ENGINEERING TOMORROW

Programming Guide

VLT® Compressor Drive CDS 803

6–30 kW

vlt-drives.danfoss.com | VLT®

Contents

1 Introduction

1.1 Purpose of the Programming Guide

This Programming Guide provides information for advanced programming of the drive. It provides a complete overview and description of all parameters.

The Programming Guide is intended for use by qualified personnel.

To operate the drive safely and professionally, read and follow the Programming Guide and pay particular attention to the safety instructions and general warnings.

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1.2 Manual and Software Version

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

Table 1: Manual and Software Version

Edition	Remarks	Software version
AU356039245821, version 0101	• Drive sizes 18–30 kW added.	6.0–10 kW (8–15 hp): Version 2.00 18–30 kW (25–40 hp): Version 61.10

1.3 Additional Resources

1.3.1 Supplementary Documentation

Other resources are available to understand advanced drive functions and programming.

- The *Operating Guide* provides information on safety, installation, and commissioning. It also provides a list of warnings and alarms, and general specifications.
- The *Design Guide* provides detailed information about capabilities and functionality to design motor control systems.
- The *Modbus RTU Operating Instructions* explains how to physically establish and configure communication between the Danfoss FC Series and a controller using the Modbus RTU protocol. Download the Operating Instructions from www.danfoss.com in the sections *Service and Support/Documentation*.

See www.danfoss.com for supplementary documentation.

1.3.2 VLT® Motion Control Tool MCT 10 Software Support

Download the software from the Service and Support download page on www.danfoss.com.

During the installation process of the software, enter CD-key 34544400 to activate the CDS 803 functionality. An activation key is not required for using the CDS 803 functionality.

The latest software does not always contain the latest updates for the drive. Contact the local sales office for the latest drive updates (in the form of *.upd files), or download the drive updates from the Service and Support download page on www.danfoss.com.

2 Safety

2.1 Safety Symbols

The following symbols are used in this manual:

⚠ DANGER ⚠

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING ⚠

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

⚠ CAUTION ⚠

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

2.2 Qualified Personnel

To allow trouble-free and safe operation of the unit, only qualified personnel with proven skills are allowed to transport, store, assemble, install, program, commission, maintain, and decommission this equipment.

Persons with proven skills:

- Are qualified electrical engineers, or persons who have received training from qualified electrical engineers and are suitably experienced to operate devices, systems, plant, and machinery in accordance with pertinent laws and regulations.
- Are familiar with the basic regulations concerning health and safety/accident prevention.
- Have read and understood the safety guidelines given in all manuals provided with the unit, especially the instructions given in the Operating Guide.
- Have good knowledge of the generic and specialist standards applicable to the specific application.

2.3 Safety Precautions

⚠ WARNING

HIGH VOLTAGE

AC drives contain high voltage when connected to AC mains input, DC supply, or load sharing. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.

- Only qualified personnel must perform installation, start-up, and maintenance.

⚠ WARNING ⚠

UNINTENDED START

When the drive is connected to AC mains, DC supply, or load sharing, the motor may start at any time. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage. Start the motor with an external switch, a fieldbus command, an input reference signal from the local control panel (LCP), via remote operation using MCT 10 software, or after a cleared fault condition.

- Disconnect the drive from the mains.
- Press [Off/Reset] on the LCP before programming parameters.
- Ensure that the drive is fully wired and assembled when it is connected to AC mains, DC supply, or load sharing.

⚠ WARNING ⚠

DISCHARGE TIME

The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.

Failure to wait the specified time after power has been removed before performing service or repair work could result in death or serious injury.

- Stop the motor.
- Disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other drives.
- Wait for the capacitors to discharge fully. The minimum waiting time is specified in the table *Discharge time* and is also visible on the nameplate on top of the drive.
- Before performing any service or repair work, use an appropriate voltage measuring device to make sure that the capacitors are fully discharged.

Table 2: Discharge Time

Voltage [V]	Power range [kW (hp)]	Minimum waiting time (minutes)
3x200	6.0–10 (8.0–15)	15
3x400	6.0–7.5 (8.0–10)	4
3x400	10–30 (15–40)	15

⚠ WARNING

LEAKAGE CURRENT HAZARD

Leakage currents exceed 3.5 mA. Failure to ground the drive properly can result in death or serious injury.

- Ensure the correct grounding of the equipment by a certified electrical installer.

⚠ WARNING ⚠

EQUIPMENT HAZARD

Contact with rotating shafts and electrical equipment can result in death or serious injury.

- Ensure that only trained and qualified personnel perform installation, start-up, and maintenance.
- Ensure that electrical work conforms to national and local electrical codes.
- Follow the procedures in this manual.

⚠ CAUTION ⚠

INTERNAL FAILURE HAZARD

An internal failure in the drive can result in serious injury when the drive is not properly closed.

- Ensure that all safety covers are in place and securely fastened before applying power.

3 Electrical Diagrams

3.1 Electrical Wiring

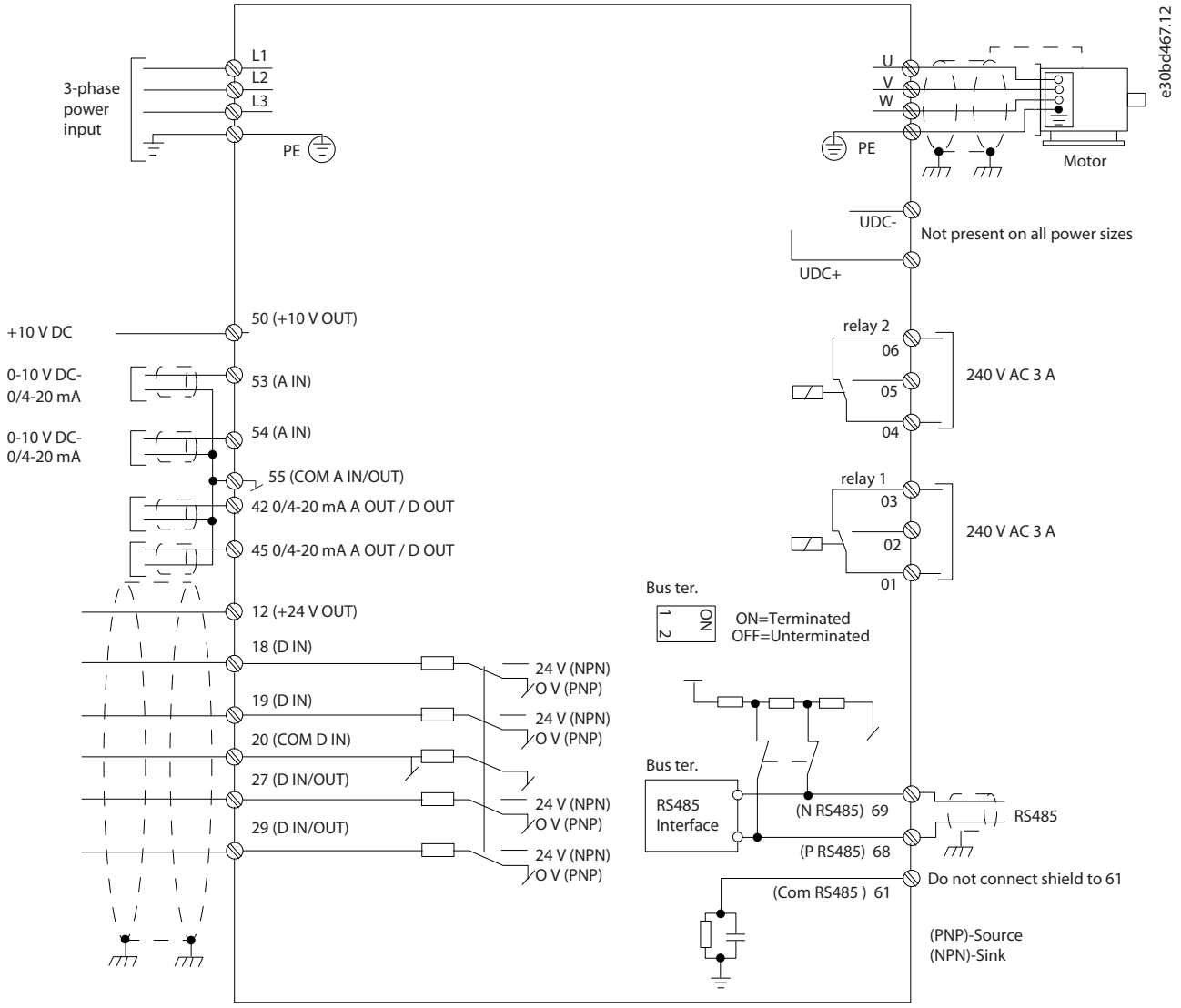

Illustration 1: Basic Wiring Schematic Drawing

N O T I C E

There is no access to UDC- and UDC+ on the following units:

- IP20, 380–480 V, 30 kW (40 hp).

3.2 Control Terminals

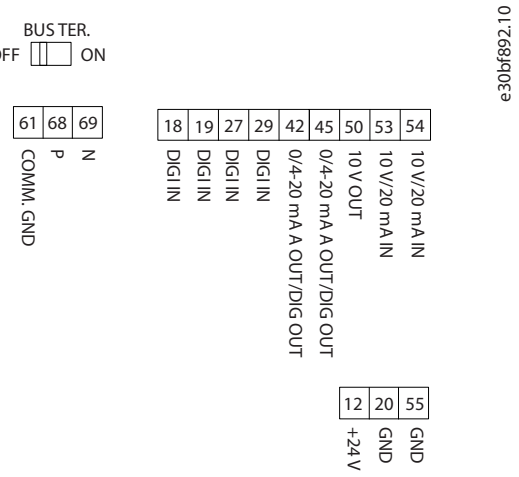

Illustration 2: Control Terminals

4 Programming

4.1 Programming Interfaces

The drive can be programmed in 3 different ways:

- Locally via the LCP.
- Externally via the RS485 interface by either
  - using Modbus RTU
  - or by installing VLT® Motion Control Tool MCT 10.

Refer to the 1.3 Additional Resources for further information on Modbus RTU and VLT® Motion Control Tool MCT 10.

4.2 Local Control Panel (LCP)

The LCP is divided into 4 functional sections.

- A. Display
- B. Menu key
- C. Navigation keys and indicator lights
- D. Operation keys and indicator lights

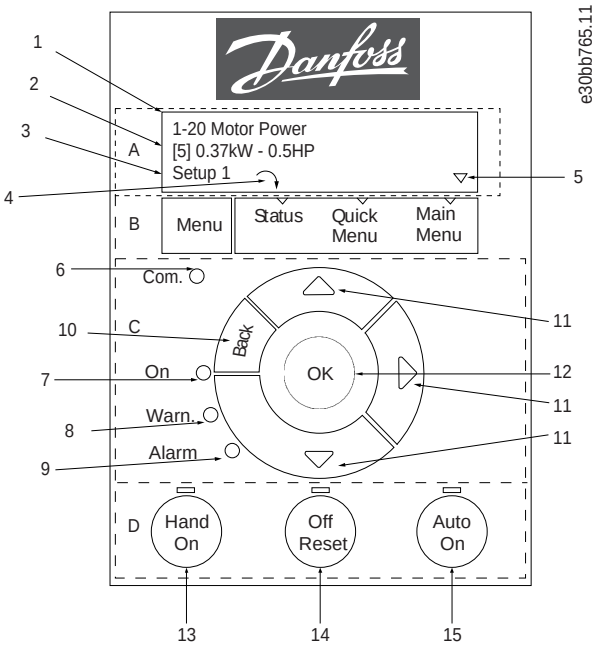

Illustration 3: Local Control Panel (LCP)

A. Display

The LCD display is illuminated with 2 alphanumeric lines. Table 3 describes the information that can be read from the display.

Table 3: Legend to Section A, Illustration 3

1	Parameter number and name.
2	Parameter value.
3	Setup number shows the active setup and the edit setup. If the same setup acts as both active and edit setup, only that setup number is shown (factory setting). When active and edit setup differ, both numbers are shown in the display (setup 12). The number flashing indicates the edit setup.
4	Motor direction is shown to the bottom left of the display – indicated by a small arrow pointing either clockwise or counter-clockwise.
5	The triangle indicates if the LCP is in Status, Quick Menu, or Main Menu.

B. Menu key

Press [Menu] to select among Status, Quick Menu, or Main Menu.

C. Navigation keys and indicator lights

Table 4: Legend to Section C, Illustration 3

6	Com. (yellow indicator): Flashes during bus communication.
7	On (green indicator): Control section is working correctly.
8	Warn. (yellow indicator): Indicates a warning.
9	Alarm (red indicator): Indicates an alarm.
10	[Back]: For moving to the previous step or layer in the navigation structure.
11	[▵] [▿] [▹]: For navigating among parameter groups and parameters, and within parameters. They can also be used for setting local reference.
12	[OK]: For selecting a parameter and for accepting changes to parameter settings.

D. Operation keys and indicator lights

Table 5: Legend to Section D, Illustration 3

13	[Hand On]: Starts the motor and enables control of the drive via the LCP. **N O T I C E** *[2] Coast inverse* is the default option for *parameter 5-12 Terminal 27 Digital Input*. If there is no 24 V supply to terminal 27, [Hand On] does not start the compressor. Connect terminal 12 to terminal 27.
14	[Off/Reset]: Stops the compressor (Off). If in alarm mode, the alarm is reset.
15	[Auto On]: The drive is controlled either via control terminals or serial communication.

4.3 Menus

4.3.1 Access to Parameters

The are 2 different ways of accessing the parameters from the LCP:

- Quick Menu
- Main Menu

The Quick Menu contains a collection of parameters used for programming the most common functions.
The Main Menu contains all parameters in the drive.

4.3.1.1 Programming via the Quick Menu

Procedure

1. To enter the *Quick Menu*, press [Menu] until indicator in display is placed above *Quick Menu*.
2. Press [▵] [▿] to select quick guide, closed-loop setup, compressor setup, or changes made, then press [OK].
3. Press [▵] [▿] to browse through the parameters in the *Quick Menu*.
4. Press [OK] to select a parameter.
5. Press [▵] [▿] to change the value of a parameter setting.
6. Press [OK] to accept the change.
7. Press either [Back] twice to enter *Status*, or press [Menu] once to enter *Main Menu*.

4.3.1.2 Programming via the Main Menu

Procedure

1. Press [Menu] until indicator in display is placed above *Main Menu*.
2. Press [▲] [▼] to browse through the parameter groups.
3. Press [OK] to select a parameter group.
4. Press [▲] [▼] to browse through the parameters in the specific group.
5. Press [OK] to select the parameter.
6. Press [▲] [▼] to set/change the parameter value.
7. Press [OK] to accept the change or press [Back] to go back to the previous level.

4.3.2 Status Menu

In the Status menu, view the following:

- Motor frequency [Hz], *parameter 16-13 Frequency*.
- Motor current [A], *parameter 16-14 Motor current*.
- Motor speed reference in percentage [%], *parameter 16-02 Reference [%]*.
- Feedback, *parameter 16-52 Feedback [Unit]*.
- Motor power *parameter 16-10 Power [kW*].
- Custom readout *parameter 16-09 Custom Readout*.

4.3.3 Quick Menu

Use the *Quick Menu* to program the most common functions. The *Quick Menu* consists of:

- Quick menu for open-loop applications.
- Compressor functions.
- Closed-loop setup quick menu.
- Changes made.

4.3.3.1 The Start-up Quick Guide for Compressor Open-loop Applications

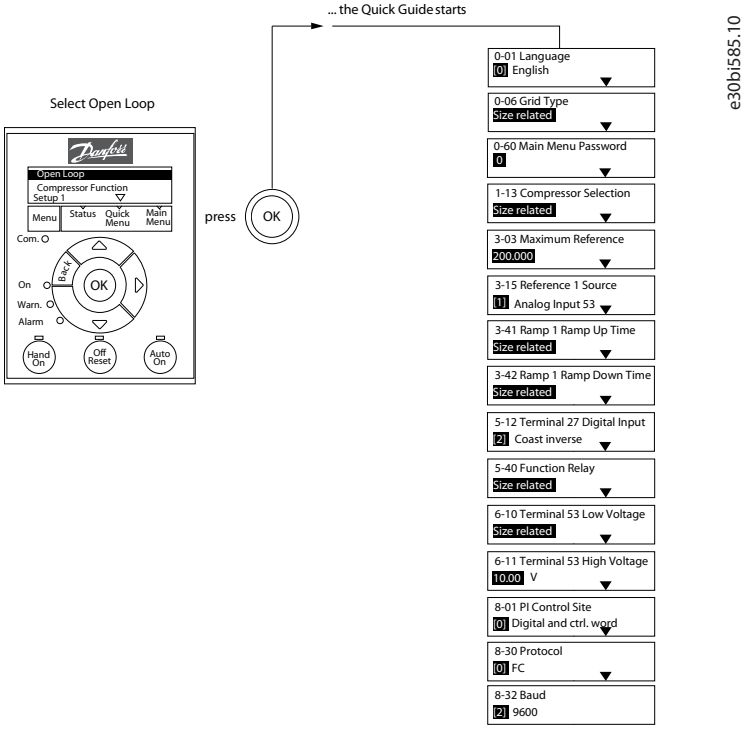

Illustration 4: Smart Guide for Open-loop Applications

Table 6: Open-loop Applications Set-up

Parameter	Option	Default	Function
Parameter 0-01 Language	[0] English [1] Deutsch [2] Français [3] Dansk [4] Español [5] Italiano [28] Bras.port	[0] English	Select the language for the display.
Parameter 0-06 GridType	[0] 200–240 V/50 Hz/IT-grid [1] 200–240 V/50 Hz/Delta [2] 200–240 V/50 Hz [10] 380–440 V/50 Hz/IT-grid [11] 380–440 V/50 Hz/Delta [12] 380–440 V/50 Hz [20] 440–480 V/50 Hz/IT-grid [21] 440–480 V/50 Hz/Delta [22] 440–480 V/50 Hz [100] 200–240 V/60 Hz/IT-grid [101] 200–240 V/60 Hz/Delta [102] 200–240 V/60 Hz [110] 380–440 V/60 Hz/IT-grid [111] 380–440 V/60 Hz/Delta [112] 380–440 V/60 Hz [120] 440–480 V/60 Hz/IT-grid [121] 440–480 V/60 Hz/Delta [122] 440–480 V/60 Hz	Size related	Select operating mode for restart after reconnection of the drive to mains voltage after power-down.
Parameter 0-60 Main Menu Password	0–999	0	Define the password for access to the LCP.
Parameter 1-13 Compressor Selection 6–10 kW	[24] VZH028-R410A [25] VZH035-R410A [26] VZH044-R410A [27] VLZ028 [28] VLZ035 [29] VLZ044	Size related	Select which compressor to use.
Parameter 1-13 Compressor Selection 18–30 kW	[21] VZH088-R410A [22] VZH117-R410A [23] VZH170-R410A [30] VZH088-R452B [31] VZH088-R454B [32] VZH117-R452B [33] VZH117-R454B [34] VZH170-R452B [35] VZH170-R454B		
Parameter 3-03 Maximum Reference	0–200 Hz	200 Hz	The maximum reference is the highest obtainable by summing all references.

Parameter	Option	Default	Function
Parameter 3-15 Reference 1 Source	[0] No function [1] Analog in 53 [2] Analog in 54 [7] Pulse input 29 [11] Local bus reference	[1] Analog in 53	Select the input to be used for the reference signal.
Parameter 3-41 Ramp 1 Ramp Up Time	0.05–3600.0 s	Size related	Ramp-up time from 0 to *parameter 1-25 Motor Nominal Speed*.
Parameter 3-42 Ramp 1 Ramp Down Time	0.05–3600.0 s	Size related	Ramp-down time from nominal motor speed to 0.
Parameter 5-12 Terminal 27 Digital Input	[0] No operation [1] Reset [2] Coast inverse [3] Coast and reset inverse [4] Quick stop inverse [5] DC-brake inverse [6] Stop inverse [7] External Interlock [8] Start [9] Latched start [10] Reversing [11] Start reversing [14] Jog [16] Preset ref bit 0 [17] Preset ref bit 1 [18] Preset ref bit 2 [19] Freeze reference [20] Speed up [22] Speed down [23] Set-up select bit 0 [34] Ramp bit 0 [52] Run permissive [53] Hand start [54] Auto start [60] Counter A (up) [61] Counter A (down) [62] Reset Counter A [63] Counter B (up) [64] Counter B (down) [65] Reset Counter B	[2] Coast inverse	Select the input function for terminal 27.
Parameter 5-40 Function Relay [0] Function relay	See *parameter 5-40 Function Relay*	Size related	Select the function to control output relay 1.
Parameter 5-40 Function Relay [1] Function relay	See *parameter 5-40 Function Relay*	Drive running	Select the function to control output relay 2.
Parameter 6-10 Terminal 53 Low Voltage	0–10 V	Size related	Enter the voltage that corresponds to the low reference value.

Parameter	Option	Default	Function
Parameter 6-11 Terminal 53 High Voltage	0–10 V	10 V	Enter the voltage that corresponds to the high reference value.
Parameter 8-01 Control Site	[0] Digital and ctrl.word [1] Digital only [2] Controlword only	[0] Digital and ctrl. word	Select if digital, bus, or a combination of both should control the drive.
Parameter 8-30 Protocol	[0] FC [2] Modbus RTU	[0] FC	Select the protocol for the integrated RS485 port.
Parameter 8-32 Baud Rate	[0] 2400 Baud [1] 4800 Baud [2] 9600 Baud [3] 19200 Baud [4] 38400 Baud [5] 57600 Baud [6] 76800 Baud [7] 115200 Baud	9600	Select the baud rate for the RS485 port.

4.3.3.2 Compressor Functions Quick Guide

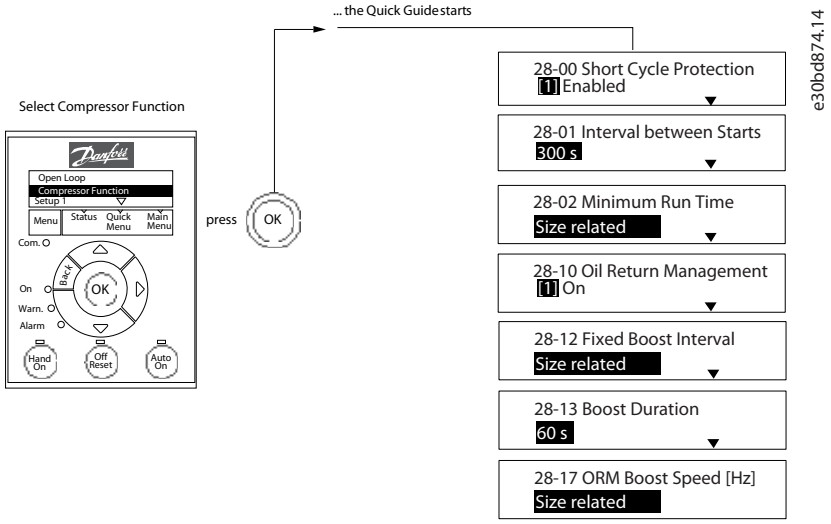

Illustration 5: Quick Guide for Compressor Functions

Table 7: Compressor Functions

Parameter	Option	Default	Function
Parameter 28-00 Short Cycle Protection	[0] Disabled [1] Enabled	[1] Enabled	Select if short cycle protection is to be used.
Parameter 28-01 Interval between Starts	0–3600 s	300 s	Enter the minimum allowed time between starts.
Parameter 28-02 Minimum Run Time	10–3600 s	Size related	Enter the minimum allowed time to run before stop.
Parameter 28-10 Oil Return Management	[0] Off [1] On	[1] On	Select if oil return management is to be used.

Parameter	Option	Default	Function
Parameter 28-12 Fixed Boost Interval	1–168 h	Size related	Oil Boosts is performed at fixed time intervals
Parameter 28-13 Boost Duration	60–300 s	60 s	Enter the boost duration for the oil return.
Parameter 28-17 ORM Boost Speed [Hz]	80–200 Hz	Size related	Enter speed of the compressor during oil return boost.

4.3.3.3 The Start-up Quick Guide for Compressor Closed-loop Applications

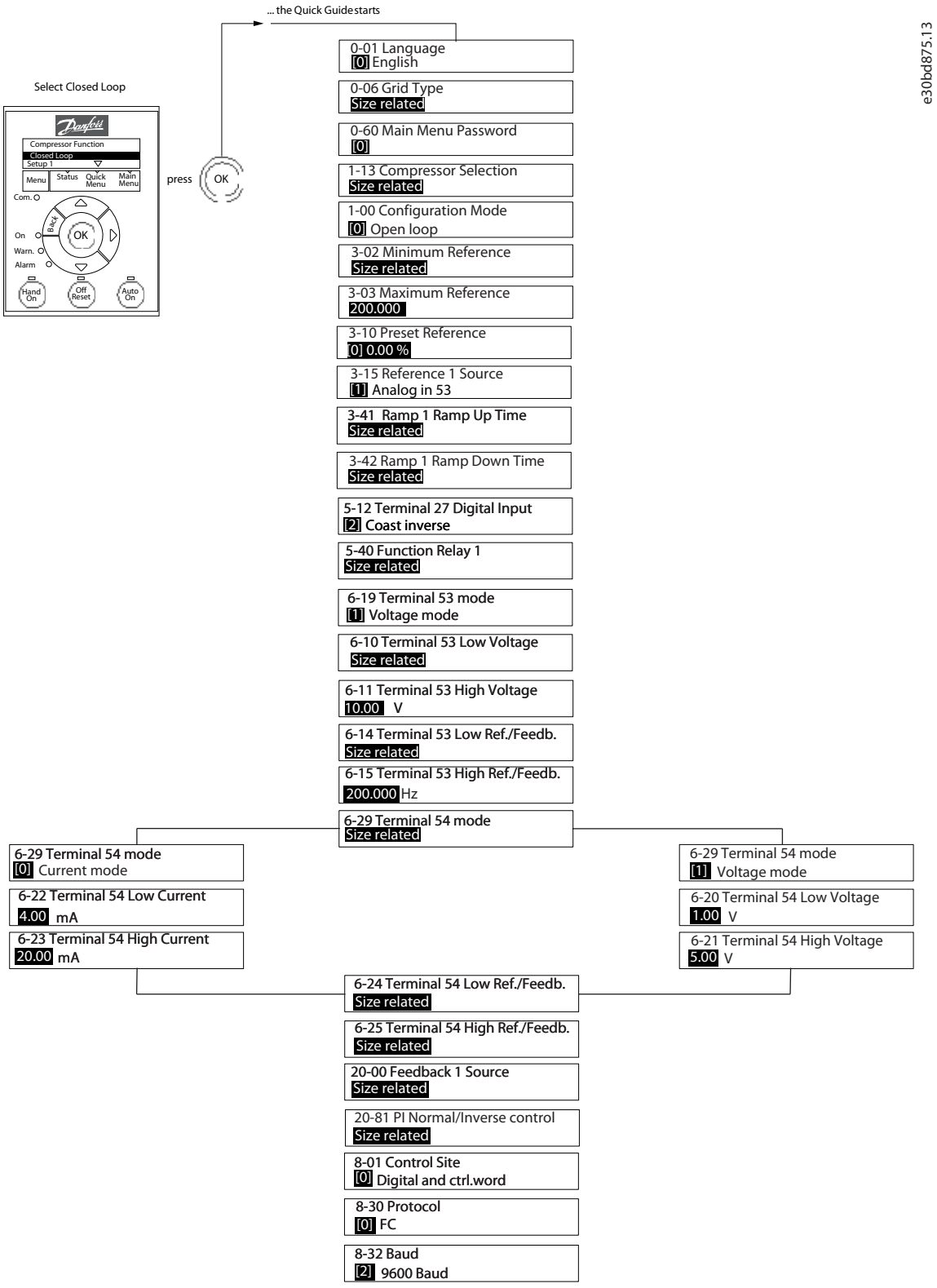

Illustration 6: Closed-loop Quick Guide

Table 8: Closed-loop Applications Setup

Parameter	Option	Default	Function
Parameter 0-01 Language	[0] English	0	Select the language for the display.

