1 m/s
80.02	GEAR RATIO	Defines the gear box ratio used in m/s to rpm conversions and vice versa.	
	0.001…1000.000	Gear box ratio.	1000 = 1
80.03	SHEAVE DIAMETER	Defines the sheave diameter of the lift system.	
	1…10000 mm	Sheave diameter in millimeters.	1 = 1 mm
80.04	ROPING RATIO	Defines the roping ratio of the lift system.	
	1…8	System roping ratio.	1 = 1
80.05	SPEED REF SEL1	Selects the source for speed reference selection pointer 1. The bit combination of parameters 80.05, *80.06* and *80.07* determines the speed reference when neither the evacuation mode nor the inspection mode is active.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
80.06	SPEED REF SEL2	Selects the source for speed reference selection pointer 2. The bit combination of parameters *80.05*, 80.06 and *80.07* determines the speed reference when neither the evacuation mode nor the inspection mode is active.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	

No.	Name/Value	Description	FbEq
80.07	SPEED REF SEL3	Selects the source for speed reference selection pointer 3. The bit combination of parameters *80.05*, *80.06* and 80.07 determines the speed reference when neither the evacuation mode nor the inspection mode is active.	
		Bit pointer: CONST or POINTER (See *Terms and abbreviations* on page *143*.)	
80.08	SPEED1	A factory-set zero speed reference (0 m/s) to be used when the bit combination of parameters *80.05*, *80.06* and *80.07* is 000. Can be used for stopping the lift in the normal travel mode. Cannot be set by the user.	
80.09	LEVELING SPEED	Defines the speed reference to be used during leveling, ie, when the bit combination of parameters *80.05*, *80.06* and *80.07* is 110. When the floor switch is hit, the drive decelerates to the leveling speed.	
	0.00…25.00 m/s	Leveling speed reference.	100 = 1 m/s
80.10	RELVL SPEED SEL	Selects the source of the speed reference to be used in the releveling mode. If the lift overshoots the floor level, it is driven back to the floor level using the releveling mode.	
	PAR 80.11	Parameter *80.11* RELEVELING SPEED selected as the source of the releveling speed reference.	0
	AI1 SCALED	AI1 signal (*02.05* AI1 SCALED) selected as the source of the releveling speed reference.	1
	AI2 SCALED	AI2 signal (*02.07* AI2 SCALED) selected as the source of the releveling speed reference.	2
80.11	RELEVELING SPEED	Defines the speed reference to be used in the releveling mode when selected as the source of parameter *80.10* RELVL SPEED SEL. Used when the bit combination of parameters *80.05*, *80.06* and *80.07* is 001.	
	0.00…25.00 m/s	Releveling speed reference.	100 = 1 m/s
80.12	MEDIUM SPEED	Defines the speed reference to be used in the normal travel mode when the bit combination of parameters *80.05*, *80.06* and *80.07* is 010. This is an additional speed reference which can be defined to be used instead of the nominal speed based on the floor distance.	
	0.00…25.00 m/s	Medium speed reference.	100 = 1 m/s
80.13	INSPECTION SPEED	Defines the speed reference to be used when the inspection mode is enabled with parameter *10.92* INSPECTION MODE. If the inspection mode is not in use, this speed reference can also be defined to be used in the normal travel mode when the bit combination of parameters *80.05*, *80.06* and *80.07* is 101.	
	0.00…25.00 m/s	Inspection speed reference.	100 = 1 m/s
80.14	EVACUATION SPEED	Defines the speed reference to be used when the evacuation mode is enabled with parameter *10.89* EVACUATION MODE.	
	0.00…25.00 m/s	Evacuation speed reference.	100 = 1 m/s
80.15	SPEED2	Defines the speed reference to be used in the normal travel mode when the bit combination of parameters *80.05*, *80.06* and *80.07* is 001. This is an additional speed reference which can be defined to be used instead of the nominal speed based on the floor distance.	
	0.00…25.00 m/s	Speed2.	100 = 1 m/s

No.	Name/Value	Description	FbEq
80.16	SPEED3	Defines the speed reference to be used in the normal travel mode when the bit combination of parameters *80.05*, *80.06* and *80.07* is 001. This is an additional speed reference which can be defined to be used instead of the nominal speed based on the floor distance.	
	0.00…25.00 m/s	Speed3.	100 = 1 m/s
80.17	OFF DLY SPD LIM	Defines the lift speed limit for activating the extended off-delay time periods defined with parameters *80.18* …*80.21*. The delay periods are used only when the lift speed is lower than this limit.	
	0.00…25.00 m/s	Off-delay speed limit.	100 = 1 m/s
80.18	SPEED2 OFF DLY	Defines the time period for extending the speed2 reference (parameter *80.15* SPEED2). Speed2 is used further for the duration of this time period, even if it was deactivated by the speed reference selection bits.	
	0.0…5.0 s	Speed2 off-delay.	10 = 1 s
80.19	MED SPD OFF DLY	Defines the time period for extending the medium speed reference (parameter *80.12* MEDIUM SPEED). The medium speed reference is used further for the duration of this time period, even if it was deactivated by the speed reference selection bits.	
	0.0…5.0 s	Medium speed off-delay.	10 = 1 s
80.20	NOM SPD OFF DLY	Defines the time period for extending the nominal speed reference (parameter *80.01* NOMINAL SPEED). The nominal speed reference is used further for the duration of this time period, even if it was deactivated by the speed reference selection bits.	
	0.0…5.0 s	Nominal speed off-delay.	10 = 1 s
80.21	SPEED3 OFF DLY	Defines the time period for extending the speed3 reference (parameter *80.16* SPEED3). Speed3 is used further for the duration of this time period, even if it was deactivated by the speed reference selection bits.	
	0.0…5.0 s	Speed3 off-delay.	10 = 1 s

81 LIFT SUPERVISION		Parameters related to speed match, inverter overload, motor stall and leveling overtime stop. See also section *Protection functions* on page *117*.	
81.01	INV OVERLOAD SEL	Defines the inverter limit bits to be monitored by the Inverter overload function. When the bit value = 1, the corresponding bits in signal *06.07* TORQ LIM STATUS are used for generating fault INV OVERLOAD. The drive trips on fault INV OVERLOAD if it exceeds any of the inverter limits while the motor is in the generating mode and generating more than 10% of the motor nominal power and running at an actual speed greater than 5% of the motor nominal speed, and the time delay defined with parameter *81.02* has elapsed. The inverter limit bits are: • Bit 0 MINIMUM TORQUE • Bit 1 MAXIMUM TORQUE • Bit 2 INTERNAL CURRENT • Bit 3 LOAD ANGLE • Bit 4 MOTOR PULLOUT	
	0x0000…0xFFFF	Inverter limit bit selection	1 = 1

No.	Name/Value	Description	FbEq
81.02	INV OVERLOAD DLY	Defines the time delay for generating fault INV OVERLOAD after the drive has exceeded any of the inverter limits defined with parameter *81.01* INV OVERLOAD SEL.	
	0.0…5.0 s	Time delay for generating fault INV OVERLOAD.	10 = 1 s
81.03	SPEED MATCH	Enables/disables the Speed match function.	
	DISABLED	Speed match function disabled.	0
	ENABLED	Speed match function enabled.	1
81.04	SPD STD DEV LVL	Defines the absolute speed deviation level for the steady state. See also parameter *81.06* SPEED MATCH DLY.	
	0.00…10.00 m/s	Steady state speed deviation level.	100 = 1 m/s
81.05	SPD RMP DEV LVL	Defines the absolute speed deviation level for the ramp state (during acceleration/deceleration). See also parameter *81.06* SPEED MATCH DLY.	
	0.00…10.00 m/s	Ramp state speed deviation level.	100 = 1 m/s
81.06	SPEED MATCH DLY	Defines the time delay for generating fault SPEED MATCH. The fault is generated when the speed error is higher than defined with parameter *81.04* SPD STD DEV LVL in the steady state or defined with parameter *81.05* SPD RMP DEV LVL in the ramp state, and the time delay defined with this parameter has elapsed.	
	0.0…10.0 s	Time delay for generating fault SPEED MATCH.	10 = 1 s
81.07	STALL TORQ MAX	Defines the maximum torque limit for generating fault MOTOR STALL. If the torque actual (*01.06* TORQUE) is greater than this value and the motor actual speed is lower than the value defined with parameter *81.09* STALL SPEED LIM, fault MOTOR STALL is generated after the period defined with parameter *81.10* STALL FAULT DLY.	
	0.0…250.0%	Maximum torque limit for generating fault MOTOR STALL.	10 = 1%
81.08	STALL TORQ MIN	Defines the minimum torque limit for generating fault MOTOR STALL. If the torque actual (*01.06* TORQUE) is smaller than this value and the motor actual speed is lower than the value defined with parameter *81.09* STALL SPEED LIM, fault MOTOR STALL is generated after the period defined with parameter *81.10* STALL FAULT DLY.	
	-250.0…0.0%	Minimum torque limit for generating fault MOTOR STALL.	10 = 1%
81.09	STALL SPEED LIM	Defines the speed limit for the Motor stall function. Fault MOTOR STALL is generated when the motor actual speed (*01.01* SPEED ACT) is lower than this value, the drive has exceeded the torque limits defined with parameters *81.07* STALL TORQ MAX and *81.08* STALL TORQ MIN, and the time delay defined with *81.10* STALL FAULT DLY has elapsed. The Motor stall function is enabled when the value of this parameter is > 0.	
	0.00…25.00 m/s	Speed limit for the Motor stall function.	100 = 1 m/s
81.10	STALL FAULT DLY	Defines the time delay for generating fault MOTOR STALL when the drive has exceeded the maximum or minimum torque limits defined with parameters *81.07* STALL TORQ MAX and *81.08* STALL TORQ MIN LIM.	
	0.0…5.0 s	Time delay for generating fault MOTOR STALL.	10 = 1 s

No.	Name/Value	Description	FbEq
81.11	LVL MAX TIME	Defines the maximum time the drive can run at the leveling speed. If the stop command has not been received before this time period elapses, the Leveling overtime stop function activates an emergency stop command (OFF3). The function is enabled when the value of this parameter is > 0.	
	0.0…25.0 s	Maximum leveling time for the Leveling overtime stop function.	10 = 1 s
82 TORQUE COMP		Actual load, friction and inertia compensation torque calculations. See also sections *Actual load measurement* on page *108* and *Torque compensation* on page *111*.	
82.01	STATIC FRIC TRQ	Defines the static friction of the system in percentage of the motor nominal torque.	
	0.00…200.00 %	Static friction in percentage of the motor nominal torque.	100 = 1%
82.02	DYN FRIC SPEED1	Defines the value for speed point 1 used for calculating the dynamic friction (see the graph in section *Dynamic friction compensation* on page *112*).	
	0.00…25.00 m/s	Speed point 1.	100 = 1 m/s
82.03	DYN FRIC SPEED2	Defines the value for speed point 2 used for calculating the dynamic friction. See parameter *82.02* DYN FRIC SPEED1.	
	0.00…25.00 m/s	Speed point 2.	100 = 1 m/s
82.04	DYN FRIC SPEED3	Defines the value for speed point 3 used for calculating the dynamic friction. See parameter *82.02* DYN FRIC SPEED1.	
	0.00…25.00 m/s	Speed point 3.	100 = 1 m/s
82.05	DYN FRIC TORQ1	Defines the value for friction torque 1 used for calculating the dynamic friction.	
	0.00…100.00 %	Friction torque 1.	100 = 1%
82.06	DYN FRIC TORQ2	Defines the value for friction torque 2 used for calculating the dynamic friction.	
	0.00…100.00 %	Friction torque 2.	100 = 1%
82.07	DYN FRIC TORQ3	Defines the value for friction torque 3 used for calculating the dynamic friction.	
	0.00…100.00 %	Friction torque 3.	100 = 1%
82.08	LOAD WEIGHT SEL	Selects the source for the load weight signal. The source can be either *02.05* AI1 SCALED or *02.07* AI2 SCALED.	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
82.09	INERTIA COMP EN	Enables/disables the Inertia compensation function.	
	DISABLED	Inertia compensation function is disabled.	0
	ENABLED	Inertia compensation function is enabled.	1
82.10	MOMENT OF INERT	Defines the lift system's or lift load's moment of inertia calculated during start-up.	
	0.0000… 32767.0000 kgm^2	Moment of inertia.	10000 = 1 kgm^2
82.11	WEIGHT NO LOAD	Defines the value of the load weight signal at no load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08* LOAD WEIGHT SEL).	
	0.00…32767.00	Load weight signal at no load.	100 = 1

No.	Name/Value	Description	FbEq
82.12	WEIGHT HALF LOAD	Defines the value of the load weight signal at half load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08* LOAD WEIGHT SEL).	
	0.00…32767.00	Load weight signal at half load.	100 = 1
82.13	WEIGHT FULL LOAD	Defines the value of the load weight signal at full load (*02.05* AI1 SCALED or *02.07* AI2 SCALED, as selected by parameter *82.08* LOAD WEIGHT SEL).	
	0.00…32767.00	Load weight signal at full load.	100 = 1
82.14	TORQUE NO LOAD	Defines the torque used when the lift is running with no load (*01.06* TORQUE).	
	-300.00…300.00%	No load torque.	100 = 1%
82.15	TORQUE HALF LOAD	Defines the torque used when the lift is running with half load (*01.06* TORQUE).	
	-300.00…300.00%	Half load torque.	100 = 1%
82.16	TORQUE FULL LOAD	Defines the torque used when the lift is running with full load (*01.06* TORQUE).	
	-300.00…300.00%	Full load torque.	100 = 1%

83 SMART SLOWDOWN		Parameters related to the Smart slowdown function. See also section *Smart slowdown* on page *103*.	
83.01	SMART SLOWDN SEL	Enables/disables the Smart slowdown function.	
	NOT SEL	Smart slowdown function is not enabled.	0
	ESTIMATED	Smart slowdown function is enabled with the estimated speed. The distance traveled is calculated by integrating the actual speed.	1
	ENCODER	Smart slowdown function is enabled with an encoder. The distance traveled is based on the actual position of the encoder (*01.12* POS ACT).	2
83.02	LV STOP SWC DIST	Defines the distance between leveling and stopping switches.	
	0.00…100.00 m	Distance between leveling and stopping switches.	100 = 1 m
83.03	SAFETY MARGIN	Defines what percentage of parameter *83.02* is used as the safety distance when the Smart slowdown function is enabled. Safety distance is the distance which must be run with the steady state leveling speed.	
	0.00…100.00%	Safety margin in percentages.	100 = 1%

90 ENC MODULE SEL		Settings for encoder activation, emulation, TTL echo, and communication fault detection.	
90.01	ENCODER 1 SEL	Activates the communication to optional encoder/resolver interface 1. **Note:** It is recommended that encoder interface 1 is used whenever possible, since the data received through that interface is fresher than the data received through interface 2. On the other hand, when position values used in emulation are determined by the drive software, the use of encoder interface 2 is recommended as the values are transmitted earlier through interface 2 than through interface 1.	
	None	Inactive.	0

No.	Name/Value	Description	FbEq
	FEN-01 TTL+	Communication active. Module type: FEN-01 TTL Encoder interface Module. Input: TTL encoder input with commutation support (X32). See parameter group *93 PULSE ENC CONF*.	1
	FEN-01 TTL	Communication active. Module type: FEN-01 TTL Encoder interface Module. Input: TTL encoder input (X31). See parameter group *93 PULSE ENC CONF*.	2
	FEN-11 ABS	Communication active. Module type: FEN-11 Absolute Encoder Interface. Input: Absolute encoder input (X42). See parameter group *91 ABSOL ENC CONF*.	3
	FEN-11 TTL	Communication active. Module type: FEN-11 Absolute Encoder Interface. Input: TTL encoder input (X41). See parameter group *93 PULSE ENC CONF*.	4
	FEN-21 RES	Communication active. Module type: FEN-21 Resolver Interface. Input: Resolver input (X52). See parameter group *92 RESOLVER CONF*.	5
	FEN-21 TTL	Communication active. Module type: FEN-21 Resolver Interface. Input: TTL encoder input (X51). See parameter group *93 PULSE ENC CONF*.	6
	FEN-31 HTL	Communication active. Module type: FEN-31 HTL Encoder Interface. Input: HTL encoder input (X82). See parameter group *93 PULSE ENC CONF*.	7
90.02	ENCODER 2 SEL	Activates the communication to the optional encoder/resolver interface 2. **Note:** The counting of full shaft revolutions is not supported for encoder 2.	
		For selections, see parameter *90.01* ENCODER 1 SEL.	1 = 1
90.03	EMUL MODE SEL	Enables encoder emulation and selects the position value and the TTL output used in the emulation process. In encoder emulation, a calculated position difference is transformed to a corresponding number of TTL pulses to be transmitted via the TTL output. The position difference is the difference between the latest and the previous position values. The position value used in emulation can be either a position determined by the drive software or a position measured by an encoder. If the drive software position is used, the source for the used position is selected by parameter *93.22* EMUL POS REF. Because the software causes a delay, it is recommended that the actual position is always taken from an encoder. Drive software is recommended to be used only with position reference emulation. Encoder emulation can be used to increase or decrease the pulse number when TTL encoder data is transmitted via the TTL output, eg, to another drive. If the pulse number requires no alternation, use encoder echo for data transformation. See parameter *90.04* TTL ECHO SEL. **Note:** If encoder emulation and echo are enabled for the same FEN-xx TTL output, the emulation overrides the echo. If an encoder input is selected as the emulation source, the corresponding selection must be activated either with parameter *90.01* ENCODER 1 SEL or *90.02* ENCODER 2 SEL. The TTL encoder pulse number used in emulation must be defined by parameter *93.21* EMUL PULSE NR. See parameter group *93 PULSE ENC CONF*.	
	Disabled	Emulation disabled.	0