Parameter	Option	Default	Function
	[1] Deutsch [2] Français [3] Dansk [4] Spanish [5] Italiano [28] Bras.port		
Parameter 0-06 GridType	[0] 200–240 V/50 Hz/IT-grid [1] 200–240 V/50 Hz/Delta [2] 200–240 V/50 Hz [10] 380–440 V/50 Hz/IT-grid [11] 380–440 V/50 Hz/Delta [12] 380–440 V/50 Hz [20] 440–480 V/50 Hz/IT-grid [21] 440–480 V/50 Hz/Delta [22] 440–480 V/50 Hz [100] 200–240 V/60 Hz/IT-grid [101] 200–240 V/60 Hz/Delta [102] 200–240 V/60 Hz [110] 380–440 V/60 Hz/IT-grid [111] 380–440 V/60 Hz/Delta [112] 380–440 V/60 Hz [120] 440–480 V/60 Hz/IT-grid [121] 440–480 V/60 Hz/Delta [122] 440–480 V/60 Hz	Size related	Select the operating mode for restart after reconnection of the drive to mains voltage after power-down.
Parameter 0-60 Main Menu Password	0–999	0	Define the password for access to the LCP.
Parameter 1-00 Configuration Mode	[0] Open loop [3] Closed loop	[0] Open loop	Select closed loop.
Parameter 1-13 Compressor Selection 6–10 kW	[24] VZH028-R410A [25] VZH035-R410A [26] VZH044-R410A [27] VLZ028 [28] VLZ035 [29] VLZ044	Size related	Select the compressor in use.
Parameter 1-13 Compressor Selection 18–30 kW	[21] VZH088-R410A [22] VZH117-R410A [23] VZH170-R410A [30] VZH088-R452B [31] VZH088-R454B [32] VZH117-R452B [33] VZH117-R454B [34] VZH170-R452B [35] VZH170-R454B		
Parameter 3-02 Minimum Reference	0–200 Hz	30 Hz (6–10 kW)	The minimum reference is the lowest value obtainable by summing all references.

Parameter	Option	Default	Function
		50 Hz (18–30 kW)	
Parameter 3-03 Maximum Reference	0–200 Hz	200 Hz	The maximum reference is the highest obtainable by summing all references.
Parameter 3-10 Reference 1 Source	-100 – 100%	0%	Set up a fixed setpoint in preset reference [0].
Parameter 3-15 Reference 1 Source	[0] No function [1] Analog in 53 [2] Analog in 54 [7] Pulse input 29 [11] Local bus reference	[1] Analog in 53	Select the input to be used for the reference signal.
Parameter 3-41 Ramp 1 Ramp Up Time	0.05–3600.0 s	90.00 s (6–10 kW) 180.00 s (18–30 kW)	Ramp-up time from 0 to *parameter 1-25 Motor Nominal Speed*.
Parameter 3-42 Ramp 1 Ramp Down Time	0.05–3600.0 s	30.00 s (6–10 kW) 180.00 s (18–30 kW)	Ramp-down time from nominal motor speed to 0.
Parameter 5-12 Terminal 27 Digital Input	[0] No operation [1] Reset [2] Coast inverse [3] Coast and reset inverse [4] Quick stop inverse [5] DC-brake inverse [6] Stop inverse [7] External Interlock [8] Start [9] Latched start [10] Reversing [11] Start reversing [14] Jog [16] Preset ref bit 0 [17] Preset ref bit 1 [18] Preset ref bit 2 [19] Freeze reference [20] Speed up [22] Speed down [23] Set-up select bit 0 [34] Ramp bit 0 [52] Run permissive [53] Hand start [54] Auto start [60] Counter A (up) [61] Counter A (down) [62] Reset Counter A [63] Counter B (up)	[2] Coast inverse	Select the input function for terminal 27.

Parameter	Option	Default	Function
	[64] Counter B (down) [65] Reset Counter B		
Parameter 5-40 Function Relay [0] Function relay	See *parameter 5-40 Function Relay*	[9] Alarm (6–10 kW) [65] Comparator 5 (18–30 kW)	Select the function to control output relay 1.
Parameter 5-40 Function Relay [1] Function Relay	See *parameter 5-40 Function Relay*	Drive running	Select the function to control output relay 2.
Paraneter 6-19 Terminal 53 Mode(1)	[0] Current mode [1] Voltage mode	[1] Voltage mode	Program terminal 53 to either current or voltage.
Parameter 6-10 Terminal 53 Low Voltage	0–10 V	0.07 V (6–10 kW) 0 V (18–30 kW)	Enter the voltage that corresponds to the low reference value.
Parameter 6-11 Terminal 53 High Voltage	0–10 V	10 V	Enter the voltage that corresponds to the high reference value.
Parameter 6-14 Terminal 53 Low Ref./ Feedb. Value	-4999 – 4999	Size related	Enter the reference value that corresponds to the voltage set in *parameter 6-10 Terminal 53 Low Voltage*.
Parameter 6-15 Terminal 53 High Ref./ Feedb. Value	-4999 – 4999	200	Enter the reference value that corresponds to the voltage set in *parameter 6-11 Terminal 53 High Voltage*.
Parameter 6-29 Terminal 54 Mode	[0] Current mode [1] Voltage mode	[0] Current mode (6–10 kW) [1] Voltage mode (18–30 kW)	Program terminal 54 to either current or voltage.
Parameter 6-20 Terminal 54 Low Voltage	0–10 V	0.07 V (6–10 kW) 1 V (18–30 kW)	Enter the voltage corresponding to the low reference value set in *parameter 6-24 Terminal 54 Low Ref./Feedb. Value*.
Parameter 6-21 Terminal 54 High Voltage	0–10 V	10 V (6–10 kW) 5 V (18–30 kW)	Enter the voltage corresponding to the high reference value set in *parameter Terminal 54 High Ref./Feedb. Value*.
Parameter 6-22 Terminal 54 Low Current	0.00–20.00 mA	4.00 mA	Enter the current that corresponds to the low reference value.
Parameter 6-23 Terminal 54 High Current	0–10 V	10 V	Enter the current that corresponds to the high reference value.
Parameter 6-24 Terminal 54 Low Ref./ Feedb. Value	-0.00–20.00 mA	Size related	Enter the reference value that corresponds to the current set in *parameter 6-20 Terminal 54 Low Voltage*.
Parameter 6-25 Terminal 54 High Ref./ Feedb. Value	-4999 – 4999	Size related	Enter the reference value that corresponds to the current set in *parameter 6-21 Terminal 54 High Voltage*.

Parameter	Option	Default	Function
Parameter 8-01 Control Site	[0] Digital and ctrl.word [1] Digital only [2] Controlword only	[0] Digital and ctrl. word	Select if digital, bus, or a combination of both should control the drive.
Parameter 8-30 Protocol	[0] FC [2] Modbus RTU	[0] FC	Select the protocol for the integrated RS485 port.
Parameter 8-32 Baud Rate	[0] 2400 Baud [1] 4800 Baud [2] 9600 Baud [3] 19200 Baud [4] 38400 Baud [5] 57600 Baud [6] 76800 Baud [7] 115200 Baud	9600	Select the baud rate for the RS485 port.
Parameter 20-00 Feedback 1 Source	[0] No function [1] Analog Input 53 [2] Analog Input 54 [3] Pulse input 29 [100] Bus Feedback 1 [101] Bus Feedback 2	[0] No function	Select which input to use as the source of the feedback signal.
Parameter 20-01 Feedback 1 Conversion	[0] Linear [1] Square root	[0] Linear	Select how to calculate the feedback.

[1] When *parameter 6-19 Terminal 53 Mode* is *[0] Current mode*, the next parameters will be *parameter 6-12 Terminal 53 Low Current* and *parameter 6-13 Terminal 53 High Current*. When *parameter 6-19 Terminal 53 Mode* is *[1] Voltage mode*, the next parameters will be *parameter 6-10 Terminal 53 Low Voltage* and *parameter 6-11 Terminal 53 High Voltage*. When *parameter 6-29 Terminal 54 Mode* is *[0] Current mode*, the next parameters will be *parameter 6-22 Terminal 54 Low Current* and *parameter 6-23 Terminal 54 High Current*. When *parameter 6-29 Terminal 54 Mode* is *[1] Voltage*, the next parameters are *parameter 6-20 Terminal 54 Low Voltage* and *parameter 6-21 Terminal 54 High Voltage*.

4.3.3.4 Changes Made

Changes Made lists all parameters changed from default settings.

- The list shows only parameters which have been changed in the current edit set-up.
- Parameters which have been reset to default values are not listed.
- The message *Empty* indicates that no parameters have been changed.

4.3.4 Main Menu

The *Main Menu* is used for programming all parameters. The *Main Menu* parameters can be accessed immediately unless a password has been created via *parameter 0-60 Main Menu Password*. For most applications, it is not necessary to access the *Main Menu* parameters. The *Quick Menu* provides the simplest and quickest access to the typical required parameters.

4.4 Uploading and Downloading Parameter Settings

4.4.1 Data Transfer from Drive to LCP

Once the setup of a drive is complete, Danfoss recommends storing the data in the LCP or on a PC via VLT® Motion Control Tool MCT 10.

⚠ W A R N I N G ⚠

Stop the compressor before performing this operation.

Procedure

1. Go to *parameter 0-50 LCP Copy*.
2. Press [OK].
3. Select *[1] All to LCP*.
4. Press [OK].

4.4.2 Data Transfer from LCP to Drive

Connect the LCP to another drive to copy the parameter settings to this drive as well.

⚠ W A R N I N G ⚠

Stop the compressor before performing this operation.

Procedure

1. Go to *parameter 0-50 LCP Copy*.
2. Press [OK].
3. Select *[2] All from LCP*.
4. Press [OK].

4.5 Restoring Factory Default Settings

There are 2 different ways of initializing the drive to factory default settings:

- Via *parameter 14-22 Operation Mode* (this is the recommended way).
- Two-finger initialization

Some parameters will not be reset, see more details in 4.5.1 Recommended Initialization (via Parameter 14-22 Operation Mode) and 4.5.2 Two-finger Initialization.

4.5.1 Recommended Initialization (via Parameter 14-22 Operation Mode)

Initialization of the drive to default settings (via *parameter 14-22 Operation Mode*)

Procedure

1. Select *parameter 14-22 Operation Mode.*
2. Press [OK].
3. Select *[2] Initialisation* and press [OK].
4. Cut off the mains supply and wait until the display turns off.
5. Reconnect the mains supply.

The drive is now reset, except the following parameters:

Parameter 0-03 Regional Settings

Parameter 1-06 Clockwise Direction

Parameter 1-13 Compressor Selection

Parameter 4-18 Current Limit

Parameter 8-30 Protocol

Parameter 8-31 Address

Parameter 8-32 Baud Rate

Parameter 8-33 Parity / Stop Bits

Parameter 8-35 Minimum Response Delay

Parameter 8-36 Maximum Response Delay

Parameter 8-37 Maximum Inter-char delay

Parameter 15-00 Operating hours to *parameter 15-05 Over Volt's*

Parameter 15-03 Power Up's

Parameter 15-04 Over Temp's

Parameter 15-05 Over Volt's

Parameter 15-30 Alarm Log: Error Code

Parameter group 15-4 Drive identification parameters*

4.5.2 Two-finger Initialization

Procedure

1. Power off the drive.
2. Press [OK] and [Menu].
3. Power up the drive while still pressing the keys above for 10 s.

The drive is now reset, except the following parameters:

Parameter 1-06 Clockwise Direction

Parameter 15-00 Operating hours

Parameter 15-03 Power Up's

Parameter 15-04 Over Temp's

Parameter 15-05 Over Volt's

Parameter 15-30 Alarm Log: Error Code

Parameter group 15-4 Drive identification parameters*

Initialization of parameters is confirmed by AL80 in the display after the power cycle.

5 Parameter Descriptions and Functions

5.1 Introduction to Parameters

The * in parameter numbers indicates a group or subgroup of parameters for which the first 1 or 2 numbers are the same. For example, 0-** indicates the group of parameters that all start with 0. 0-0* indicates the subgroup of parameters that share the first 2 numbers, which are 0-0.

An asterisk (*) after an option number indicates the default option. For example, *[0]* English* is the default option for *parameter 0-01 Language*.

Organization of the parameter chapter

The VLT® Compressor DriveCDS 803 uses 2 different software version depending on the power range. The 6–10 kW drives use one software version, while 18–30 kW drives use another software version. The chapter is split into the following 3 sections:

- *Common Parameters*: This section contains all available parameters shared across all power ranges.
- *6–10 kW Specific Parameters*: This section contains the parameters available only for 6–10 kW drives.
- *18–30 kW Specific Parameters*: This section contains the parameters available only for 18–30 kW drives.

5.1.1 Reading the parameter table

This Programming Guide includes parameter and options tables. These descriptions explain how to read the parameter and options tables.

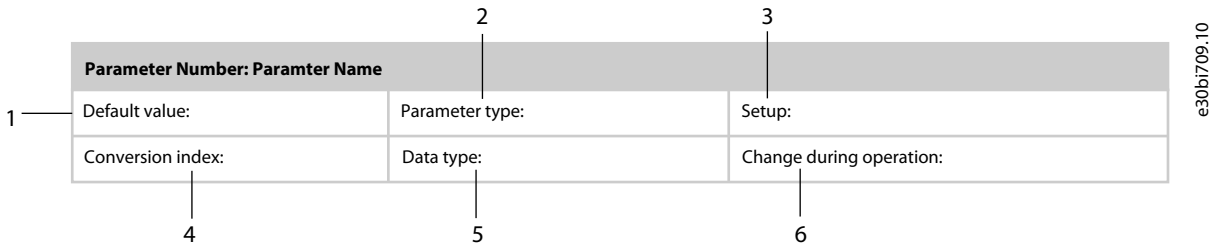

Illustration 7: Parameter Table

1 indicates the value set in factory. *Expressionlimit* means the default value is not a fixed value and may link to power size and parameter dependency.

2 indicates whether the parameter type is option or range. *Option* means that the user is presented with a predefined selection to choose between. *Range* means that the user can select any value within the specified range.

3 indicates the manner of parameter set-ups. *2 setups* means that the parameter can be set individually in each of the 2 setups. For example, 1 single parameter can have 2 different data values. *1 setup* indicates that the data value is the same in all setups.

4 refers to the conversion index. Parameter values are transferred as whole numbers only. Conversion factors are therefore used to transfer decimals. If a value is transferred as 100 and a conversion index of -1, the real value is 10.0.

5 indicates the different data types for the parameters.

6 indicates whether the parameter value can be changed while the drive is in operation. False indicates that the frequency converter must be stopped before a change can be made.

Table 9: Conversion Table

Conversion index	Conversion factor
100	1
75	3600000
74	3600
70	60
67	1/60
6	1000000
5	100000

Conversion index	Conversion factor
4	10000
3	1000
2	100
1	10
0	1
-1	0.1
-2	0.01
-3	0.001
-4	0.0001
-5	0.00001
-6	0.000001

Table 10: Data type

Data type	Description	Type
2	Integer 8	Int8
3	Integer 16	Int16
4	Integer 32	Int32
5	Unsigned 8	Uint8
6	Unsigned 16	Uint16
7	Unsigned 32	Uint32
9	Visible string	VisStr
33	Normalized value 2 bytes	N2
35	Bit sequence of 16 boolean variables	V2

5.2 Common Parameters

5.2.1 Parameter Group 0-** Operation and Display

5.2.1.1 Parameter Group 0-0* Basic Settings

Parameter 0-01 Language

Table 11: Parameter 0-01 Language

0-01 Language		
Default value: English	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: True

Defines the language to be used in the display.

Option	Name	Description
[0]*	English	
[1]	Deutsch	
[2]	Français	
[3]	Dansk	
[4]	Español	
[5]	Italiano	
[28]	Bras. Port	
[255]	No text	

Parameter 0-04 Operating State at Power-up

Table 12: Parameter 0-04 Operating State at Power-up

0-04 Operating State at Power-up		
Default value: Resume	Parameter type: Option	Setup: 2 setup
Conversion index: –	Data type: Uint8	Change during operation: True

Select the operating mode after recognition of the drive to mains voltage after power-down when operating in Hand (local) mode.

Option	Name	Description
[0]*	Resume	Resumes operation of the drive, maintaining the same start/stop condition (applied by [Hand ON]/[Off] on the LCP or local start via the digital input) as before the drive was powered down.
[1]	Forced stop, ref=old	Uses saved reference [1] to stop the drive, but at the same time retains the local speed reference in memory before powering down. After mains voltage is reconnected, and after receiving a start command (pressing [Hand On] or using the local start command via a digital input), the drive restarts and operates at the retained speed reference.

Parameter 0-07 Auto DC Braking

Table 13: Parameter 0-07 Auto DC Braking

0-07 Auto DC Braking		
Default value: On	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Protective function against overvoltage at coast.

NOTICE

Can cause PWM when coasted.

Option	Name	Description
[0]	Off	This function is not active.
[1]*	On	This function is active.

5.2.1.2 Parameter Group 0-1* Set-up Operations

Parameter 0-10 Active Set-up

Table 14: Parameter 0-10 Active Set-up

0-10 Active Set-up		
Default value: Set-up 1	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: True

Select the setup in which the drive operates.

Option	Name	Description
[1]*	Set-up 1	Set-up 1 is active.
[2]	Set-up 2	Set-up 2 is active.
[9]	Multi Set-up	Used for remote setup selections via digital inputs and the serial communication port. This setup uses the settings from *parameter 0-12 Link Setups*.

Parameter 0-11 Programming Set-up

Table 15: Parameter 0-11 Programming Set-up

0-11 Programming Set-up		
Default value: Active Set-up	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

The number of the setup being edited is shown flashing in the LCP.

Option	Name	Description
[1]	Set-up 1	Edit set-up 1.
[2]	Set-up 2	Edit set-up 2.
[9]*	Active Set-up	Edit parameters in the setup selected via digital I/Os.

Parameter 0-12 Link Setups

Table 16: Parameter 0-12 Link Setups

0-12 Link Setups		
Default value: Linked	Parameter type: Option	Setup: 2 setup
Conversion index: –	Data type: Uint8	Change during operation: False

If the setups are not linked, a change between them is not possible while the compressor is running.

Option	Name	Description
[0]	Not linked	When selecting a different setup for operation, the setup change does not occur until the compressor is coasted.
[20]*	Linked	Copies *Not changeable during operation* parameters from one setup to the other. It is possible to switch setup while the compressor is running.

5.2.1.3 Parameter Group 0-3* LCP Custom Readout

Parameter 0-30 Custom Readout Unit

Table 17: Parameter 0-30 Custom Readout Unit

0-30 Custom Readout Unit		
Default value: %	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: True

Program a value to be shown in the display of the LCP. The value has a linear, squared, or cubed relation to speed. This relation depends on the unit selected. The actual calculated value can be read in *parameter 16-09 Custom Readout*.

Option	Name	Description
[0]	None	
[1]*	%	
[5]	PPM	
[10]	l/Min	
[11]	RPM	
[12]	Pulse/s	
[20]	l/s	
[21]	l/min	
[22]	l/h	
[23]	m^3/s	
[24]	m^3/min	
[25]	m^3/h	
[30]	kg/s	
[31]	kg/min	
[32]	kg/h	
[33]	t/min	
[34]	t/h	
[40]	m/s	
[41]	m/min	
[45]	m	
[60]	Degree Celsius	
[70]	mbar	
[71]	bar	
[72]	Pa	
[73]	kPa	
[74]	m Wg	
[80]	kW	

Option	Name	Description
[120]	GPM	
[121]	gal/s	
[122]	gal/min	
[123]	gal/h	
[124]	CFM	
[127]	ft3/h	
[140]	ft/s	
[141]	ft/min	
[160]	Degree Fahr	
[170]	psi	
[171]	lb/in^2	
[172]	in WG	
[173]	ft WG	
[180]	hp	

Parameter 0-31 Custom Readout Min Value

Table 18: Parameter 0-31 Custom Readout Min Value

0-31 Custom Readout Min Value		
Default value: 0 CustomReadoutUnit	Parameter type: Range [0 - Expressionlimit (999999.99)]	Setup: 1 setup
Conversion index: –	Data type: Int32	Change during operation: True

This parameter sets the minimum value of the custom-defined readout (occurs at 0 speed). It is only possible to select a value different from 0 when selecting a linear unit in *parameter 0-30 Custom Readout Unit*. For quadric and cubic units, the minimum value is 0.

Parameter 0-32 Custom Readout Max Value

Table 19: Parameter 0-32 Custom Readout Max Value

0-32 Custom Readout Max Value		
Default value: 100 CustomReadoutUnit	Parameter type: Range [0.0 - Expressionlimit (999999.99)]	Setup: 1 setup
Conversion index: -2	Data type: Int32	Change during operation: True

This parameter sets the maximum value to be shown when the speed of the compressor has reached the value set for *parameter 4-14 Motor Speed High Limit [Hz]*.

5.2.1.4 Parameter Group 0-4* LCP Keypad

Parameter 0-42 [Auto On] Key on LCP

Table 20: Parameter 0-42 [Auto On] key on the LCP

0-42 [Auto On] key on the LCP		
Default value: Enabled	Parameter type: Option	Setup: 2 setups

0-42 [Auto On] key on the LCP		
Conversion index: –	Data type: Uint8	Change during operation: True

Option	Name	Description
[0]	Disabled	To avoid unintended start of the drive from the LCP, select *[0] Disabled*.
[1]*	Enabled	[Auto On] is enabled.

Parameter 0-44 [Off/Reset] Key on LCP

Table 21: Parameter 0-44 [Off/Reset] key on the LCP

0-44 [Off/Reset] key on the LCP		
Default value: Enabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: True

Option	Name	Description
[0]	Disabled	Disable the [Off/Reset] key.
[1]*	Enabled	Enable both off and reset functions.
[7]	Enable Reset Only	Enable the reset function and disable the off function to avoid unintended stop of the drive.

5.2.1.5 Parameter Group 0-5* Copy/Save

Copy parameter settings between setups and to/from the LCP.

Parameter 0-50 LCP Copy

Table 22: Parameter 0-50 LCP Copy

0-50 LCP Copy		
Default value: No copy	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	No copy	
[1]	All to LCP	Copies all parameters in all setups from the drive memory to the LCP memory. For service purposes, to copy all parameters to the LCP after commissioning.
[2]	All from LCP	Copies all parameters in all setups from the LCP memory to the drive memory.
[3]	Size indep. from LCP	Copies only the parameters that are independent of the compressor size. The latter selection can be used to program several drives with the same function without disturbing compressor data which is already set.

Parameter 0-51 Set-up Copy

Table 23: Parameter 0-51 Set-up Copy

0-51 Set-up Copy		
Default value: No copy	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	No copy	
[1]	Copy from setup 1	Copy from setup 1 to setup 2.
[2]	Copy from setup 2	Copy from setup 2 to setup 1.
[9]	Copy from factory setup	Copy factory setting to programming setup (selected in *parameter 0-11 Programming Set-up*).

5.2.1.6 Parameter Group 0-6* Password

Table 24: Parameter 0-60 Main Menu Password

0-60 Main Menu Password		
Default value: 0	Parameter type: Range [0 - 999]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: True

Define the password for access to the Main Menu via the [Main Menu] key. Setting the value to 0 disables the password function.

5.2.2 Parameter Group 1-** Load and Motor

5.2.2.1 Parameter Group 1-0* General Settings

Parameter 1-00 Configuration Mode

Table 25: Parameter 1-00 Configuration Mode

1-00 Configuration Mode		
Default value: Open loop	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: True

Select which application control principle should be used.

N O T I C E

This parameter cannot be adjusted while the compressor is running.

Option	Name	Description
[0]*	Open loop	Compressor speed is determined by applying a speed reference or by setting speed when in hand-on mode. Open loop is also used if the drive is part of a closed-loop control system based on an external PI controller providing a speed reference signal as output.
[3]	Process Control Loop	Compressor speed is determined by a reference from the built-in PI controller varying the compressor speed as of a closed-loop control process (for example, constant pressure or flow). Configure the PI controller in *parameter group 20-** Drive Closed Loop*.

5.2.2.2 Parameter Group 1-7* Start Adjustments

Parameters for configuring special motor start features.

Parameter 1-71 Start Delay

Table 26: Parameter 1-71 Start Delay

1-71 Start Delay		
Default value: 60 s	Parameter type: Range [0 - 120 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

This parameter enables a delay of the starting time. The drive begins with the start function selected in *parameter 1-72 Start Function*. Set the start delay time until acceleration is to begin.