No.	Name/Value	Description	FbEq
	FEN-01 SWref	Module type: FEN-01 TTL Encoder interface Module. Emulation: Drive software position (source selected by par. *93.22* EMUL POS REF) is emulated to FEN-01 TTL output.	1
	FEN-01 TTL+	Module type: FEN-01 TTL Encoder interface Module. Emulation: FEN-01 TTL encoder input (X32) position is emulated to FEN-01 TTL output.	2
	FEN-01 TTL	Module type: FEN-01 TTL Encoder interface Module. Emulation: FEN-01 TTL encoder input (X31) position is emulated to FEN-01 TTL output.	3
	FEN-11 SWref	Module type: FEN-11 Absolute Encoder Interface. Emulation: Drive software position (source selected by par. *93.22* EMUL POS REF) is emulated to FEN-11 TTL output.	4
	FEN-11 ABS	Module type: FEN-11 Absolute Encoder Interface. Emulation: FEN-11 absolute encoder input (X42) position is emulated to FEN-11 TTL output.	5
	FEN-11 TTL	Module type: FEN-11 Absolute Encoder Interface. Emulation: FEN-11 TTL encoder input (X41) position is emulated to FEN-11 TTL output.	6
	FEN-21 SWref	Module type: FEN-21 Resolver Interface. Emulation: Drive software position (source selected by par. *93.22* EMUL POS REF) is emulated to FEN-21 TTL output.	7
	FEN-21 RES	Module type: FEN-21 Resolver Interface. Emulation: FEN-21 resolver input (X52) position is emulated to FEN-21 TTL output.	8
	FEN-21 TTL	Module type: FEN-21 Resolver Interface. Emulation: FEN-21 TTL encoder input (X51) position is emulated to FEN-21 TTL output.	9
	FEN-31 SWref	Module type: FEN-31 HTL Encoder Interface. Emulation: Drive software position (source selected by par. *93.22* EMUL POS REF) is emulated to FEN-31 TTL output.	10
	FEN-31 HTL	Module type: FEN-31 HTL Encoder Interface. Emulation: FEN-31 HTL encoder input (X82) position is emulated to FEN-31 TTL output.	11
90.04	TTL ECHO SEL	Enables and selects the interface for the TTL encoder signal echo. **Note:** If encoder emulation and echo are enabled for the same FEN-xx TTL output, the emulation overrides the echo.	
	Disabled	TTL echo disabled.	0
	FEN-01 TTL+	Module type: FEN-01 TTL Encoder Interface. Echo: TTL encoder input (X32) pulses are echoed to the TTL output.	1
	FEN-01 TTL	Module type: FEN-01 TTL Encoder Interface. Echo: TTL encoder input (X31) pulses are echoed to the TTL output.	2
	FEN-11 TTL	Module type: FEN-11 Absolute Encoder Interface. Echo: TTL encoder input (X41) pulses are echoed to the TTL output.	3
	FEN-21 TTL	Module type: FEN-21 Resolver Interface. Echo: TTL encoder input (X51) pulses are echoed to the TTL output.	4
	FEN-31 HTL	Module type: FEN-31 HTL Encoder Interface. Echo: HTL encoder input (X82) pulses are echoed to the TTL output.	5

No.	Name/Value	Description	FbEq
90.05	ENC CABLE FAULT	Selects the action in case an encoder cable fault is detected by the FEN-xx encoder interface. **Notes:** • At the time of printing, this functionality is only available with the absolute encoder input of the FEN-11 based on sine/cosine incremental signals, and with the HTL input of the FEN-31. • When the encoder input is used for speed feedback (see *22.01* SPEED FB SEL), this parameter may be overridden by parameter *22.09* SPEED FB FAULT.	
	No	Cable fault detection inactive.	0
	Fault	The drive trips on an ENCODER 1/2 CABLE fault.	1
	Warning	The drive generates an ENCODER 1/2 CABLE warning. This is the recommended setting if the maximum pulse frequency of sine/cosine incremental signals exceeds 100 kHz; at high frequencies, the signals may attenuate enough to invoke the function. The maximum pulse frequency can be calculated as follows: $\frac{\text{Pulses per revolution (par. 91.01)} \times \text{Maximum speed in rpm}}{60}$	2
90.10	ENC PAR REFRESH	Setting this parameter to 1 forces a reconfiguration of the FEN-xx interfaces, which is needed for any parameter changes in groups 90…93 to take effect. **Note:** This parameter cannot be changed while the drive is running.	
	Done	Refreshing done.	0
	Configure	Reconfigure. The value will automatically revert to DONE.	1

91 ABSOL ENC CONF		Absolute encoder configuration; used when parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL is set to *FEN-11 ABS*.	
91.01	SINE COSINE NR	Defines the number of sine/cosine wave cycles within one revolution. **Note:** This parameter does not need to be set when EnDat or SSI encoders are used in the continuous mode. See parameter *91.25* SSI MODE / *91.30* ENDAT MODE.	
	0…65535	Number of sine/cosine wave cycles within one revolution.	1 = 1
91.02	ABS ENC INTERF	Selects the source for the encoder absolute position.	
	None	Not selected.	0
	Commut sig	Commutation signals.	1
	Endat	Serial interface: EnDat encoder.	2
	Hiperface	Serial interface: HIPERFACE encoder.	3
	SSI	Serial interface: SSI encoder.	4
	Tamag. 17/33B	Serial interface: Tamagawa 17/33-bit encoder.	5

No.	Name/Value	Description	FbEq
91.03	REV COUNT BITS	Defines the number of bits used in revolution counting with multiturn encoders. Used when parameter *91.02* ABS ENC INTERF is set to *Endat*, *Hiperface*, or *SSI*. When parameter *91.02* is set to *Tamag. 17/33B*, setting this parameter to a non-zero value activates multiturn data requesting.	
	0…32	Number of bits used in revolution count. Eg, 4096 revolutions => 12 bits.	1 = 1
91.04	POS DATA BITS	Defines the number of bits used within one revolution when parameter *91.02* ABS ENC INTERF is set to *Endat*, *Hiperface*, or *SSI*. When parameter *91.02* is set to *Tamag. 17/33B*, this parameter is internally set to 17.	
	0…32	Number of bits used within one revolution. Eg, 32768 positions per revolution => 15 bits.	1 = 1
91.05	REFMARK ENA	Enables the encoder zero pulse for the absolute encoder input (X42) of an FEN-11 module (if present). Zero pulse can be used for position latching. **Note:** With serial interfaces (that is, when parameter *91.02* ABS ENC INTERF is set to *Endat*, *Hiperface*, *SSI* or *Tamag. 17/33B*), the zero pulse does not exist.	
	FALSE	Zero pulse disabled.	0
	TRUE	Zero pulse enabled.	1
91.10	HIPERFACE PARITY	Defines the use of parity and stop bit(s) for HIPERFACE encoder (ie, when parameter *91.02* ABS ENC INTERF is set to *Hiperface*). Typically this parameter does not need to be set.	
	Odd	Odd parity indication bit, one stop bit.	0
	Even	Even parity indication bit, one stop bit.	1
91.11	HIPERF BAUDRATE	Defines the transfer rate of the link for HIPERFACE encoder (ie, when parameter *91.02* ABS ENC INTERF is set to *Hiperface*). Typically this parameter does not need to be set.	
	4800	4800 bits/s.	0
	9600	9600 bits/s.	1
	19200	19200 bits/s.	2
	38400	38400 bits/s.	3
91.12	HIPERF NODE ADDR	Defines the node address for HIPERFACE encoder (ie, when parameter *91.02* ABS ENC INTERF is set to *Hiperface*). Typically this parameter does not need to be set.	
	0…255	HIPERFACE encoder node address.	1 = 1
91.20	SSI CLOCK CYCLES	Defines the length of the SSI message. The length is defined as the number of clock cycles. The number of cycles can be calculated by adding 1 to the number of the bits in an SSI message frame. Used with SSI encoders, ie, when parameter *91.02* ABS ENC INTERF is set to *SSI*.	
	2…127	SSI message length.	1 = 1
91.21	SSI POSITION MSB	Defines the location of the MSB (main significant bit) of the position data within an SSI message. Used with SSI encoders, ie, when parameter *91.02* ABS ENC INTERF is set to *SSI*.	
	1…126	Position data MSB location (bit number).	1 = 1

No.	Name/Value	Description	FbEq
91.22	SSI REVOL MSB	Defines the location of the MSB (main significant bit) of the revolution count within an SSI message. Used with SSI encoders, ie, when parameter *91.02* ABS ENC INTERF is set to *SSI*.	
	1…126	Revolution count MSB location (bit number).	1 = 1
91.23	SSI DATA FORMAT	Selects the data format for an SSI encoder (ie, when parameter *91.02* ABS ENC INTERF is set to *SSI*).	
	binary	Binary code.	0
	gray	Gray code.	1
91.24	SSI BAUD RATE	Selects the baud rate for an SSI encoder (ie, when parameter *91.02* ABS ENC INTERF is set to *SSI*.	
	10 kbit/s	10 kbit/s.	0
	50 kbit/s	50 kbit/s.	1
	100 kbit/s	100 kbit/s.	2
	200 kbit/s	200 kbit/s.	3
	500 kbit/s	500 kbit/s.	4
	1000 kbit/s	1000 kbit/s.	5
91.25	SSI MODE	Selects the SSI encoder mode. **Note:** Parameter needs to be set only when an SSI encoder is used in the continuous mode, ie, SSI encoder without incremental sin/cos signals (supported only as encoder 1). The SSI encoder is selected by setting parameter *91.02* ABS ENC INTERF to *SSI*.	
	Initial pos.	Single position transfer mode (initial position)	0
	Continuous	Continuous position transfer mode.	1
91.26	SSI TRANSMIT CYC	Selects the transmission cycle for an SSI encoder. **Note:** This parameter needs to be set only when an SSI encoder is used in the continuous mode, ie, SSI encoder without incremental sin/cos signals (supported only as encoder 1). The SSI encoder is selected by setting parameter *91.02* ABS ENC INTERF to *SSI*.	
	50 us	50 µs.	0
	100 us	100 µs.	1
	200 us	200 µs.	2
	500 us	500 µs.	3
	1 ms	1 ms.	4
	2 ms	2 ms.	5
91.27	SSI ZERO PHASE	Defines the phase angle within one sine/cosine signal period that corresponds to the value of zero on the SSI serial link data. The parameter is used to adjust the synchronization of the SSI position data and the position based on sine/cosine incremental signals. Incorrect synchronization may cause an error of ±1 incremental period. **Note:** This parameter needs to be set only when an SSI encoder with sine/cosine incremental signals is used in the initial position mode.	
	315–45 deg	315–45 degrees.	0
	45–135 deg	45–135 degrees.	1

No.	Name/Value	Description	FbEq
	135–225 deg	135–225 degrees.	2
	225–315 deg	225–315 degrees.	3
91.30	ENDAT MODE	Selects the EnDat encoder mode. **Note:** This parameter needs to be set only when an EnDat encoder is used in the continuous mode, ie, EnDat encoder without incremental sin/cos signals (supported only as encoder 1). The EnDat encoder is selected by setting parameter *91.02* ABS ENC INTERF to *Endat*.	
	Initial pos.	Single position transfer mode (initial position).	0
	Continuous	Continuous position data transfer mode.	1
91.31	ENDAT MAX CALC	Selects the maximum encoder calculation time for an EnDat encoder. **Note:** This parameter needs to be set only when an EnDat encoder is used in the continuous mode, ie, EnDat encoder without incremental sin/cos signals (supported only as encoder 1). The EnDat encoder is selected by setting parameter *91.02* ABS ENC INTERF to *Endat*.	
	10 us	10 µs.	0
	100 us	100 µs.	1
	1 ms	1 ms.	2
	50 ms	50 ms.	3

92 RESOLVER CONF		Resolver configuration; used when parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL is set to *FEN-21 RES*.	
92.01	RESOLV POLEPAIRS	Selects the number of pole pairs.	
	1…32	Number of pole pairs.	1 = 1
92.02	EXC SIGNAL AMPL	Defines the amplitude of the excitation signal.	
	4.0…12.0 Vrms	Excitation signal amplitude.	10 = 1 Vrms
92.03	EXC SIGNAL FREQ	Defines the frequency of the excitation signal.	
	1…20 kHz	Excitation signal frequency.	1 = 1 kHz

93 PULSE ENC CONF		TTL/HTL input and TTL output configuration.	
93.01	ENC1 PULSE NR	Defines the pulse number per revolution for encoder 1.	
	0…65535	Pulses per revolution for encoder 1.	1 = 1
93.02	ENC1 TYPE	Selects the type of encoder 1.	
	Quadrature	Quadrature encoder (two channels, channels A and B).	0
	single track	Single track encoder (one channel, channel A).	1
93.03	ENC1 SP CALCMODE	Selects the speed calculation mode for encoder 1. *When the single track mode has been selected by parameter *93.02* ENC1 TYPE, the speed is always positive.	
	A&B all	Channels A and B: Rising and falling edges are used for speed calculation. Channel B: Defines the direction of rotation. * **Note:** When the single track mode has been selected by parameter *93.02* ENC1 TYPE, setting 0 acts like setting 1.	0

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>FbEq</th></tr>
<tr><td></td><td>A all</td><td>Channel A: Rising and falling edges are used for speed calculation. Channel B: Defines the direction of rotation. *</td><td>1</td></tr>
<tr><td></td><td>A rising</td><td>Channel A: Rising edges are used for speed calculation. Channel B: Defines the direction of rotation. *</td><td>2</td></tr>
<tr><td></td><td>A falling</td><td>Channel A: Falling edges are used for speed calculation. Channel B: Defines the direction of rotation. *</td><td>3</td></tr>
<tr><td></td><td>auto rising
auto falling</td><td>Used mode (1, 2 or 3) is changed automatically depending on the pulse frequency according to the following table:
<table><tr><th>93.03 = 4</th><th>93.03 = 5</th><th rowspan="2">Pulse frequency of the channel(s)</th></tr><tr><th colspan="2">Used mode</th></tr><tr><td>0</td><td>0</td><td>< 2442 Hz</td></tr><tr><td>1</td><td>1</td><td>2442…4884 Hz</td></tr><tr><td>2</td><td>3</td><td>> 4884 Hz</td></tr></table></td><td>4
5</td></tr>
<tr><td>93.04</td><td>ENC1 POS EST ENA</td><td>Selects whether position estimation is used with encoder 1 to increase position data resolution or not.</td><td></td></tr>
<tr><td></td><td>FALSE</td><td>Measured position (Resolution: 4 x pulses per revolution for quadrature encoders, 2 x pulses per revolution for single track encoders.)</td><td>0</td></tr>
<tr><td></td><td>TRUE</td><td>Estimated position. (Uses position extrapolation. Extrapolated at the time of data request.)</td><td>1</td></tr>
<tr><td>93.05</td><td>ENC1 SP EST ENA</td><td>Selects whether calculated or estimated speed is used with encoder 1.</td><td></td></tr>
<tr><td></td><td>FALSE</td><td>Last calculated speed (calculation interval is 62.5 µs…4 ms).</td><td>0</td></tr>
<tr><td></td><td>TRUE</td><td>Estimated speed (estimated at the time of data request) Estimation increases the speed ripple in steady state operation, but improves the dynamics.</td><td>1</td></tr>
<tr><td>93.06</td><td>ENC1 OSC LIM</td><td>Activates transient filter for encoder 1. Changes of direction of rotation are ignored above the selected pulse frequency.</td><td></td></tr>
<tr><td></td><td>4880Hz</td><td>Change in rotation of direction allowed below 4880 Hz.</td><td>0</td></tr>
<tr><td></td><td>2440Hz</td><td>Change in rotation of direction allowed below 2440 Hz.</td><td>1</td></tr>
<tr><td></td><td>1220Hz</td><td>Change in rotation of direction allowed below 1220 Hz.</td><td>2</td></tr>
<tr><td></td><td>Disabled</td><td>Change in rotation of direction allowed at any pulse frequency.</td><td>3</td></tr>
<tr><td>93.11</td><td>EN2 PULSE NR</td><td>Defines the pulse number per revolution for encoder 2.</td><td></td></tr>
<tr><td></td><td>0…65535</td><td>Pulses per revolution for encoder 2.</td><td>1 = 1</td></tr>
<tr><td>93.12</td><td>ENC2 TYPE</td><td>Selects the type of encoder 2.</td><td></td></tr>
<tr><td></td><td></td><td>For selections, see parameter 93.02 ENC1 TYPE.</td><td></td></tr>
<tr><td>93.13</td><td>ENC2 SP CALCMODE</td><td>Selects the speed calculation mode for encoder 2.</td><td></td></tr>
<tr><td></td><td></td><td>For selections, see parameter 93.03 ENC1 SP CALCMODE.</td><td></td></tr>
<tr><td>93.14</td><td>ENC2 POS EST ENA</td><td>Selects whether measured or estimated position is used with encoder 2.</td><td></td></tr>
<tr><td></td><td></td><td>For selections, see parameter 93.04 ENC1 POS EST ENA.</td><td></td></tr>
<tr><td>93.15</td><td>NC2 SP EST ENA</td><td>Selects whether calculated or estimated speed is used with encoder 2.</td><td></td></tr>
<tr><td></td><td></td><td>For selections, see parameter 93.05 ENC1 SP EST ENA.</td><td></td></tr>
</table>

No.	Name/Value	Description	FbEq
93.16	ENC2 OSC LIM	Activates transient filter for encoder 2. Changes of direction of rotation are ignored above the selected pulse frequency.	
		For selections, see parameter *93.06* ENC1 OSC LIM.	
93.21	EMUL PULSE NR	Defines the number of TTL pulses per revolution used in encoder emulation. Encoder emulation is enabled by parameter *90.03* EMUL MODE SEL.	
	0…65535	TTL pulses used in encoder emulation.	1 = 1
93.22	EMUL POS REF	Selects the source for the position value used in encoder emulation when parameter *90.03* EMUL MODE SEL is set to *FEN-01 SWref*, *FEN-11 SWref*, *FEN-21 SWref* or *FEN-31 SWref*. See parameter group *90 ENC MODULE SEL*. The source can be any actual or reference position value (except *01.09* ENCODER 1 POS and *01.11* ENCODER 2 POS).	
		Value pointer (See *Terms and abbreviations* on page *143*.)	
93.23	EMUL POS OFFSET	Defines the zero point for emulated position in relation of the zero point of the input position (within one revolution). The input position is selected by parameter *90.03* EMUL MODE SEL. For example, if the offset is 0, an emulated zero pulse is generated each time the input position moves across 0. With an offset of 0.5, an emulated zero pulse is generated each time the input position (within one revolution) moves across 0.5.	
	0.00000 …0.99998 rev	Emulated zero pulse position offset.	100000 = 1 rev

95 HW CONFIGURATION		Miscellaneous hardware-related settings.	
95.01	CTRL UNIT SUPPLY	Defines the manner in which the drive control unit is powered.	
	Internal 24V	The drive control unit is powered from the drive power unit it is mounted on.	0
	External 24V	The drive control unit is powered from an external power supply.	1
95.02	EXTERNAL CHOKE	Defines if the drive is equipped with an AC choke or not.	
	NO	The drive is not equipped with an AC choke.	0
	YES	The drive is equipped with an AC choke.	1