5.2.3 Parameter Group 2-** Brakes

5.2.3.1 Parameter Goup 2-1* Brake Energy Function

Parameter group for selecting dynamic brake parameters.

Parameter 2-17 Over-voltage Control

Table 27: Parameter 2-17 Over-voltage Control

2-17 Over-voltage Control		
Default value: Enabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select whether to enable OVC during ramp down. Enabling OVC reduces the risk of a drive trip due to overvoltage on the DC link caused by generative power from the load.

Option	Name	Description
[0]	Disabled	No OVC required.
[2]*	Enabled	Activates OVC. **N O T I C E** The ramp time is automatically adjusted to avoid tripping of the drive.

5.2.4 Parameter Group 3-** Reference/Ramps

5.2.4.1 Parameter Group 3-0* Reference Limits

Parameters for setting the reference unit, limits, and ranges.

Also see *parameter group 20-0* Feedback* for information on settings in closed loop.

Parameter 3-02 Minimum Reference

Table 28: Parameter 3-02 Minimum Reference

3-02 Minimum Reference		
Default value: ExpressionLimit	Parameter type: Range [0 – 200 ReferenceFeedbackUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

The minimum reference is the lowest value obtainable by summing all references.

Parameter 3-03 Maximum Reference

Table 29: Parameter 3-03 Maximum Reference

3-03 Maximum Reference		
Default value: 200 ReferenceFeedbackUnit	Parameter type: Range [0 – 200 ReferenceFeedbackUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

The maximum reference is the highest value obtainable by summing all references. The maximum reference unit matches the configuration selected in *parameter 1-00 Configuration Mode*.

5.2.4.2 Parameter Group 3-1* References

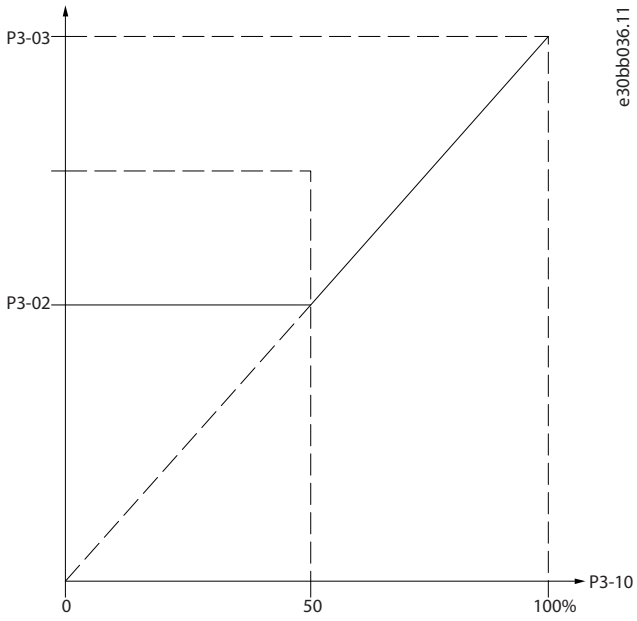

Illustration 8: References

Parameter 3-10 References

Table 30: Parameter 3-10 Preset Reference

3-10 Preset Reference		
Default value: 0%	Parameter type: Range [-100 – 100%]	Setup: 2 setups
Conversion index: -2	Data type: Int16[8]	Change during operation: True

Enter up to 8 different preset references (0–7) in this parameter, using array programming. For selecting dedicated references, select *[16] Preset reference bit 0*, *[17] Preset reference bit 1*, or *[18] Preset reference bit 2* for corresponding digital inputs in *parameter group 5-1* Digital Inputs*.

Parameter 3-14 Preset Relative Reference

Table 31: Parameter 3-14 Preset Relative Reference

3-14 Preset Relative Reference		
Default value: 0%	Parameter type: Range [-100 – 100%]	Setup: 2 setups
Conversion index: -2	Data type: Int16	Change during operation: True

The actual reference, X, is increased or decreased with the percentage, Y, set in this parameter. This results in the actual reference, Z. Actual reference (X) is the sum of the inputs selected in *parameter 3-15 Reference 1 Source*, *parameter 3-16 Reference 2 Source*, *parameter 3-17 Reference 3 Source*, and *parameter 8-02 Control Source*.

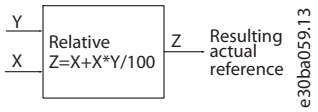

Illustration 9: Preset Relative Reference

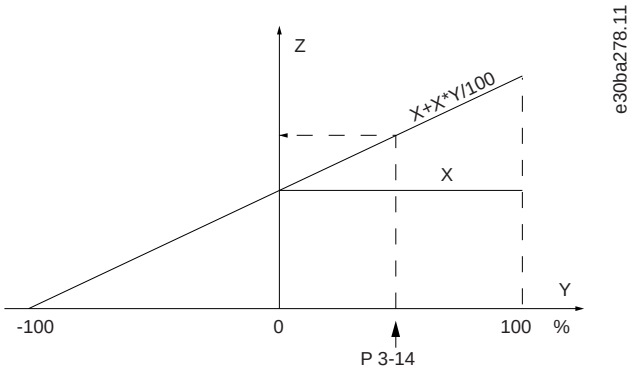

Illustration 10: Actual Reference

Parameter 3-15 Reference 1 Source

Table 32: Parameter 3-15 Reference 1 Source

3-15 Reference 1 Source		
Default value: Analog input 53	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the input to be used for the 1st reference signal. *Parameters 3-15* to *3-17* define up to 3 difference reference signals. The sum of these signals defines the actual reference.

Option	Name	Description
[0]	No function	
[1]*	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[11]	Local bus reference	

Parameter 3-17 Reference 3 Source

Table 33: Parameter 3-17 Reference 3 Source

3-17 Reference 3 Source		
Default value: Local bus reference	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the input to be used for the 3rd reference signal. *Parameters 3-15* to *3-17* define up to 3 difference reference signals. The sum of these signals defines the actual reference.

Option	Name	Description
[0]	No function	
[1]	Analog input 53	

Option	Name	Description
[2]	Analog input 54	
[7]	Pulse input 29	
[11]*	Local bus reference	

5.2.4.3 Parameter Group 3-4* Ramp 1

Configure the ramp time parameters for each of the 2 ramps (*parameter group 3-4* Ramp 1* and *parameter group 3-5* Ramp 2). The ramp time is preset to the minimum value of 10 ms for all power sizes.*

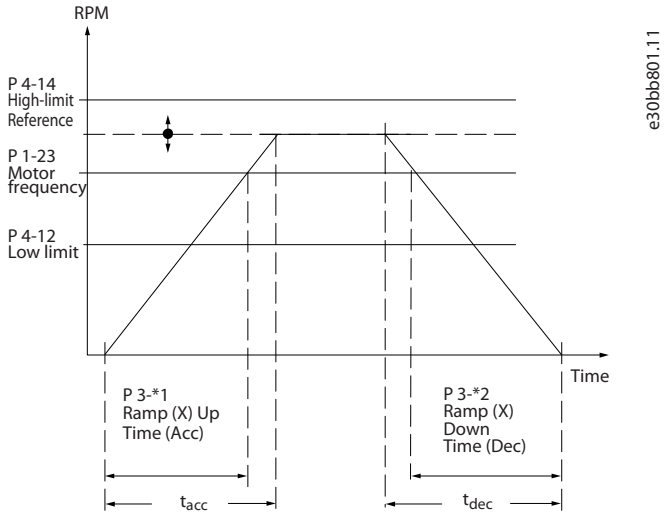

Illustration 11: Ramps

Parameter 3-41 Ramp 1 Ramp Up Time

Table 34: Parameter 3-41 Ramp 1 Ramp Up Time

3-41 Ramp 1 Ramp Up Time		
Default value: ExpressionLimit	Parameter type: Range [0.05 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter acceleration time from 0 RPM to *parameter 1-25 Motor Nominal Speed*. Select a ramp-up time such that the output current does not exceed the current limit in *parameter 4-18 Current Limit* during ramping. See ramp-down time in *parameter 3-42 Ramp 1 Ramp Down Time*.

Parameter 3-42 Ramp 1 Ramp Down Time

Table 35: Parameter 3-42 Ramp 1 Ramp Down Time

3-42 Ramp 1 Ramp Down Time		
Default value: ExpressionLimit	Parameter type: Range [0.05 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter deceleration time from *parameter 1-25 Motor Nominal Speed* to 0 RPM. Select a ramp-up time such that the output current does not exceed the current limit in *parameter 4-18 Current Limit* during ramping. See ramp-up time in *parameter 3-41 Ramp 1 Ramp Up Time*.

5.2.4.4 Parameter Group 3-5* Ramp 2

This parameter group configures ramp 2 parameters.

Parameter 3-51 Ramp 2 Ramp Up Time

Table 36: Parameter 3-51 Ramp 2 Ramp Up Time

3-51 Ramp 2 Ramp Up Time		
Default value: ExpressionLimit	Parameter type: Range [0.05 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter acceleration time from 0 Hz to *parameter 1-23 Motor Frequency* if induction motor is selected. Enter acceleration time from 0 RPM to *parameter 1-25 Motor Nominal Speed* if PM motor is selected. Select a ramp-up time such that the output current does not exceed the current limit in *parameter 4-18 Current Limit* during ramping. See ramp-down time in *parameter 3-52 Ramp 2 Ramp Down Time*.

Parameter 3-52 Ramp 2 Ramp Down Time

Table 37: Parameter 3-52 Ramp 2 Ramp Down Time

3-52 Ramp 2 Ramp Down Time		
Default value: ExpressionLimit	Parameter type: Range [0.05 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the ramp-down time from *parameter 1-25 Motor Nominal Speed* to 0 RPM. Select a ramp-down time such that no overvoltage occurs in the inverter due to regenerative operation of the motor, and such that the generated current does not exceed the current limit in *parameter 4-18 Current Limit*. See ramp-up time in *parameter 3-51 Ramp 2 Ramp Up Time*.

5.2.4.5 Parameter Group 3-8* Other Ramps

Parameter 3-80 Jog Ramp Time

Table 38: Parameter 3-80 Jog Ramp Time

3-80 Jog Ramp Time		
Default value: ExpressionLimit	Parameter type: Range [0.05 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the jog ramp time, that is, the acceleration/deceleration time between 0 Hz to *parameter 1-25 motor Nominal Speed*. Ensure that the resulting output current required for the given jog ramp does not exceed the current limit in *parameter 4-18 Current Limit*. The jog ramp time starts after activation of a jog signal via the control panel, a selected digital input, or the serial communication port.

5.2.5 Parameter Group 4-** Limits/Warnings

5.2.5.1 Parameter Group 4-1* Motor Limits

Define current and speed limits for the compressor and the reaction of the drive when the limits are exceeded.

Parameter 4-12 Motor Speed Low Limit [Hz]

Table 39: Parameter 4-12 Motor Speed Low Limit [Hz]

4-12 Motor Speed Low Limit [Hz]		
Default value: ExpressionLimit	Parameter type: Range [0 – 200 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Enter the minimum limit for motor speed. The motor speed low limit can be set to correspond to the minimum output frequency of the motor shaft. The speed low limit must not exceed the setting in *parameter 4-14 Motor Speed High Limit [Hz]*.

Parameter 4-14 Motor Speed High Limit [Hz]

Table 40: Parameter 4-14 Motor Speed High Limit [Hz]

4-14 Motor Speed High Limit [Hz]		
Default value: ExpressionLimit	Parameter type: Range [30 – 200 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Enter the maximum limit for compressor speed. *Parameter 4-14 Motor Speed High Limit [Hz]* can be set to match the manufacturer's recommended compressor speed. The motor speed high limit must exceed the value in *parameter 4-12 Motor Speed Low Limit [Hz]*.

N O T I C E

Motor speed high limit cannot be set higher than *parameter 4-19 Max Output Frequency*.

Parameter 4-19 Max Output Frequency

Table 41: Parameter 4-19 Max Output Frequency

4-19 Max Output Frequency		
Default value: ExpressionLimit	Parameter type: Range [0 – 400]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Enter the maximum output frequency value. *Parameter 4-19 Max Output Frequency* specifies the absolute limit on the drive output frequency for improved safety in applications where accidental overspeeding must be avoided. This absolute limit applies to all configurations and is independent of the setting in *parameter 1-00 Configuration Mode*.

5.2.5.2 Parameter Group 4-4* Adjustable Warnings 2

Parameter 4-40 Warning Freq. Low

Table 42: Parameter 4-40 Warning Freq. Low

4-40 Warning Freq. Low		
Default value: ExpressionLimit	Parameter type: Range [0 – 500]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Use this parameter to set a lower limit for the frequency range. When the compressor speed drops below this limit, the display reads SPEED LOW. Warning bit 10 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-41 Warning Freq. High

Table 43: Parameter 4-41 Warning Freq. High

4-41 Warning Freq. High		
Default value: ExpressionLimit	Parameter type: Range [0 – 500]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Use this parameter to set an upper limit for the frequency range. When the compressor speed exceeds this limit, the display reads SPEED HIGH. Warning bit 9 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

5.2.5.3 Parameter Group 4-5* Adjustable Warnings

Define adjustable warning limits for current. Warnings are shown on the display, programmed output, or fieldbus.

Parameter 4-50 Warning Current Low

Table 44: Parameter 4-50 Warning Current Low

4-50 Warning Current Low		
Default value: 0 A	Parameter type: Range [0 – 500 A]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the I_{LOW} value. When the compressor current drops below this limit, a bit in the status word is set. This value can also be programmed to produce a signal on the digital output or the relay output.

Parameter 4-51 Warning Current High

Table 45: Parameter 4-51 Warning Current High

4-51 Warning Current High		
Default value: 0 A	Parameter type: Range [0 – 500 A]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the I_{HIGH} value. When the compressor current exceeds this limit, a bit in the status word is set. This value can also be programmed to produce a signal on the digital output or the relay output.

5.2.5.4 Parameter Group 4-6* Speed Bypass

Define the speed bypass areas for the ramps. Three frequency ranges can be avoided.

Parameter 4-61 Bypass Speed From [Hz]

Table 46: Parameter 4-61 Bypass Speed From [Hz]

4-61 Bypass Speed From [Hz]		
Default value: 0 Hz	Parameter type: Range [0 – 500 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Some systems call for avoiding certain output speeds due to resonance problems in the system. Enter the lower limits of the speeds to be avoided.

Parameter 4-63 Bypass Speed To [Hz]

Table 47: Parameter 4-63 Bypass Speed To [Hz]

4-63 Bypass Speed To [Hz]		
Default value: 0 Hz	Parameter type: Range [0 – 500 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Some systems call for avoiding certain output speeds due to resonance problems in the system. Enter the upper limits of the speeds to be avoided.

5.2.6 Parameter Group 5-** Digital In/Out

5.2.6.1 Parameter Group 5-0* Digital I/O Mode

Parameters for configuring the input and output using NPN and PNP.

N O T I C E
This parameter cannot be adjusted while the compressor is running.

Table 48: Parameter 5-00 Digital Input Mode

5-00 Digital Input Mode		
Default value: PNP	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Set NPN or PNP mode for digital inputs 18, 19, 27, and 29. Digital input mode.

Option	Name	Description
[0]*	PNP	Action on positive directional pulses (0). PNP systems are pulled down to GND.
[1]	NPN	Action on negative directional pulses (1). NPN systems are pulled up to +24 V internally in the drive.

5.2.6.2 Parameter Group 5-1* Digital Inputs

Parameters for configuring the input functions for the input terminals. The digital inputs are used for selecting various functions in the drive. All digital inputs can be set to the following functions:

Table 49: Digital Input Functions

Digital input function	Description
[0] No operation	No reaction to signals transmitted to the terminal.
[1] Reset	Reset the drive after a TRIP/ALARM. Trip lock alarms can be reset.
[2] Coast inverse	Leaves the compressor in free mode. Logic 0⇒coast stop.
[3] Coast and reset inverse	Reset and coast stop inverted input (NC). Leaves the compressor in free mode and resets the drive. Logic 0⇒coast stop and reset.
[4] Quick stop inverse	Inverted input (NC). Generates a stop in accordance with the quick stop ramp time set in *parameter 3-81 Quick Stop Ramp Time*. After ramping down, the shaft is in free mode.
[5] DC-brake inverse	Inverted input for DC braking (NC). Stops the compressor by energizing it with DC current for a certain period, see *parameter 2-01 DC Brake Current*. The function is only active when the value in *parameter 2-02 DC Braking Time* is different from 0. This selection is not possible when *parameter 1-10 Motor Construction* is set to *[1] PM non-salient SPM*.
[6] Stop inverse	Stop inverted function. Generates a stop function when selected terminals go from logic 1 to 0 (not latched). Stop is performed according to the selected ramp time.
[7] External interlock	Same function as *[2] Coast inverse*, but this function generates the alarm message *External fault* on the display when the terminal, which is programmed for *[2] Coast inverse*, is logic 0. The alarm message is also active via digital outputs and relay outputs, if programmed for *[7] External interlock*. The alarm can be reset using a digital input, fieldbus, or the [Reset] key if the cause for the external interlock has been removed.
[8] Start	Select start for a start/stop command. Logic 1=start, logic 0=stop.
[9] Latched start	The compressor starts if a pulse is applied for minimum 2 ms. The compressor stops when *[6] Stop inverse* is activated.
[10] Reversing	Change direction of compressor shaft rotation. Reversing signal only changes direction of rotation; it does not activate the start function. Select *[2] Both direction* in *parameter 4-10 Motor Speed Direction*. 0=normal, 1=reversing.
[11] Start reversing	Use for start/stop and for reversing at the same time. Signals on *[8] Start* are not allowed at the same time. 0=stop, 1=start reversing.
[14] Jog	Used for activating jog speed. See *parameter 3-11 Jog Speed [Hz]*.

Digital input function	Description
[16] Preset ref bit 0	Enables a selection between 1 of the 8 preset references according to Table 50.
[17] Preset ref bit 1	Enables a selection between 1 of the 8 preset references according to Table 50.
[18] Preset ref bit 2	Enables a selection between 1 of the 8 preset references according to Table 50.
[19] Freeze reference	Freeze the actual reference. The frozen reference is now the point of enable/condition for *[21] Speed up* and *[22] Speed down* to be used. If speed up/down is used, speed change always follows ramp 2 (*parameter 3-51 Ramp 2 Ramp Up Time* and *parameter 3-52 Ramp 2 Ramp Down Time* in the range *parameter 3-02 Minimum Reference–parameter 3-03 Maximum Reference*.
[20] Freeze output	Freeze the actual output. The frozen output is now the point of enable/condition for *[21] Speed up* and *[22] Speed down* to be used. If speed up/down is used, speed change always follows ramp 2 (*parameter 3-51 Ramp 2 Ramp Up Time* and *parameter 3-52 Ramp 2 Ramp Down Time* in the range *parameter 3-02 Minimum Reference–parameter 3-03 Maximum Reference*.
[21] Speed up	Select this option for digital control of the up/down speed. Activate this function by selecting either *[19] Freeze reference* or *[20] Freeze output*. When *[21] Speed up* is activated for less than 400 ms, the resulting reference is increased by 0.1%. If *[21] Speed up* is activated for more than 400 ms, the resulting reference ramps according to ramp 1 in *parameter 3-41 Ramp 1 Ramp Up Time*.
[22] Speed down	Same function as *[21] Speed up*, but the reference decreases.
[23] Set-up select bit 0	Selects 1 of the 2 setups. Set *parameter 0-10 Active Set-up* to *[9] Multi set-up*.
[32] Pulse input	Select *[32] Pulse input* when using a pulse sequence as either reference or feedback. Scaling is done in *parameter group 5-5* Pulse Input*. Available only on terminal 29.
[34] Ramp bit 0	Select which ramp to use. Logic 0 selects ramp 1 while logic 1 selects ramp 2.
[52] Run permissive	The input terminal, for which *[52] Run Permissive* has been programmed, must be logic 1 before a start command can be accepted. *[52] Run permissive* has a logic AND function related to the terminal which is programmed for *[8] Start*, *[14] Jog*, or *[20] Freeze output*. To start running the compressor, both conditions must be fulfilled. If *[52] Run permissive* is programmed on multiple terminals, it only has to be logic 1 on 1 of the terminals for the function to be carried out. The digital output signal for Run Request (*[8] Start*, *[14] Jog*, or *[20] Freeze output*) programmed in *parameter group 5-4* Relays* is not affected by *[52] Run permissive*. **N O T I C E** If no *[52] Run permissive* signal is applied but either run, jog, or freeze commands are activated, the status line in the display shows either Run Requested, Jog Requested, or Freeze Requested.
[53] Hand start	A signal applied puts the drive into Hand mode as if [Hand On] had been pressed and a normal stop command is overridden. If disconnecting the signal, the compressor stops. To make any other start commands valid, another digital input must be assigned to *[54] Auto Start* and a signal applied to this. The [Hand On] and [Auto On] keys have no impact. The [Off] key overrides *[53] Hand start* and *[54] Auto start*. Press either [Hand On] or [Auto On] to make *[53] Hand start* and *[54] Auto start* active again. If there is no signal on *[53] Hand start* or *[54] Auto start*, the compressor stops regardless of any normal start command applied. If a signal is applied to both *[53] Hand start* and *[54] Auto start*, the function is Auto start.
[54] Auto start	A signal applied puts the drive into Auto mode as if [Auto On] had been pressed. See also *[53] Hand start*.
[60] Counter A (up)	Input for increment counting in the SLC counter.

Digital input function	Description
[61] Counter A (down)	Input for decrement counting in the SLC counter.
[62] Reset counter A	Input for reset of counter A.
[63] Counter B (up)	Input for increment counting in the SLC counter.
[64] Counter B (down)	Input for decrement counting in the SLC counter.
[65] Reset counter B	Input for reset of counter B.

Table 50: Selected Preset References

Selected preset reference	Preset reference bit 2	Preset reference bit 1	Preset reference bit 0
Preset reference 0	0	0	0
Preset reference 1	0	0	1
Preset reference 2	0	1	0
Preset reference 3	0	1	1
Preset reference 4	1	0	0
Preset reference 5	1	0	1
Preset reference 6	1	1	0
Preset reference 7	1	1	1

Parameter 5-10 Terminal 18 Digital Input

Table 51: Parameter 5-10 Terminal 18 Digital Input

5-10 Terminal 18 Digital Input		
Default value: Start	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Parameter for configuring the input function on input terminal 18. See Table 49 for descriptions of the functions.

Option	Name	Description
[0]	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inverse	
[4]	Quick stop inverse	
[5]	DC-brake inverse	
[6]	Stop inverse	

Option	Name	Description
[7]	External interlock	
[8]*	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[16]	Preset ref bit 0	
[17]	Preset ref bit 1	
[18]	Preset ref bit 2	
[19]	Freeze reference	
[20]	Freeze output	
[21]	Speed up	
[22]	Speed down	
[23]	Set-up select bit 0	
[34]	Ramp bit 0	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	
[63]	Counter B (up)	
[64]	Counter B (down)	
[65]	Reset Counter B	

Parameter 5-11 Terminal 19 Digital Input

Table 52: Parameter 5-11 Terminal 19 Digital Input

5-11 Terminal 19 Digital Input		
Default value: No operation	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Parameter for configuring the input function on input terminal 19. See Table 49 for descriptions of the functions.

Option	Name	Description
[0]*	No operation	

Option	Name	Description
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inverse	
[4]	Quick stop inverse	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[16]	Preset ref bit 0	
[17]	Preset ref bit 1	
[18]	Preset ref bit 2	
[19]	Freeze reference	
[20]	Freeze output	
[21]	Speed up	
[22]	Speed down	
[23]	Set-up select bit 0	
[34]	Ramp bit 0	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	
[63]	Counter B (up)	
[64]	Counter B (down)	
[65]	Reset Counter B	

Parameter 5-12 Terminal 27 Digital Input

Table 53: Parameter 5-12 Terminal 27 Digital Input

5-12 Terminal 27 Digital Input		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Parameter for configuring the input function on input terminal 27. See Table 49 for descriptions of the functions.

Option	Name	Description
[0]	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inverse	
[4]	Quick stop inverse	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[16]	Preset ref bit 0	
[17]	Preset ref bit 1	
[18]	Preset ref bit 2	
[19]	Freeze reference	
[20]	Freeze output	
[21]	Speed up	
[22]	Speed down	
[23]	Set-up select bit 0	
[34]	Ramp bit 0	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	

Option	Name	Description
[63]	Counter B (up)	
[64]	Counter B (down)	
[65]	Reset Counter B	

5.2.6.3 Parameter Group 5-4* Relays

Parameters for configuring the timing and the output functions for the relays.

Table 54: Parameter 5-40 Function Relay

5-40 Function Relay		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8 [2]	Change during operation: False

Select options to define the function of the relays. The selection of each mechanical relay is realized in an array parameter.

Option	Name	Description
[0]	No operation	Default for both relays.
[1]	Control ready	The control board receives supply voltage.
[2]	Drive ready	The drive is ready for operation and applies a supply signal on the control board.
[3]	Drive ready/remote control	The drive is ready for operation in auto on-mode.
[4]	Standby/no warning	The drive is ready for operation. No start or stop command is given. No warnings are present.
[5]	Drive running	The compressor runs.
[6]	Running/no warning	The compressor runs and no warnings are present.
[7]	Run in range/no warning	The compressor runs within programmed current ranges, see *parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*. No warnings are present.
[8]	Run on ref/no warning	The compressor runs at reference speed and with no warnings.
[9]	Alarm	An alarm activates output.
[10]	Alarm or warning	An alarm or warning activates output.
[12]	Out of current range	The compressor current is outside the range set in *parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*.
[13]	Below current, low	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[14]	Above current, high	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Below speed, low	The drive output speed is lower than the limit set in *parameter 4-40 Warning Freq. Low*.
[17]	Above speed, high	The drive output speed is higher than the limit set in *parameter 4-41 Warning Freq. High*.
[19]	Below feedback, low	The feedback is lower than the limit set in *parameter 4-56 Warning Feedback Low*.
[20]	Above feedback, high	The feedback is higher than the limit set in *parameter 4-57 Warning Feedback High*.