No.	Name/Value	Description	FbEq
97 USER MOTOR PAR		User adjustment of motor model values estimated during ID run. The values can be entered in either “per unit” or SI.	
97.01	USE GIVEN PARAMS	Activates the motor model parameters *97.02*…*97.14* and the rotor angle offset parameter *97.20*. **Notes:** • The parameter value is automatically set to zero when ID run is selected by parameter *99.13* IDRUN MODE. The values of parameters *97.02*…*97.14* are updated according to the motor characteristics identified during the ID run. • This parameter cannot be changed while the drive is running.	
	NoUserPars	Parameters *97.02*…*97.14* inactive.	0
	UserMotPars	The values of parameters *97.02*…*97.14* are used in the motor model.	1
	UserPosOffs	The value of parameter *97.20* is used as the rotor angle offset. Parameters *97.02*…*97.14* are inactive.	
	AllUserPars	The values of parameters *97.02*…*97.14* are used in the motor model, and the value of parameter *97.20* is used as the rotor angle offset.	
97.02	RS USER	Defines the stator resistance R_S of the motor model.	
	0.00000…0.50000 p.u	Stator resistance.	100000 = 1 p.u
97.03	RR USER	Defines the rotor resistance R_R of the motor model. **Note:** This parameter is valid only for asynchronous motors.	
	0.00000…0.50000 p.u	Rotor resistance.	100000 = 1 p.u
97.04	LM USER	Defines the main inductance L_M of the motor model. **Note:** This parameter is valid only for asynchronous motors.	
	0.00000…10.00000 p.u	Main inductance.	100000 = 1 p.u
97.05	SIGMAL USER	Defines the leakage inductance σL_S. **Note:** This parameter is valid only for asynchronous motors.	
	0.00000…10.00000 p.u	Leakage inductance.	100000 = 1 p.u
97.06	LD USER	Defines the direct axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	
	0.00000…10.00000 p.u	Direct axis (synchronous) inductance.	100000 = 1 p.u
97.07	LQ USER	Defines the quadrature axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	
	0.00000…10.00000 p.u	Quadrature axis (synchronous) inductance.	100000 = 1 p.u
97.08	PM FLUX USER	Defines the permanent magnet flux. **Note:** This parameter is valid only for permanent magnet motors.	
	0.00000…2.00000 p.u	Permanent magnet flux.	100000 = 1 p.u

No.	Name/Value	Description	FbEq
97.09	RS USER SI	Defines the stator resistance R_S of the motor model.	
	0.00000… 100.00000 Ohm	Stator resistance.	100000 = 1 Ohm
97.10	RR USER SI	Defines the rotor resistance R_R of the motor model. **Note:** This parameter is valid only for asynchronous motors.	
	0.00000 …100.00000 Ohm	Rotor resistance.	100000 = 1 Ohm
97.11	LM USER SI	Defines the main inductance L_M of the motor model. **Note:** This parameter is valid only for asynchronous motors.	
	0.00 …100000.00 mH	Main inductance.	100 = 1 mH
97.12	SIGL USER SI	Defines the leakage inductance σL_S. **Note:** This parameter is valid only for asynchronous motors.	
	0.00 …100000.00 mH	Leakage inductance.	100 = 1 mH
97.13	LD USER SI	Defines the direct axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	
	0.00 …100000.00 mH	Direct axis (synchronous) inductance.	100 = 1 mH
97.14	LQ USER SI	Defines the quadrature axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	
	0.00 …100000.00 mH	Quadrature axis (synchronous) inductance.	100 = 1 mH
97.20	POS OFFSET USER	Defines an angle offset between the zero position of the synchronous motor and the zero position of the position sensor. **Notes:** • The value is in electrical degrees. The electrical angle equals the mechanical angle multiplied by the number of motor pole pairs. • This parameter is valid only for permanent magnet motors.	
	0…360°	Angle offset.	1 = 1°

98 MOTOR CALC VALUES		Calculated motor values.	
98.01	TORQ NOM SCALE	Nominal torque in N•m which corresponds to 100%. **Note:** This parameter is copied from parameter *99.12* MOT NOM TORQUE, if given. Otherwise the value is calculated.	
	0.000… 2147483.647 N•m	Nominal torque.	1000 = 1 N•m
98.02	POLEPAIRS	Calculated number of motor pole pairs. **Note:** This parameter cannot be set by the user.	
	0…1000	Calculated number of motor pole pairs.	1 = 1

No.	Name/Value	Description	FbEq
99 START-UP DATA		Start-up settings such as language, motor data and motor control mode.	
99.01	LANGUAGE	Selects the language. **Note:** Not all languages listed below are necessarily supported.	
	ENGLISH	English.	0809 hex
	DEUTSCH	German.	0407 hex
	ITALIANO	Italian.	0410 hex
	ESPAÑOL	Spanish.	040A hex
	SVENSKA	Swedish.	041D hex
	TÜRKÇE	Turkish.	041F hex
	RUSSKI	Russian	0419 hex
99.04	MOTOR TYPE	Selects the motor type. **Note:** This parameter cannot be changed while the drive is running.	
	AM	Asynchronous motor. Three-phase AC voltage supplied induction motor with a squirrel cage rotor.	0
	PMSM	Permanent magnet motor. Three-phase AC voltage supplied synchronous motor with a permanent magnet rotor and sinusoidal BackEMF voltage.	1
99.05	MOTOR CTRL MODE	Selects the motor control mode. DTC (Direct Torque Control) mode is suitable for most applications. Scalar control is suitable for special cases where DTC cannot be applied. In scalar control, the drive is controlled with a frequency reference. The outstanding motor control accuracy of DTC cannot be achieved in scalar control. There are some standard features that are disabled in the scalar control mode, for example motor identification run (*99.13*), torque limits in parameter group *20 LIMITS*, DC hold and DC magnetising (*11.04*…*11.06*, *11.01*). **Note:** Correct motor run requires that the magnetising current of the motor does not exceed 90 percent of the nominal current of the inverter. **Note:** Scalar control mode must be used • with multimotor applications 1) if the load is not equally shared between the motors, 2) if the motors are of different sizes, or 3) if the motors are going to be changed after the motor identification, • if the nominal current of the motor is less than 1/6 of the nominal output current of the drive, or • if the drive is used with no motor connected (eg, for test purposes).	
	DTC	Direct torque control mode.	0
	Scalar	Scalar control mode.	1

No.	Name/Value	Description	FbEq
99.06	MOT NOM CURRENT	Defines the nominal motor current. Must be equal to the value on the motor rating plate. If several motors are connected to the inverter, enter the total current of the motors. **Note:** Correct motor run requires that the magnetising current of the motor does not exceed 90 percent of the nominal current of the inverter. **Note:** This parameter cannot be changed while the drive is running.	
	0.4…5.0 A	Nominal motor current. **Note:** The allowed range is 1/6…2 × I_{2N} of drive for the direct control mode (parameter *99.05* MOTOR CTRL MODE = *DTC*). For the scalar control mode (parameter *99.05* MOTOR CTRL MODE = *Scalar*), the allowed range is 0…2 × I_{2N} of drive.	10 = 1 A
99.07	MOT NOM VOLTAGE	Defines the nominal motor voltage. Nominal voltage is a fundamental phase to phase rms voltage, which is supplied to the motor at the nominal operating point. This parameter value must be equal to the value on the asynchronous motor name plate. **Note:** Make sure that the motor is connected correctly (star or delta) in accordance with the rating plate. **Note:** With permanent magnet motors, the nominal voltage is the BackEMF voltage (at motor nominal speed). If the voltage is given as voltage per rpm, eg, 60 V per 1000 rpm, the voltage for 3000 rpm nominal speed is 3 × 60 V = 180 V. Note that the nominal voltage is not equal to the equivalent DC motor voltage (E.D.C.M.) value given by some motor manufactures. The nominal voltage can be calculated by dividing the E.D.C.M. voltage by 1.7 (= square root of 3). **Note:** The stress on the motor insulations is always dependent on the drive supply voltage. This also applies to the case where the motor voltage rating is lower than the rating of the drive and the supply of the drive. **Note:** This parameter cannot be changed while the drive is running.	
	80.0…960.0 V	Nominal motor voltage. **Note:** The allowed range is 1/6…2 × U_N of drive.	10 = 1 V
99.08	MOT NOM FREQ	Defines the nominal motor frequency. **Note:** This parameter cannot be changed while the drive is running.	
	5.0…500.0 Hz	Nominal motor frequency.	10 = 1 Hz
99.09	MOT NOM SPEED	Defines the nominal motor speed. Must be equal to the value on the motor rating plate. When the parameter value is changed, check the speed limits in parameter group *20 LIMITS*. **Note:** This parameter cannot be changed while the drive is running.	
	0…30000 rpm	Nominal motor speed.	1 = 1 rpm
99.10	MOT NOM POWER	Defines the nominal motor power. Must be equal to the value on the motor rating plate. If several motors are connected to the inverter, enter the total power of the motors. Set also parameter *99.11* MOT NOM COSFII. **Note:** This parameter cannot be changed while the drive is running.	
	0.00…10000.00 kW	Nominal motor power.	100 = 1 kW

No.	Name/Value	Description	FbEq
99.11	MOT NOM COSFII	Defines the cosphi (not applicable to permanent magnet motors) for a more accurate motor model. Not obligatory; if set, should be equal to the value on the motor rating plate. **Note:** This parameter cannot be changed while the drive is running.	
	0.00…1.00	Cosphi (0 = parameter disabled).	100 = 1
99.12	MOT NOM TORQUE	Defines the nominal motor shaft torque for a more accurate motor model. Not obligatory. **Note:** This parameter cannot be changed while the drive is running.	
	0.000… 2147483.647 N•m	Nominal motor shaft torque.	1000 = 1 N•m
99.13	IDRUN MODE	Selects the type of the motor identification performed at the next start of the drive in the DTC mode. During the identification, the drive will identify the characteristics of the motor for optimum motor control. After the ID run, the drive is stopped. **Note:** This parameter cannot be changed while the drive is running. Once the ID run is activated, it can be cancelled by stopping the drive: If the ID run has already been performed once, the parameter is automatically set to *No*. If no ID run has been performed yet, the parameter is automatically set to *Standstill*. In this case, the ID run must be performed. **Notes:** • ID run can only be performed in local control (ie, when drive is controlled via the PC tool or control panel). • ID run cannot be performed if parameter *99.05* MOTOR CTRL MODE is set to *Scalar*. • ID run must be performed every time any of the motor parameters (*99.04*, *99.06*…*99.12*) have been changed. The parameter is automatically set to STANDSTILL after the motor parameters have been set. • The motor must be de-coupled from the lift system during normal or reduced ID run as well as if rotating autophasing is required (ie, the motor shaft must NOT be locked and the load torque must be < 10% during the ID run). • The drive will not control the mechanical brake of the motor open during the ID run. Ensure by some other means that the brake will be open if the standard or reduced ID run or rotating autophasing is required. • Ensure that possible safe torque off and emergency stop circuits are closed during the ID run.	
	No	No motor ID run is requested. This mode can be selected only if the ID run (Normal/Reduced/Standstill) has already been performed once.	0

No.	Name/Value	Description	FbEq
	Normal	Guarantees the best possible control accuracy. The ID run takes about 90 seconds. This mode should be selected whenever possible. **Note:** The motor must be de-coupled from the lift system during normal or reduced ID run as well as if rotating autophasing is required (ie, the motor shaft must NOT be locked and the load torque must be < 10% during the ID run). **Note:** Check the direction of rotation of the motor before starting the ID run. During the run, the motor will rotate in the forward direction. **WARNING!** The motor will run at up to approx. 50…100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	1
	Reduced	Reduced ID run. This mode should be selected instead of the Normal ID Run if full flux is required to keep the motor brake open (conical motor). With the Reduced ID run, the control in the field weakening area or at high torques is not necessarily as accurate as with the Normal ID run. Reduced ID run is completed faster than the Normal ID Run (< 90 seconds). **Note:** The motor must be de-coupled from the lift system during normal or reduced ID run as well as if rotating autophasing is required (ie, the motor shaft must NOT be locked and the load torque must be < 10% during the ID run). **Note:** Check the direction of rotation of the motor before starting the ID run. During the run, the motor will rotate in the forward direction. **WARNING!** The motor will run at up to approx. 50…100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	2
	Standstill	Standstill ID run. The motor is injected with DC current. With asynchronous motor, the motor shaft is not rotating (with a permanent magnet motor the shaft can rotate < 0.5 revolution). **Note:** This mode should be selected only if the Normal or Reduced ID run is not possible (the motor cannot be de-coupled from the lift system).	3
	Autophasing	During autophasing, the start angle of the motor is determined. Note that other motor model values are not updated. See also parameter *11.07* AUTOPHASING MODE and section *Autophasing* on page *130*. **Notes:** • Autophasing can only be selected after the Normal/ Reduced/Standstill ID run has been performed once. Autophasing is used when an absolute encoder, a resolver or an encoder with commutation signals has been added/ changed to a permanent magnet motor and there is no need to perform the Normal/Reduced/Standstill ID run again. • The motor must be de-coupled from the lift system during normal or reduced ID run as well as if rotating autophasing is required (ie, the motor shaft must NOT be locked and the load torque must be < 10% during the ID run).	4
	Cur meas cal	Current offset and gain measurement calibration. The calibration will be performed at the next start.	5

Additional parameter data

What this chapter contains

This chapter lists the parameters with some additional data. For parameter descriptions, see chapter *Parameters*.

Terms and abbreviations

Term	Definition
Actual signal	Signal measured or calculated by the drive. Can be monitored by the user. No user setting is possible.
Bit pointer	Bit pointer. A bit pointer can point to a single bit in the value of another parameter, or be fixed to 0 (C.FALSE) or 1 (C.TRUE).
enum	Enumerated list, ie, selection list
INT32	32-bit integer value (31 bits + sign)
No.	Parameter number
Pb	Packed boolean
PT	Parameter protection type. See WP, WPD and WP0.
REAL	16-bit value 16-bit value (31 bits + sign) = integer value = fractional value
REAL24	8-bit value 24-bit value (31 bits + sign) = integer value = fractional value
Save PF	Parameter setting is protected against power failure.
Type	Data type. See enum, INT32, Bit pointer, Val pointer, Pb, REAL, REAL24, UINT32.
UINT32	32-bit unsigned integer value
Val pointer	Value pointer. Points to the value of another parameter.

Term	Definition
WP	Write protected parameter (ie, read only)
WPD	Write protected parameter while drive is running
WP0	Parameter can only be set to zero.

Parameter groups 01…09

No.	Name	Type	Range	Unit	Update time	Data length	PT	Save PF
01 ACTUAL VALUES								
01.01	SPEED ACT	REAL	-30000.00…30000.00	rpm	250 µs	32	WP	-
01.02	SPEED ACT PERC	REAL	-1000.00…1000.00	%	2 ms	32	WP	-
01.03	FREQUENCY	REAL	-30000.00…30000.00	Hz	2 ms	32	WP	-
01.04	CURRENT	REAL	0.00…30000.00	A	10 ms	32	WP	-
01.05	CURRENT PERC	REAL	0.0…1000.0	%	2 ms	16	WP	-
01.06	TORQUE	REAL	-1600.0…1600.0	%	2 ms	16	WP	-
01.07	DC-VOLTAGE	REAL	0.00…2000.00	V	2 ms	32	WP	-
01.08	ENCODER 1 SPEED	REAL	-32768.00…32768.00	rpm	250 µs	32	WP	-
01.09	ENCODER 1 POS	REAL24	0.00000000 …1.00000000	rev	250 µs	32	WP	-
01.10	ENCODER 2 SPEED	REAL	-32768.00…32768.00	rpm	250 µs	32	WP	-
01.11	ENCODER 2 POS	REAL24	0.00000000 …1.00000000	rev	250 µs	32	WP	-
01.12	POS ACT	REAL	-32768.000 …32768.000	*	250 µs	32	WP	-
01.13	POS 2ND ENC	REAL	-32768.000 …32768.000	*	250 µs	32	WP	-
01.14	SPEED ESTIMATED	REAL	-30000.00…30000.00	rpm	2 ms	32	WP	-
01.15	TEMP INVERTER	REAL24	-40.0…160.0	%	2 ms	16	WP	-
01.16	TEMP BC	REAL24	-40.0…160.0	%	2 ms	16	WP	-
01.17	MOTOR TEMP	REAL	-10.0…250.0	°C	10 ms	16	WP	-
01.18	MOTOR TEMP EST	INT32	-60…1000	°C	-	16	WP	x
01.19	USED SUPPLY VOLT	REAL	0.0…1000.0	V	10 ms	16	WP	-
01.20	BRAKE RES LOAD	REAL24	0…1000	%	50 ms	16	WP	-
01.21	CPU USAGE	UINT32	0…100	%	-	16	WP	-
01.22	INVERTER POWER	REAL	-32768.00…32768.00	kW	10 ms	32	WP	-
01.26	ON TIME COUNTER	INT32	0.0…35791394.1	h	10 ms	32	WP0	x
01.27	RUN TIME COUNTER	INT32	0.0…35791394.1	h	10 ms	32	WP0	x
01.28	FAN ON-TIME	INT32	0.0…35791394.1	h	10 ms	32	WP0	x
02 I/O VALUES								
02.01	DI STATUS	Pb	0b000000…0b111111	-	2 ms	16	WP	-
02.02	RO STATUS	Pb	0b000…0b111	-	2 ms	16	WP	-
02.03	DIO STATUS	Pb	0b000…0b111	-	2 ms	16	WP	-
02.04	AI1	REAL	-11.000…11.000	V or mA	2 ms	16	WP	-
02.05	AI1 SCALED	REAL	-32768.000 …32768.000	-	250 µs	32	WP	-
02.06	AI2	REAL	-11.000…11.000	V or mA	2 ms	16	WP	-

No.	Name	Type	Range	Unit	Update time	Data length	PT	Save PF
02.07	AI2 SCALED	REAL	-32768.000 …32768.000	-	250 µs	32	WP	-
02.08	AO1	REAL	0.000…22.700	mA	2 ms	16	WP	-
02.09	AO2	REAL	-10.000…10.000	V	2 ms	16	WP	-
02.10	DIO2 FREQ IN	REAL	-32768.000 …32768.000	Hz	2 ms	32	WP	-
02.11	DIO3 FREQ OUT	REAL	-32768.000 …32768.000	Hz	2 ms	32	WP	-
02.12	FBA MAIN CW	Pb	0x00000000 … 0xFFFFFFFF	-	500 µs	32	WP	-
02.13	FBA MAIN SW	Pb	0x00000000 … 0xFFFFFFFF	-	500 µs	32	WP	-
02.14	FBA MAIN REF1	INT32	-2147483647 …2147483647	-	500 µs	32	WP	-
02.15	FBA MAIN REF2	INT32	-2147483647 …2147483647	-	500 µs	32	WP	-
02.16	FEN DI STATUS	Pb	0b000000…0b111111	-	500 µs	16	WP	-
02.17	D2D MAIN CW	Pb	0x000…0xFFFF	-	500 µs	16	WP	-
02.18	D2D FOLLOWER CW	Pb	0x000…0xFFFF	-	2 ms	16	WP	-
02.19	D2D REF1	REAL	-2147483647 …2147483647	-	500 µs	32	WP	-
02.20	D2D REF2	REAL	-2147483647 …2147483647	-	2 ms	32	WP	-
02.80	EXT DIO STATUS	Pb	0x0000…0xFFFF	-	20 ms	32	WP	-
02.81	EXT RO STATUS	Pb	0x0000…0xFFFF	-	20 ms	32	WP	-
03 CONTROL VALUES								
03.02	SPEED REF2	REAL	-30000.00…30000.00	rpm	500 µs	32	WP	-
03.03	SPEEDREF RAMP IN	REAL	-30000.00…30000.00	rpm	500 µs	32	WP	-
03.04	SPEEDREF RAMPED	REAL	-30000.00…30000.00	rpm	500 µs	32	WP	-
03.05	SPEEDREF USED	REAL	-30000.00…30000.00	rpm	250 µs	32	WP	-
03.06	SPEED ERROR FILT	REAL	-30000.00…30000.00	rpm	250 µs	32	WP	-
03.07	ACC COMP TORQ	REAL	-1600.0…1600.0	%	250 µs	16	WP	-
03.08	TORQ REF SP CTRL	REAL	-1600.0…1600.0	%	250 µs	16	WP	-
03.13	TORQ REF TO TC	REAL	-1600.0…1600.0	%	250 µs	16	WP	-
03.14	BRAKE TORQ MEM	REAL	-1000.0…1000.0	%	2 ms	16	WP	x
03.15	BRAKE COMMAND	enum	0…1	-	2 ms	16	WP	-
03.16	FLUX REF USED	REAL24	0…200	%	2 ms	16	WP	-
03.17	TORQUE REF USED	REAL	-1600.0…1600.0	%	250 µs	32	WP	-

No.	Name	Type	Range	Unit	Update time	Data length	PT	Save PF
05 LIFT CTRL SIGNALS								
05.01	LIFT SW	Pb	0x0000…0xFFFF	-	20 ms	32	WP	-
05.02	LIFT FW	Pb	0x0000…0xFFFF	-	100 ms	32	WP	-
05.03	LIFT SPEED SEL	REAL	-32768.00…32768.00	m/s	20 ms	32	WP	-
05.04	LOAD ACT TORQ	REAL	-32768.00…32768.00	%	20 ms	32	WP	-
05.05	ACC COMP TORQ	REAL	-32768.00…32768.00	%	20 ms	32	WP	-
05.06	STATIC FRIQ TORQ	REAL	-32768.00…32768.00	%	20 ms	32	WP	-
05.07	DYN FRIQ TORQ	REAL	-32768.00…32768.00	%	20 ms	32	WP	-
05.08	LIFT SPEED ACT	REAL	-32768.00…32768.00	m/s	20 ms	32	WP	-
05.09	LIFT SPEED REF	REAL	-32768.00…32768.00	m/s	20 ms	32	WP	
05.10	LVLING DIST ACT	REAL	-32768.00…32768.00	m	20 ms	32	WP	-
05.11	FLOOR DISTANCE	REAL	-32768.00…32768.00	m	20 ms	32	WP	-
05.12	EVACUATION DIR	enum	0…1	-	20 ms	16	WP	
06 DRIVE STATUS								
06.01	STATUS WORD 1	Pb	0x0000…0xFFFF	-	2 ms	16	WP	-
06.02	STATUS WORD 2	Pb	0x0000…0xFFFF	-	2 ms	16	WP	-
06.03	SPEED CTRL STAT	Pb	0x0000…0xFFFF	-	250 µs	16	WP	-
06.05	LIMIT WORD 1	Pb	0x0000…0xFFFF	-	250 µs	16	WP	-
06.07	TORQ LIM STATUS	Pb	0x0000…0xFFFF	-	250 µs	16	WP	-
06.14	SUPERV STATUS	Pb	0b000…0b111	-	2 ms	16	WP	-
08 ALARMS & FAULTS								
08.01	ACTIVE FAULT	enum	0…65535	-	-	16	WP	-
08.02	LAST FAULT	enum	0…2147483647	-	-	16	WP0	-
08.03	FAULT TIME HI	INT32	0…2147483647	days	-	32	WP	-
08.04	FAULT TIME LO	INT32	00:00:00… 2147483647	time	-	32	WP	-
08.05	ALARM WORD 1	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	-
08.06	ALARM WORD 2	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	-
08.07	ALARM WORD 3	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	-
08.08	ALARM WORD 4	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	-
08.09	ALARM WORD 5	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	
08.10	ALARM WORD 6	UINT32	0x0000…0xFFFF	-	2 ms	16	WP0	
09 SYSTEM INFO								
09.01	DRIVE TYPE	INT32	0…65535	-	-	16	WP	-
09.02	DRIVE RATING ID	INT32	0…65535	-	-	16	WP	-
09.03	FIRMWARE ID	Pb	0x00000000… 0xFFFFFFFF	-	-	16	WP	-
09.04	FIRMWARE VER	Pb	0x0000… 0xFFFF	-	-	16	WP	-

No.	Name	Type	Range	Unit	Update time	Data length	PT	Save PF
09.05	FIRMWARE PATCH	Pb	0…4294967295	-	-	16	WP	-
09.10	INT LOGIC VER	Pb	0x0000… 0xFFFF	-	-	32	WP	-
09.20	OPTION SLOT 1	INT32	0…24	-	-	16	WP	-
09.21	OPTION SLOT 2	INT32	0…24	-	-	16	WP	-
09.22	OPTION SLOT 3	INT32	0…23	-	-	16	WP	-

Parameter groups 10…99

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
10 START/STOP									
10.01	EXT1 START FUNC	enum	0…6	-	2 ms	16	IN1 F IN2R	WPD	-
10.02	EXT1 START IN1	Bit pointer	-	-	2 ms	32	P.02.01.00	WPD	-
10.03	EXT1 START IN2	Bit pointer	-	-	2 ms	32	P.02.01.01	WPD	-
10.07	JOG1 START	Internally used. Cannot be set by the user.						WP	-
10.08	FAULT RESET SEL	Internally used. Cannot be set by the user.						WP	-
10.09	RUNENABLE	Internally used. Cannot be set by the user.						WP	-
10.10	EM STOP OFF3	Internally used. Cannot be set by the user.						WP	-
10.11	EM STOP OFF1	Bit pointer	-	-	2 ms	32	C.TRUE	WPD	-
10.12	START INHIBIT	enum	0…1	-	2 ms	16	Disabled	-	
10.13	FB CW USED	Val pointer	-	-	2 ms	32	P.02.12	WPD	-
10.14	JOG2 START	Internally used. Cannot be set by the user.						WP	-
10.15	JOG ENABLE	Internally used. Cannot be set by the user.						WP	-
10.16	D2D CW USED	Val pointer	-	-	2 ms	32	P.02.17	WPD	-
10.17	START ENABLE	Internally used. Cannot be set by the user.						WP	-
10.80	SLOWDOWN SEL	enum	0…3	-	20 ms	16	NOT SEL	-	-
10.81	SLOWDOWN IN1	Bit pointer	-	-	20 ms	32	C.TRUE	-	-
10.82	SLOWDOWN IN2	Bit pointer	-	-	20 ms	32	C.TRUE	-	-
10.85	SLOWDOWN SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.25	-	-
10.86	UPPER F LIM SWC	Bit pointer	-	-	20 ms	32	C.TRUE	-	-
10.87	LOWER F LIM SWC	Bit pointer	-	-	20 ms	32	C.TRUE	-	-
10.88	LIFT RUN ENABLE	Bit pointer	-	-	20 ms	32	C.TRUE	-	-
10.89	EVACUATION MODE	Bit pointer	-	-	100 ms	32	C.FALSE	-	-
10.90	EVACUATION AUTO	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
10.91	FLOOR LIM SWITCH	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
10.92	INSPECTION MODE	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
10.93	INSPECTION UP	Bit pointer	-	-	100 ms	32	C.FALSE	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
10.94	INSPECTION DOWN	Bit pointer	-	-	100 ms	32	C.FALSE	-	-
10.95	LIFT CW	UINT32	0x000…0xFFFF	-	20 ms	32	0x0000 (hex)	-	-
11 START/STOP MODE									
11.01	START MODE	enum	0…2	-	-	16	Const time	WPD	-
11.02	DC MAGN TIME	UINT32	0…10000	ms	-	16	500	WPD	-
11.03	STOP MODE	enum	1…2	-	2 ms	16	Ramp	-	-
11.04	DC HOLD SPEED	REAL	0.0…1000.0	rpm	2 ms	16	5.0	-	-
11.05	DC HOLD CUR REF	UINT32	0…100	%	2 ms	16	30	-	-
11.06	DC HOLD	enum	0…1	-	2 ms	16	Disabled	-	-
11.07	AUTOPHASING MODE	enum	0…2	-	-	16	Turning	-	-
12 DIGITAL IO									
12.01	DIO1 CONF	enum	0…1	-	10 ms	16	Input	-	-
12.02	DIO2 CONF	enum	0…2	-	10 ms	16	Output	-	-
12.03	DIO3 CONF	enum	0…3	-	10 ms	16	Output	-	-
12.04	DIO1 OUT PTR	Bit pointer	-	-	10 ms	32	C.FALSE	-	-
12.05	DIO2 OUT PTR	Bit pointer	-	-	10 ms	32	P.06.01.00	-	-
12.06	DIO3 OUT PTR	Bit pointer	-	-	10 ms	32	P.06.01.10	-	-
12.07	DIO3 F OUT PTR	Val pointer	-	-	10 ms	32	P.01.01	-	-
12.08	DIO3 F MAX	REAL	3…32768	Hz	10 ms	16	1000	-	-
12.09	DIO3 F MIN	REAL	3…32768	Hz	10 ms	16	3	-	-
12.10	DIO3 F MAX SCALE	REAL	0…32768	-	10 ms	16	1500	-	-
12.11	DIO3 F MIN SCALE	REAL	0…32768	-	10 ms	16	0	-	-
12.12	RO1 OUT PTR	Bit pointer	-	-	10 ms	32	P.03.15.00	-	-
12.13	DI INVERT MASK	UINT32	0b000000… 0b111111	-	10 ms	16	0b000000 (bin)	-	-
12.14	DIO2 F MAX	REAL	3…32768	Hz	10 ms	16	1000	-	-
12.15	DIO2 F MIN	REAL	3…32768	Hz	10 ms	16	3	-	-
12.16	DIO2 F MAX SCALE	REAL	-32768… 32768	-	10 ms	16	1500	-	-
12.17	DIO2 F MIN SCALE	REAL	-32768… 32768	-	10 ms	16	0	-	-
12.80	EXT IO SEL	enum	0…1	-	20 ms	16	None	-	-
12.81	EXT IO DIO1 CONF	enum	0…1	-	20 ms	16	Input	-	-
12.82	EXT IO DIO2 CONF	enum	0…1	-	20 ms	16	Input	-	-
12.83	EXT IO DIO3 CONF	enum	0…1	-	20 ms	16	Input	-	-
12.84	EXT IO DIO4 CONF	enum	0…1	-	20 ms	16	Input	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
12.85	EXT DIO1 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
12.86	EXT DIO2 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
12.87	EXT DIO3 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
12.88	EXT DIO4 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
12.89	EXT RO1 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
12.90	EXT RO2 OUT PTR	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
13 ANALOGUE INPUTS									
13.01	AI1 FILT TIME	REAL	0.000…30.000	s	10 ms	16	0.000	-	-
13.02	AI1 MAX	REAL	-11.000…11.000 / -22.000…22.000	V or mA	10 ms	16	10.000	-	-
13.03	AI1 MIN	REAL	-11.000…11.000 / -22.000…22.000	V or mA	10 ms	16	-10.000	-	-
13.04	AI1 MAX SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	1500.000	-	-
13.05	AI1 MIN SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	-1500.000	-	-
13.06	AI2 FILT TIME	REAL	0.000…30.000	s	10 ms	16	0.000	-	-
13.07	AI2 MAX	REAL	-11.000…11.000 / -22.000…22.000	V or mA	10 ms	16	10.000	-	-
13.08	AI2 MIN	REAL	-11.000…11.000 / -22.000…22.000	V or mA	10 ms	16	-10.000	-	-
13.09	AI2 MAX SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	100.000	-	-
13.10	AI2 MIN SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	-100.000	-	-
13.11	AITUNE	enum	0…4	-	10 ms	16	No action	-	-
13.12	AI SUPERVISION	enum	0…3	-	2 ms	16	No	-	-
13.13	AI SUPERVIS ACT	UINT32	0b0000…0b1111	-	2 ms	32	0b0000 (bin)	-	-
15 ANALOGUE OUTPUTS									
15.01	AO1 PTR	Val pointer	-	-	-	32	P.01.05	-	-
15.02	AO1 FILT TIME	REAL	0.000…30.000	s	10 ms	16	0.100	-	-
15.03	AO1 MAX	REAL	0.000…22.700	mA	10 ms	16	20.000	-	-
15.04	AO1 MIN	REAL	0.000…22.700	mA	10 ms	16	4.000	-	-
15.05	AO1 MAX SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	100.000	-	-
15.06	AO1 MIN SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	0.000	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
15.07	AO2 PTR	Val pointer	-	-	-	32	P.01.02	-	-
15.08	AO2 FILT TIME	REAL	0.000…30.000	s	10 ms	16	0.100	-	-
15.09	AO2 MAX	REAL	-10.000…10.000	V	10 ms	16	10.000	-	-
15.10	AO2 MIN	REAL	-10.000…10.000	V	10 ms	16	-10.000	-	-
15.11	AO2 MAX SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	100.000	-	-
15.12	AO2 MIN SCALE	REAL	-32768.000 …32768.000	-	10 ms	32	-100.000	-	-
16 SYSTEM									
16.01	LOCAL LOCK	Bit pointer	-	-	2 ms	32	C.FALSE	-	-
16.02	PARAMETER LOCK	enum	0…2	-	2 ms	16	Open	-	-
16.03	PASS CODE	INT32	0…2147483647	-	-	32	0	-	-
16.04	PARAM RESTORE	enum	0…2	-	-	16	Done	WPD	-
16.07	PARAM SAVE	enum	0…1	-	-	16	Done	-	-
16.09	USER SET SEL	enum	1…10	-	-	32	No request	WPD	-
16.10	USER SET LOG	Pb	0…4294967295	-	-	32	N/A	WP	-
16.11	USER IO SET LO	Bit pointer	-	-	-	32	C.FALSE	-	-
16.12	USER IO SET HI	Bit pointer	-	-	-	32	C.FALSE	-	-
16.13	TIME SOURCE PRIO	enum	0…8	-	-	16	FB_D2D_MMI	-	-
17 PANEL DISPLAY									
17.01	SIGNAL1 PARAM	Val pointer	0.0…255.255	-	-	16	05.08	-	-
17.02	SIGNAL2 PARAM	Val pointer	0.0…255.255	-	-	16	05.09	-	-
17.03	SIGNAL3 PARAM	Val pointer	0.0…255.255	-	-	16	01.06	-	-
20 LIMITS									
20.01	MAXIMUM SPEED	REAL	0…30000	rpm	2 ms	32	1500	-	-
20.02	MINIMUM SPEED	REAL	-30000…0	rpm	2 ms	32	-1500	-	-
20.03	POS SPEED ENA	Internally used. Cannot be set by the user.						WP	-
20.04	NEG SPEED ENA	Internally used. Cannot be set by the user.						WP	-
20.05	MAXIMUM CURRENT	REAL	0.00…30000.00	A	10 ms	32	7.07	-	-
20.06	MAXIMUM TORQUE	REAL	0.0…1600.0	%	2 ms	16	300	-	-
20.07	MINIMUM TORQUE	REAL	-1600.0…0.0	%	2 ms	16	-300	-	-
20.08	THERM CURR LIM	enum	0…1	-	-	16	Enable	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
22 SPEED FEEDBACK									
22.01	SPEED FB SEL	enum	0…2	-	10 ms	16	Estimated	-	-
22.02	SPEED ACT FTIME	REAL	0.000 …10000.000	ms	10 ms	32	3.000	-	-
22.03	MOTOR GEAR MUL	INT32	-2147483647 …2147483647	-	10 ms	32	1	-	-
22.04	MOTOR GEAR DIV	UINT32	1…2147483647	-	10 ms	32	1	-	-
22.05	ZERO SPEED LIMIT	REAL	0.00…30000.00	rpm	2 ms	32	30.00	-	-
22.06	ZERO SPEED DELAY	UINT32	0…30000	ms	2 ms	16	100	-	-
22.07	ABOVE SPEED LIM	REAL	0…30000	rpm	2 ms	16	1500	-	-
22.08	SPEED TRIPMARGIN	REAL	0.0…10000.0	rpm	2 ms	32	100.0	-	-
22.09	SPEED FB FAULT	enum	0…2	-	10 ms	16	Fault	-	-
24 SPEED REF MOD									
24.02	SPEED REF2 SEL	enum	0…8	-	10 ms	16	ZERO	-	-
24.03	SPEED REF1 IN	Internally used. Cannot be set by the user.						WP	-
24.04	SPEED REF2 IN	Val pointer	-	-	10 ms	32	P.03.02	-	-
24.05	SPEED REF 1/2SEL	Bit pointer	-	-	2 ms	32	C.FALSE	-	-
25 SPEED REF RAMP									
25.01	SPEED RAMP IN	Internally used. Cannot be set by the user.						WP	-
25.02	SPEED SCALING	Internally used. Cannot be set by the user.						WP	-
25.11	EM STOP TIME	REAL	0.000…1800.000	s	20 ms	32	1.000	-	-
25.80	ACC/DEC SEL	Bit pointer	-	-	20 ms	32	C.FALSE	-	-
25.81	ACC1	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.82	DEC1	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.83	ACC2	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.84	DEC2	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.85	INSPECT MODE ACC	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.86	INSPECT MODE DEC	REAL	0.01…25.00	m/s^2	20 ms	32	0.80	-	-
25.87	EVAC MODE ACC	REAL	0.01…25.00	m/s^2	20 ms	32	0.20	-	-
25.88	EVAC MODE DEC	REAL	0.01…25.00	m/s^2	20 ms	32	0.20	-	-
25.89	RELEVELING DEC	REAL	0.01…25.00	m/s^2	20 ms	32	0.40	-	-
25.90	JERK DISABLE	Bit pointer	-	-	100 ms	32	C.FALSE	-	-
25.91	JERK1	REAL	0.01…100.00	m/s^3	20 ms	32	1.00	-	-
25.92	JERK2	REAL	0.01…100.00	m/s^3	20 ms	32	1.50	-	-
25.93	JERK3	REAL	0.01…100.00	m/s^3	20 ms	32	1.50	-	-
25.94	JERK4	REAL	0.01…100.00	m/s^3	20 ms	32	0.80	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
25.95	JERK5	REAL	0.01…100.00	m/s^3	20 ms	32	0.40	-	-
25.96	JERK6	REAL	0.01…100.00	m/s^3	20 ms	32	0.40	-	-
25.97	JERK7	REAL	0.01…100.00	m/s^3	20 ms	32	0.40	-	-
26 SPEED ERROR									
26.05	SPEED STEP	REAL	-30000.00 …30000.00	rpm	2 ms	32	0.00	-	-
26.06	SPD ERR FTIME	REAL	0.0…1000.0	ms	2 ms	16	0.0	-	-
26.07	SPEED WINDOW	REAL	0…30000	rpm	250 µs	16	10	-	-
28 SPEED CONTROL									
28.01	SPEED ERR NCTRL	Val pointer	-	-	2 ms	32	P.03.06	WP	-
28.02	PROPORT GAIN	REAL	0.00…200.00	-	2 ms	16	10.00	-	-
28.03	INTEGRATION TIME	REAL	0.000…600.000	s	2 ms	32	0.500	-	-
28.04	DERIVATION TIME	REAL	0.000…10.000	s	2 ms	16	0.000	-	-
28.05	DERIV FILT TIME	REAL	0.0…1000.0	ms	2 ms	16	8.0	-	-
28.06	ACC COMPENSATION	Internally used. Cannot be set by the user.						WP	-
28.09	SPEEDCTRL BAL EN	Internally used. Cannot be set by the user.						WP	-
28.10	MIN TORQ SP CTRL	REAL	-1600.0…1600.0	%	2 ms	16	-300.0	-	-
28.11	MAX TORQ SP CTRL	REAL	-1600.0…1600.0	%	2 ms	16	300.0	-	-
28.12	PI ADAPT MAX SPD	REAL	0…30000	rpm	10 ms	16	0	-	-
28.13	PI ADAPT MIN SPD	REAL	0…30000	rpm	10 ms	16	0	-	-
28.14	P GAIN ADPT COEF	REAL	0.000…10.000	-	10 ms	16	1.000	-	-
28.15	I TIME ADPT COEF	REAL	0.000…10.000	-	10 ms	16	1.000	-	-
33 SUPERVISION									
33.01	SUPERV1 FUNC	UINT32	0…4	-	2 ms	16	Disabled	-	-
33.02	SUPERV1 ACT	Val pointer	-	-	2 ms	32	P.01.01	-	-
33.03	SUPERV1 LIM HI	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-
33.04	SUPERV1 LIM LO	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-
33.05	SUPERV2 FUNC	UINT32	0…4	-	2 ms	16	Disabled	-	-
33.06	SUPERV2 ACT	Val pointer	-	-	2 ms	32	P.01.04	-	-
33.07	SUPERV2 LIM HI	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-
33.08	SUPERV2 LIM LO	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
33.09	SUPERV3 FUNC	UINT32	0…4	-	2 ms	16	Disabled	-	-
33.10	SUPERV3 ACT	Val pointer	-	-	2 ms	32	P.01.06	-	-
33.11	SUPERV3 LIM HI	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-
33.12	SUPERV3 LIM LO	REAL	-32768.00… 32768.00	-	2 ms	32	0.00	-	-
35 MECH BRAKE CTRL									
35.01	BRAKE CONTROL	enum	0…2	-	2 ms	16	NO	WPD	-
35.02	BRAKE ACKNOWL	Bit pointer	-	-	2 ms	32	C.FALSE	WPD	-
35.03	BRAKE OPEN DELAY	UINT32	0.00…5.00	s	2 ms	16	0.10	-	-
35.04	BRAKE CLOSE DLY	UINT32	0.00…60.00	s	2 ms	16	0.50	-	-
35.05	BRAKE CLOSE SPD	REAL	0.0…1000.0	rpm	2 ms	16	30.0	-	-
35.07	BRAKE CLOSE REQ	Bit pointer	-	-	2 ms	32	C.FALSE	WPD	-
35.08	BRAKE OPEN HOLD	Internally used. Cannot be set by the user.						WP	-
35.09	BRAKE FAULT FUNC	enum	0…2	-	2 ms	16	FAULT	-	-
35.80	BRK OPEN TRQ SEL	Val pointer	-	-	100 ms	32	BRK OPEN TRQ (P. 35.81)	-	-
35.81	BRAKE OPEN TORQ	REAL	0.0…300.0	%	20 ms	32	0.0	-	-
35.82	TORQUE PROVING	enum	0…1	-	20 ms	16	DISABLED	-	-
35.83	TORQ PROVING REF	REAL	0.0…100.0	%	20 ms	32	30.0	-	-
35.84	TRQ PROV FLT DLY	REAL	0.0…10.0	s	20 ms	32	1.0	-	-
35.85	SLIP SPEED LIM	REAL	0.00…5.00	m/s	20 ms	32	0.05	-	-
35.86	SLIP FAULT DELAY	REAL	0.0…10.0	s	20 ms	32	0.5	-	-
35.87	TORQUE LIMITER	enum	0…1	-	20 ms	16	DISABLED	-	-
35.88	TRQ LIMITER DLY	REAL	0.1…2.0	s	20 ms	32	0.3	-	-
35.89	TRQ LIMITER RAMP	REAL	0.0…2.0	s	20 ms	32	0.3	-	-
40 MOTOR CONTROL									
40.02	SF REF	enum	0…16	kHz	-	16	4	-	-
40.03	SLIP GAIN	REAL	0…200	%	-	-	100	-	-
40.06	FORCE OPEN LOOP	enum	0…1	-	250 µs	16	FALSE	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
45 MOT THERM PROT									
45.01	MOT TEMP PROT	enum	0…2	-	10 ms	16	Fault	-	-
45.02	MOT TEMP SOURCE	enum	0…6	-	10 ms	16	ESTIMATED	-	-
45.03	MOT TEMP ALM LIM	INT32	0…200	°C	-	16	90	-	-
45.04	MOT TEMP FLT LIM	INT32	0…200	°C	-	16	110	-	-
45.05	AMBIENT TEMP	INT32	-60…100	°C	-	16	20	-	-
45.06	MOT LOAD CURVE	INT32	50…150	%	-	16	100	-	-
45.07	ZERO SPEED LOAD	INT32	50…150	%	-	16	100	-	-
45.08	BREAK POINT	INT32	0.01…500.00	Hz	-	16	45.00	-	-
45.09	MOTNOM TEMP RISE	INT32	0…300	°C	-	16	80	-	-
45.10	MOT THERM TIME	INT32	100…10000	s	-	16	256	-	-
46 FAULT FUNCTIONS									
46.01	EXTERNAL FAULT	Bit pointer	-	-	2 ms	16	C.TRUE	-	-
46.02	SPEED REF SAFE	REAL	-30000…30000	rpm	2 ms	16	0	-	-
46.03	LOCAL CTRL LOSS	enum	0…3	-	-	16	Fault	-	-
46.04	MOT PHASE LOSS	enum	0…1	-	2 ms	16	Fault	-	-
46.05	EARTH FAULT	enum	0…2	-	-	16	Fault	-	-
46.06	SUPPL PHS LOSS	enum	0…1	-	2 ms	16	Fault	-	-
46.07	STO DIAGNOSTIC	enum	1…4	-	10 ms	16	Fault	-	-
46.08	CROSS CONNECTION	enum	0…1	-	-	16	Fault	-	-
46.80	FAULT RESET	Bit pointer	-	-	100 ms	32	DIO STATUS. 0 (P.02.03.00)	-	-
46.81	AUTORESET TRIALS	UINT32	0…5	-	20 ms	32	0	-	-
46.82	AUTORST TRL TIME	REAL	1.0…600.0	s	20 ms	32	30.0	-	-
46.83	AUTORESET DELAY	REAL	0.0…120.0	s	20 ms	32	0.0	-	-
46.84	AUTORESET SEL	Pb	0x0000…0xFFFF	-	20 ms	32	0x0000 (hex)	-	-
47 VOLTAGE CTRL									
47.02	UNDERVOLT CTRL	enum	0…1	-	10 ms	16	Enable	-	-
47.03	SUPPLVOLTAUTO-ID	enum	0…1	-	10 ms	16	Enable	-	-
47.04	SUPPLY VOLTAGE	REAL	0.0…1000.0	V	2 ms	16	400.0	-	-
47.05	LOW VOLT MOD ENA	Bit pointer	-	-	-	32	C.FALSE	-	-
47.06	LOW VOLT DC MIN	REAL	250.0…450.0	V	10 ms	16	250.0	-	-
47.07	LOW VOLT DC MAX	REAL	350.0…810.0	V	10 ms	16	810.0	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
47.08	EXT PU SUPPLY	Bit pointer	-	-	-	32	C.FALSE	-	-
48 BRAKE CHOPPER									
48.01	BC ENABLE	enum	0…2	-	-	16	Disable	-	-
48.02	BC RUN-TIME ENA	Bit pointer		-	2 ms	32	C.TRUE	-	-
48.03	BRTHERMTIMECONST	REAL24	0…10000	s	-	32	0	-	-
48.04	BR POWER MAX CNT	REAL24	0.0…10000.0	kW	-	32	0.0	-	-
48.05	R BR	REAL24	0.1…1000.0	Ohm	-	32	120.0	-	-
48.06	BR TEMP FAULTLIM	REAL24	0…150	%	-	16	105	-	-
48.07	BR TEMP ALARMLIM	REAL24	0…150	%	-	16	95	-	-
50 FIELDBUS									
50.01	FBA ENABLE	enum	0…1	-	-	16	Disable	-	-
50.02	COMM LOSS FUNC	enum	0…3	-	-	16	No	-	-
50.03	COMM LOSS T OUT	UINT32	0.3…6553.5	s	-	16	0.3	-	-
50.04	FBA REF1 MODESEL	enum	0…2	-	10 ms	16	Speed	-	-
50.05	FBA REF2 MODESEL	enum	0…2	-	10 ms	16	Position	-	-
50.06	FBA ACT1 TR SRC	Val pointer	-	-	10 ms	32	P.01.01	-	-
50.07	FBA ACT2 TR SRC	Val pointer	-	-	10 ms	32	P.01.06	-	-
50.08	FBA SW B12 SRC	Bit pointer	-	-	500 µs	32	C.FALSE	-	-
50.09	FBA SW B13 SRC	Bit pointer	-	-	500 µs	32	C.FALSE	-	-
50.10	FBA SW B14 SRC	Bit pointer	-	-	500 µs	32	C.FALSE	-	-
50.11	FBA SW B15 SRC	Bit pointer	-	-	500 µs	32	C.FALSE	-	-
52 FBA DATA IN									
51.01	FBA TYPE	UINT32	0…65535	-	-	16	0	-	-
51.02	FBA PAR2	UINT32	0…65535	-	-	16	0	-	x
…	…	…	…	…	-	….	…	-	-
51.26	FBA PAR26	UINT32	0…65535	-	-	16	0	-	x
51.27	FBA PAR REFRESH	UINT32	0…1	-	-	16	DONE	WPD	x
51.28	PAR TABLE VER	UINT32	0x0000...0xFFFF	-	-	16	0x0000 (hex)	-	x
51.29	DRIVE TYPE CODE	UINT32	0…65535	-	-	16	0	-	x