Option	Name	Description
[21]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, drive, or thermistor.
[22]	Ready, no thermal warning	The drive is ready for operation and no overtemperature warning is present.
[23]	Remote, ready, no thermal warning	The drive is ready for operation in Auto on mode, and no overtemperature warning is present.
[24]	Ready, voltage OK	The drive is ready for operation and mains voltage is within the specified voltage range.
[25]	Reverse	The compressor runs/is ready to run clockwise when logic=0 and counterclockwise when logic=1. The output changes when the reversing signal is applied.
[26]	Bus OK	Active communication (no timeout) via serial communication port.
[35]	External interlock	See 5.2.6.2 Parameter Group 5-1* Digital Inputs.
[36]	Control word bit 11	Bit 11 in the control word controls the relay.
[37]	Control word bit 12	Bit 12 in the control word controls the relay.
[41]	Below reference, low	The reference is lower than the limit set in *parameter 4-54 Warning Reference Low*.
[42]	Above ref, high	The reference is higher than the limit set in *parameter 4-55 Warning Reference High*.
[44]	Oil boost active	
[45]	Bus control	The output is configured in *parameter 5-90 Digital & Relay Bus Control*.
[60]	Comparator 0	See *parameter group 13-1* Comparators*. If Comparator 0 is evaluated as true, the output goes high. Otherwise, it is low.
[61]	Comparator 1	See *parameter group 13-1* Comparators*. If Comparator 1 is evaluated as true, the output goes high. Otherwise, it is low.
[62]	Comparator 2	See *parameter group 13-1* Comparators*. If Comparator 2 is evaluated as true, the output goes high. Otherwise, it is low.
[63]	Comparator 3	See *parameter group 13-1* Comparators*. If Comparator 3 is evaluated as true, the output goes high. Otherwise, it is low.
[64]	Comparator 4	See *parameter group 13-1* Comparators*. If Comparator 4 is evaluated as true, the output goes high. Otherwise, it is low.
[65]	Comparator 5	See *parameter group 13-1* Comparators*. If Comparator 5 is evaluated as true, the output goes high. Otherwise, it is low.
[70]	Logic rule 0	See *parameter group 13-4* Logic Rules*. If Logic rule 0 is evaluated as true, the output goes high. Otherwise, it is low.
[71]	Logic rule 1	See *parameter group 13-4* Logic Rules*. If Logic rule 1 is evaluated as true, the output goes high. Otherwise, it is low.
[72]	Logic rule 2	See *parameter group 13-4* Logic Rules*. If Logic rule 2 is evaluated as true, the output goes high. Otherwise, it is low.
[73]	Logic rule 3	See *parameter group 13-4* Logic Rules*. If Logic rule 3 is evaluated as true, the output goes high. Otherwise, it is low.
[74]	Logic rule 4	See *parameter group 13-4* Logic Rules*. If Logic rule 4 is evaluated as true, the output goes high. Otherwise, it is low.

Option	Name	Description
[75]	Logic rule 5	See *parameter group 13-4* Logic Rules*. If Logic rule 5 is evaluated as true, the output goes high. Otherwise, it is low.
[80]	SL digital output A	See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[38] Set dig. out. A high* is executed. The input goes low whenever the smart logic *[32] Action set dig. out A low* is executed.
[81]	SL digital output B	See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[39] Set dig. out. B high* is executed. The input goes low whenever the smart logic *[33] Action set dig. out B low* is executed.
[82]	SL digital output C	See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[40] Set dig. out. C high* is executed. The input goes low whenever the smart logic *[34] Action set dig. out C low* is executed.
[83]	SL digital output D	See *parameter 13-52 SL Controller Action*. The input goes high whenever the smart logic action *[41] Set dig. out. D high* is executed. The input goes low whenever the smart logic *[35] Action set dig. out D low* is executed.
[160]	No alarm	The output is high when no alarm is present.
[161]	Running reverse	The output is high when the drive runs counterclockwise (the logical product of the status bits *running* AND *reverse*).
[165]	Local ref. active	The output is high when *parameter 3-13 Reference Site=[2] Local* or when *parameter 3-13 Reference Site=[0] Linked to hand auto* at the same time as the LCP is in hand-on mode.
[166]	Remote ref. active	The output is thigh when *parameter 3-13 Reference Site* is set to *[0] Linked to hand auto* or *[1] Remote* while the LCP is in auto on-mode.
[167]	Start command active	The output is high when there is an active start command (that is, via digital input, bus connection, Hand on, or Auto on) and no stop command is active.
[168]	Drive in hand mode	The output is high when the drive is in hand-on mode (as indicated by the LED light above [Hand On]).
[169]	Drive in auto mode	The output is high when the drive is in auto on-mode (as indicated by the LED light above [Auto On]).
[194]	Broken belt function	This function is only available for 18–30 kW compressor drives.

5.2.6.4 Parameter Group 5-5* Pulse Input

The pulse input parameters are used to define an appropriate window for the impulse reference area by configuring the scaling and filter settings for the pulse inputs. Set terminal 29 (*parameter 5-13 Terminal 29 Digital Input*) to *[32] Pulse Input*. If terminal 29 is used as an input, set *parameter 5-01 Terminal 27 Mode* to *[0] Input*.

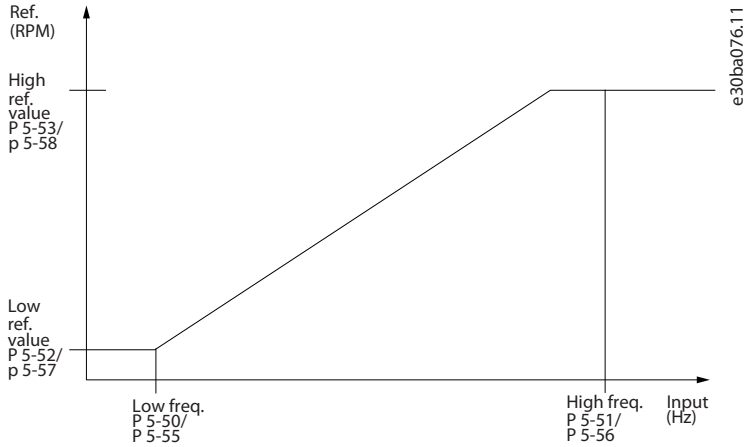

Illustration 12: Pulse Input

Parameter 5-52 Term. 29 Low Ref./Feedb. Value

Table 55: Parameter 5-52 Term. 29 Low Ref./Feedb. Value

5-52 Term. 29 Low Ref./Feedb. Value		
Default value: 0 Hz	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the low reference value for the compressor shaft speed [RPM]. This is also the lowest feedback value. Select terminal 29 as a digital input.

Parameter 5-53 Term. 29 High Ref./Feedb. Value

Table 56: Parameter 5-53 Term. 29 High Ref./Feedb. Value

5-53 Term. 29 High Ref./Feedb. Value		
Default value: ExpressionLimit	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the high reference value [RPM] for the compressor shaft speed and the high feedback value. Select terminal 29 as a digital input.

5.2.6.5 Parameter Group 5-9* Bus Controlled

This parameter group selects digital and relay outputs via a fieldbus setting.

Table 57: Parameter 5-90 Digital & Relay Bus Control

5-90 Digital & Relay Bus Control		
Default value: 0	Parameter type: Range [-0 – 0xFFFFFFFF]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter holds the state of the bus-controlled digital outputs relays. A logical 1 indicates that the output is high or active. A logical 0 indicates that the output is low or inactive.

Table 58: Bit Functions

Bit number	Function
0–3	Reserved
4	Relay 1 output terminal

Bit number	Function
6–23	Reserved
24	Terminal 42 digital output
26–31	Reserved

5.2.7 Parameter Group 6-** Analog In/Out

Parameter group for setting up the analog I/O configuration and the digital output.

The drive provides 2 analog inputs:

- Terminal 53
- Terminal 54

The analog inputs can be freely allocated to either voltage (0–10 V) or current input (0/4–20 mA).

5.2.7.1 Parameter Group 6-0* Analog I/O Mode

Parameter 6-00 Live Zero Timeout Time

Table 59: Parameter 6-00 Live Zero Timeout Time

6-00 Live Zero Timeout Time		
Default value: 10 s	Parameter type: Range [1 – 99]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

Enter the timeout time.

Parameter 6-01 Live Zero Timeout Function

Table 60: Parameter 6-01 Live Zero Timeout Function

6-01 Live Zero Timeout Function		
Default value: Off	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the timeout function. The function set in this parameter is activated if the input signal on terminal 53 or 54 is below 50% of the value in *parameter 6-10 Terminal 53 Low Voltage*, *parameter 6-12 Terminal 53 Low Current*, *parameter 6-20 Terminal 54 Low Voltage*, or *parameter 6-22 Terminal 54 Low Current* for a period defined in *parameter 6-00 Live Zero Timeout Time*.

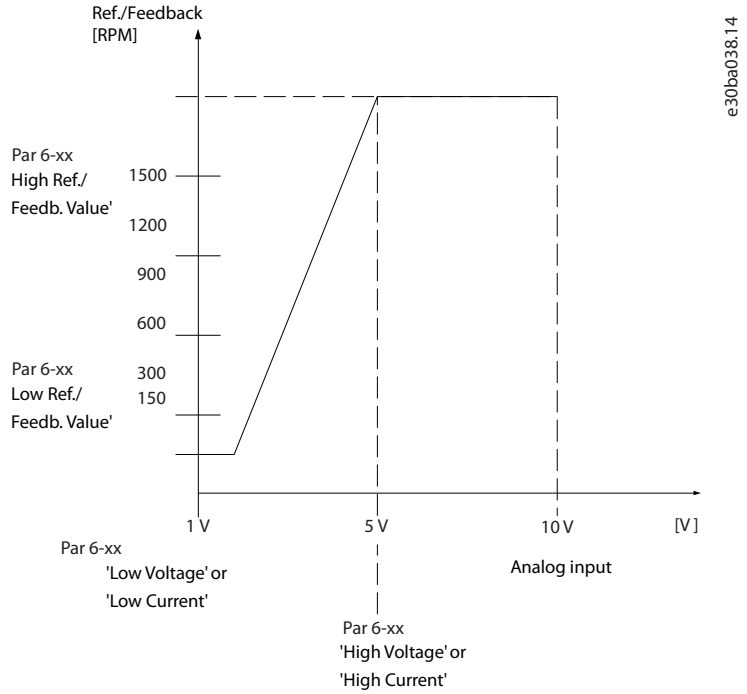

Illustration 13: Live Zero Timeout Function

Option	Name	Description
[0]*	Off	
[1]	Freeze	
[2]	Stop	
[3]	Jogging	
[4]	Max. speed	
[5]	Stop and trip	

5.2.7.2 Parameter Group 6-1* Analog Input 53

Parameters for configuring the scaling and limits for analog input 53 (terminal 53).

Parameter 6-11 Terminal 53 High Voltage

Table 61: Parameter 6-11 Terminal 53 High Voltage

6-11 Terminal 53 High Voltage		
Default value: 10 V	Parameter type: Range [0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to the high reference value set in *parameter 6-15 Terminal 53 High Ref./Feedb. Value*.

Parameter 6-12 Terminal 53 Low Current

Table 62: Parameter 6-12 Terminal 53 Low Current

6-12 Terminal 53 Low Current		
Default value: 4 mA	Parameter type: Range [0 – 20 mA]	Setup: 2 setups
Conversion index: -5	Data type: Uint16	Change during operation: False

Enter the low current value. This reference signal corresponds to the low reference/feedback value that is set in *parameter 6-14 Terminal 53 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >2 mA.

Parameter 6-13 Terminal 53 High Current

Table 63: Parameter 6-13 Terminal 53 High Current

6-13 Terminal 53 High Current		
Default value: 20 mA	Parameter type: Range [0 – 20 mA]	Setup: 2 setups
Conversion index: -5	Data type: Uint16	Change during operation: False

Enter the high current value corresponding to the high reference/feedback set in *parameter 6-15 Terminal 53 High Ref./Feedb. Value*.

Parameter 6-14 Terminal 53 Low Ref./Feedb. Value

Table 64: Parameter 6-14 Terminal 53 Low Ref./Feedb. Value

6-14 Terminal 53 Low Ref./Feedb. Value		
Default value: ExpressionLimit	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the reference or feedback value that corresponds to the voltage or current set in *parameter 6-10 Terminal 53 Low Voltage* and *parameter 6-12 Terminal 53 Low Current*.

Parameter 6-15 Terminal 53 High Ref./Feedb. Value

Table 65: Parameter 6-15 Terminal 53 High Ref./Feedb. Value

6-15 Terminal 53 High Ref./Feedb. Value		
Default value: 200	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the reference or feedback value that corresponds to the voltage or current set in *parameter 6-11 Terminal 53 High Voltage* and *parameter 6-13 Terminal 53 High Current*.

Parameter 6-16 Terminal 53 Filter Time Constant

Table 66: Parameter 6-16 Terminal 53 Filter Time Constant

6-16 Terminal 53 Filter Time Constant		
Default value: 0.01 s	Parameter type: Range [0.01 - 10 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the time constant. This constant is a first-order digital low-pass filter time constant for suppressing electrical noise in terminal 53. A high time constant value improves dampening, but also increases the time delay through the filter.

Parameter 6-19 Terminal 53 Mode

Table 67: Parameter 6-19 Terminal 53 Mode

6-19 Terminal 53 Mode		
Default value: Voltage mode	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select whether terminal 53 is used for current or voltage input.

Option	Name	Description
[0]	Current mode	Terminal 53 is set for current.

Option	Name	Description
[1]*	Voltage mode	Terminal 53 is set for voltage.

5.2.7.3 Parameter Group 6-2* Analog Input 54

Parameters for configuring the scaling and limits for analog input 54 (terminal 54).

Parameter 6-22 Terminal 54 Low Current

Table 68: Parameter 6-22 Terminal 54 Low Current

6-22 Terminal 54 Low Current		
Default value: 4 mA	Parameter type: Range [0 – 20 mA]	Setup: 2 setups
Conversion index: -5	Data type: Uint16	Change during operation: False

Enter the low current value. This reference signal corresponds to the low reference/feedback value that is set in *parameter 6-24 Terminal 54 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >2 mA.

Parameter 6-23 Terminal 54 High Current

Table 69: Parameter 6-23 Terminal 54 High Current

6-23 Terminal 54 High Current		
Default value: 20 mA	Parameter type: Range [0 – 20 mA]	Setup: 2 setups
Conversion index: -5	Data type: Uint16	Change during operation: False

Enter the high current value corresponding to the high reference/feedback set in *parameter 6-25 Terminal 54 High Ref./Feedb. Value*.

Parameter 6-25 Terminal 54 High Ref./Feedb. Value

Table 70: Parameter 6-25 Terminal 54 High Ref./Feedb. Value

6-25 Terminal 54 High Ref./Feedb. Value		
Default value: ExpressionLimit	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the reference or feedback value that corresponds to the voltage or current set in *parameter 6-21 Terminal 54 High Voltage* and *parameter 6-13 Terminal 53 High Current*.

Parameter 6-26 Terminal 54 Filter Time Constant

Table 71: Parameter 6-26 Terminal 54 Filter Time Constant

6-26 Terminal 54 Filter Time Constant		
Default value: 0.01 s	Parameter type: Range [0.01 - 10 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the time constant. This constant is a first-order digital low-pass filter time constant for suppressing electrical noise in terminal 54. A high time constant value improves dampening, but also increases the time delay through the filter.

5.2.7.4 Parameter Group 6-7* Analog/Digital Output 45

Parameters for configuring the scaling and limits for analog/digital output terminal 45. Analog outputs are current outputs: 0/4–20 mA. Resolution on analog output is 12 bit. Analog output terminals can also be set up as digital output.

Parameter 6-70 Terminal 45 Mode

Table 72: Parameter 6-70 Terminal 45 Mode

6-70 Terminal 45 Mode		
Default value: 0–20 mA	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Set terminal 45 to act as analog output or as digital output.

Option	Name	Description
[0]*	0–20 mA	
[1]	4–20 mA	
[2]	Digital output	

Parameter 6-71 Terminal 45 Analog Output

Table 73: Parameter 6-71 Terminal 45 Analog Output

6-71 Terminal 45 Analog Output		
Default value: No operation	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the function of terminal 45 as an analog current output. See also *parameter 6-70 Terminal 45 Mode*.

Option	Name	Description
[0]*	No operation	
[100]	Output frequency	0–400 Hz
[101]	Reference	Min_{ref}–Max_{ref}
[102]	Feedback	Min_{FB}–Max_{FB}
[103]	Motor current	0–I_{max}
[106]	Power	0–P_{nom}
[139]	Bus control	0–100%
[254]	DC-link voltage	

Parameter 6-72 Terminal 45 Digital Output

Table 74: Parameter 6-72 Terminal 45 Digital Output

6-72 Terminal 45 Digital Output		
Default value: No operation	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the function of terminal 45 as an digital current output. See also *parameter 6-70 Terminal 45 Mode*. See *parameter 5-40 Function Relay* for descriptions of the parameter options.

Option	Name	Description
[0]*	No operation	
[1]	Control ready	

Option	Name	Description
[2]	Drive ready	
[3]	Drive ready/remote control	
[4]	Standby/no warning	
[5]	Drive running	
[6]	Running/no warning	
[7]	Run in range/no warning	
[8]	Runn on ref/no warning	
[9]	Alarm	
[10]	Alarm or warning	
[12]	Out of current range	
[13]	Below current low	
[14]	Above current, high	
[16]	Below speed, low	
[17]	Above speed, high	
[19]	Below feedback, low	
[20]	Above feedback, high	
[21]	Thermal warning	
[22]	Ready, no thermal warning	
[23]	Remote, ready, no thermal warning	
[24]	Ready, voltage OK	
[25]	Reverse	
[26]	Bus OK	
[35]	External interlock	
[36]	Control word bit 11	
[37]	Control word bit 12	
[41]	Below reference, low	
[42]	Above ref, high	
[44]	Oil boost, active	
[45]	Bus control	
[60]	Comparator 0	
[61]	Comparator 1	
[62]	Comparator 2	

Option	Name	Description
[63]	Comparator 3	
[64]	Comparator 4	
[65]	Comparator 5	
[70]	Logic rule 0	
[71]	Logic rule 1	
[72]	Logic rule 2	
[73]	Logic rule 3	
[74]	Logic rule 4	
[75]	Logic rule 5	
[80]	SL digital output A	
[81]	SL digital output B	
[82]	SL digital output C	
[83]	SL digital output D	
[160]	No alarm	
[161]	Running reverse	
[165]	Local ref. active	
[166]	Remote ref. active	
[167]	Start command active	
[168]	Drive in hand mode	
[169]	Drive in auto mode	
[194]	Broken belt function	This option is only available in 18–30 kW drives.

Parameter 6-73 Terminal 45 Output Min Scale

Table 75: Parameter 6-73 Terminal 45 Output Min Scale

6-73 Terminal 45 Output Min Scale		
Default value: 0%	Parameter type: Range [0 - 200%]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Scale for the minimum output (0 mA or 4 mA) of the analog signal at terminal 45. Set the value to be the percentage of the full range of the variable selected in *parameter 6-71 Terminal 45 Analog Output*.

Parameter 6-74 Terminal 45 Output Max Scale

Table 76: Parameter 6-74 Terminal 45 Output Max Scale

6-74 Terminal 45 Output Max Scale		
Default value: 100%	Parameter type: Range [0 - 200%]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Scale for the maximum output (20 mA) of the analog signal at terminal 45. Set the value to be the percentage of the full range of the variable selected in *parameter 6-71 Terminal 45 Analog Output*.

Parameter 6-76 Terminal 45 Output Bus Control

Table 77: Parameter 6-76 Terminal 45 Output Bus Control

6-76 Terminal 45 Output Bus Control		
Default value: 0	Parameter type: Range [0 - 16384]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Holds the level of analog output if controlled by bus.

5.2.7.5 Parameter Group 6-9* Analog/Digital Output 42

Parameters for configuring the limits for analog/digital output terminal 42. Analog outputs are current outputs: 0/4–20 mA. Resolution on analog outputs is 12 bits. Analog output terminals can also be set up as digital output.

Parameter 6-90 Terminal 42 Mode

Table 78: Parameter 6-90 Terminal 42 Mode

6-20 Terminal 42 Mode		
Default value: 0–20 mA	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Set terminal 42 to act as analog output or as digital output.

Option	Name	Description
[0]*	0–20 mA	
[1]	4–20 mA	
[2]	Digital output	

Parameter 6-91 Terminal 42 Analog Output

Table 79: Parameter 6-91 Terminal 42 Analog Output

6-91 Terminal 42 Analog Output		
Default value: No operation	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the function of terminal 42 as an analog current output. See also *parameter 6-90 Terminal 42 Mode*.

Option	Name	Description
[0]*	No operation	
[100]	Output frequency	0–100 Hz
[101]	Reference	Min_{ref}–Max_{ref}
[102]	Feedback	Min_{FB}–Max_{FB}
[103]	Motor current	0–I_{max}
[106]	Power	0–P_{nom}
[139]	Bus control	0–100%

Option	Name	Description
[254]	DC-link voltage	

Parameter 6-92 Terminal 42 Digital Output

Table 80: Parameter 6-92 Terminal 42 Digital Output

6-92 Terminal 42 Digital Output		
Default value: No operation	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the function of terminal 45 as an digital current output. See also *parameter 6-90 Terminal 42 Mode*. See *parameter 5-40 Function Relay* for descriptions of the parameter options.

Option	Name	Description
[0]*	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive ready/remote control	
[4]	Standby/no warning	
[5]	Drive running	
[6]	Running/no warning	
[7]	Run in range/no warning	
[8]	Runn on ref/no warning	
[9]	Alarm	
[10]	Alarm or warning	
[12]	Out of current range	
[13]	Below current low	
[14]	Above current, high	
[16]	Below speed, low	
[17]	Above speed, high	
[19]	Below feedback, low	
[20]	Above feedback, high	
[21]	Thermal warning	
[22]	Ready, no thermal warning	
[23]	Remote, ready, no thermal warning	
[24]	Ready, voltage OK	
[25]	Reverse	
[26]	Bus OK	

Option	Name	Description
[35]	External interlock	
[36]	Control word bit 11	
[37]	Control word bit 12	
[41]	Below reference, low	
[42]	Above ref, high	
[44]	Oil boost, active	
[45]	Bus control	
[60]	Comparator 0	
[61]	Comparator 1	
[62]	Comparator 2	
[63]	Comparator 3	
[64]	Comparator 4	
[65]	Comparator 5	
[70]	Logic rule 0	
[71]	Logic rule 1	
[72]	Logic rule 2	
[73]	Logic rule 3	
[74]	Logic rule 4	
[75]	Logic rule 5	
[80]	SL digital output A	
[81]	SL digital output B	
[82]	SL digital output C	
[83]	SL digital output D	
[160]	No alarm	
[161]	Running reverse	
[165]	Local ref. active	
[166]	Remote ref. active	
[167]	Start command active	
[168]	Drive in hand mode	
[169]	Drive in auto mode	
[194]	Broken belt function	This option is only available in 18–30 kW drives.

Parameter 6-93 Terminal 42 Output Min Scale

Table 81: Parameter 6-93 Terminal 42 Output Min Scale

6-93 Terminal 42 Output Min Scale		
Default value: 0%	Parameter type: Range [0 - 200%]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Scale for the minimum output (0 mA or 4 mA) of the analog signal at terminal 42. Set the value to be the percentage of the full range of the variable selected in *parameter 6-91 Terminal 42 Analog Output*.

Parameter 6-94 Terminal 42 Max Scale

Table 82: Parameter 6-94 Terminal 42 Output Max Scale

6-94 Terminal 42 Output Max Scale		
Default value: 100%	Parameter type: Range [0 - 200%]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Scale for the maximum output (20 mA) of the analog signal at terminal 42. Set the value to be the percentage of the full range of the variable selected in *parameter 6-91 Terminal 42 Analog Output*.

Parameter 6-96 Terminal 42 Output Bus Control

Table 83: Parameter 6-96 Terminal 42 Output Bus Control

6-96 Terminal 42 Output Bus Control		
Default value: 0	Parameter type: Range [0 - 16384]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Holds the level of analog output if controlled by bus.

5.2.8 Parameter Group 8-** Communications and Options

5.2.8.1 Parameter Group 8-0* General Settings

Parameter 8-01 Control Site

Table 84: Parameter 8-01 Control Site

8-01 Control Site		
Default value: Digital and ctrl. word	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

This parameter overrules settings in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select*.

Option	Name	Description
[0]*	Digital and ctrl. word	Control by using both digital input and control word.
[1]	Digital only	Control by using digital inputs only.
[2]	Controlword only	Control by using control word only.

Parameter 8-02 Control Source

Table 85: Parameter 8-02 Control Source

8-02 Control Source		
Default value: FC port	Parameter type: Option	Setup: 2 setups

8-02 Control Source		
Conversion index: –	Data type: Uint8	Change during operation: False

Select the source of the control word.

Option	Name	Description
[0]	None	No source has been selected for the control word.
[1]*	FC port	FC port is selected as source for the control word.

Parameter 8-03 Control Timeout Time

Table 86: Parameter 8-03 Control Timeout Time

8-03 Control Timeout Time		
Default value: 20 s	Parameter type: Range [0.1 – 200]	Setup: 1 setup
Conversion index: -1	Data type: Uint16	Change during operation: False

Enter the maximum time expected to pass between the reception of 2 consecutive telegrams. If this time is exceeded, it indicates that the serial communication has stopped. The function selected in *parameter 8-04 Control Timeout Function* is carried out.

5.2.8.2 Parameter Group 8-3* FC Port Settings

Parameter 8-31 Address

Table 87: Parameter 8-31 Address

8-31 Address		
Default value: 1	Parameter type: Range [0.0 – 247]	Setup: 1 setup
Conversion index: 0	Data type: Uint8	Change during operation: False

Enter the address for the RS485 port. Valid range: 1–126 for FC port or 1–247 for Modbus.

Parameter 8-32 Baud Rate

Table 88: Parameter 8-32 Baud Rate

8-32 Baud Rate		
Default value: ExpressionLimit	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the baud rate for the RS485 port. Default refers to the FC protocol. Change of protocol may change the baud rate.