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
51.30	MAPPING FILE VER	UINT32	0…65535	-	-	16	0	-	x
51.31	D2FBA COMM STA	UINT32	0…6	-	-	16	IDLE	-	x
51.32	FBA COMM SW VER	UINT32	0x0000...0xFFFF	-	-	16	0x0000 (hex)	-	x
51.33	FBA APPL SW VER	UINT32	0x0000...0xFFFF	-	-	16	0x0000 (hex)	-	x
52 FBA DATA IN									
52.01	FBA DATA IN1	UINT32	0…9999	-	-	16	0	-	x
…	…	…	…	…	-	…	…	-	-
52.12	FBA DATA IN12	UINT32	0…9999	-	-	16	0	-	x
53 FBA DATA OUT									
53.01	FBA DATA OUT1	UINT32	0…9999	-	-	16	0	-	x
…	…	…	…	…	-	…	…	-	-
53.12	FBA DATA OUT12	UINT32	0…9999	-	-	16	0	-	x
55 COMMUNICATION TOOL									
55.01	MDB STATION ID	UINT32	1…247	-	-	16	1	-	-
55.02	MDB BAUD RATE	UINT32	0…4	-	-	16	Auto	-	-
55.03	MDB PARITY	UINT32	0…3	-	-	16	0	-	-
57 D2D COMMUNICATION									
57.01	LINK MODE	UINT32	0…2	-	10 ms	16	Disabled	WPD	-
57.02	COMM LOSS FUNC	UINT32	0…2	-	10 ms	16	Alarm	-	-
57.03	NODE ADDRESS	UINT32	1…62	-	10 ms	16	1	WPD	-
57.04	FOLLOWER MASK 1	UINT32	0x00000000… 0xFFFFFFFF	-	10 ms	32	0x00000000 (hex)	WPD	-
57.05	FOLLOWER MASK 2	UINT32	0x00000000… 0xFFFFFFFF	-	10 ms	32	0x00000000 (hex)	WPD	-
57.06	REF 1 SRC	Val pointer	-	-	10 ms	32	P.03.04	-	-
57.07	REF 2 SRC	Val pointer	-	-	10 ms	32	P.03.13	-	-
57.08	FOLLOWER CW SRC	Val pointer	-	-	10 ms	32	P.02.18	-	-
57.09	KERNEL SYNC MODE	enum	0…3	-	10 ms	16	NoSync	WPD	-
57.10	KERNEL SYNC OFFS	REAL	-4.999…5.000	ms	10 ms	16	0.000	WPD	-
57.11	REF 1 MSG TYPE	UINT32	0…1	-	10 ms	16	Broadcast	-	-
57.12	REF1 MC GROUP	UINT32	0…62	-	10 ms	16	0	-	-
57.13	NEXT REF1 MC GRP	UINT32	0…62	-	10 ms	16	0	-	-
57.14	NR REF1 MC GRPS	UINT32	1…62	-	10 ms	16	1	-	-
57.15	D2D COMM PORT	UINT32	0…3	-	-	16	on-board	WPD	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
60 POS FEEDBACK									
60.01	POS ACT SEL	enum	0…1	-	10 ms	16	ENC1	-	-
60.02	POS AXIS MODE	enum	0…1	-	2 ms	16	Linear	WPD	-
60.03	LOAD GEAR MUL	INT32	-2147483647 …2147483647	-	2 ms	32	1	-	-
60.04	LOAD GEAR DIV	UINT32	1…2147483647	-	2 ms	32	1	-	-
60.05	POS UNIT	enum	0…3	-	10 ms	16	Meter	-	-
60.06	FEED CONST MUL	UINT32	1…2147483647	-	10 ms	32	1	-	-
60.07	FEED CONST DEN	UINT32	1…2147483647	-	10 ms	32	1	-	-
80 LIFT SPEED REF									
80.01	NOMINAL SPEED	REAL	0.00…25.00	m/s	20 ms	32	1.00	-	-
80.02	GEAR RATIO	REAL	0.001…1000.000	-	20 ms	32	1.000	-	-
80.03	SHEAVE DIAMETER	REAL	1…10000	mm	20 ms	32	500	-	-
80.04	ROPING RATIO	REAL	1…8	-	20 ms	32	1	-	-
80.05	SPEED REF SEL1	Bit pointer	-	-	20 ms	32	DI STATUS.3 (P.02.01.03)	-	-
80.06	SPEED REF SEL2	Bit pointer	-	-	20 ms	32	DI STATUS.4 (P.02.01.04)	-	-
80.07	SPEED REF SEL3	Bit pointer	-	-	20 ms	32	DI STATUS.5 (P.02.01.05)	-	-
80.08	SPEED1	A factory-set zero speed reference (0 m/s). Cannot be set by the user.						WP	-
80.09	LEVELING SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.25	-	-
80.10	RELVL SPEED SEL	enum	0…2	-	100 ms	16	PAR 80.11	-	-
80.11	RELEVELING SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.10	-	-
80.12	MEDIUM SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.50	-	-
80.13	INSPECTION SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.25	-	-
80.14	EVACUATION SPEED	REAL	0.00…25.00	m/s	20 ms	32	0.10	-	-
80.15	SPEED2	REAL	0.00…25.00	m/s	20 ms	32	0.40	-	-
80.16	SPEED3	REAL	0.00…25.00	m/s	20 ms	32	0.60	-	-
80.17	OFF DLY SPD LIM	REAL	0.00…25.00	m/s	20 ms	32	0.00	-	-
80.18	SPEED2 OFF DLY	REAL	0.0…5.0	s	20 ms	32	0.0	-	-
80.19	MED SPD OFF DLY	REAL	0.0…5.0	s	20 ms	32	0.0	-	-
80.20	NOM SPD OFF DLY	REAL	0.0…5.0	s	20 ms	32	0.0	-	-
80.21	SPEED3 OFF DLY	REAL	0.0…5.0	s	20 ms	32	0.0	-	-
81 LIFT SUPERVISION									
81.01	INV OVERLOAD SEL	Pb	0x0000…0xFFFF	-	20 ms	32	0x0000 (hex)	-	-
81.02	INV OVERLOAD DLY	REAL	0.0…5.0	s	20 ms	32	0.5	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
81.03	SPEED MATCH	enum	0…1	-	20 ms	16	DISABLED	-	-
81.04	SPD STD DEV LVL	REAL	0.00…10.00	m/s	20 ms	32	0.10	-	-
81.05	SPD RMP DEV LVL	REAL	0.00…10.00	m/s	20 ms	32	0.20	-	-
81.06	SPEED MATCH DLY	REAL	0.0…10.0	s	20 ms	32	1.0	-	-
81.07	STALL TORQ MAX	REAL	0.0…250.0	%	20 ms	32	70.0	-	-
81.08	STALL TORQ MIN	REAL	-250.0…0.0	%	20 ms	32	-70.0	-	-
81.09	STALL SPEED LIM	REAL	0.00…25.00	m/s	20 ms	32	0.00	-	-
81.10	STALL FAULT DLY	REAL	0.0…5.0	s	20 ms	32	2.0	-	-
81.11	LVL MAX TIME	REAL	0.0…25.0	s	20 ms	32	0.0	-	-
82 TORQUE COMP									
82.01	STATIC FRIC TRQ	REAL	0.00…200.00	%	20 ms	32	0.00	-	-
82.02	DYN FRIC SPEED1	REAL	0.00…25.00	m/s	20 ms	32	0.30	-	-
82.03	DYN FRIC SPEED2	REAL	0.00…25.00	m/s	20 ms	32	0.60	-	-
82.04	DYN FRIC SPEED3	REAL	0.00…25.00	m/s	20 ms	32	1.00	-	-
82.05	DYN FRIC TORQ1	REAL	0.00…100.00	%	20 ms	32	0.00	-	-
82.06	DYN FRIC TORQ2	REAL	0.00…100.00	%	20 ms	32	0.00	-	-
82.07	DYN FRIC TORQ3	REAL	0.00…100.00	%	20 ms	32	0.00	-	-
82.08	LOAD WEIGHT SEL	Val pointer	-	-	100 ms	32	AI1 SCALED (P. 02.05)	-	-
82.09	INERTIA COMP EN	enum	0…1	-	20 ms	16	DISABLED	-	-
82.10	MOMENT OF INERT	REAL	0.0000 …32767.0000	kgm^2	20 ms	32	0.0000	-	-
82.11	WEIGHT NO LOAD	REAL	0.00…32767.00	-	20 ms	32	0.00	-	-
82.12	WEIGHT HALF LOAD	REAL	0.00…32767.00	-	20 ms	32	0.00	-	-
82.13	WEIGHT FULL LOAD	REAL	0.00…32767.00	-	20 ms	32	0.00	-	-
82.14	TORQUE NO LOAD	REAL	-300.00…300.00	%	20 ms	32	0.00	-	-
82.15	TORQUE HALF LOAD	REAL	-300.00…300.00	%	20 ms	32	0.00	-	-
82.16	TORQUE FULL LOAD	REAL	-300.00…300.00	%	20 ms	32	0.00	-	-
83 SMART SLOWDOWN									
83.01	SMART SLOWDN SEL	enum	0…2	-	20 ms	16	NOT SEL	-	-
83.02	LV STOP SWC DIST	REAL	0.00…100.00	m	20 ms	32	0.00	-	-
83.03	SAFETY MARGIN	REAL	0.00…100.00	%	20 ms	32	0.00	-	-
90 ENC MODULE SEL									
90.01	ENCODER 1 SEL	enum	0…7	-	-	16	None	-	-
90.02	ENCODER 2 SEL	enum	0…7	-	-	16	None	-	-
90.03	EMUL MODE SEL	enum	0…11	-	-	16	Disabled	-	-
90.04	TTL ECHO SEL	enum	0…5	-	-	16	Disabled	-	-
90.05	ENC CABLE FAULT	UINT32	0…2	-	-	16	Fault	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
90.10	ENC PAR REFRESH	UINT32	0…1	-	-	16	Done	WPD	-
91 ABSOL ENC CONF									
91.01	SINE COSINE NR	UINT32	0…65535	-	-	16	0	-	-
91.02	ABS ENC INTERF	UINT32	0…5	-	-	16	None	-	-
91.03	REV COUNT BITS	UINT32	0…32	-	-	16	0	-	-
91.04	POS DATA BITS	UINT32	0…32	-	-	16	0	-	-
91.05	REFMARK ENA	UINT32	0…1	-	-	16	FALSE	-	-
91.10	HIPERFACE PARITY	UINT32	0…1	-	-	16	Odd	-	-
91.11	HIPERF BAUDRATE	UINT32	0…3	-	-	16	9600	-	-
91.12	HIPERF NODE ADDR	UINT32	0…255	-	-	16	64	-	-
91.20	SSI CLOCK CYCLES	UINT32	2…127	-	-	16	2	-	-
91.21	SSI POSITION MSB	UINT32	1…126	-	-	16	1	-	-
91.22	SSI REVOL MSB	UINT32	1…126	-	-	16	1	-	-
91.23	SSI DATA FORMAT	UINT32	0…1	-	-	16	binary	-	-
91.24	SSI BAUD RATE	UINT32	0…5	-	-	16	100 kbit/s	-	-
91.25	SSI MODE	UINT32	0…1	-	-	16	Initial pos.	-	-
91.26	SSI TRANSMIT CYC	UINT32	0…5	-	--	16	100 us	-	-
91.27	SSI ZERO PHASE	UINT32	0…3	-	-	16	315-45 deg	-	-
91.30	ENDAT MODE	UINT32	0…1	-	-	16	Initial pos.	-	-
91.31	ENDAT MAX CALC	UINT32	0…3	-	-	16	50 ms	-	
92 RESOLVER CONF									
92.01	RESOLV POLEPAIRS	UINT32	1…32	-	-	16	1	-	-
92.02	EXC SIGNAL AMPL	UINT32	4.0…12.0	Vrms	-	16	4.0	-	-
92.03	EXC SIGNAL FREQ	UINT32	1…20	kHz	-	16	1	-	-
93 PULSE ENC CONF									
93.01	ENC1 PULSE NR	UINT32	0…65535	-	-	16	0	-	-
93.02	ENC1 TYPE	enum	0…1	-	-	16	Quadrature	-	-
93.03	ENC1 SP CALCMODE	enum	0….5	-	-	16	auto rising	-	-
93.04	ENC1 POS EST ENA	enum	0…1	-	-	16	TRUE	-	-
93.05	ENC1 SP EST ENA	enum	0…1	-	-	16	FALSE	-	-
93.06	ENC1 OSC LIM	enum	0…3	-	-	16	4880HZ	-	
93.11	ENC2 PULSE NR	UINT32	0…65535	-	-	16	0	-	-
93.12	ENC2 TYPE	enum	0…1	-	-	16	Quadrature	-	-
93.13	ENC2 SP CALCMODE	enum	0….5	-	-	16	auto rising	-	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
93.14	ENC2 POS EST ENA	enum	0…1	-	-	16	TRUE	-	-
93.15	ENC2 SP EST ENA	enum	0…1	-	-	16	FALSE	-	-
93.16	ENC2 OSC LIM	enum	0…3	-	-	16	4880HZ	-	-
93.21	EMUL PULSE NR	UINT32	0…65535	-	-	16	0	-	-
93.22	EMUL POS REF	Val pointer	-	-	-	32	P.01.12	-	-
93.23	EMUL POS OFFSET	REAL	0 .00000 …0.99998	rev	-	32	0.00000	-	-
95 HW CONFIGURATION									
95.01	CTRL UNIT SUPPLY	enum	0…1	-	-	16	Internal 24V	-	-
95.02	EXTERNAL CHOKE	enum	0…1	-	-	16	NO	-	-
97 USER MOTOR PAR									
97.01	USE GIVEN PARAMS	enum	0…3	-	-	16	NoUserPars	WPD	-
97.02	RS USER	REAL24	0.00000 …0.50000	p.u.	-	32	0.00000	-	-
97.03	RR USER	REAL24	0.00000 …0.50000	p.u.	-	32	0.00000	-	-
97.04	LM USER	REAL24	0.00000 …10.00000	p.u.	-	32	0.00000	-	-
97.05	SIGMAL USER	REAL24	0.00000 …1.00000	p.u.	-	32	0.00000	-	-
97.06	LD USER	REAL24	0.00000 …10.00000	p.u.	-	32	0.00000	-	-
97.07	LQ USER	REAL24	0.00000 …10.00000	p.u.	-	32	0.00000	-	-
97.08	PM FLUX USER	REAL24	0.00000 …2.00000	p.u.	-	32	0.00000	-	-
97.09	RS USER SI	REAL24	0.00000 …100.00000	Ohm	-	32	0.00000	-	-
97.10	RR USER SI	REAL24	0.00000 …100.00000	Ohm	-	32	0.00000	-	-
97.11	LM USER SI	REAL24	0.00…100000.00	mH	-	32	0.00	-	-
97.12	SIGL USER SI	REAL24	0.00…100000.00	mH	-	32	0.00	-	-
97.13	LD USER SI	REAL24	0.00…100000.00	mH	-	32	0.00	-	-
97.14	LQ USER SI	REAL24	0.00…100000.00	mH	-	32	0.00	-	-
97.20	POS OFFSET USER	REAL	0…360	° (el.)	-	32	0	-	-
98 MOTOR CALC VALUES									
98.01	TORQ NOM SCALE	UINT32	0.000 …2147483.647	N•m	-	32	0.0000	WP	-
98.02	POLEPAIRS	UINT32	0…1000	-	-	16	0	WP	-