Option	Name	Description
[0]	2400 Baud	
[1]	4800 Baud	
[2]	9600 Baud	
[3]	19200 Baud	
[4]	38400 Baud	
[5]	57600 Baud	
[6]	76800 Baud	

Option	Name	Description
[7]	115200 Baud	

Parameter 8-33 Parity/Stop Bits

Table 89: Parameter 8-33 Parity/Stop Bits

8-33 Parity/Stop Bits		
Default value: ExpressionLimit	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Parity and stop bits for the protocol using the FC port. For some of the protocol, not all options are available. Default refers to the FC protocol. Changing the protocol may change the baud rate.

Option	Name	Description
[0]	Even parity, 1 stop bit	
[1]	Odd parity, 1 stop bit	
[2]	No parity, 1 stop bit	
[3]	No parity, 2 stop bits	

Parameter 8-35 Minimum Response Delay

Table 90: Parameter 8-35 Minimum Response Delay

8-35 Minimum Response Delay		
Default value: 0.01 s	Parameter type: Range [0.001– 0.5]	Setup: 1 setup
Conversion index: -3	Data type: Uint16	Change during operation: False

Specify the minimum delay time between receiving a request and transmitting a response. This is used for overcoming modem turnaround delays.

Parameter 8-36 Maximum Response Delay

Table 91: Parameter 8-36 Maximum Response Delay

8-36 Maximum Response Delay		
Default value: 5.0 s	Parameter type: Range [0.1– 10.0]	Setup: 1 setup
Conversion index: -3	Data type: Uint16	Change during operation: False

Specify the maximum delay time between receiving a request and transmitting a response. If this time is exceeded, no response is returned.

Parameter 8-37 Maximum Inter-char Delay

Table 92: Parameter 8-37 Maximum Inter-char Delay

8-37 Maximum Inter-char Delay		
Default value: 0.025 s	Parameter type: Range [0.025– 0.025]	Setup: 1 setup
Conversion index: -3	Data type: Uint16	Change during operation: False

Specify the maximum delay time between 2 characters in a message. Exceeding this delay time causes the message to be discarded.

5.2.8.3 Parameter Group 8-4* FC MC Protocol Set

Parameter 8-42 PCD Write Configuration

Table 93: Parameter 8-42 PCD Write Configuration

8-42 PCD Write Configuration		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8 [16]	Change during operation: True

Different parameters can be assigned to PCD 3–10 of the PPOs (the number of PCDs depends on the PPO type). The values in PCD 3–10 are written to the selected parameters as data values.

Option	Name	Description
[0]	None	
[1]	[302] Minimum reference	
[2]	[303] Maximum reference	
[3]	[341] Ramp 1 ramp up time	
[4]	[342] Ramp 2 ramp down time	
[5]	[351] Ramp 2 ramp up time	
[6]	[352] Ramp 2 ramp down time	
[7]	[380] Jog ramp time	
[8]	[381] Quick stop time	
[9]	[412] Motor speed low limit [Hz]	
[10]	[414] Motor speed high limit [Hz]	
[11]	[590] Digital & relay bus control	
[12]	[676] Terminal 45 output bus control	
[13]	[696] Terminal 42 output bus control	
[14]	[894] Bus feedback 1	
[15]	FC port CTW	
[16]	FC port REF	

5.2.8.4 Parameter Group 8-5* Digital/Bus

Parameters for configuring the control word digital/bus merging.

Parameter 8-50 Coasting Select

Table 94: Parameter 8-50 Coasting Select

8-50 Coasting Select		
Default value: Logic OR	Parameter type: Option	Setup: All setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the coasting function via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]	Digital input	Activates coast via a digital input.

Option	Name	Description
[1]	Bus	Activates coast via the serial communication port.
[2]	Logic AND	Activates coast via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]*	Logic OR	Activates coast via the serial communication port or via 1 of the digital inputs.

Parameter 8-51 Quick Stop Select

Table 95: Parameter 8-51 Quick Stop Select

8-51 Quick Stop Select		
Default value: Logic OR	Parameter type: Option	Setup: All setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the quick stop function via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]	Digital input	Activates quick stop via a digital input.
[1]	Bus	Activates quick stop via the serial communication port.
[2]	Logic AND	Activates quick stop via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]*	Logic OR	Activates quick stop via the serial communication port or via 1 of the digital inputs.

Parameter 8-53 Start Select

Table 96: Parameter 8-53 Start Select

8-53 Start Select		
Default value: Logic OR	Parameter type: Option	Setup: All setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the start function via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]	Digital input	Activates start via a digital input.
[1]	Bus	Activates start via the serial communication port.
[2]	Logic AND	Activates start via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]*	Logic OR	Activates start via the serial communication port or via 1 of the digital inputs.

Parameter 8-55 Set-up Select

Table 97: Parameter 8-55 Set-up Select

8-55 Set-up Select		
Default value: Logic OR	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the setup selection via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]	Digital input	Activates the setup selection via a digital input.
[1]	Bus	Activates the setup selection via the serial communication port.
[2]	Logic AND	Activates the setup selection via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]*	Logic OR	Activates the setup selection via the serial communication port or via 1 of the digital inputs.

Parameter 8-56 Preset Reference Select

Table 98: Parameter 8-56 Preset Reference Select

8-56 Preset Reference Select		
Default value: Logic OR	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the preset reference selection via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]	Digital input	Activates the preset reference selection via a digital input.
[1]	Bus	Activates the preset reference selection via the serial communication port.
[2]	Logic AND	Activates the preset reference selection via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]*	Logic OR	Activates the preset reference selection via the serial communication port or via 1 of the digital inputs.

5.2.8.5 Parameter Group 8-8* FC Port Diagnostics

These parameters are used for monitoring the bus communication via the FC port.

Parameter 8-80 Bus Message Count

Table 99: Parameter 8-80 Bus Message Count

8-80 Bus Message Count		
Default value: 0	Parameter type: Range [0– 429496729]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter shows the number of valid telegrams detected on the bus.

Parameter 8-81 Bus Error Count

Table 100: Parameter 8-81 Bus Error Count

8-81 Bus Error Count		
Default value: 0	Parameter type: Range [0– 429496729]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter shows the number of telegrams with faults (for example, CRC faults) detected on the bus.

Parameter 8-82 Slave Messages Rcvd

Table 101: Parameter 8-82 Slave Messages Rcvd

8-82 Slave Messages Rcvd		
Default value: 0	Parameter type: Range [0– 429496729]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter shows the number of valid telegrams addressed to the slave, sent by the drive.

Parameter 8-84 Slave Message Sent

Table 102: Parameter 8-84 Slave Messages Sent

8-84 Slave Messages Sent		
Default value: 0	Parameter type: Range [0– 429496729]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter shows the number of messages sent from the slave.

Parameter 8-85 Slave Timeout Errors

Table 103: Parameter 8-85 Slave Timeout Errors

8-85 Slave Timeout Errors		
Default value: 0	Parameter type: Range [0– 429496729]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter shows the number of slave timeout errors.

Parameter 8-88 Reset FC Port Diagnostics

Table 104: Parameter 8-88 Reset FC Port Diagnostics

8-88 Reset FC Port Diagnostic		
Default value: Do no reset	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Reset all FC port diagnostics counters.

Option	Name	Description
[0]*	Do not reset	The diagnostics counter is not reset.
[1]	Reset counter	The diagnostics counter is reset.

5.2.8.6 Parameter Group 8-9* Bus Feedback

Parameter 8-94 Bus Feedback 1

Table 105: Parameter 8-94 Bus Feedback 1

8-94 Bus Feedback 1		
Default value: 0	Parameter type: Range [-32767 – 32767]	Setup: 2 setups
Conversion index: 0	Data type: Int16	Change during operation: False

Write feedback to this parameter via the serial communication port. Select this parameter in *parameter 20-00 Feedback 1 Source* or in *parameter 20-03 Feedback 2 Source* as a feedback source. Hex value 4000 h corresponds to 100%. Feedback/range is ±200%.

Parameter 8-95 Bus Feedback 2

Table 106: Parameter 8-95 Bus Feedback 2

8-95 Bus Feedback 2		
Default value: 0	Parameter type: Range [-32767 – 32767]	Setup: 1 setup
Conversion index: 0	Data type: Int16	Change during operation: False

Write feedback to this parameter via the serial communication port. Select this parameter in *parameter 20-00 Feedback 1 Source* as a feedback source. Hex value 4000 h corresponds to 100%. Feedback/range is ±200%.

5.2.9 Parameter Group 13-** Smart Logic

5.2.9.1 Smart Logic Controller

Smart Logic Control (SLC) is a sequence of user-defined actions (see *parameter 13-52 SL Controller Action [x]*) executed by the SLC when the SLC evaluates the associated user-defined event (see *parameter 13-51 SL Controller Event [x]*) as TRUE.

Events and actions are each numbered and linked in pairs (states). This means that when [0] event is fulfilled (attains the value true), [0] action is executed. After executing this action, the conditions of [1] event is evaluated. If it is evaluated as true, [1] action is executed, and so on. Only 1 event is evaluated at any time. If an event is evaluated as false, nothing happens (in the SLC) during the current scan interval and no other events are evaluated. This means that when the SLC starts, it evaluates event [0] (and only [0] event) each scan interval. Only when [0] event is evaluated true, the SLC executes [0] action and starts evaluating [1] event. It is possible to program from 1–20 events and actions. When the last event/action has been executed, the sequence starts over again from [0] event/[0] action.

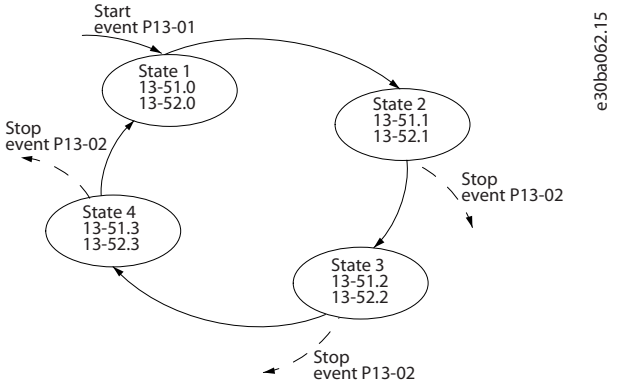

Illustration 14: Example with 3 Events/Actions

Starting and stopping the SLC

To start or stop the SLC, select *[1] On* or *[2] Off* in *parameter 13-00 SL Controller Mode*. The SLC always starts in state 0 (where it evaluates [0] event). The SLC starts when the start event (defined in *parameter 13-01 Start Event)* is evaluated as true (if *[1] On* is selected in *parameter 13-00 SL Controller Mode*). The SLC stops when the stop event (*parameter 13-02 Stop Event*) is true. *Parameter 13-03 Reset SLC* resets all SLC parameters and starts programming from the beginning.

5.2.9.2 Parameter Group 13-0* SLC Settings

To activate, deactivate, and reset the smart logic control sequence, use the SLC settings. The logic function and comparators are always running in the background, which opens for separate control of digital inputs and outputs.

Parameter 13-00 SL Controller Mode

Table 107: Parameter 13-00 SL Controller Mode

13-00 Controller Mode		
Default value: Off	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

To enable the smart logic control to start when a start command is present, select *[1] On*. To disable the smart logic control, select *[0] Off*.

Option	Name	Description
[0]*	Off	Disables the smart logic controller.
[1]	On	Enables the smart logic controller.

Parameter 13-01 Start Event

Table 108: Parameter 13-01 Start Event

13-01 Start Event		
Default value: Start command	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

To activate the smart logic controller, select the boolean (TRUE or FALSE) input.

Option	Name	Description
[0]	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.

Option	Name	Description
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]*	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.

Parameter 13-02 Stop Event

Table 109: Parameter 13-02 Stop Event

13-02 Stop Event		
Default value: Drive stopped	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

To deactivate the smart logic controller, select the boolean (TRUE or FALSE) input.

Option	Name	Description
[0]	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.

Option	Name	Description
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.
[30]	SL timeout 0	Use the result of timer 0 in the logic rule.
[31]	SL timeout 1	Use the result of timer 1 in the logic rule.
[32]	SL timeout 2	Use the result of timer 2 in the logic rule.
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]*	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.
[70]	SL timeout 3	Use the result of timer 3 in the logic rule.
[71]	SL timeout 4	Use the result of timer 4 in the logic rule.
[72]	SL timeout 5	Use the result of timer 5 in the logic rule.
[73]	SL timeout 6	Use the result of timer 6 in the logic rule.
[74]	SL timeout 7	Use the result of timer 7 in the logic rule.

Parameter 13-03 Reset SLC

Table 110: Parameter 13-03 Reset SLC

13-03 Reset SLC		
Default value: Do not reset SLC	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	Do not reset SLC	Retains all programmed settings in *parameter group 13-** Smart Logic*.
[1]	Reset SLC	Resets all parameters in *parameter group 13-** Smart Logic* to default settings.

5.2.9.3 Parameter Group 13-2* Timers

Use the result (true or false) from timers directly to define an event (see *parameter 13-51 SL Controller Event*), or as boolean input in a logic rule (see *parameter 13-40 Logic Rule Boolean 1*, *parameter 13-42 Logic Rule Boolean 2*, or *parameter 13-43 Logic Rule Boolean 3*). A timer is only false when started by an action (for example, *[29] Start timer 1*) until the timer value entered in this parameter has elapsed. Then it becomes true again.

All parameters within this group are array parameters with index 0–2. Select index 0 to program timer 0, select index 1 to program timer 1, and so on.

Parameter 13-30 SL Controller Timer

Table 111: Parameter 13-20 SL Controller Timer

13-20 SL Controller Timer		
Default value: 0 s	Parameter type: Range [0 - 3600 s]	Setup: 1 setup
Conversion index: -2	Data type: Uint32 [8]	Change during operation: False

Enter the value to define the duration fo the false output from the programmed timer. A timer is only false if it is started by an action (see *parameter 13-52 SL Controller Action)*, options *[29]–[31]* and *[70]–[74]* Start Timer X) and until the timer value has elapsed. Array parameters contain timers 0–7.

5.2.9.4 Parameter Group 13-4* Logic Rules

Combine up to 3 boolean inputs (TRUE/FALSE inputs) from timers, comparators, digital inputs, status bits, and events using the logical operators AND, OR, and NOT. Select boolean inputs for the calculation in *parameter 13-40 Logic Rule Boolean 1*, *parameter 13-42 Logic Rule Boolean 2*, and *parameter 13-44 Logic Rule Boolean 3*. Define the operators used to combine the selected inputs logically in *parameter 13-41 Logic Rule Operator 1* and *parameter 13-42 Logic Rule Operator 2*.

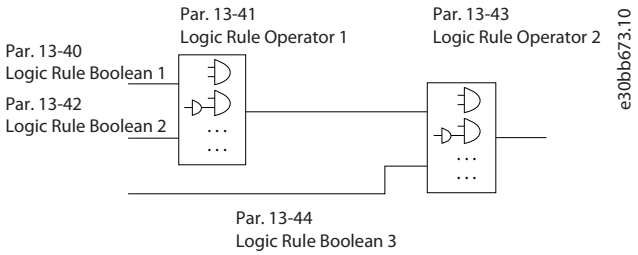

Illustration 15: Logic Rules

Priority of calculation

The results of *parameter 13-40 Logic Rule Boolean 1*, *parameter 13-41 Logic Rule Operator 1*, and *parameter 13-42 Logic Rule Boolean 2* are calculated first. The outcome (true/false) of this calculation is combined with the settings of *parameter 13-43 Logic Rule Operator 2* and *parameter 13-44 Logic Rule Boolean 3*, yielding the final result (true/false) of the logic rule.

Parameter 13-40 Logic Rule Boolean 1

Table 112: Parameter 13-40 Logic Rule Boolean 1

13-40 Logic Rule Boolean 1		
Default value: False	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the 1st boolean (TRUE or FALSE) input for the selected logic rule.

Option	Name	Description
[0]*	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.
[30]	SL timeout 0	Use the result of timer 0 in the logic rule.
[31]	SL timeout 1	Use the result of timer 1 in the logic rule.
[32]	SL timeout 2	Use the result of timer 2 in the logic rule.
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).

Option	Name	Description
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.
[70]	SL timeout 3	Use the result of timer 3 in the logic rule.
[71]	SL timeout 4	Use the result of timer 4 in the logic rule.
[72]	SL timeout 5	Use the result of timer 5 in the logic rule.
[73]	SL timeout 6	Use the result of timer 6 in the logic rule.
[74]	SL timeout 7	Use the result of timer 7 in the logic rule.

Parameter 13-41 Logic Rule Operator 1

Table 113: Parameter 13-41 Logic Rule Operator 1

13-41 Logic Rule Operator 1		
Default value: Disabled	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the 1st logical operator to use on the boolean inputs.

Option	Name	Description
[0]*	Disabled	
[1]	AND	
[2]	OR	
[3]	AND NOT	
[4]	OR NOT	
[5]	NOT AND	
[6]	NOT OR	
[7]	NOT AND NOT	
[8]	NOT OR NOT	

Logic Rule Boolean 2

Table 114: Parameter 13-42 Logic Rule Boolean 2

13-42 Logic Rule Boolean 2		
Default value: False	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the 2nd boolean (TRUE or FALSE) input for the selected logic rule.

Option	Name	Description
[0]*	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.
[30]	SL timeout 0	Use the result of timer 0 in the logic rule.
[31]	SL timeout 1	Use the result of timer 1 in the logic rule.
[32]	SL timeout 2	Use the result of timer 2 in the logic rule.
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).

Option	Name	Description
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.
[70]	SL timeout 3	Use the result of timer 3 in the logic rule.
[71]	SL timeout 4	Use the result of timer 4 in the logic rule.
[72]	SL timeout 5	Use the result of timer 5 in the logic rule.
[73]	SL timeout 6	Use the result of timer 6 in the logic rule.
[74]	SL timeout 7	Use the result of timer 7 in the logic rule.

Parameter 13-43 Logic Rule Operator 2

Table 115: Parameter 13-43 Logic Rule Operator 2

13-43 Logic Rule Operator 2		
Default value: Disabled	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the 2nd logical operator to use on the boolean input calculated in *parameter 13-40 Logic Rule Boolean 1*, *parameter 13-41 Logic Rule Operator 1*, *parameter 13-42 Logic Rule Boolean 2*, and the boolean input coming from *parameter 13-42 Logic Rule Boolean 2*. *[13–44]* signifies the boolean input of *parameter 13-44 Logic Rule Boolean 3*. *[13-40/13-42]* signifies the boolean input calculated in *parameter 13-40 Logic Rule Boolean 1*, *parameter 13-41 Logic Rule Operator 1*, and *parameter 13-42 Logic Rule Boolean 2*.

Option	Name	Description
[0]*	Disabled	Select this option to ignore *parameter 13-44 Logic Rule Boolean 3*.
[1]	AND	
[2]	OR	
[3]	AND NOT	
[4]	OR NOT	
[5]	NOT AND	
[6]	NOT OR	
[7]	NOT AND NOT	
[8]	NOT OR NOT	

Parameter 13-44 Logic Rule Boolean 3

Table 116: Parameter 13-44 Logic Rule Boolean 3

13-44 Logic Rule Boolean 3		
Default value: False	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the 3rd boolean (TRUE or FALSE) input for the selected logic rule.

Option	Name	Description
[0]*	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.
[30]	SL timeout 0	Use the result of timer 0 in the logic rule.
[31]	SL timeout 1	Use the result of timer 1 in the logic rule.
[32]	SL timeout 2	Use the result of timer 2 in the logic rule.
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).

Option	Name	Description
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.
[70]	SL timeout 3	Use the result of timer 3 in the logic rule.
[71]	SL timeout 4	Use the result of timer 4 in the logic rule.
[72]	SL timeout 5	Use the result of timer 5 in the logic rule.
[73]	SL timeout 6	Use the result of timer 6 in the logic rule.
[74]	SL timeout 7	Use the result of timer 7 in the logic rule.

5.2.9.5 Parameter Group 13-5* States

Parameter 13-51 SL Controller Event

Table 117: Parameter 13-51 SL Controller Event

13-51 SL Controller Event		
Default value: False	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [20]	Change during operation: False

Select the boolean input (TRUE or FALSE) to define the smart logic controller even.

Option	Name	Description
[0]*	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value of TRUE in the logic rule.
[2]	Running	The compressor runs.
[3]	In range	The compressor runs within the programed current ranges (*parameter 4-50 Warning Current Low* and *parameter 4-51 Warning Current High*).
[4]	On reference	The compressor runs at reference speed.
[7]	Out of current range	The compressor current is outside the range set in *parameter 4-18 Current Limit*.
[8]	Below I_{low}	The compressor current is lower than set in *parameter 4-50 Warning Current Low*.
[9]	Above I_{high}	The compressor current is higher than set in *parameter 4-51 Warning Current High*.
[16]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the compressor, the drive, or the thermistor.
[17]	Mains out of range	
[18]	Reversing	The drive runs in reverse direction.
[19]	Warning	A warning is present.
[20]	Alarm (trip)	An alarm is present.

Option	Name	Description
[21]	Alarm (trip lock)	A trip lock alarm is present.
[22]	Comparator 0	Use the result of comparator 0 in the logic rule.
[23]	Comparator 1	Use the result of comparator 1 in the logic rule.
[24]	Comparator 2	Use the result of comparator 2 in the logic rule.
[25]	Comparator 3	Use the result of comparator 3 in the logic rule.
[26]	Logic rule 0	Use the result of the logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of the logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of the logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of the logic rule 3 in the logic rule.
[30]	SL timeout 0	Use the result of timer 0 in the logic rule.
[31]	SL timeout 1	Use the result of timer 1 in the logic rule.
[32]	SL timeout 2	Use the result of timer 2 in the logic rule.
[33]	Digital input DI18	Use the value of DI18 in the logic rule (high=true).
[34]	Digital input DI19	Use the value of DI19 in the logic rule (high=true).
[35]	Digital input DI27	Use the value of DI27 in the logic rule (high=true).
[36]	Digital input DI29	Use the value of DI29 in the logic rule (high=true).
[39]	Start command	The event is true if the drive is started (either via digital input, fieldbus, or other).
[40]	Drive stopped	The event is true if the drive is stopped or coasted (either via digital input, fieldbus, or other).
[42]	Auto reset trip	The event is true if the drive is tripped (but not trip locked) and an automatic reset is issued.
[50]	Comparator 4	Use the result of comparator 4 in the logic rule.
[51]	Comparator 5	Use the result of comparator 5 in the logic rule.
[60]	Logic rule 4	Use the result of logic rule 4 in the logic rule.
[61]	Logic rule 5	Use the result of logic rule 5 in the logic rule.
[70]	SL timeout 3	Use the result of timer 3 in the logic rule.
[71]	SL timeout 4	Use the result of timer 4 in the logic rule.
[72]	SL timeout 5	Use the result of timer 5 in the logic rule.
[73]	SL timeout 6	Use the result of timer 6 in the logic rule.
[74]	SL timeout 7	Use the result of timer 7 in the logic rule.

Parameter 13-52 SL Controller Action

Table 118: Parameter 13-52 SL Controller Action

13-52 SL Controller Action		
Default value: Disabled	Parameter type: Option	Setup: 1 setup

13-52 SL Controller Action		
Conversion index: –	Data type: Uint8 [20]	Change during operation: False

Select the action corresponding to the SLC event. Actions are executed when the corresponding event (defined in *parameter 13-51 SL Controller Event*) is evaluated as true.

Option	Name	Description
[0]*	Disabled	
[1]	No action	
[2]	Select setup 1	Changes the active setup to 1.
[3]	Select setup 2	Changes the active setup to 2.
[10]	Select preset ref 0	Selects preset reference 0.
[11]	Select preset ref 1	Selects preset reference 1.
[12]	Select preset ref 2	Selects preset reference 2.
[13]	Select preset ref 3	Selects preset reference 3.
[14]	Select preset ref 4	Selects preset reference 4.
[15]	Select preset ref 5	Selects preset reference 5.
[16]	Select preset ref 6	Selects preset reference 6.
[17]	Select preset ref 7	Select preset ref 7. If the active preset reference is changed, it merges with other preset reference commands coming from either the digital inputs or via a fieldbus.
[18]	Select ramp 1	Selects ramp 1.
[19]	Select ramp 2	Selects ramp 2.
[22]	Run	Issues a start command to the drive.
[23]	Run reverse	Issues a start reverse command to the drive.
[24]	Stop	Issues a stop command to the drive.
[25]	Qstop	Issues a quick stop command to the drive.
[26]	DC brake	Issues a DC stop command to the drive.
[27]	Coast	The drive coasts immediately. All stop commands, including the coast command, stop the SLC.
[28]	Freeze output	Freezes the output frequency fo the drive.
[29]	Start timer 0	Starts timer 0, see *parameter 13-20 SL Controller Timer* for further descriptions.
[30]	Start timer 1	Starts timer 1, see *parameter 13-20 SL Controller Timer* for further descriptions.
[31]	Start timer 2	Starts timer 2, see *parameter 13-20 SL Controller Timer* for further descriptions.
[32]	Set digital out A low	Any output with digital output 1 selected is low (off).
[33]	Set digital out B low	Any output with digital output 2 selected is low (off).
[34]	Set digital out C low	Any output with digital output 3 selected is low (off).
[35]	Set digital out D low	Any output with digital output 4 selected is low (off).

Option	Name	Description
[38]	Set digital out A high	Any output with digital output 1 selected is high (closed).
[39]	Set digital out B high	Any output with digital output 2 selected is high (closed).
[40]	Set digital out C high	Any output with digital output 3 selected is high (closed).
[41]	Set digital out D high	Any output with digital output 4 selected is high (closed).
[60]	Reset counter A	Resets counter A to 0.
[61]	Reset counter B	Resets counter B to 0.
[70]	Start timer 3	Starts timer 3.
[71]	Start timer 4	Starts timer 4.
[72]	Start timer 5	Starts timer 5.
[73]	Start timer 6	Starts timer 6.
[74]	Start timer 7	Starts timer 7.
[100]	ResetAlarm	

5.2.10 Parameter Group 14-** Special Functions

5.2.10.1 Parameter Group 14-0* Inverter Switching

Parameter 14-01 Switching Frequency

Table 119: Parameter 14-01 Switching Frequency

14-01 Switching Frequency		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the inverter switching frequency. Changing the switching frequency can help to reduce acoustic noise from the compressor.

N O T I C E

The output frequency value of the drive must never exceed 1/10 of the switching frequency. When the compressor runs, adjust the switching frequency in this parameter until the compressor is as noiseless as possible.

N O T I C E

High switching frequencies heat the drive and may reduce its lifetime.

Option	Name	Description
[0]	Ran3	3 kHz true random PWM (white noise modulation).
[1]	Ran5	5 kHz true random PWM (white noise modulation).
[2]	2.0 kHz	
[3]	3.0 kHz	
[4]	4.0 kHz	

Option	Name	Description
[5]	5.0 kHz	
[6]	6.0 kHz	
[7]	8.0 kHz	
[8]	10.0 kHz	
[9]	12.0 kHz	
[10]	16.0 kHz	

Parameter 14-03 Overmodulation

Table 120: Parameter 14-03 Overmodulation

14-03 Overmodulation		
Default value: On	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	Off	Selects no overmodulation of the output voltage to avoid torque ripple on the compressor shaft.
[1]*	On	The overmodulation function generates an extra voltage of up to 8% of U_{max} output voltage without over-modulation, which results in an extra torque of 10–12% in the middle of the oversynchronous range (from = % at nominal speed rising to approximately 12% at double nominal speed).
[2]	2.0 kHz	
[3]	3.0 kHz	
[4]	4.0 kHz	
[5]	5.0 kHz	
[6]	6.0 kHz	
[7]	8.0 kHz	
[8]	10.0 kHz	
[9]	12.0 kHz	
[10]	16.0 kHz	

5.2.10.2 Parameter Group 14-1* Mains On/Off

Parameters for configuring mains failure monitoring and handling.

Parameter 14-11 Mains Fault Voltage Level

Table 121: Parameter 14-11 Mains Fault Voltage Level

14-11 Mains Fault Voltage Level		
Default value: ExpressionLimit	Parameter type: Range [100 – 800 V]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

This parameter defines the threshold voltage at which the selected function in *parameter 14.10 Mains Failure* should be activated. The detection level is at a factor sqrt^2 of the value in this parameter.

Parameter 14-12 Response to Mains Imbalance

Table 122: Parameter 14-03 Overmodulation

14-03 Overmodulation		
Default value: Warning	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Operation under severe mains imbalance conditions reduces the lifetime of the compressor. If the compressor is operated continuously near nominal load, conditions are considered severe. When a severe mains imbalance is detected, select 1 of the available functions.

Option	Name	Description
[0]	Trip	Trips the drive.
[1]*	Warning	Issues a warning.
[2]	Disabled	No action. **N O T I C E** Disabling this parameter may lead to reduced lifetime.
[3]	Derate	Derates the load by mains imbalance.

5.2.10.3 Parameter Group 14-2* Trip Reset

Parameter 14-22 Operation Mode

Table 123: Parameter 14-22 Operation Mode

14-22 Operation Mode		
Default value: Normal operation	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

To reset all parameter values to default, select *[2] Initialisation*.

Option	Name	Description
[0]*	Normal operation	Select this option for normal operation of the drive with the compressor in the selected application.
[2]	Initialisation	To reset all parameter values to default settings, select this option. *Parameter 15-03 Power Up's*, *parameter 15-04 Over Temp's*, and *parameter 15-05 Over Volt's* are not reset with this option. The drive resets during the next power-up. *Parameter 14-22 Operation Mode* also reverts to the default setting *[2] Initialisation*.

Parameter 14-24 Trip Delay at Current Limit

Table 124: Parameter 14-24 Trip Delay at Current Limit

14-24 Trip Delay at Current Limit		
Default value: 60 s	Parameter type: Range [0 – 60 s]	Setup: 1 setup
Conversion index: 0	Data type: Uint8	Change during operation: False

Enter the current limit trip delay in s. When the output reaches the current limit, a warning is triggered. When the current limit warning has been continuously present for the period specified in this parameter, the drive trips. To run continuously in current limit without tripping, set this parameter to 60 s. Thermal monitoring of the drive remains active.

Parameter 14-27 Action at Inverter Fault

Table 125: Parameter 14-27 Action at Inverter Fault

14-27 Action at Inverter Fault		
Default value: Warning	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select how the drive acts if overvoltage, overcurrent, short circuit, or grounding errors occur.

Option	Name	Description
[0]	Trip	
[1]*	Warning	

5.2.10.4 Parameter Group 14-3* Current Limit Control

Parameters for configuring the current limit controller, which is activated when the compressor current exceeds the preset current limits (see *parameter 4-18 Current Limit)*. These parameters are used to reduce torque as quickly as possible without losing control of the compressor.

Parameter 14-30 Current Lim Ctrl, Proportional Gain

Table 126: Parameter 14-30 Current Lim Ctrl, Proportional Gain

14-30 Current Lim Ctrl, Proportional Gain		
Default value: 100%	Parameter type: Range [0 – 500%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Enter the proportional gain value for the current limit controller. A higher value makes the controller react faster. Excessive value setting leads to controller instability.

Parameter 14-31 Current Lim Ctrl, Integration Time

Table 127: Parameter 14-31 Current Lim Ctrl, Integration Time

14-31 Current Lim Ctrl, Integration Time		
Default value: ExpressionLimit	Parameter type: Range [0.002 – 2 s]	Setup: 2 setups
Conversion index: -3	Data type: Uint16	Change during operation: False

Enter the current limit control integration time. Setting the time to a lower value makes it react faster. A setting too low leads to control instability.

Parameter 14-32 Current Lim Ctrl, Filter Time

Table 128: Parameter 14-32 Current Lim Ctrl, Filter Time

14-32 Current Lim Ctrl, Filter Time		
Default value: ExpressionLimit	Parameter type: Range [1 – 100 ms]	Setup: 2 setups
Conversion index: -4	Data type: Uint16	Change during operation: False

Set a time constant for the current limit controller low-pass filter.

5.2.10.5 Parameter Group 14-5* Environment

These parameters help the drive to operate under special environmental conditions.

Parameter 14-55 Output Filter

Table 129: Parameter 14-55 Output Filter

14-55 Output Filter		
Default value: No filter	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	No filter	
[1]	Sine-wave filter	
[3]	Sine-wave filter with feedback	

5.2.10.6 Parameter Group 14-6* Auto Derate

Paramter group for configuring automatic derating based on the output frequency of the drive.

Parameter 14-61 Function at Inverter Load

Table 130: Parameter 14-61 Function at Inverter Overload

14-61 Function at Inverter Overload		
Default value: Trip	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

When the drive issues an inverter overload warning, select whether to continue, and probably trip the drive, or to derate the output current.

Option	Name	Description
[0]*	Trip	
[1]	Derate	

Parameter 14-63 Min Switch Frequency

Table 131: Parameter 14-61 Function at Inverter Overload

14-61 Function at Inverter Overload		
Default value: 2.0 kHz	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Set the minimum switching frequency allowed by the output filter.

Option	Name	Description
[0]*	2.0 kHz	
[3]	3.0 kHz	
[4]	4.0 kHz	
[5]	5.0 kHz	
[6]	6.0 kHz	
[7]	8.0 kHz	
[8]	10.0 kHz	

Option	Name	Description
[9]	12.0 kHz	
[10]	16.0 kHz	

5.2.11 Parameter Group 15-** Drive Information

This parameter group contains drive information, such as operating data, hardware configuration, and software versions.

5.2.11.1 Parameter Group 15-0* Operating Data

Parameter 15-00 Operating Hours

Table 132: Parameter 15-00 Operating Hours

15-00 Operating Hours		
Default value: 0 h	Parameter type: Range [0 – 0x7FFFFFFF h]	Setup: 1 setup
Conversion index: 74	Data type: Uint32	Change during operation: False

View how many hours the drive has run. The value is saved when the drive is turned off.

Parameter 15-01 Running Hours

Table 133: Parameter 15-01 Running Hours

15-01 Running Hours		
Default value: 0 h	Parameter type: Range [0 – 0x7FFFFFFF h]	Setup: 1 setup
Conversion index: 74	Data type: Uint32	Change during operation: False

View how many hours the compressor has run. Reset the counter in *parameter 15-07 Reset Running Hours Counter*. The value is saved when the drive is turned off.

Parameter 15-03 Power Up's

Table 134: Parameter 15-03 Power Up's

15-03 Power Up's		
Default value: 0	Parameter type: Range [0 – 2147483647]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the number of times the drive has been powered up.

Parameter 15-04 Over Temp's

Table 135: Parameter 15-04 Over Temp's

15-04 Over Temp's		
Default value: 0	Parameter type: Range [0 – 65535]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View the number of drive temperature faults that have occurred.

Parameter 15-05 Over Volt's

Table 136: Parameter 15-05 Over Volt's

15-05 Over Volt's		
Default value: 0	Parameter type: Range [0 – 65535]	Setup: 1 setup

15-05 Over Volt's		
Conversion index: 0	Data type: Uint16	Change during operation: False

View the number of drive overvoltages that have occurred.

Parameter 15-06 Reset kWh Counter

Table 137: Parameter 15-06 Reset kWh Counter

15-06 Reset kWh Counter		
Default value: Do not reset	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	Do not reset	
[1]	Reset counter	To reset the kWh counter to 0, select *[1] Reset* and press [OK].

Parameter 15-07 Reset Running Hours Counter

Table 138: Parameter 15-07 Reset Running Hours Counter

15-07 Reset Running Hours Counter		
Default value: Do not reset	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]*	Do not reset	
[1]	Reset counter	To reset the running hours counter, select *[1] Reset* and press [OK].

Parameter 15-08 Number of Starts

Table 139: Parameter 15-08 Number of Starts

15-08 Number of Starts		
Default value: 0	Parameter type: Range [0 – 2147483647]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

States the number of starts executed on the drive. The counter can be reset in *parameter 15-07 Reset Running Hours Counter*. The value is saved when the drive is turned off.

Parameter 15-09 Number of Auto Resets

Table 140: Parameter 15-09 Number of Auto Resets

15-09 Number of Auto Resets		
Default value: 0	Parameter type: Range [0 – 2147483647]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

States the number of auto resets executed by the drive.

5.2.11.2 Parameter Group 15-3* Alarm Log

Parameters in this group are array parameters, where up to 10 faults log can be viewed. [0] is the most recent logged data, and [9] the oldest. Fault codes, values, and time stamp can be viewed for all logged data.

Parameter 15-30 Alarm Log: Error Code

Table 141: Parameter 15-30 Alarm Log: Error Code

15-30 Alarm Log: Error Code		
Default value: 0	Parameter type: Range [0 – 255]	Setup: 1 setup
Conversion index: 0	Data type: Uint8 [10]	Change during operation: False

View the fault code and look up its meaning in 6 Troubleshooting.

Parameter 15-31 InternalFaultReason

Table 142: Parameter 15-31 InternalFaultReason

15-31 InternalFaultReason		
Default value: 0	Parameter type: Range [-32767 – 32767]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View a description of the error. This parameter is used with *alarm 38, Internal Fault*.

5.2.11.3 Parameter Group 15-4* Drive Identification

Parameters containing read-only information about the hardware and software configuration of the drive.

Parameter 15-40 FC Type

Table 143: Parameter 15-40 FC Type

15-40 FC Type		
Default value: 0	Parameter type: Range [0 – 6]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 6	Change during operation: False

View the FC type code. The readout is identical to the drive series power field of the type code definition, characters 1–6.

Parameter 15-41 Power Section

Table 144: Parameter 15-41 Power Section

15-41 Power Section		
Default value: 0	Parameter type: Range [0 – 20]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 20	Change during operation: False

View the FC type code. The readout is identical to the drive series power field of the type code definition, characters 7–10.

Parameter 15-42 Voltage

Table 145: Parameter 15-42 Voltage

15-42 Voltage		
Default value: 0	Parameter type: Range [0 – 20]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 20	Change during operation: False

View the FC type code. The readout is identical to the drive series power field of the type code definition, characters 11–12.

Parameter 15-43 Software Version

Table 146: Parameter 15-43 Software Version

15-43 Software Version		
Default value: 0	Parameter type: Range [0 – 0]	Setup: 1 setup

15-43 Software Version		
Conversion index: 0	Data type: VisibleString of length 20	Change during operation: False

View the software version of the drive.

Parameter 15-44 Ordered TypeCode

Table 147: Parameter 15-44 Ordered TypeCode

15-44 Ordered TypeCode		
Default value: 0	Parameter type: Range [0 – 40]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 40	Change during operation: False

View the type code string used for reordering the drive in its original configuration.

Parameter 15-45 Actual Typecode String

Table 148: Parameter 15-45 Actual Typecode String

15-45 Actual Typecode String		
Default value: 0	Parameter type: Range [0 – 40]	Setup: 2 setups
Conversion index: 0	Data type: VisibleString of length 40	Change during operation: False

View the actual type code string.

Parameter 15-46 Drive Ordering No

Table 149: Parameter 15-46 Drive Ordering No

15-46 Drive Ordering No		
Default value: 0	Parameter type: Range [0 – 8]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 8	Change during operation: False

View the 8-digit ordering number for reordering the drive in its original configuration.

Parameter 15-48 LCP ID No

Table 150: Parameter 15-48 LCP ID No

15-48 LCP ID No		
Default value: 0	Parameter type: Range [0 – 0]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 21	Change during operation: False

View the LCP ID number.

SW ID Control Card

Table 151: Parameter 15-49 SW ID Control Card

15-49 SW ID Control Card		
Default value: 0	Parameter type: Range [0 – 0]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 21	Change during operation: False

View the control card software version number.

Parameter 15-50 SW ID Power Card

Table 152: Parameter 15-50 SW ID Power Card

15-50 SW ID Power Card		
Default value: 0	Parameter type: Range [0 – 0]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 21	Change during operation: False

View the power card software version number.

Parameter 15-51 Drive Serial Number

Table 153: Parameter 15-51 Drive Serial Number

15-51 Drive Serial Number		
Default value: 0	Parameter type: Range [0 – 10]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 10	Change during operation: False

View the serial number of the drive.

Parameter 15-53 Power Card Serial Number

Table 154: Parameter 15-53 Power Card Serial Number

15-53 Power Card Serial Number		
Default value: 0	Parameter type: Range [0 – 0]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 10	Change during operation: False

View the serial number of the power card.

Parameter 15-59 Filename

Table 155: Parameter 15-59 Filename

15-59 Filename		
Default value: 0	Parameter type: Range [0 – 16]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 16 [2]	Change during operation: False

View the current CSIV file name.

5.2.12 Parameter Group 16-** Data Readouts

5.2.12.1 Parameter Group 16-0* General Status

Parameter 16-00 Control Word

Table 156: Parameter 16-00 Control Word

16-00 Control Word		
Default value: 0	Parameter type: Range [0 – 65535]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View the control word sent from the drive via the serial communication port in hex code.

Table 157: Control Bit Descriptions

Bit	Bit=0	Bit=1
00	Preset reference option lsb	–
01	Preset reference option 2nd bit of preset references	–

Bit	Bit=0	Bit=1
02	DC brake	Ramp
03	Coasting	Enable
04	Quick stop	Ramp
05	Freeze output	Ramp
06	Ramp stop	Start
07	No function	Reset
08	No function	Jog
09	Ramp 1	Ramp 2
10	Data not valid	Valid
11	Relay_A not active	Relay_A active
12	Relay_B not active	Relay_B active
13	Choice of set-up lsb	–
14	No function	No function
15	No function	Reversing

Parameter 16-01 Reference [Unit]

Table 158: Parameter 16-01 Reference [Unit]

16-01 Reference [Unit]		
Default value: 0 ReferenceFeedback	Parameter type: Range [-4999 – 4999 ReferenceFeedback]	Setup: 1 setup
Conversion index: -3	Data type: Int32	Change during operation: False

View the preset reference value applied on impulse or analog basis in the unit resulting from the configuration selected in *parameter 1-00 Configuration Mode*.

Parameter 16-02 Reference [%]

Table 159: Parameter 16-02 Reference [%]

16-02 Reference [%]		
Default value: 0%	Parameter type: Range [-200 – 200%]	Setup: 1 setup
Conversion index: -1	Data type: Int16	Change during operation: False

View the total reference. The total reference is the sum of digital, analog, preset, bus, and freeze references.

Parameter 16-03 Status Word

Table 160: Parameter 16-03 Status Word

16-03 Status Word		
Default value: 0	Parameter type: Range [0 – 65535]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View the status word sent from the drive via the serial communication port in hex code.

Table 161: Status Bit Descriptions

Bit	Bit=0	Bit=1
00	Control not ready	Ready
01	VLT not ready	Ready
02	Coasting	Enable
03	No fault	Trip
04	No warning	Warning
05	Reversed	–
06	No trip lock	Trip lock
07	No warning	Warning
08	Speed≠ref.	Speed=ref.
09	Local control	Bus control
10	Out of range	Frequency OK
11	Not running	Running
12	No function	No function
13	Voltage OK	Above limit
14	Current OK	Above limit
15	Temperature OK	Above limit

Parameter 16-05 Main Actual Value [%]

Table 162: Parameter 16-05 Main Actual Value [%]

16-05 Main Actual Value [%		
Default value: 0%	Parameter type: Range [-200 – 200%]	Setup: 1 setup
Conversion index: -2	Data type: Int16	Change during operation: False

View the 2-byte word sent with the status word to the bus master reporting the main actual value.

Parameter 16-09 Custom Readout

Table 163: Parameter 16-09 Custom Readout

16-09 Main Actual Value [%]		
Default value: 0 CustomReadout	Parameter type: Range [0 – 9999 CustomReadout]	Setup: 1 setup
Conversion index: -2	Data type: Int32	Change during operation: False

View the user-defined readouts as defined in *parameter 0-30 Custom Readout Unit*, *parameter 0-31 Custom Readout Min Value*, and *parameter 0-32 Custom Readout Max Value*.

5.2.12.2 Parameter Group 16-1* Motor Status

Parameter 16-10 Power [kW]

Table 164: Parameter 16-10 Power [kW]

16-10 Power [kW]		
Default value: 0 kW	Parameter type: Range [0 – 1000 kW]	Setup: 1 setup
Conversion index: -3	Data type: Uint32	Change during operation: False

Shows the actual compressor power in kW. The value is calculated based on the actual compressor voltage and compressor current.

Parameter 16-11 Power [hp]

Table 165: Parameter 16-11 Power [hp]

16-11 Power [hp]		
Default value: 0 hp	Parameter type: Range [0 – 1000 hp]	Setup: 1 setup
Conversion index: -3	Data type: Uint32	Change during operation: False

Shows the actual compressor power in hp. The value is calculated based on the actual compressor voltage and compressor current.

Parameter 16-12 Motor Voltage

Table 166: Parameter 16-12 Motor Voltage

16-12 Motor Voltage		
Default value: 0 V	Parameter type: Range [0 – 65535 V]	Setup: 1 setup
Conversion index: -1	Data type: Uint32	Change during operation: False

View the compressor voltage, a calculated value used for controlling the compressor.

Parameter 16-13 Frequency

Table 167: Parameter 16-13 Frequency

16-13 Frequency		
Default value: 0 Hz	Parameter type: Range [0 – 6553.5 Hz]	Setup: 1 setup
Conversion index: -1	Data type: Uint32	Change during operation: False

View the compressor frequency, without resonance damping.

Parameter 16-14 Motor Current

Table 168: Parameter 16-14 Motor Current

16-14 Motor Current		
Default value: 0 A	Parameter type: Range [0 – 655.35 A]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the compressor current measured as an average value, I_{RMS}.

Parameter 16-15 Frequency [%]

Table 169: Parameter 16-15 Frequency [%]

16-15 Frequency		
Default value: 0%	Parameter type: Range [0 – 6553.5%]	Setup: 1 setup
Conversion index: -1	Data type: Uint16	Change during operation: False

View a 2-byte word reporting the actual compressor frequency (without resonance damping) as a percentage (scale 0000–4000 hex) of *parameter 4-19 Max Output Frequency*.

Parameter 16-16 Torque [Nm]

Table 170: Parameter 16-16 Torque [Nm]

16-16 Torque [Nm]		
Default value: 0 Nm	Parameter type: Range [-30000 – 30000 Nm]	Setup: 2 setups
Conversion index: -1	Data type: Int32	Change during operation: False

View the torque value with sign, applied to the motor shaft. Linearity is not exact between 160% motor current and torque in relation to the rated torque. Some motors supply more than 160% torque. Therefore, the minimum value and the maximum value depend on the maximum motor current and the motor used. The value is filtered, and thus approximately 30 ms may pass from when an input changes value to when the data readout values change.

Parameter 16-17 Speed [RPM]

Table 171: Parameter 16-17 Speed [RPM]

16-17 Speed [RPM]		
Default value: 0 RPM	Parameter type: Range [-30000 – 30000 RPM]	Setup: 2 setups
Conversion index: -1	Data type: Int32	Change during operation: False

View the actual motor RPM. The motor RPM is estimated in open-loop process or closed-loop process control modes and the motor RPM is measured in speed closed-loop mode.

Parameter 16-18 Motor Thermal

Table 172: Parameter 16-18 Motor Thermal

16-18 Motor Thermal		
Default value: 0%	Parameter type: Range [0 - 100%]	Setup: 1 setup
Conversion index: 0	Data type: Uint8	Change during operation: False

View the calculated compressor motor temperature in percentage of allowed maximum. At 100%, a trip occurs, if selected in *parameter 1-90 Motor Thermal Protection*. The basis for the calculation is the ETR function selected in *parameter 1-90 Motor Thermal Protection*.

Parameter 16-22 Torque [%]

Table 173: Parameter 16-22 Torque [%]

16-22 Torque [%]		
Default value: 0%	Parameter type: Range [-200 - 200%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

This is a readout parameter only. Shows the actual torque yielded in percentage of the rated torque, based on the setting of the motor size, and rated speed in *parameter 1-20 Motor Power* or *parameter 1-21 Motor Power [HP]* and *parameter 1-25 Motor Nominal*.

5.2.12.3 Parameter Group 16-3* Drive Status

Parameter 16-30 DC Link Voltage

Table 174: Parameter 16-30 DC Link Voltage

16-30 DC Link Voltage		
Default value: 0 V	Parameter type: Range [0 - 65535 V]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

Shows the actual DC-link voltage.

Parameter 16-34 Heatsink Temp.

Table 175: Parameter 16-34 Heatsink Temp.

16-34 Heatsink Temp.		
Default value: 0 °C	Parameter type: Range [-128 - 127 °C]	Setup: 1 setup
Conversion index: 100	Data type: Int8	Change during operation: False

View the heat sink temperature of the drive.

Parameter 16-35 Inverter Thermal

Table 176: Parameter 16-35 Inverter Thermal

16-35 Inverter Thermal		
Default value: 0%	Parameter type: Range [0 - 255%]	Setup: 1 setup
Conversion index: 0	Data type: Uint8	Change during operation: False

View the percentage of thermal load on the drive. At 100%, a trip occurs.

Parameter 16-36 Inv. Nom. Current

Table 177: Parameter 16-36 Inv. Nom. Current

16-36 Inv. Nom. Current		
Default value: 0 A	Parameter type: Range [0 - 655.35 A]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the inverter nominal current. The data is used for compressor protection, and more.

Parameter 16-37 Inv. Max. Current

Table 178: Parameter 16-37 Inv. Max. Current

16-37 Inv. Max. Current		
Default value: 0 A	Parameter type: Range [0 - 655.35 A]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the inverter maximum current. The data is used for calculation of drive protection, and more.

Parameter 16-38 SL Controller Site

Table 179: Parameter 16-38 SL Controller State

16-38 SL Controller State		
Default value: 0	Parameter type: Range [0 - 20]	Setup: 1 setup
Conversion index: 0	Data type: Uint8	Change during operation: False

View the actual state of the smart logic controller (SLC).

5.2.12.4 Parameter Group 16-5* Ref. & Feedb.

Parameter 16-50 External Reference

Table 180: Parameter 16-50 External Reference

16-50 External Reference		
Default value: 0%	Parameter type: Range [-200 - 200%]	Setup: 1 setup
Conversion index: -1	Data type: Int16	Change during operation: False

View the total reference, the sum of digital, analog, preset, bus, and freeze references.

Parameter 16-52 Feedback[Unit]

Table 181: Parameter 16-52 Feedback[Unit]

16-52 Feedback[Unit]		
Default value: 0 ProcessCtrlUnit	Parameter type: Range [-4999 - 4999 ProcessCtrlUnit]	Setup: 1 setup
Conversion index: -3	Data type: Int32	Change during operation: False

View the feedback resulting from the selection of scaling in *parameter 3-02 Minimum Reference* and *parameter 3-03 Maximum Reference*.

Parameter 16-54 Feedback 1 [Unit]

Table 182: Parameter 16-54 Feedback 1 [Unit]

16-54 Feedback 1 [Unit]		
Default value: 0 ProcessCtrlUnit	Parameter type: Range [-999999.999 - 999999.999 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

View the feedback resulting from the selection of scaling in *parameter 3-02 Minimum Reference* and *parameter 3-03 Maximum Reference*.

Parameter 16-55 Feedback 2 [Unit]

Table 183: Parameter 16-55 Feedback 2 [Unit]

16-55 Feedback 2 [Unit]		
Default value: 0 ProcessCtrlUnit	Parameter type: Range [-999999.999 - 999999.999 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

View the value of feedback 2, see *parameter group 20-0* Feedback*. The value is limited by settings in *parameter 20-13 Minimum Reference/ Feedb.* and *parameter 20-14 Maximum Reference/Feedb. Units* as set in *parameter 20-12 Reference/Feedback Unit*.

5.2.12.5 Parameter Group 16-6* Inputs and Outputs

Parameter 16-60 Digital Input

Table 184: Parameter 16-60 Digital Input

16-60 Digital Input		
Default value: 0	Parameter type: Range [0 - 4095]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View the actual state of the digital inputs 18, 19, 27, and 29.

Bit number	Description
0	Unused
1	Unused
2	Digital input terminal 29
3	Digital input terminal 27
4	Digital input terminal 19

Bit number	Description
5	Digital input terminal 18
6–15	Unused

Parameter 16-61 Terminal 53 Setting

Table 185: Parameter 16-61 Terminal 53 Setting

16-61 Terminal 53 Setting		
Default value: Current mode	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

View the setting of terminal 53.