No.	Name	Type	Range	Unit	Update time	Data len.	Default	PT	Save PF
99 START-UP DATA									
99.01	LANGUAGE	enum	0x0000…0xFFFF	-	-	16	ENGLISH	-	-
99.04	MOTOR TYPE	enum	0…1	-	-	16	AM	WPD	-
99.05	MOTOR CTRL MODE	enum	0…1	-	-	16	DTC	-	-
99.06	MOT NOM CURRENT	REAL	0.4…5.0	A	-	32	0.0	WPD	-
99.07	MOT NOM VOLTAGE	REAL	80.0…960.0	V	-	32	0.0	WPD	-
99.08	MOT NOM FREQ	REAL	5.0…500.0	Hz	-	32	0.0	WPD	-
99.09	MOT NOM SPEED	REAL	0…30000	rpm	-	32	0	WPD	-
99.10	MOT NOM POWER	REAL	0.00…10000.00	kW	-	32	0.00	WPD	-
99.11	MOT NOM COSFII	REAL24	0.00…1.00	-	-	32	0.00	WPD	-
99.12	MOT NOM TORQUE	INT32	0.000 …2147483.647	N•m	-	32	0.000	WPD	-
99.13	IDRUN MODE	enum	0…5	-	-	16	No	WPD	-

* The unit depends on parameter *60.05* POS UNIT selection.

9

Fault tracing

What this chapter contains

The chapter lists the alarm and fault messages including possible causes and corrective actions.

Safety

WARNING! Only qualified electricians are allowed to maintain the drive. The *Safety Instructions* on the first pages of the appropriate *Hardware manual* must be read before you start working with the drive.

Alarm and fault indications

An alarm or a fault message indicates abnormal drive status. Most alarm and fault causes can be identified and corrected using this information. If not, an ABB representative should be contacted.

The alarm/fault code is displayed on the 7-segment display of the drive. The following table describes the indications given by the 7-segment display.

Display	Meaning
“E-” followed by error code	System error. See the appropriate drive *Hardware manual*.
“A-” followed by error code	Alarm. See section *Alarm messages generated by the drive* on page *256*.
“F-” followed by error code	Fault. See section *Fault messages generated by the drive* on page *264*.

How to reset

The drive can be reset either by pressing the RESET key on the control panel or PC tool, or by switching the supply voltage off for a while. When the fault has been removed, the motor can be restarted.

Faults can also be reset from an external source selected with parameter *46.80* FAULT RESET. In addition, the drive features an automatic fault reset function. For more information, see section *Automatic fault reset* on page *92*.

Fault history

When a fault is detected, it is stored in the fault logger with a time stamp. The fault history stores information on the 16 latest faults of the drive. Three of the latest faults are stored at the beginning of a power switch off.

Parameters *08.01* ACTIVE FAULT and *08.02* LAST FAULT store the fault codes of the most recent faults.

Alarms can be monitored via alarm words *08.05* ALARM WORD 1 … *08.08* ALARM WORD 4. Alarm information is lost at power switch off or fault reset.

Alarm messages generated by the drive

Code	Alarm	Cause	What to do
2000	BRAKE START TORQUE Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake alarm. The alarm is activated if the required motor starting torque, *35.81* BRAKE OPEN TORQ, is not achieved.	Check the brake open torque setting, parameter *35.81*. Check drive torque and current limits. See parameter group *20 LIMITS* on page *183*.
2001	BRAKE NOT CLOSED Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake control alarm. The alarm is activated, eg, if brake acknowledgement is not as expected during brake closing.	Check mechanical brake connection. Check mechanical brake settings, parameters *35.01*…*35.09*. To determine whether the problem is with the acknowledgement signal or brake: Check if the brake is closed or open.
2002	BRAKE NOT OPEN Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake control alarm. The alarm is activated, eg, if brake acknowledgement is not as expected during brake opening.	Check mechanical brake connection. Check mechanical brake settings, parameters *35.01*…*35.09*. To determine whether the problem is with the acknowledgement signal or brake: Check if the brake is closed or open.
2003	SAFE TORQUE OFF Programmable fault: *46.07* STO DIAGNOSTIC	Safe torque off function is active, ie, safety circuit signal(s) connected to connector X6 is lost while the drive is stopped and parameter *46.07* STO DIAGNOSTIC is set to *Alarm*.	Check safety circuit connections. For more information, see the appropriate drive *Hardware manual*.
2004	STO MODE CHANGE	Error in changing Safe torque off supervision, ie, parameter *46.07* STO DIAGNOSTIC setting could not be changed to value *Alarm*.	Contact your local ABB representative.

Code	Alarm	Cause	What to do
2005	MOTOR TEMPERATURE Programmable fault: *45.01* MOT TEMP PROT	Estimated motor temperature (based on the motor thermal model) has exceeded the alarm limit defined with parameter *45.03* MOT TEMP ALM LIM.	Check motor ratings and load. Let the motor cool down. Ensure proper motor cooling: Check the cooling fan, clean cooling surfaces, etc. Check the value of the alarm limit. Check motor thermal model settings, parameters *45.06*…*45.08* and *45.10* MOT THERM TIME.
		Measured motor temperature has exceeded the alarm limit defined with parameter *45.03* MOT TEMP ALM LIM.	Check that the actual number of sensors corresponds to the value set with parameter *45.02* MOT TEMP SOURCE. Check motor ratings and load. Let the motor cool down. Ensure proper motor cooling: Check the cooling fan, clean cooling surfaces, etc. Check the value of the alarm limit.
2006	EMERGENCY OFF	Drive has received an emergency OFF2 command.	To restart the drive, activate the Run enable signal (source selected by parameter *10.88* LIFT RUN ENABLE) and start the drive.
2007	RUN ENABLE	No Run enable signal is received.	Check the setting of parameter *10.88* LIFT RUN ENABLE. Switch the signal (eg, digital input) on or check the wiring of the selected source.
2008	ID-RUN	Motor identification run is on.	This alarm belongs to the normal start-up procedure. Wait until the drive indicates that motor identification is completed.
		Motor identification is required.	This alarm belongs to the normal start-up procedure. Select how motor identification should be performed, parameter *99.13* IDRUN MODE. Start identification routines by pressing the Start key.
2009	EMERGENCY STOP	Drive has received an emergency stop command (OFF1/OFF3).	Check that it is safe to continue operation. Return the emergency stop push button to the normal position. Restart the drive.
2010	POSITION SCALING	Overflow or underflow in position calculation (caused by the position scaling used).	Check position scaling parameter settings: *60.06* FEED CONST NUM and *60.07* FEED CONST DEN.
2011	BR OVERHEAT	Brake resistor temperature has exceeded the alarm limit defined with parameter *48.07* BR TEMP ALARMLIM.	Stop the drive. Let the resistor cool down. Check resistor overload protection function settings, parameters *48.01*…*48.05*. Check the alarm limit setting, parameter *48.07*. Check that the braking cycle meets the allowed limits.

Code	Alarm	Cause	What to do
2012	BC OVERHEAT	Brake chopper IGBT temperature has exceeded the internal alarm limit.	Let the chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet. Check resistor overload protection function settings, parameters *48.01*…*48.05*. Check that the braking cycle meets allowed limits. Check that the drive supply AC voltage is not excessive.
2013	DEVICE OVERTEMP	Measured drive temperature has exceeded the internal alarm limit.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
2014	INTBOARD OVERTEMP	Interface board (between power unit and control unit) temperature has exceeded the internal alarm limit.	Let the drive cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet.
2015	BC MOD OVERTEMP	Input bridge or brake chopper temperature has exceeded the internal alarm limit.	Let the drive cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet.
2016	IGBT OVERTEMP	Drive temperature based on the thermal model has exceeded the internal alarm limit.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
2017	FIELDBUS COMM Programmable fault: *50.02* COMM LOSS FUNC	Cyclical communication between the drive and fieldbus adapter module or between PLC and fieldbus adapter module is lost.	Check the status of fieldbus communication. See the appropriate fieldbus adapter module *User's manual*. Check fieldbus parameter settings. See parameter group *50 FIELDBUS* on page *205*. Check cable connections. Check if the communication master can communicate.
2018	LOCAL CTRL LOSS Programmable fault: *46.03* LOCAL CTRL LOSS	Control panel or PC tool selected as the active control location for the drive has ceased communicating.	Check the PC tool or control panel connection. Check the control panel connector. Replace the control panel in the mounting platform.

Code	Alarm	Cause	What to do
2019	AI SUPERVISION Programmable fault: *13.12* AI SUPERVISION	Analog input AI1 or AI2 signal has reached the limit defined with parameter *13.13* AI SUPERVIS ACT.	Check the analog input AI1/2 source and connections. Check analog input AI1/2 minimum and maximum limit settings, parameters *13.02* and *13.03* / *13.07* and *13.08*.
2020	FB PAR CONF	The drive does not have a functionality requested by PLC, or the requested functionality has not been activated.	Check PLC programming. Check fieldbus parameter settings. See parameter group *50 FIELDBUS* on page *205*.
2021	NO MOTOR DATA	Parameters in group *99 START-UP DATA* have not been set.	Check that all the required parameters in group *99 START-UP DATA* have been set. **Note:** It is normal for this alarm to appear during the start-up until the motor data is entered.
2022	ENCODER 1 FAILURE	Encoder 1 has been activated by a parameter but the encoder interface (FEN-xx) cannot be found.	Check that parameter *90.01* ENCODER 1 SEL setting corresponds to encoder interface 1 (FEN-xx) installed in drive Slot 1/2 (signal *09.20* OPTION SLOT 1 / *09.21* OPTION SLOT 2). **Note:** The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.
2023	ENCODER 2 FAILURE	Encoder 2 has been activated by a parameter but the encoder interface (FEN-xx) cannot be found.	Check that parameter *90.02* ENCODER 2 SEL setting corresponds to encoder interface 2 (FEN-xx) installed in drive Slot 1/2 (signal *09.20* OPTION SLOT 1 / *09.21* OPTION SLOT 2). Note: The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.
		EnDat or SSI encoder is used in the continuous mode as encoder 2. [Ie, *90.02* ENCODER 2 SEL = *FEN-11 ABS* and *91.02* ABS ENC INTERF = *Endat* or *SSI* and *91.30* ENDAT MODE = *Continuous* (or *91.25* SSI MODE = *Continuous*).]	If possible, use single position transfer instead of continuous position transfer (ie, if the encoder has incremental sin/cos signals): • Change parameter *91.25* SSI MODE / *91.30* ENDAT MODE to value *Initial pos.* Otherwise use an EnDat/SSI encoder as encoder 1: • Change parameter *90.01* ENCODER 1 SEL to value *FEN-11 ABS* and parameter *90.02* ENCODER 2 SEL to value *None*. **Note:** The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.