Option	Name	Description
[0]*	Current mode	
[1]	Voltage mode	

Parameter 16-62 Analog Input 53

Table 186: Parameter 16-62 Analog Input 53

16-62 Analog Input 53		
Default value: 1	Parameter type: Range [0 - 20]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the actual input on analog input 53.

Parameter 16-63 Termianl 54 Setting

Table 187: Parameter 16-63 Terminal 54 Setting

16-63 Terminal 54 Setting		
Default value: Current mode	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

View the setting of terminal 54 (current or voltage).

Option	Name	Description
[0]*	Current mode	
[1]	Voltage mode	

Parameter 16-64 Analog Input 54

Table 188: Parameter 16-64 Analog Input 54

16-64 Analog Input 54		
Default value: 1	Parameter type: Range [0 - 20]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the actual input on analog input 54.

Parameter 16-65 Analog Output 42 [mA]

Table 189: Parameter 16-65 Analog Output 42 [mA]

16-65 Analog Output 42 [mA]		
Default value: 0 mA	Parameter type: Range [0 - 20 mA]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the actual value at output 42 in mA. The value shown reflects the selection in *parameter 6-90 Terminal 42 Mode* and *parameter 6-91 Terminal 42 Analog Output*.

Parameter 16-66 Digital Output

Table 190: Parameter 16-66 Digital Output

16-66 Digital Output		
Default value: 0	Parameter type: Range [0 - 63]	Setup: 1 setup
Conversion index: -2	Data type: u_int16 of length 5	Change during operation: False

View the binary value of all digital outputs.

Table 191: Binary Value of Digital Outputs

XX[0]	None used
X0	Terminal 42 not used, terminal 45 low.
X1	Terminal 42 not used, terminal 45 high.
0X	Terminal 42 low, terminal 45 not used.
0	Terminal 42 low, terminal 45 low.
1	Terminal 42 low, terminal 45 high.
1X	Terminal 42 high, terminal 45 not used.
10	Terminal 42 high, terminal 45 low.
11	Terminal 42 high, terminal 45 high.

Parameter 16-67 Pulse Input 29

Table 192: Parameter 16-67 Pulse Input 29 [Hz]

16-67 Pulse Input 29 [Hz]		
Default value: 0	Parameter type: Range [0 - 130000]	Setup: 2 setups
Conversion index: 0	Data type: Int32	Change during operation: False

View the actual frequency rate on terminal 29.

Parameter 16-71 Relay Output

Table 193: Parameter 16-71 Relay Output

16-71 Relay Output		
Default value: 0	Parameter type: Range [0 - 31]	Setup: 1 setup
Conversion index: 0	Data type: Uint16	Change during operation: False

View the setting of the relay.

Table 194: Bits Definition

Bit number	Definition
0–2	Unused
3	Relay 02
4	Relay 01
5–15	Unused

Parameter 16-72 Counter A

Table 195: Parameter 16-72 Counter A

16-72 Counter A		
Default value: 0	Parameter type: Range [-32768 - 32768]	Setup: 1 setup
Conversion index: 0	Data type: Int16	Change during operation: False

View the value of counter A. Counters are useful as comparator operands, see *parameter 13-10 Comparator Operand*. The value can be reset or changed either via digital inputs or by using an SLC action (*parameter 13-52 SL Controller Action*.)

Parameter 16-73 Counter B

Table 196: Parameter 16-73 Counter B

16-73 Counter B		
Default value: 0	Parameter type: Range [-32768 - 32767]	Setup: 1 setup
Conversion index: 0	Data type: Int16	Change during operation: False

View the value of counter B. Counters are useful as comparator operands, see *parameter 13-10 Comparator Operand*. The value can be reset or changed either via digital inputs or by using an SLC action (*parameter 13-52 SL Controller Action*.)

Parameter 16-79 Analog Output 45 [mA]

Table 197: Parameter 16-79 Analog Output 45 [mA]

16-79 Analog Output 45 [mA]		
Default value: 0 mA	Parameter type: Range [0 - 20 mA]	Setup: 1 setup
Conversion index: -2	Data type: Uint16	Change during operation: False

View the actual value at output 45 in mA. The value shown reflects the selection in *parameter 6-70 Terminal 45 Mode* and *parameter 6-71 Terminal 45 Analog Output*.

5.2.12.6 Parameter Group 16-8* Fieldbus & FC Port

Parameters for reporting the bus reference and control words.

Parameter 16-86 FC Port REF 1

Table 198: Parameter 16-86 FC Port REF 1

16-86 FC Port REF 1		
Default value: 0	Parameter type: Range [-32768 - 32767]	Setup: 1 setup
Conversion index: 0	Data type: Int16	Change during operation: False

View the last received reference from the FC port.

5.2.12.7 Parameter Group 16-9* Diagnosis Read-Outs

Parameter 16-90 Alarm Word

Table 199: Parameter 16-90 Alarm Word

16-90 Alarm Word		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the alarm word sent via the serial communication port in hex code.

Parameter 16-91 Alarm Word 2

Table 200: Parameter 16-91 Alarm Word 2

16-91 Alarm Word 2		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the alarm word 2 sent via the serial communication port in hex code.

Parameter 16-92 Warning Word

Table 201: Parameter 16-92 Warning Word

16-92 Warning Word		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the warning word sent via the serial communication port in hex code.

Parameter 16-93 Warning Word 2

Table 202: Parameter 16-93 Warning Word 2

16-93 Warning Word 2		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the warning word 2 sent via the serial communication port in hex code.

Parameter 16-94 Ext. Status Word

Table 203: Parameter 16-94 Ext. Status Word

16-94 Ext. Status Word		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

Shows the extended status word sent via the serial communication port in hex code.

Parameter 16-95 Ext. Status Word 2

Table 204: Parameter 16-94 Ext. Status Word

16-94 Ext. Status Word		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

Shows the extended status word 2 sent via the serial communication port in hex code.

Parameter 16-97 Alarm Word 3

Table 205: Parameter 16-97 Alarm Word 3

16-97 Alarm Word 3		
Default value: 0	Parameter type: Range [0 - 0xFFFFFFFFUL]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

View the alarm word 3 sent via the serial communication port in hex code.

5.2.13 Parameter Group 20-** Drive Closed Loop

5.2.13.1 Parameter Group 20-0* Feedback

Parameter 20-01 Feedback 1 Conversion

Table 206: Parameter 20-01 Feedback 1 Conversion

20-01 Feedback 1 Conversion		
Default value: Linear	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

This parameter allows a conversion to be applied to feedback.

Option	Name	Description
[0]*	Linear	
[1]	Square root	

Parameter 20-03 Feedback 2 Source

Table 207: Parameter 20-03 Feedback 2 Source

20-03 Feedback 2 Source		
Default value: No function	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

The effective feedback signal is made up of up to 3 different input signals. Select which drive input should be treated as the source of the 2nd of these signals.

Option	Name	Description
[0]*	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[100]	Bus feedback 1	
[101]	Bus feedback 2	

Parameter 20-04 Feedback 2 Conversion

Table 208: Parameter 20-04 Feedback 2 Conversion

20-04Feedback 2 Conversion		
Default value: Linear	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select a conversion for the feedback 2 signal. Select Linear to leave the feedback signal unchanged.

Option	Name	Description
[0]*	Linear	
[1]	Square root	

5.2.13.2 Parameter Group 20-2* Feedback/Setpoint

Parameter 20-20 Feedback Function

Table 209: Parameter 20-20 Feedback Function

20-20 Feedback Function		
Default value: Minimum	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select how the feedback should be calculated. The feedback can be either a single feedback source or a combination of several feedbacks.

Option	Name	Description
[0]	Sum	
[1]	Difference	
[2]	Average	
[3]*	Minimum	
[4]	Maximum	

5.2.13.3 Parameter Group 20-8* PI Basic Settings

Parameter 20-83 PI Start Speed [Hz]

Table 210: Parameter 20-83 PI Start Speed [Hz]

20-83 PI Start Speed [Hz]		
Default value: ExpressionLimit	Parameter type: Range [0 - 200.0]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Enter the motor speed to be attained as a start signal for commencement of PI control. Upon power-up, the drive operates in speed open-loop control. When the Process PI start speed is reached, the drive will change to PI control.

Parameter 20-84 On Reference Bandwidth

Table 211: Parameter 20-84 On Reference Bandwidth

20-84 On Reference Bandwidth		
Default value: 5%	Parameter type: Range [0 - 200%]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

Enter the on reference bandwidth. When the PI control error (the difference between the reference and the feedback) is greater than the value of this parameter, then the on reference status bit is set high.

5.2.13.4 Parameter Group 20-9* PI Controller

Parameter 20-91 PI Anti Windup

Table 212: Parameter 20-91 PI Anti Windup

20-91 PI Anti Windup		
Default value: On	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Set the regulation of an error.

Option	Name	Description
[0]	Off	Continue regulation of an error even when the output frequency cannot be increased or decreased.
[1]*	On	Cease regulation of an error when the output frequency can no longer be adjusted.

Parameter 20-93 PI Proportional Gain

Table 213: Parameter 20-93 PI Proportional Gain

20-93 PI Proportional Gain		
Default value: 0.50	Parameter type: Range [0 - 10]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the process controller proportional gain. Quick control is obtained at high amplification. However, if amplification is too high, the process may become unstable.

Parameter 20-94 PI Integral Time

Table 214: Parameter 20-94 PI Integral Time

20-94 PI Integral Time		
Default value: 20 s	Parameter type: Range [0.10 - 9999 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the process controller integral time. Obtain quick control through a short integral time, though if the integral time is too short, the process becomes unstable. An excessively long integral time disables the integral action.

Parameter 20-97 PI Feed Forward Factor

Table 215: Parameter 20-97 PI Feed Forward Factor

20-97 PI Feed Forward Factor		
Default value: 0%	Parameter type: Range [0 - 400%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Enter the PI feed forward factor. The FF factor sends a constant fraction of the reference signal to bypass PI control, so the PI only has an effect on the remaining fraction of the control signal. Increases dynamic performance.

5.2.14 Parameter Group 28-** Compressor Functions

When controlling compressors, there is often a need for limiting the number of starts. One way to limit the starts is to ensure a minimum run-time (time between a start and a stop) and a minimum interval between starts. *Parameter 28-02 Minimum Run Time* can override any normal stop command and *parameter 28-01 Interval between Starts* can override any normal start command.

5.2.14.1 Parameter Group 28-0* Short Cycle Protection

Parameter 28-00 Short Cycle Protection

Table 216: Parameter 28-00 Short Cycle Protection

28-00 Short Cycle Protection		
Default value: Enabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	Disabled	Short-cycle protection is disabled.
[1]*	Enabled	Short-cycle protection is enabled.

Parameter 28-01 Interval Between Starts

Table 217: Parameter 28-01 Interval Between Starts

28-01 Interval Between Starts		
Default value: 300 s	Parameter type: Range [0 - 3600 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Sets the time desired as minimum time between 2 starts. Any normal start command (start/jog/freeze) is disregarded until the timer has expired.

5.2.14.2 Parameter Group 28-1* Oil Return Management

Insufficient lubrication can be the result of oil depositing itself in pipes and bends. Return oil deposits to the crankcase by increasing velocity for short periods at regular time intervals or by ensuring adequate oil return when velocity is too low.

With oil return management enabled, the drive performs oil return by boosting the compressor speed for a selectable duration. Program the duration in *parameter 28-13 Boost Duration*. The boosts are performed if the compressor speed has been less than 40 rps (80 Hz) for too long. A text message on the LCP indicates oil return boosts.

Parameter 28-10 Oil Return Management

Table 218: Parameter 28-10 Oil Return Management

28-10 Oil Return Management		
Default value: On	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	Off	No function.
[1]*	On	Oil return management is active.

Parameter 28-13 Boost Duration

Table 219: Parameter 28-13 Boost Duration

28-13 Boost Duration		
Default value: 60 s	Parameter type: Range [60 - 300 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

This parameter controls the duration of oil return boosts.

5.2.14.3 Parameter Group 28-6* Compressor Readouts

Parameter 28-60 RPS

Table 220: Parameter 28-60 RPS

28-60 RPS		
Default value: 0 /s	Parameter type: Range [0 - 250 /s]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

View the actual compressor frequency in rps (rounds per second).

5.3 6–10 kW Specific Parameters

5.3.1 Parameter Group 0-** Operation and Display

5.3.1.1 Parameter Group 0-0* Basic Settings

Parameter 0-06 Grid Type

Table 221: Parameter 0-06 Grid Type

0-06 Grid Type		
Default value: –	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the grid type of the supply voltage/frequency. IT grid is a supply mains where there are no connections to ground. Delta is a supply mains where the secondary part of the transformer is delta-connected and 1 phase is connected to ground.

N O T I C E

Not all options are supported in all power sizes.

Option	Name	Description
[0]	200-240V/50Hz/IT-grid	
[1]	200-240V/50Hz/Delta	
[2]	200-240V/50Hz	
[10]	380-440V/50Hz/IT-grid	
[11]	380-440V/50Hz/Delta	
[12]	380-440V/50Hz	
[20]	440-480V/50Hz/IT-grid	
[21]	440-480V/50Hz/Delta	
[22]	440-480V/50Hz	
[100]	200-240V/60Hz/IT-grid	
[101]	200-240V/60Hz/Delta	
[102]	200-240V/60Hz	
[110]	380-440V/60Hz/IT-grid	

Option	Name	Description
[111]	380-440V/60Hz/Delta	
[112]	380-440V/60Hz	
[120]	440-480V/60Hz/IT-grid	
[121]	440-480V/60Hz/Delta	
[122]	440-480V/60Hz	

5.3.1.2 Parameter Group 0-4* LCP Keypad

Parameter 0-40 [Hand On] Key on LCP

Table 222: Parameter 0-40 [Hand On] key on the LCP

0-40 [Hand On] key on the LCP		
Default value: Enabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: True

Option	Name	Description
[0]	Disabled	To avoid unintended start of the drive in hand-on mode, select *[0] Disabled*.
[1]*	Enabled	[Hand On] is enabled.

5.3.2 Parameter Group 1-** Load and Motor

5.3.2.1 Parameter Group 1-0* General Settings

Parameter 1-01 Motor Control Principle

Table 223: Parameter 1-01 Motor Control Principle

1-01 Motor Control Principle		
Default value: VVC+	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	U/f	**NOTICE** When running U/f, control slip and load compensations are not included. Used for parallel-connected compressors and/or special compressor applications. Set the U/f settings in *parameter 1-55 U/f Characteristic - U* and *parameter 1-56 U/f Characteristic - f*.
[1]*	VVC+	**NOTICE** When *parameter 1-10 Motor Construction* is set to PM-enabled options, only VVC+ option is available. Normal running mode, including slip and load compensations.

Parameter 1-06 Clockwise Direction

Table 224: Parameter 1-06 Clockwise Direction

1-06 Clockwise Direction		
Default value: Normal	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

NOTICE

This parameter cannot be adjusted while the compressor is running.

This parameter defines the term *clockwise* corresponding to the LCP direction arrow. Used for easy change of direction of shaft rotation without swapping motor cables.

Option	Name	Description
[0]*	Normal	The motor shaft turns in clockwise direction when the drive is connected U⇒U; V⇒V; and W⇒W to the compressor.
[1]	Inverse	The motor shaft turns in counterclockwise direction when the drive is connected U⇒U; V⇒V; and W⇒W to the compressor.

5.3.2.2 Parameter Group 1-1* Motor Selection

Parameter 1-10 Motor Construction

Table 225: Parameter 1-10 Motor Construction

1-10 Motor Construction		
Default value: PM, Salient IPM, Sat	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	Asynchron	For induction motors.
[1]	PM, non-salient SPM	For permanent magnet (PM) motors with surface-mounted (non-salient) magnets. Refer to *parameter 1-14 Damping Gain* to *parameter 1-17 Voltage Filter Time Const.* for details about optimizing the motor operation.
[3]*	PM, salient IPM, Sat.	For permanent magnet (PM) motors with interior (salient) magnets with inductance saturation control.

Parameter 1-13 Compressor Selection

Table 226: Parameter 1-13 Compressor Selection

1-13 Compressor Selection		
Default value: –	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

The default setting of most of the parameters in the drive (for example, compressor data, limits, ramps) depends on the compressor and system refrigerant selected for the drive. The drive selects the default compressor based on the power size and voltage range of the drive.

NOTICE

If the compressor selection is changed, all dependent parameters reset to default and any user settings are lost.

Option	Name	Description
[24]	VZH028-R410A	
[25]	VZH035-R410A	
[26]	VZH044-R410A	
[27]	VLZ028	
[28]	VLZ035	
[29]	VLZ044	

5.3.2.3 Parameter Group 1-2* Motor Data

Parameter 1-20 Motor Power

Table 227: Parameter 1-20 Motor Power

1-20 Motor Power		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Enter the nominal power in kW/hp according to the motor nameplate data. The default value corresponds to the nominal rated output of the unit.

Option	Name	Description
[3]	0.18 kW - 0.25 hp	
[4]	0.25 kW - 0.33 hp	
[5]	0.37 kW - 0.5 hp	
[6]	0.55 kW - 0.75 hp	
[7]	0.75 kW - 1 hp	
[8]	1.1 kW - 1.5 hp	
[9]	1.5 kW - 2 hp	
[10]	2.2 kW - 3 hp	
[11]	3 kW - 4 hp	
[12]	3.7 kW - 5 hp	
[13]	4 kW - 5.4 hp	
[14]	5.5 kW - 7.5 hp	
[15]	7.5 kW - 10 hp	
[16]	11 kW - 15 hp	
[17]	15 kW - 20 hp	
[18]	18.5 kW - 25 hp	
[19]	22 kW - 30 hp	
[20]	30 kW - 40 hp	

Parameter 1-22 Motor Voltage

Table 228: Parameter 1-22 Motor Voltage

1-22 Motor Voltage		
Default value: ExpressionLimit	Parameter type: Range [50 - 1000 V]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Enter the nominal motor voltage according to the motor nameplate data. The default value corresponds to the nominal rated output of the unit.

Parameter 1-23 Motor Frequency

Table 229: Parameter 1-23 Motor Frequency

1-23 Motor Frequency		
Default value: ExpressionLimit	Parameter type: Range [20 - 400 Hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Select the motor frequency value from the motor nameplate data. For 87 Hz operation with 230/400 V motors, set the nameplate data to 230 V/50 Hz. Adapt *parameter 4-14 Motor Speed High Limit [Hz]* and *parameter 3-03 Maximum Reference* to the 87 Hz application.

Parameter 1-24 Motor Current

Table 230: Parameter 1-24 Motor Current

1-24 Motor Current		
Default value: ExpressionLimit	Parameter type: Range [0.01 - 1000.00 A]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the nominal motor current value from the motor nameplate data. This data is used for calculating motor torque, motor thermal protections, and so on.

Parameter 1-25 Motor Nominal Speed

Table 231: Parameter 1-25 Motor Nominal Speed

1-25 Motor Nominal Speed		
Default value: ExpressionLimit	Parameter type: Range [50 - 60000 RPM]	Setup: 2 setups
Conversion index: 67	Data type: Uint32	Change during operation: False

Enter the nominal motor speed value form the motor nameplate data. This data is used for calculating automatic motor compensations.

Parameter 1-26 Motor Cont. Rated Torque

Table 232: Parameter 1-26 Motor Cont. Rated Torque

1-26 Motor Cont. Rated Torque		
Default value: ExpressionLimit	Parameter type: Range [0.1 - 10000.0 Nm]	Setup: 2 setups
Conversion index: -1	Data type: Uint32	Change during operation: False

N O T I C E

Changing this parameter affects settings of other parameters.

This parameter is available only when *parameter 1-10 Motor Construction* is set to options that enable permanent motor mode.

Parameter 1-29 Automatic Motor Adaptation (AMA)

Table 233: Parameter 1-29 Automatic Motor Adaptation (AMA)

1-29 Automatic Motor Adaptation (AMA)		
Default value: Off	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

NOTICE

This parameter cannot be adjusted while the compressor is running.

The AMA function optimizes dynamic motor performance by automatically optimizing the advanced motor parameters while the motor is stationary.

Option	Name	Description
[0]*	Off	No function
[1]	Enable complete AMA	When *parameter 1-10 Motor Construction* is set to *[0] Asynchron*, perform AMA of *parameter 1-30 Stator Resistance (Rs)*, *parameter 1-33 Stator Leakage Reactance (X1)*, and *parameter 1-35 Main Reactance (Xh)*. When *parameter 1-10 Motor Construction* is set to options that enable permanent motors, perform AMA of *parameter 1-30 Stator Resistance (Rs)* and *parameter 1-37 d-axis Inductance (Ld)*. **NOTICE** Terminal 27 Digital Input (*parameter 5-12 Terminal 27 Digital Input*) has coast inverse as the default setting. This means that AMA cannot be performed if there is no 24 V to terminal 27.
[2]	Enable reduced AMA	Performs a reduced AMA of the stator resistance, Rs, in the system only. Select this option if an LC filter is used between the drive and the motor.

5.3.2.4 Parameter Group 1-3* Adv. Motor Data

Parameter 1-30 Stator Resistance (R_s)

Table 234: Parameter 1-30 Stator Resistance (R_s)

1-30 Stator Resistance (R_s)		
Default value: ExpressionLimit	Parameter type: Range [0.0 - 9999.000]	Setup: 2 setups
Conversion index: -3	Data type: Uint32	Change during operation: False

Set the stator resistance value. Enter the value from a motor datasheet or perform an AMA on a cold motor.

Parameter 1-37 d-axis Inductance (Ld)

Table 235: Parameter 1-37 d-axis Inductance (Ld)

1-37 d-axis Inductance (Ld)		
Default value: ExpressionLimit	Parameter type: Range [0 - 65535]	Setup: 2 setups
Conversion index: -6	Data type: int32	Change during operation: False

Obtain the value from the permanent magnet motor datasheet.

Parameter 1-38 q-axis Inductance (Lq)

Table 236: Parameter 1-38 q-axis Inductance (Lq)

1-38 q-axis Inductance (Lq)		
Default value: ExpressionLimit	Parameter type: Range [0 - 65535]	Setup: 2 setups
Conversion index: -6	Data type: int32	Change during operation: False

Set the value of the q-axis inductance. Obtain the value from the permanent magnet motor datasheet. The value cannot be changed while the motor is running.

Parameter 1-39 Motor Poles

Table 237: Parameter 1-39 Motor Poles

1-39 Motor Poles		
Default value: ExpressionLimit	Parameter type: Range [2 - 100]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

Enter the number of motor poles. The motor pole value is always an even number, because it refers to the total pole number, not pairs of poles.

5.3.2.5 Parameter Group 1-4* Adv. Motor Data II

Parameter 1-40 Back EMF at 1000 RPM

Table 238: Parameter 1-40 Back EMF at 1000 RPM

1-40 Back EMF at 1000 RPM		
Default value: ExpressionLimit	Parameter type: Range [1 - 9000 V]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Line-line RMS back EMF voltage at 1000 RPM.

Parameter 1-42 Motor Cable Length

Table 239: Parameter 1-42 Motor Cable Length

1-42 Motor Cable Length		
Default value: 10 m	Parameter type: Range [0 - 100 m]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

Set the motor cable length during commissioning.

Parameter 1-43 Motor Cable Length Feet

Table 240: Parameter 1-43 Motor Cable Length Feet

1-43 Motor Cable Length Feet		
Default value: 164 ft	Parameter type: Range [0 - 328 ft]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Set the motor cable length during commissioning.

Parameter 1-44 d-axis Inductance Sar (LdSat)

Table 241: Parameter 1-44 d-axis Inductance Sat (LdSat)

1-44 d-axis Inductance Sat (LdSat)		
Default value: ExpressionLimit	Parameter type: Range [0 - 65535 mH]	Setup: 2 setups

1-44 d-axis Inductance Sat (LdSat)		
Conversion index: -6	Data type: Int32	Change during operation: False

This parameter corresponds to the inductance saturation of Ld. Ideally, this parameter has the same value as *parameter 1-37 d-axis Inductance (Ld)*. However, if the motor supplier provides an induction curve, enter the induction value here, which is 200% of the nominal current.

Parameter 1-45 q-axis Inductance Sat (LqSat)

Table 242: Parameter 1-45 q-axis Inductance Sat (LqSat)

1-45 q-axis Inductance Sat (LqSat)		
Default value: ExpressionLimit	Parameter type: Range [0 - 65535 mH]	Setup: 2 setups
Conversion index: -6	Data type: Int32	Change during operation: False

This parameter corresponds to the inductance saturation of Lq. Ideally, this parameter has the same value as *parameter 1-38 q-axis Inductance (Lq)*. However, if the motor supplier provides an induction curve, enter the induction value here, which is 200% of the nominal current.

Parameter 1-48 Current at Min Inductance for d-axis

Table 243: Parameter 1-48 Current at Min Inductance for d-axis

1-48 Current at Min Inductance for d-axis		
Default value: 70%	Parameter type: 20 - 200%]	Setup: 2 setups
Conversion index: 0	Data type: Int16	Change during operation: False

Use this parameter to set the inductance saturation point.

Parameter 1-49 Current at Min Inductance for q-axis

Table 244: Parameter 1-49 Current at Min Inductance for q-axis

1-49 Current at Min Inductance for q-axis		
Default value: 70%	Parameter type: 20 - 200%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

This parameter specifies the saturation curve of the q-inductance values. From 20–100% of this parameter, the inductances are linearly approximated due to *parameter 1-37 d-axis Inductance (Ld)*, *parameter 1-38 q-axis Inductance (Lq)*, *parameter 1-44 d-axis Inductance Sat (LdSat)*, and *parameter 1-45 q-axis Inductance Sat. (LqSat)*. Below and above, they are specified by the corresponding parameters. Parameters are related to the motor nameplate load compensations, the application load type, and the electronic brake function for quick stop/hold of the motor.

5.3.2.6 Parameter Group 1-6* Load Depen. Setting

Parameter 1-66 Min. Current at Low Speed

Table 245: Parameter 1-66 Min. Current at Low Speed

1-66 Min. Current at Low Speed		
Default value: 50%	Parameter type: [0–120%]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Applies to PM motors only. Increasing the minimum current improves motor torque at low speed, but also reduces efficiency.