Code	Alarm	Cause	What to do
2026	ENC EMULATION FAILURE	Encoder emulation error	If the position value used in emulation is measured by the encoder: • Check that the FEN-xx encoder used in emulation (*90.03* EMUL MODE SEL) corresponds to FEN-xx encoder interface 1 or (and) 2 activated with parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL. (Parameter *90.01*/*90.02* activates the position calculation of the used FEN-xx input). If the position value used in emulation is determined by drive software: • Check that the FEN-xx encoder used in emulation (*90.03* EMUL MODE SEL) corresponds to FEN-xx encoder interface 1 or (and) 2 activated with parameter *90.01* ENCODER 1 SEL / *90.02* ENCODER 2 SEL (because position data used in emulation is written to FEN-xx during encoder data request). Encoder interface 2 is recommended. **Note:** The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.
2027	FEN TEMP MEAS FAILURE	Error in temperature measurement when a temperature sensor (KTY or PTC) connected to encoder interface FEN-xx is used.	Check that parameter *45.02* MOT TEMP SOURCE setting corresponds to encoder interface installation (*09.20* OPTION SLOT 1 / *09.21* OPTION SLOT 2): If one FEN-xx module is used: • Parameter *45.02* MOT TEMP SOURCE setting must be either *KTY 1st FEN* or *PTC 1st FEN*. FEN-xx module can be in either Slot 1 or Slot 2. If two FEN-xx modules are used: • When parameter *45.02* MOT TEMP SOURCE setting is *KTY 1st FEN* or *PTC 1st FEN*, the encoder installed in drive Slot 1 is used. • When parameter *45.02* MOT TEMP SOURCE setting is *KTY 2nd FEN* or *PTC 2nd FEN*, the encoder installed in drive Slot 2 is used.
		Error in temperature measurement when a KTY sensor connected to encoder interface FEN-01 is used.	FEN-01 does not support temperature measurement with a KTY sensor. Use a PTC sensor or another encoder interface module.
2028	ENC EMUL MAX FREQ	TTL pulse frequency used in encoder emulation exceeds the maximum allowed limit (500 kHz).	Decrease parameter *93.21* EMUL PULSE NR value. **Note:** The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.

Code	Alarm	Cause	What to do
2029	ENC EMUL REF ERROR	Encoder emulation has failed due to a failure in writing a new (position) reference for emulation.	Contact your local ABB representative.
2030	RESOLVER AUTOTUNE ERR	Resolver autotuning routines, which are automatically started when resolver input is activated for the first time, have failed.	Check the cable between resolver and resolver interface module (FEN-21) and the order of connector signal wires at both ends of the cable. Check resolver parameter settings. For resolver parameters and information, see parameter group *92 RESOLVER CONF* on page *224*. **Note:** Resolver autotuning routines should always be performed after resolver cable connection has been modified. Autotuning routines can be activated by setting parameter *92.02* EXC SIGNAL AMPL or *92.03* EXC SIGNAL FREQ, and then setting parameter *90.10* ENC PAR REFRESH to *Configure*.
2031	ENCODER 1 CABLE	Encoder 1 cable fault detected.	Check the cable between FEN-xx interface and encoder 1. After any modifications in cabling, re-configure the interface by switching the drive power off and on, or by activating parameter *90.10* ENC PAR REFRESH.
2032	ENCODER 2 CABLE	Encoder 2 cable fault detected.	Check the cable between FEN-xx interface and encoder 2. After any modifications in cabling, re-configure the interface by switching the drive power off and on, or by activating parameter *90.10* ENC PAR REFRESH.
2033	D2D COMMUNICATION Programmable fault: *57.02* COMM LOSS FUNC	On the master drive: The drive has not been replied to by an activated follower for five consecutive polling cycles.	Check that all drives that are polled (parameters *57.04* and *57.05*) on the drive-to-drive link are powered, properly connected to the link, and have the correct node address. Check the drive-to-drive link wiring.
		On a follower drive: The drive has not received new reference 1 and/or 2 for five consecutive reference handling cycles.	Check the settings of parameters *57.06* and *57.07* on the master drive. Check the drive-to-drive link wiring.
2034	D2D BUFFER OVERLOAD Programmable fault: *57.02* COMM LOSS FUNC	Transmission of drive-to-drive references failed because of message buffer overflow.	Contact your local ABB representative.
2035	PS COMM	Communication errors detected between the JCU Control Unit and the power unit of the drive.	Check the connections between the JCU Control Unit and the power unit.
2036	RESTORE	Restoration of backed-up parameters failed.	Contact your local ABB representative.

Code	Alarm	Cause	What to do
2037	CUR MEAS CALIBRATION	Current measurement calibration will occur at the next start.	Informative alarm.
2038	AUTOPHASING	Autophasing will occur at the next start.	Informative alarm.
2039	EARTH FAULT Programmable fault: *46.05* EARTH FAULT	Drive has detected load unbalance typically due to an earth fault in the motor or motor cable.	Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check that there is no earth fault in the motor or motor cables: measure insulation resistances of the motor and motor cable. If no earth fault can be detected, contact your local ABB representative.
2041	MOTOR NOM VALUE	The motor configuration parameters are set incorrectly.	Check the settings of the motor configuration parameters in group *99 START-UP DATA*.
		The drive is not dimensioned correctly.	Check that the drive is sized correctly for the motor.
2042	D2D CONFIG	The settings of drive-to-drive link configuration parameters (group *57 D2D COMMUNICATION*) are incompatible.	Check the settings of the parameters in group *57 D2D COMMUNICATION*.
2047	SPEED FEEDBACK	No speed feedback is received.	Check the settings of the parameters in group *22 SPEED FEEDBACK*. Check encoder installation. See the description of fault *0039* (ENCODER1) for more information.
2048	OPTION COMM LOSS	Communication between the drive and option module (FEN-xx and/or FIO-xx) is lost.	Check that option modules are properly connected to Slot 1 and (or) Slot 2. Check that option modules or Slot 1/2 connectors are not damaged. To determine whether a module or connector is damaged: Test each module individually in Slot 1 and Slot 2.
2072	DC NOT CHARGED	The voltage of the intermediate DC circuit has not yet risen to operating level.	Wait for the DC voltage to rise.
2075	LOW VOLT MOD CON	Low voltage mode has been activated but the parameter settings are outside allowable limits.	Check the Low voltage mode parameters in group *47 VOLTAGE CTRL*. See also section *Low voltage mode* on page *141*.
2401	SLOWDOWN UP *05.01* LIFT SW bit 1	Slowdown command is active in the upward direction based on the selection in parameter *10.80* SLOWDOWN SEL.	Check the slowdown configuration and signal connection wiring.
2402	SLOWDOWN DN *05.01* LIFT SW bit 2	Slowdown command is active in the downward direction based on the selection in parameter *10.80* SLOWDOWN SEL.	Check the slowdown configuration and signal connection wiring.

Code	Alarm	Cause	What to do
2403	UPPER FINAL LIM SWC *05.01* LIFT SW bit 3	Upper final limit switch command is active.	Check the upper final limit connection wiring. Run the motor in the opposite direction and deactivate the upper final limit switch command.
2404	LOWER FINAL LIM SWC *05.01* LIFT SW bit 4	Lower final limit switch command is active.	Check the lower final limit connection wiring. Run the motor in the opposite direction and deactivate the lower limit command.
2405	BRAKE SLIP *05.01* LIFT SW bit 11	Brake is slipping while the motor is not running.	Check the mechanical brake physically for a rope slip. Check the Speed match function parameter settings in group *81 LIFT SUPERVISION*.
2406	LVL TIME OVER	Leveling overtime stop function has been activated during the last run.	Check the stop switch and wiring on the problematic floor.
2407	SMART SLOWDOWN CONFIG	Smart slowdown function is enabled with an encoder, but encoder/resolver feedback is not configured.	Check the encoder/resolver connection. Check the encoder/resolver selection in group *90 ENC MODULE SEL* and the related parameter settings in groups 91, 92 or 93.

Fault messages generated by the drive

Code	Fault	Cause	What to do
0001	OVERCURRENT	Output current has exceeded the internal fault limit.	Check motor load. Check acceleration time. See parameter group *25 SPEED REF RAMP* on page *187*. Check the motor and motor cable (including phasing and delta/star connection). Check that the start-up data in parameter group *99 START-UP DATA* corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check the encoder cable (including phasing).
0002	DC OVERVOLTAGE	Excessive intermediate circuit DC voltage.	Check the mains for static or transient overvoltage. Check the brake chopper and resistor (if used). Check the deceleration time. Use the coast-to-stop function (if applicable). Retrofit the frequency converter with the brake chopper and brake resistor.
0003	DEVICE OVERTEMP	Measured drive temperature has exceeded the internal fault limit.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.
0004	SHORT CIRCUIT	Short-circuit in the motor cable(s) or motor.	Check the motor and motor cable. Check that there are no power factor correction capacitors or surge absorbers in the motor cable.
0005	DC UNDERVOLTAGE	Intermediate circuit DC voltage is not sufficient due to missing mains phase, blown fuse or rectifier bridge internal fault.	Check mains supply and fuses.
0006	EARTH FAULT Programmable fault: *46.05* EARTH FAULT	Drive has detected load unbalance typically due to an earth fault in the motor or motor cable.	Check that there are no power factor correction capacitors or surge absorbers in the motor cable. Check that there is no earth fault in the motor or motor cables: measure insulation resistances of motor and motor cable. If no earth fault can be detected, contact your local ABB representative.
0007	FAN FAULT	Fan is not able to rotate freely or the fan is disconnected. Fan operation is monitored by measuring the fan current.	Check the fan operation and connection.
0008	IGBT OVERTEMP	Drive temperature based on the thermal model has exceeded the internal fault limit.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against unit power.

Code	Fault	Cause	What to do
0009	BC WIRING	Brake resistor short circuit or brake chopper control fault.	Check brake chopper and brake resistor connection. Ensure that the brake resistor is not damaged.
0010	BC SHORT CIRCUIT	Short circuit in brake chopper IGBT.	Ensure that the brake resistor is connected and not damaged.
0011	BC OVERHEAT	Brake chopper IGBT temperature has exceeded the internal fault limit.	Let the chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet. Check resistor overload protection function settings, parameters *48.03*…*48.05*. Check that the braking cycle meets allowed limits. Check that the drive supply AC voltage is not excessive.
0012	BR OVERHEAT	Brake resistor temperature has exceeded the fault limit defined with parameter *48.06* BR TEMP FAULTLIM.	Stop the drive. Let the resistor cool down. Check resistor overload protection function settings, parameters *48.01*…*48.05*. Check the fault limit setting, parameter *48.06*. Check that the braking cycle meets allowed limits.
0013	CURR MEAS GAIN	Difference between output phase U2 and W2 current measurement gain is too great.	Contact your local ABB representative.
0014	CABLE CROSS CON Programmable fault: *48.06* CROSS CONNECTION	Incorrect input power and motor cable connection (ie, the input power cable is connected to the drive motor connection).	Check input power connections.
0015	SUPPLY PHASE Programmable fault: *46.06* SUPPL PHS LOSS	Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse.	Check input power line fuses. Check for input power supply imbalance.
0016	MOTOR PHASE Programmable fault: *46.04* MOT PHASE LOSS	Motor circuit fault due to missing motor connection (all three phases are not connected).	Connect the motor cable.
0017	ID-RUN FAULT	Motor ID Run is not completed successfully.	Check the fault logger for a fault code extension. See the appropriate actions for each extension below.
	Fault code extension: 1	The ID run cannot be completed because the maximum current setting and/or the internal current limit of the drive is too low.	Check the settings of parameters *99.06* MOT NOM CURRENT and *20.05* MAXIMUM CURRENT. Make sure that *20.05* MAXIMUM CURRENT > *99.06* MOT NOM CURRENT. Check that the drive is dimensioned correctly according to the motor.

Code	Fault	Cause	What to do
	Fault code extension: 2	The ID run cannot be completed because the maximum speed setting and/or calculated field weakening point is too low.	Check the settings of parameters *99.07* MOT NOM VOLTAGE, *99.08* MOT NOM FREQ, *99.09* MOT NOM SPEED, *20.01* MAXIMUM SPEED and *20.02* MINIMUM SPEED. Make sure that • *20.01* MAXIMUM SPEED > (0.55 × *99.09* MOT NOM SPEED) • *20.02* MINIMUM SPEED ≤ 0, and • supply voltage ≥ (0.66 × *99.07* MOT NOM VOLTAGE).
	Fault code extension: 3	The ID run cannot be completed because the maximum torque setting is too low.	Check the settings of parameters *99.12* MOT NOM TORQUE and *20.06* MAXIMUM TORQUE. Make sure that *20.06* MAXIMUM TORQUE > 100%.
	Fault code extension: 4…16	Internal error.	Contact your local ABB representative.
0018	CURR U2 MEAS	Measured offset error of U2 output phase current measurement is too great. (Offset value is updated during current calibration.)	Contact your local ABB representative.
0019	CURR V2 MEAS	Measured offset error of V2 output phase current measurement is too great. (Offset value is updated during current calibration.)	Contact your local ABB representative.
0020	CURR W2 MEAS	Measured offset error of W2 output phase current measurement is too great. (Offset value is updated during current calibration.)	Contact your local ABB representative.
0021	STO1 LOST	Safe torque off function is active, ie, safety circuit signal 1 connected between X6:1 and X6:3 is lost while the drive is at stopped state and parameter *46.07* STO DIAGNOSTIC setting is *Alarm* or *No*.	Check safety circuit connections. For more information, see the appropriate drive *Hardware manual*.
0022	STO2 LOST	Safe torque off function is active, ie, safety circuit signal 2 connected between X6:2 and X6:4 is lost while the drive is at stopped state and parameter *46.07* STO DIAGNOSTIC setting is *Alarm* or *No*.	Check safety circuit connections. For more information, see the appropriate drive *Hardware manual*.
0023	STO MODE CHANGE	Error in changing the Safe torque off supervision, ie, parameter *46.07* STO DIAGNOSTIC setting could not be changed to value *Fault*.	Contact your local ABB representative.

Code	Fault	Cause	What to do
0024	INTBOARD OVERTEMP	Interface board (between power unit and control unit) temperature has exceeded the internal fault limit.	Let the drive cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet.
0025	BC MOD OVERTEMP	Input bridge or brake chopper temperature has exceeded the internal fault limit.	Let the drive cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet.
0026	AUTOPHASING	Autophasing routine (see section *Autophasing* on page *130*) failed.	Try other autophasing modes (see parameter *11.07* AUTOPHASING MODE), if possible.
0027	PU LOST	Connection between the JCU Control Unit and the power unit of the drive is lost.	Check the connections between the JCU Control Unit and the power unit.
0028	PS COMM	Communication errors detected between the JCU Control Unit and the power unit of the drive.	Check the connections between the JCU Control Unit and the power unit.
0029	IN CHOKE TEMP	Temperature of internal AC choke excessive.	Check the cooling fan.
0030	EXTERNAL	Fault in external device. (This information is configured through one of the programmable digital inputs.)	Check external devices for faults. Check the setting of parameter *46.01* EXTERNAL FAULT.
0031	SAFE TORQUE OFF Programmable fault: *46.07* STO DIAGNOSTIC	Safe torque off function is active, ie, safety circuit signal(s) connected to connector X6 is lost • during the drive start or drive run or • while the drive is stopped and parameter *46.07* STO DIAGNOSTIC setting is *Fault*.	Check safety circuit connections. For more information, see the appropriate drive *Hardware manual*.
0032	OVERSPEED	Motor is turning faster than the highest allowed speed due to incorrectly set minimum/ maximum speed, insufficient braking torque or changes in load when using torque reference.	Check minimum/maximum speed settings, parameters *20.01* MAXIMUM SPEED and *20.02* MINIMUM SPEED. Check the adequacy of the motor braking torque. Check the applicability of torque control. Check the need for a brake chopper and resistor(s).
0033	BRAKE START TORQUE Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake fault. The fault is activated if the required motor starting torque, *35.81* BRAKE OPEN TORQ, is not achieved.	Check the brake open torque setting, parameter *35.81*. Check drive torque and current limits. See parameter group *20 LIMITS* on page *183*.

Code	Fault	Cause	What to do
0034	BRAKE NOT CLOSED Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake control fault. The fault is activated if brake acknowledgement is not as expected during brake closing.	Check the mechanical brake connection. Check mechanical brake settings, parameters *35.01*…*35.09*. To determine whether the problem is with the acknowledgement signal or brake: Check if the brake is closed or open.
0035	BRAKE NOT OPEN Programmable fault: *35.09* BRAKE FAULT FUNC	Mechanical brake control fault. The fault is activated if brake acknowledgement is not as expected during brake opening.	Check the mechanical brake connection. Check mechanical brake settings, parameters *35.01*…*35.09*. To determine whether the problem is with the acknowledgement signal or brake: Check if the brake is closed or open.
0036	LOCAL CTRL LOSS Programmable fault: *46.03* LOCAL CTRL LOSS	Control panel or PC tool selected as the active control location for the drive has ceased communicating.	Check the PC tool or control panel connection. Check the control panel connector. Replace the control panel in the mounting platform.
0037	NVMEMCORRUPTED	Drive internal fault **Note:** This fault cannot be reset.	Check the fault logger for a fault code extension. See appropriate actions for each extension below.
	Fault code extension: 2051	Total number of parameters (including unused space between parameters) exceeds firmware maximum.	Move parameters from the firmware groups to the application groups. Reduce the number of parameters.
	Fault code extension: Other	Drive internal fault	Contact your local ABB representative.
0038	OPTION COMM LOSS	Communication between the drive and option module (FEN-xx and/or FIO-xx) is lost.	Check that option modules are properly connected to Slot 1 and (or) Slot 2. Check that option modules or Slot 1/2 connectors are not damaged. To determine whether a module or connector is damaged: Test each module individually in Slot 1 and Slot 2.

Code	Fault	Cause	What to do
0039	ENCODER1	Encoder 1 feedback fault	If the fault appears during the first start-up before encoder feedback is used: • Check the cable between the encoder and encoder interface module (FEN-xx) and the order of connector signal wires at both ends of cable. If an absolute encoder, EnDat/Hiperface/SSI, with incremental sin/cos pulses is used, incorrect wiring can be located as follows: Disable serial link (zero position) by setting parameter *91.02* ABS ENC INTERF to *None* and test encoder operation: • If the encoder fault is not activated, check the serial link data wiring. Note that zero position is not taken into account when the serial link is disabled. • If the encoder fault is activated, check the serial link and sin/cos signal wiring. **Note:** Because only zero position is requested through serial link and during run, the position is updated according to sin/cos pulses. • Check encoder parameter settings. If the fault appears after encoder feedback has already been used or during a drive run: • Check that the encoder connection wiring or encoder is not damaged. • Check that encoder interface module (FEN-xx) connection or module is not damaged. • Check earthings (when disturbances are detected in communication between the encoder interface module and the encoder). For more information on encoders, see parameter groups: • *90 ENC MODULE SEL* (page *218*) • *91 ABSOL ENC CONF* (page *221*) • *92 RESOLVER CONF* (page *224*) • *93 PULSE ENC CONF* (page *224*).

Code	Fault	Cause	What to do
0040	ENCODER2	Encoder 2 feedback fault	See fault ENCODER1.
		EnDat or SSI encoder is used in the continuous mode as encoder 2. [Ie, *90.02* ENCODER 2 SEL = *FEN-11 ABS* and *91.02* ABS ENC INTERF = *Endat* or *SSI* and *91.30* ENDAT MODE = *Continuous* (or *91.25* SSI MODE = *Continuous*).]	If possible, use single position transfer instead of continuous position transfer (ie, if the encoder has incremental sin/cos signals): • Change parameter *91.25* SSI MODE / *91.30* ENDAT MODE to value *Initial pos.* Otherwise use an Endat/SSI encoder as encoder 1: • Change parameter *90.01* ENCODER 1 SEL to value *FEN-11 ABS* and parameter *90.02* ENCODER 2 SEL to value *None*. **Note:** The new setting will only take effect after parameter *90.10* ENC PAR REFRESH is used or after the JCU Control Unit is powered up the next time.
0045	FIELDBUS COMM Programmable fault: *50.02* COMM LOSS FUNC	Cyclical communication between the drive and fieldbus adapter module or between PLC and fieldbus adapter module is lost.	Check the status of fieldbus communication. See the appropriate fieldbus adapter module *User's manual*. Check fieldbus parameter settings. See parameter group *50 FIELDBUS* on page *205*. Check cable connections. Check if the communication master can communicate.
0046	FB MAPPING FILE	Drive internal fault	Contact your local ABB representative.
0047	MOTOR OVERTEMP Programmable fault: *45.01* MOT TEMP PROT	Estimated motor temperature (based on the motor thermal model) has exceeded the fault limit defined with parameter *45.04* MOT TEMP FLT LIM.	Check motor ratings and load. Let the motor cool down. Ensure proper motor cooling: Check the cooling fan, clean cooling surfaces, etc. Check the value of the fault limit. Check motor thermal model settings, parameters *45.06*…*45.08* and *45.10* MOT THERM TIME.
		Measured motor temperature has exceeded the fault limit defined with parameter *45.04* MOT TEMP FLT LIM.	Check that the actual number of sensors corresponds to the value set with parameter *45.02* MOT TEMP SOURCE. Check motor ratings and load. Let the motor cool down. Ensure proper motor cooling: Check the cooling fan, clean cooling surfaces, etc. Check the value of the fault limit.
0048	POS ACT MEAS	Selected operation mode requires position feedback data (actual position), but no feedback data is available.	Check the actual position source setting, *60.01* POS ACT SEL. Check encoder installation. See ENCODER1 fault description for more information.
0049	AI SUPERVISION Programmable fault: *13.12* AI SUPERVISION	Analog input AI1 or AI2 signal has reached the limit defined with parameter *13.13* AI SUPERVIS ACT.	Check the analog input AI1/2 source and connections. Check analog input AI1/2 minimum and maximum limit settings, parameters *13.02* and *13.03* / *13.07* and *13.08*.

Code	Fault	Cause	What to do
0050	ENCODER 1 CABLE Programmable fault: *90.05* ENC CABLE FAULT	Encoder 1 cable fault detected.	Check the cable between FEN-xx interface and encoder 1. After any modifications in cabling, re-configure the interface by switching the drive power off and on, or by activating parameter *90.10* ENC PAR REFRESH.
0051	ENCODER 2 CABLE Programmable fault: *90.05* ENC CABLE FAULT	Encoder 2 cable fault detected.	Check the cable between FEN-xx interface and encoder 2. After any modifications in cabling, re-configure the interface by switching the drive power off and on, or by activating parameter *90.10* ENC PAR REFRESH.
0052	D2D CONFIG	Configuration of the drive-to-drive link has failed for a reason other than those indicated by alarm *2042*, for example, start inhibition is requested but not granted.	Contact your local ABB representative.
0053	D2D COMM Programmable fault: *57.02* COMM LOSS FUNC	On the master drive: The drive has not been replied to by an activated follower for five consecutive polling cycles.	Check that all drives that are polled (parameters *57.04* and *57.05* FOLLOWER MASK 2) on the drive-to-drive link are powered, properly connected to the link, and have the correct node address. Check the drive-to-drive link wiring.
		On a follower drive: The drive has not received new reference 1 and/or 2 for five consecutive reference handling cycles.	Check the settings of parameters *57.06* REF 1 SRC and *57.07* REF 2 SRC on the master drive. Check the drive-to-drive link wiring.
0054	D2D BUF OVLOAD Programmable fault: *57.02* COMM LOSS FUNC	Transmission of drive-to-drive references failed because of message buffer overflow.	Contact your local ABB representative.
0055	TECH LIB	Resettable fault generated by a technology library.	Refer to the documentation of the technology library.
0056	TECH LIB CRITICAL	Permanent fault generated by a technology library.	Refer to the documentation of the technology library.
0057	FORCED TRIP	Generic Drive Communication Profile trip command.	Check PLC status.
0058	FIELDBUS PAR ERROR	The drive does not have a functionality requested by PLC, or the requested functionality has not been activated.	Check PLC programming. Check fieldbus parameter settings. See parameter group *50 FIELDBUS* on page *205*.
0061	SPEED FEEDBACK	No speed feedback is received.	Check the settings of the parameters in group *22 SPEED FEEDBACK*. Check encoder installation. See the description of fault *0039* (ENCODER1) for more information.

Code	Fault	Cause	What to do
0062	D2D SLOT COMM	Drive-to-drive link is set to use an FMBA module for communication, but no module is detected in the specified slot.	Check the settings of parameters *57.01* LINK MODE and *57.15* D2D COMM PORT. Ensure that the FMBA module has been detected by checking parameters *09.20*…*09.22*. Check that the FMBA module is correctly wired. Try installing the FMBA module into another slot. If the problem persists, contact your local ABB representative.
0067	FPGA ERROR1	Drive internal fault	Contact your local ABB representative.
0068	FPGA ERROR2	Drive internal fault	Contact your local ABB representative.
0069	ADC ERROR	Drive internal fault	Contact your local ABB representative.
0201	T2 OVERLOAD	Firmware time level 2 overload **Note:** This fault cannot be reset.	Contact your local ABB representative.
0201	T3 OVERLOAD	Firmware time level 3 overload **Note:** This fault cannot be reset.	Contact your local ABB representative.
0203	T4 OVERLOAD	Firmware time level 4 overload **Note:** This fault cannot be reset.	Contact your local ABB representative.
0204	T5 OVERLOAD	Firmware time level 5 overload **Note:** This fault cannot be reset.	Contact your local ABB representative.
0205	A1 OVERLOAD	Application time level 1 fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0206	A2 OVERLOAD	Application time level 2 fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0207	A1 INIT FAULT	Application task creation fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0208	A2 INIT FAULT	Application task creation fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0209	STACK ERROR	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0210	JMU MISSING	JMU Memory Unit is missing or broken.	Check that the JMU is properly installed. If the problem persists, replace JMU.
0301	UFF FILE READ	File read error **Note:** This fault cannot be reset.	Contact your local ABB representative.
0302	APPL DIR CREATION	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0303	FPGA CONFIG DIR	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.

Code	Fault	Cause	What to do
0304	PU RATING ID	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0305	RATING DATABASE	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0306	LICENSING	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0307	DEFAULT FILE	Drive internal fault **Note:** This fault cannot be reset.	Contact your local ABB representative.
0308	APPL FILE PAR CONF	Corrupted application file **Note:** This fault cannot be reset.	Reload the application. If the fault is still active, contact your local ABB representative.
0309	APPL LOADING	Application file incompatible or corrupted. **Note:** This fault cannot be reset.	Check the fault logger for a fault code extension. See appropriate actions for each extension below.
	Fault code extension: 8	Template used in the application incompatible with drive firmware.	Change the template of the application in DriveSPC.
	Fault code extension: 10	Parameters defined in the application conflict with existing drive parameters.	Check the application for conflicting parameters.
	Fault code extension: 35	Application memory full.	Contact your local ABB representative.
	Fault code extension: Other	Corrupted application file	Reload application. If fault is still active, contact your local ABB representative.
0310	USERSET LOAD	Loading of user set is not successfully completed because: • requested user set does not exist • user set is not compatible with the drive program • drive has been switched off during loading.	Reload.
0311	USERSET SAVE	User set is not saved because of memory corruption.	Check the setting of parameter *95.01* CTRL UNIT SUPPLY. If the fault still occurs, contact your local ABB representative.
0312	UFF OVERSIZE	UFF file is too big.	Contact your local ABB representative.
0313	UFF EOF	UFF file structure failure	Contact your local ABB representative.
0314	TECH LIB INTERFACE	Incompatible firmware interface **Note:** This fault cannot be reset.	Contact your local ABB representative.
0315	RESTORE FILE	Restoration of backed-up parameters failed.	Contact your local ABB representative.

Code	Fault	Cause	What to do
0316	DAPS MISMATCH	Mismatch between JCU Control Unit firmware and power unit logic versions.	Contact your local ABB representative.
0317	SOLUTION FAULT	Fault generated by function block SOLUTION_FAULT in the application program.	Check the usage of the SOLUTION_FAULT block in the application program.
601	SPEED MATCH *05.02* LIFT FW bit 0	Speed error is higher than defined with parameter *81.04* SPD STD DEV LVL in the steady state or defined with parameter *81.05* SPD RMP DEV LVL in the ramp state, and the time delay defined with parameter *81.06* SPEED MATCH DLY has elapsed. The speed controller is not following the speed reference.	Check ramp times. Check torque and current limit settings.
602	TORQUE PROVE *05.02* LIFT FW bit 1	Drive was not able to provide sufficient torque during a torque proving sequence. Control magnetising time is too low.	Check the motor and motor cables.
603	BRAKE SLIP *05.02* LIFT FW bit 2	Brake slipped while a torque proving sequence was taking place.	Check the brakes. Check whether the brakes are slipping in the brake closed condition.
604	INV OVERLOAD *05.02* LIFT FW bit 3	Drive has exceeded the interverter current or torque limits, and the time delay defined with parameter *81.02* INV OVERLOAD DLY has elapsed. The fault condition is checked only when the generating power is more than 10% of the motor nominal power and the actual speed greater than 5% of the motor nominal speed.	Check speed controller torque settings. Check torque, speed and power limit settings.
605	MOTOR STALL *05.02* LIFT FW bit 4	Motor actual speed is lower than defined with parameter *81.09* STALL SPEED LIM, the drive has exceeded the torque limits defined with parameters *81.07* STALL TORQ MAX and *81.08* STALL TORQ MIN, and the time delay defined with *81.10* STALL FAULT DLY has elapsed.	Check torque and current limit settings.

10

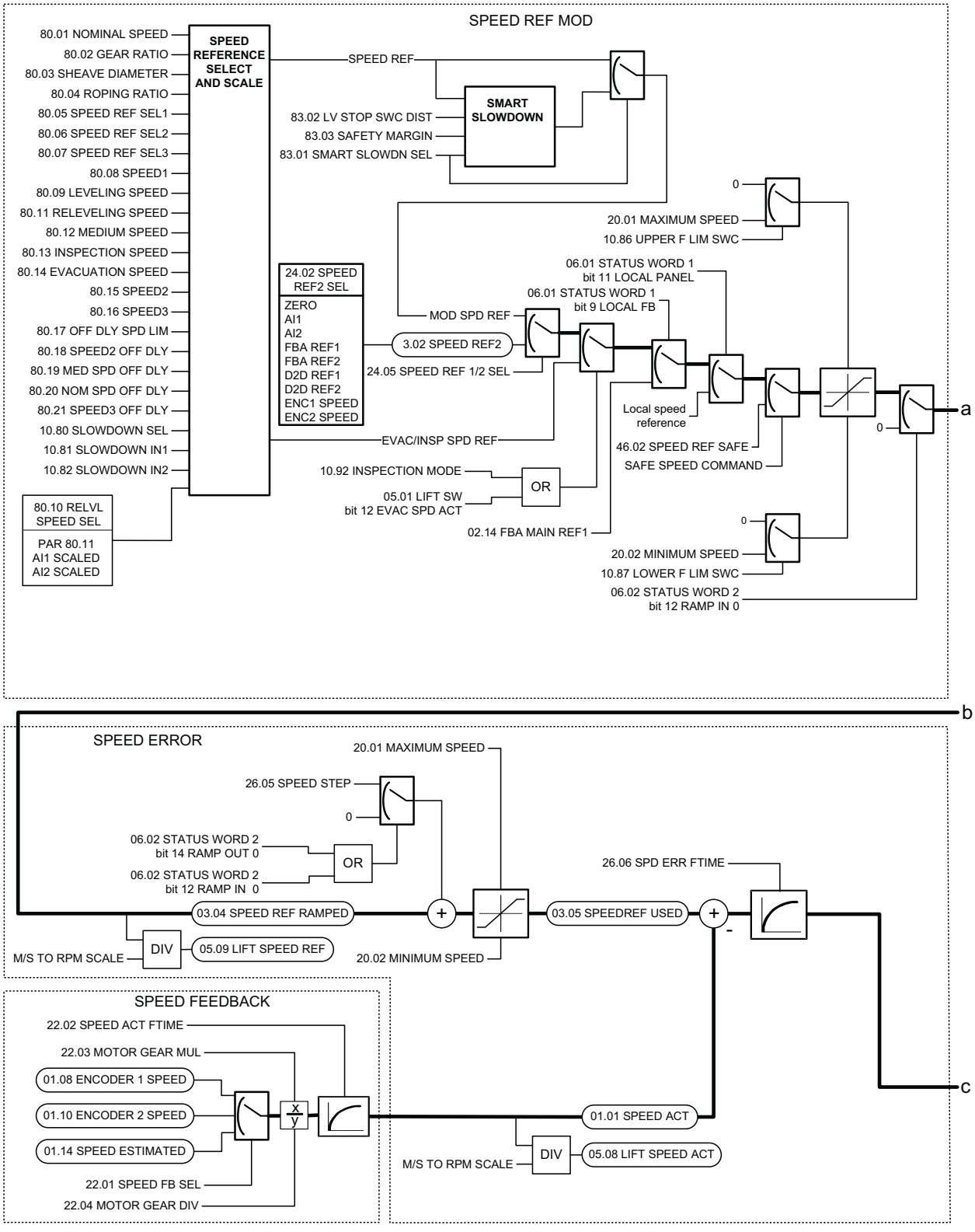
Control block diagrams

What this chapter contains

This chapter contains a graphical representation of the Lift control program.

Speed control chain

(continued on the next page...)



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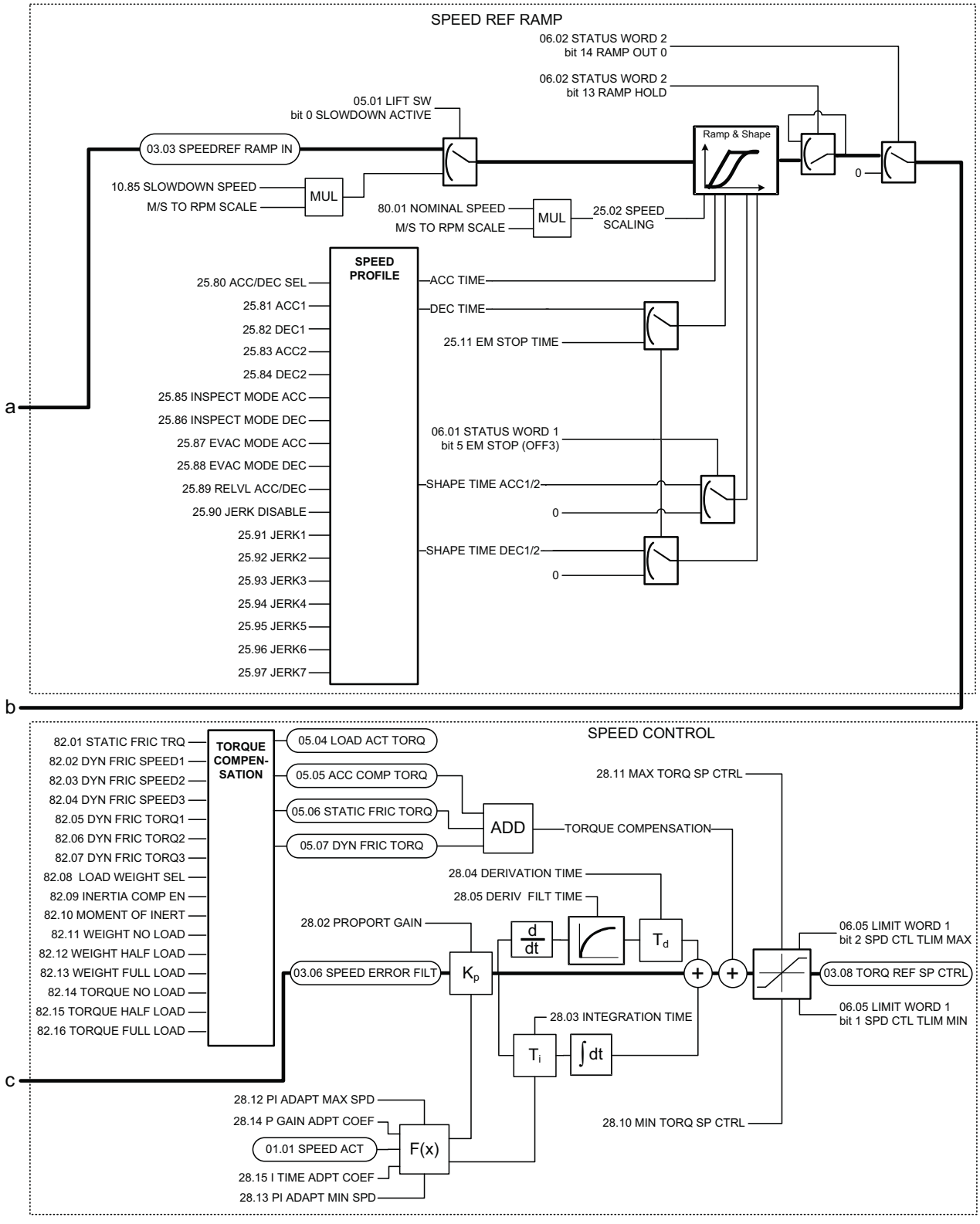

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

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33AUA0000056610 Rev B / EN EFFECTIVE: 2016-06-29