5.3.2.7 Parameter Group 1-7* Start Adjustments

Parameters for configuring special motor start features.

Parameter 1-70 Start Mode

Table 246: Parameter 1-70 Start Mode

1-70 Start Mode		
Default value: [1] Parking	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Use this parameter to select the PM motor start mode which is to initialize the VVC+ control core for previously free-running PM motors. This parameter is active for PM motors in VVC+ mode only if the motor is stopped (or running at low speed).

Option	Name	Description
[0]	Rotor Detection	The rotor detection function estimates the electrical angel of the rotor and uses the angle as a starting point. This option is the standard selection for automation drive applications. If the flying start function detects that the motor is running at low speed or is stopped, the drive can detect the rotor position (the angle). The drive then starts the motor from that angle.
[1]*	Parking	The parking function applies DC current across the stator winding and rotates the rotor to electrical zero position. This function is typically selected for HVAC applications. If the flying start function detects that the motor is running at low speed or is stopped, the drive sends out a DC current to park the motor at an angle. The drive then starts the motor from that angle.

Parameter 1-72 Start Function

Table 247: Parameter 1-72 Start Function

1-72 Start Function		
Default value: [2] Coast delay time	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	DC Hold/delay time	The motor is energized with *parameter 2-00 DC Hold/Motor Preheat Current* during start delay time.
[2]*	Coast/delay time	A temperature-dependent resistor is coasted during start delay time (drive off).

Parameter 1-73 Flying Start

Table 248: Parameter 1-73 Flying Start

1-73 Flying Start		
Default value: [0] Disabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

This function makes it possible to catch a motor that is spinning freely due to a mains dropout. Flying start searches in clockwise direction only. If not successful, a DC brake is activated. If PM-enabled options are selected, parking is carried out if the speed is below 2.5–5% of nominal speed in the time set in *parameter 2-07 Parking Time*. If the speed estimate comes out below 2.5–5% of nominal speed, the parking function is engaged (see *parameter 2-06 Parking Current* and *parameter 2-07 Parking Time*). Otherwise, the drive catches the motor at that speed and resumes normal operation. The flying start function used for PM motors is based on an initial speed estimation. The speed is always estimated as the 1st thing after an active start signal is given. Current limitations of the flying start principle used for PM motors:

- The speed range is up to 100% nominal speed or the field weakening speed (whichever is lowest).
- For high inertia applications (that is, where the load inertia is more than 30 times larger than the motor inertia).

Option	Name	Description
[0]*	Disabled	

Option	Name	Description
[1]	Enabled	A temperature-dependent resistor is coasted during start delay time (drive off).

Parameter 1-75 Start Speed [Hz]

Table 249: Parameter 1-75 Start Speed [Hz]

1-75 Start Speed [Hz]		
Default value: 100 Hz	Parameter type: Range [0–500 Hz]	Setup: 2 setups
Conversion index: –	Data type: Uint16	Change during operation: False

This parameter can be used for hoist applications (cone rotor). Set a motor start speed. After the start signal, the output speed leaps to the set value. Set the start function in *parameter 1-72 Start Function* and set a start delay time in *parameter 1-71 Start Delay*.

Parameter 1-78 Compressor Start Min Speed [Hz]

Table 250: Parameter 1-78 Compressor Start Min Speed [Hz]

1-78 Compressor Start Min Speed [Hz]		
Default value: 29 Hz	Parameter type: Range [0–400 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

N O T I C E

This parameter has no effect when *parameter 1-10 Motor Construction* is set to *[1] PM, non-salient SPM*.

The parameter enables high starting torque. This is a function where the current limit and torque limit are ignored during start of the motor. The time, from the start signal is given until the speed exceeds the speed set in this parameter, becomes a start zone where the current limit and motoric torque limit is set to what is maximum possible for the drive/motor combination. This parameter is normally set to the same value as *parameter 4-11 Motor Speed Low Limit [RPM]*. When set to 0, the function is inactive. In this starting zone, *parameter 3-82 Starting Ramp Up Time* is active instead of *parameter 3-41 Ramp 1 Ramp Up Time* to ensure extra acceleration during the start, and to minimize the time where the motor is operated under the minimum speed for the application. The time without protection from the current limit and torque limit must not exceed the value set in *parameter 1-79 Compressor Start Max Time to Trip*. If the value of *parameter 1-79 Compressor Start Max Time to Trip* is exceeded, the drive trips with *alarm 18, Start failed*. When this function is activated to get a fast start, *parameter 1-86 Trip Speed Low [RPM]* is also activated to protect the application from running below minimum motor speed, for example, when in current limit. This function allows high starting torque and use of a fast starting ramp. To ensure build-up of a high starting torque during the start, various tricks can be done through clever use of start delay/start speed/start current.

Parameter 1-79 Compressor Start Max Time to Trip

Table 251: Parameter 1-79 Compressor Start Max Time to Trip

1-79 Compressor Start Max Time to Trip		
Default value: 3 s	Parameter type: Range [0–10 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint8	Change during operation: False

N O T I C E

This parameter has no effect when *parameter 1-10 Motor Construction* is set to *[1] PM, non-salient SPM*.

The time, from the start signal is given until the speed exceeds the speed set in *parameter 1-77 Compressor Start Max Speed [RPM]*, must not exceed the time set in this parameter. If the time set is exceeded, the drive trips with *alarm 18, Start failed*. Any time set in *parameter 1-71 Start Delay* for use of a start function must be executed within the time limit.

5.3.2.8 Parameter Group 1-8* Stop Adjustments

Parameters for configuring special motor stop features.

Parameter 1-80 Function at Stop

Table 252: Parameter 1-80 Function at Stop

1-80 Function at Stop		
Default value: [0] Coast	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select this function after a stop command or after the speed is ramped down to the settings in *parameter 1-82 Min Speed for Function at Stop [Hz]*.

Option	Name	Description
[0]*	Coast	Leaves the motor in free mode.
[1]	DC hold/Motor preheat	Energizes the motor with a DC hold current (see *parameter 2-00 DC Hold/Motor Preheat Current*.

Parameter 1-82 Min Speed for Function at Stop [Hz]

Table 253: Parameter 1-82 Min Speed for Function at Stop [Hz]

1-82 Min Speed for Function at Stop [Hz]		
Default value: 0 Hz	Parameter type: Range [0–20 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Set the output frequency at which to activate *parameter 1-80 Function at Stop*.

Parameter 1-87 Compressor Min Speed for Trip [Hz]

Table 254: Parameter 1-87 Compressor Min Speed for Trip [Hz]

1-87 Compressor Min Speed for Trip [Hz]		
Default value: 28 Hz	Parameter type: Range [0–200 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

N O T I C E

This parameter is only available if *parameter 0-02 Motor Speed Unit* is set to *[1] Hz*.

Enter the low limit for the motor speed at which the drive trips. If the value is 0, the function is not active. If the speed at any time after the start (or during a stop) drops below the value in the parameter, the drive trips with *alarm 49, Speed limit*.

5.3.2.9 Parameter Group 1-9* Motor Temperature

Parameters for configuring the temperature protection features for the motor.

Parameter 1-90 Motor Thermal Protection

Table 255: Parameter 1-90 Motor Thermal Protection

1-90 Motor Thermal Protection		
Default value: ExpressionLimit	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Using ETR (electronic thermal relay), the motor temperature is calculated based on frequency, current, and time. Danfoss recommends using the ETR function if a thermistor is not present. The functionality is the same for induction motors and PM motors.

NOTICE

ETR calculation is based on motor data from *parameter group 1-2* Motor Data*.

Option	Name	Description
[0]	No protection	Disables temperature monitoring.
[1]	Thermistor warning	A thermistor gives a warning if the upper limit of the motor temperature range is exceeded.
[2]	Thermistor trip	If the upper limit of the motor temperature range is exceeded, a thermistor gives an alarm and makes the drive trip.
[3]	ETR warning 1	If the calculated upper limit of the motor temperature range is exceeded, a warning occurs.
[4]	ETR trip 1	Start motor thermal calculation based on the actual load and time as well as motor frequency only when the motor current is above 110% of the nominal motor current.
[22]	ETR trip - extended detection	Start motor thermal calculation based on the actual load and time as well as motor frequency when the motor current is above 110% of the nominal motor current. Another situation is to start motor thermal calculation when the motor current is less than 110% of the nominal motor current and trigger current limit.

Parameter 1-93 Thermistor Source

Table 256: Parameter 1-93 Thermistor Source

1-93 Thermistor Source		
Default value: [0] None	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

NOTICE

Set the digital input to *[0] PNP - Active at 24 V* in *parameter 5-03 Digital Input 29 Mode*.

Select the input at which the thermistor (PTC sensor) should be connected. When using an analog input, the same analog input cannot be used as a reference in *parameter 3-15 Reference Resource 1* to *parameter 3-17 Reference Resource 3*, *parameter 20-00 Feedback 1 Source*, *parameter 20-03 Feedback 2 Source*, *parameter 24-06 Fire Mode Reference Source*, and *parameter 24-07 Fire Mode Feedback Source*.

Option	Name	Description
[0]*	None	Do not set the thermistor source.
[1]	Analog input AI53	Use analog input 53 as thermistor source.
[6]	Digital input 29	Use digital input 29 as thermistor source.

5.3.3 Parameter Group 2-** Brakes

5.3.3.1 Parameter Group 2-0* DC Brakes

Parameters for configuring the DC brake and DC hold functions.

Parameter 2-00 DC Hold/Motor Preheat Current

Table 257: Parameter 2-00 DC Hold/Motor Preheat Current

2-00 DC Hold/Motor Preheat Current		
Default value: 0%	Parameter type: Range [0–160%]	Setup: 2 setups

2-00 DC Hold/Motor Preheat Current		
Conversion index: 0	Data type: Uint16	Change during operation: False

NOTICE

MOTOR OVERHEATING

The maximum value depends on the rated motor current. To avoid motor damage caused by overheating, do not run at 100% for too long.

Set the holding current as a percentage of the rated motor current, $I_{M,N}$, in *parameter 1-24 Motor Current*. *Parameter 2-00 DC Hold/Motor Preheat Current* holds the motor function (holding torque) or preheats the motor. This parameter is active if DC hold is selected in *parameter 1-72 Start Function*, *[0] DC Hold/delay time*, or in *parameter 1-80 Function at Stop*, *[1] DC hold/Motor preheat*.

Parameter 2-01 DC Brake Current

Table 258: Parameter 2-01 DC Brake Current

2-01 DC Brake Current		
Default value: ExpressionLimit	Parameter type: Range [0–150%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

NOTICE

MOTOR OVERHEATING

The maximum value depends on the rated motor current. To avoid motor damage caused by overheating, do not run at 100% for too long.

Set the current as a percentage of the rated motor current, $I_{M,N}$, see *parameter 1-24 Motor Current*. When the speed is below the limit set in *parameter 2-04 DC Brake Cut In Speed*, or when the DC brake inverse function is active (in *parameter group 5-1* Digital Inputs* set to *[5] DC-brake inverse*, or via the serial port), a DC brake current is applied on a stop command. See *parameter 2-02 DC Braking Time* for duration.

Parameter 2-02 DC Braking Time

Table 259: Parameter 2-02 DC Braking Time

2-02 DC Braking Time		
Default value: 0.8 s	Parameter type: Range [0–60 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Set the duration of the DC brake current set in *parameter 2-01 DC Brake Current*, once activated.

Parameter 2-04 DC Brake Cut In Speed

Table 260: Parameter 2-04 DC Brake Cut In Speed

2-04 DC Brake Cut In Speed		
Default value: 0.1 Hz	Parameter type: Range [0–500 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

This parameter is for setting the DC brake cut in speed at which *parameter 2-01 DC Brake Current* is to be active with a stop command.

Parameter 2-06 Parking Current

Table 261: Parameter 2-06 Parking Current

2-06 Parking Current		
Default value: ExpressionLimit	Parameter type: Range [0–150%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

NOTICE

Parameter 2-06 Parking Current is only active when 1 of the PM motor construction options is selected in *parameter 1-10 Motor Construction*.

Set current as a percentage of rated motor current. Active with *parameter 1-73 Flying Start*. The parking current is active during the time set in *parameter 2-07 Parking Time*.

Parameter 2-07 Parking Time

Table 262: Parameter 2-07 Parking Time

2-07 Parking Time		
Default value: 2 s	Parameter type: Range [0.1 – 60 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

NOTICE

Parameter 2-07 Parking Time is only active when 1 of the PM motor construction options is selected in *parameter 1-10 Motor Construction*.

Set the duration of the parking current time set in *parameter 2-06 Parking Current*. Active with *parameter 1-73 Flying Start*.

5.3.4 Parameter Group 3-** Reference/Ramps

5.3.4.1 Parameter Group 3-1* References

Parameter 3-11 Jog Speed [Hz]

Table 263: Parameter 3-11 Jog Speed [Hz]

3-11 Jog Speed [Hz]		
Default value: 30 Hz	Parameter type: Range [0 – 500.0 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: True

The jog speed is a fixed output speed at which the drive is running when the jog function is activated. See also *parameter 3-80 Jog Ramp Time*.

Parameter 3-16 Reference 2 Source

Table 264: Parameter 3-16 Reference 2 Source

3-16 Reference 2 Source		
Default value: Analog input 54	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the input to be used for the 2nd reference signal. *Parameters 3-15* to *3-17* define up to 3 difference reference signals. The sum of these signals defines the actual reference. See also *parameter 1-93 Thermistor Source*.

Option	Name	Description
[0]	No function	
[1]	Analog input 53	
[2]*	Analog input 54	
[7]	Pulse input 29	
[11]	Local bus reference	

5.3.4.2 Parameter Group 3-8* Other Ramps

Parameter 3-81 Quick Stop Ramp Time

Table 265: Parameter 3-81 Quick Stop Ramp Time

3-81 Quick Stop Ramp Time		
Default value: 10 s	Parameter type: Range [0.05 – 3600 s]	Setup: 1 setup
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the quick stop ramp time from *parameter 1-25 Motor Nominal Speed* to 0 Hz. During ramping, no overvoltage must occur in the inverter, nor may the generated current exceed the limit in *parameter 4-18 Current Limit*. It is activated with a signal on a selected digital input or via the serial communication port.

Parameter 3-82 Starting Ramp Up Time

Table 266: Parameter 3-82 Starting Ramp Up Time

3-82 Starting Ramp Up Time		
Default value: 15 s	Parameter type: Range [0.01 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

To ensure proper lubrication within the shortest possible time, a fast ramp needs to be used during start-up, until start speed is reached.

Parameter 3-83 Stopping Ramp Down Time

Table 267: Parameter 3-83 Stopping Ramp Down Time

3-83 Stopping Ramp Down Time		
Default value: 15 s	Parameter type: Range [0.01 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

When a stop command is applied, the speed shall ramp down.

5.3.5 Parameter Group 4-** Limits/Warnings

5.3.5.1 Parameter Group 4-1* Motor Limits

Define current and speed limits for the compressor and reaction of the drive when the limits are exceeded.

Parameter 4-10 Motor Speed Direction

Table 268: Parameter 4-10 Motor Speed Direction

4-10 Motor Speed Direction		
Default value: Clockwise	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

N O T I C E
The setting in this parameter has impact on *parameter 1-73 Flying Start*.

Option	Name	Description
[0]*	Clockwise	Only operation in clockwise direction is allowed.

Parameter 4-18 Current Limit

Table 269: Parameter 4-18 Current Limit

4-18 Current Limit		
Default value: ExpressionLimit	Parameter type: Range [0 – 1000]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Enter the current limit for compressor operation (in % of rated compressor current). If the value is higher than the maximum rated output from the drive, the current is still limited to the maximum output current of the drive. If a setting in *parameter 1-13 Compressor Selection* is changed, *parameter 4-18 Current Limit* is automatically reset to the default value.

5.3.5.2 Parameter Group 4-5* Adjustable Warnings

Define adjustable warning limits for current. Warnings are shown on the display, programmed output, or fieldbus.

Parameter 4-54 Warning Reference Low

Table 270: Parameter 4-54 Warning Reference Low

4-54 Warning Reference Low		
Default value: 0	Parameter type: Range [0 – 6010]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the lower reference limit. When the actual reference drops below this limit, the display indicates Ref_{LOW}. Terminals 27 and 29 could not be set to output. Only AO42/45 could be set to DO mode.

Parameter 4-55 Warning Reference High

Table 271: Parameter 4-55 Warning Reference High

4-55 Warning Reference High		
Default value: 6010	Parameter type: Range [0 – 6010]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Use this parameter to set an upper limit for the reference range. When the actual reference exceeds this limit, the display indicates Ref_{HIGH}. Warning bit 19 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-56 Warning Feedback Low

Table 272: Parameter 4-56 Warning Feedback Low

4-56 Warning Feedback Low		
Default value: 0 ProcessCtrlUnit	Parameter type: Range [0 – 6010 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

When the feedback drops below this limit, the display indicates FEEDBACK LOW. Warning bit 6 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-57 Warning Feedback High

Table 273: Parameter 4-57 Warning Feedback High

4-57 Warning Feedback High		
Default value: 6010 ProcessCtrlUnit	Parameter type: Range [0 – 6010 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Use this parameter to set an upper limit for the feedback range. When the actual feedback exceeds this limit, the display indicates FEEDBACK HIGH. Warning bit 5 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-58 Missing Motor Phase Function

Table 274: Parameter 4-58 Missing Motor Phase Function

4-58 Missing Motor Phase Function		
Default value: On	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Option	Name	Description
[0]	Off	No alarm is shown if a missing motor phase occurs.
[1]*	On	An alarm is shown if a missing motor phase occurs.

5.3.6 Parameter Group 5-** Digital In/Out

5.3.6.1 Parameter Group 5-1* Digital Inputs

For an introduction to digital inputs, refer to 5.2.6.2 Parameter Group 5-1* Digital Inputs.

Parameter 5-13 Terminal 29 Digital Input

Table 275: Parameter 5-13 Terminal 29 Digital Input

5-13 Terminal 29 Digital Input		
Default value: Reset	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Parameter for configuring the input function on input terminal 19. See Table 49 for descriptions of the functions.

Option	Name	Description
[0]	No operation	
[1]*	Reset	
[2]	Coast inverse	
[3]	Coast and reset inverse	
[4]	Quick stop inverse	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	

Option	Name	Description
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[16]	Preset ref bit 0	
[17]	Preset ref bit 1	
[18]	Preset ref bit 2	
[19]	Freeze reference	
[20]	Freeze output	
[21]	Speed up	
[22]	Speed down	
[23]	Set-up select bit 0	
[34]	Ramp bit 0	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	
[63]	Counter B (up)	
[64]	Counter B (down)	
[65]	Reset Counter B	

5.3.6.2 Parameter Group 5-4* Relays

Parameters for configuring the timing and the output functions for the relays.

Parameter 5-41 On Delay, Relay

Table 276: Parameter 5-41 On Delay, Relay

5-41 On Delay, Relay		
Default value: 0.01 s	Parameter type: Range [0 – 600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16 [2]	Change during operation: False

Enter the delay of the relay cut in time. Select 1 of 2 internal mechanical relays in an array function. See *parameter 5-40 Function Relay* for details.

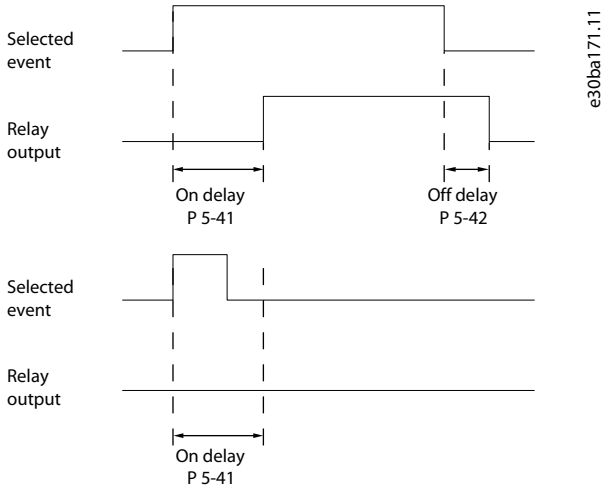

Illustration 16: On Delay, Relay

Parameter 5-42 Off Delay, Relay

Table 277: Parameter 5-42 Off Delay, Relay

5-42 Off Delay, Relay		
Default value: 0.01 s	Parameter type: Range [0 – 600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16 [2]	Change during operation: False

Enter the delay of the relay cutout time. Select 1 of 2 internal mechanical relays in an array function. See *parameter 5-40 Function Relay* for details. If the selected event condition changes before a delay time expires, the relay is unaffected.

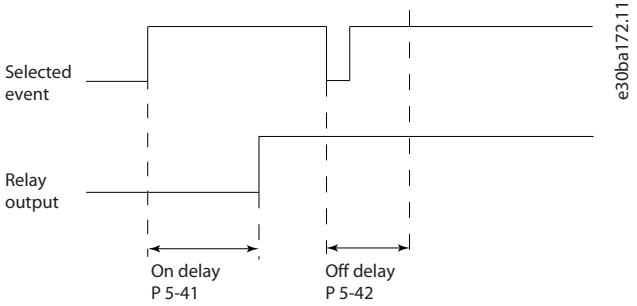

Illustration 17: Off Delay, Relay

5.3.6.3 Parameter Group 5-5* Pulse Input

The pulse input parameters are used to define an appropriate window for the impulse reference area by configuring the scaling and filter settings for the pulse inputs. Set terminal 29 (*parameter 5-13 Terminal 29 Digital Input*) to *[32] Pulse Input*. If terminal 29 is used as an input, set *parameter 5-01 Terminal 27 Mode* to *[0] Input*.

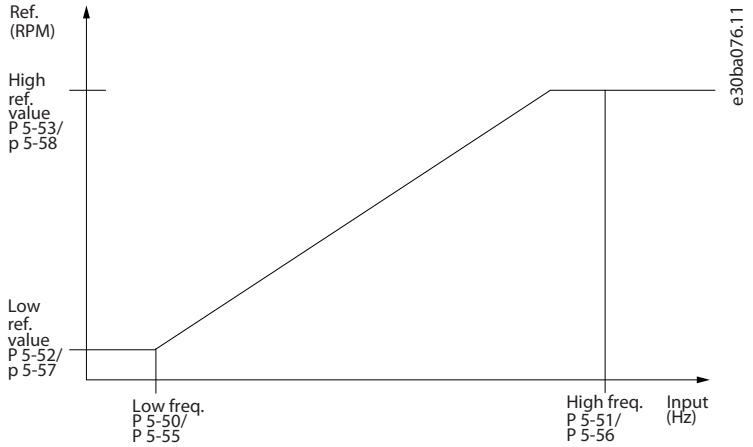

Illustration 18: Pulse Input

Parameter 5-50 Term. 29 Low Frequency

Table 278: Parameter 5-50 Term. 29 Low Frequency

5-50 Term. 29 Low Frequency		
Default value: 20 Hz	Parameter type: Range [20 – 31999 Hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Enter the low frequency limit corresponding to the low compressor shaft speed (that is, low reference value) in *parameter 5-52 Term. 29 Low Ref./Feedb. Value*.

Parameter 5-51 Term. 29 High Frequency

Table 279: Parameter 5-51 Term. 29 High Frequency

5-51 Term. 29 High Frequency		
Default value: 100 Hz	Parameter type: Range [21 – 32000 Hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Enter the low frequency limit corresponding to the low compressor shaft speed (that is, low reference value) in *parameter 5-52 Term. 29 Low Ref./Feedb. Value*.

5.3.7 Parameter Group 6-** Analog In/Out

Parameter group for setting up the analog I/O configuration and the digital output.

The drive provides 2 analog inputs:

- Terminal 53
- Terminal 54

The analog inputs can be freely allocated to either voltage (0–10 V) or current input (0/4–20 mA).

5.3.7.1 Parameter Group 6-1* Analog Input 53

Parameters for configuring the scaling and limits for analog input 53 (terminal 53).

Parameter 6-10 Terminal 53 Low Voltage

Table 280: Parameter 6-10 Terminal 53 Low Voltage

6-10 Terminal 53 Low Voltage		
Default value: 0.07 V	Parameter type: Range 0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to *parameter 6-14 Terminal 53 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >1 V.

5.3.7.2 Parameter Group 6-2* Analog Input 54

Parameters for configuring the scaling and limits for analog input 54 (terminal 54).

Parameter 6-20 Terminal 54 Low Voltage

Table 281: Parameter 6-20 Terminal 54 Low Voltage

6-20 Terminal 54 Low Voltage		
Default value: 0.07 V	Parameter type: Range 0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to the low reference value set in *parameter 6-24 Terminal 54 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >1 V.

Parameter 6-21 Terminal 54 High Voltage

Table 282: Parameter 6-21 Terminal 54 High Voltage

6-21 Terminal 54 High Voltage		
Default value: 10 V	Parameter type: Range [0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to the high reference value set in *parameter 6-25 Terminal 54 High Ref./Feedb. Value*.

Parameter 6-24 Terminal 54 Low Ref./Feedb. Value

Table 283: Parameter 6-24 Terminal 54 Low Ref./Feedb. Value

6-24 Terminal 54 Low Ref./Feedb. Value		
Default value: 0	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the reference or feedback value that corresponds to the voltage or current set in *parameter 6-10 Terminal 53 Low Voltage* and *parameter 6-12 Terminal 53 Low Current*.

Parameter 6-29 Terminal 54 Mode

Table 284: Parameter 6-29 Terminal 54 Mode

6-29 Terminal 54 Mode		
Default value: Current mode	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select whether terminal 54 is used for current or voltage input.

Option	Name	Description
[0]*	Current mode	Terminal 54 is set for current.
[1]	Voltage mode	Terminal 54 is set for voltage.

5.3.8 Parameter Group 8-** Communications and Options

5.3.8.1 Parameter Group 8-0* General Settings

Parameter 8-04 Control Timeout Function

Table 285: Parameter 8-04 Control Timeout Function

8-04 Control Timeout Function		
Default value: Off	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the timeout function. The timeout function is activated when the control word fails to be updated within the time specified in *parameter 8-03 Control Timeout Time*.

Option	Name	Description
[0]*	Off	
[1]	Freeze output	
[2]	Stop	
[3]	Jogging	
[4]	Max. speed	
[5]	Stop and trip	
[20]	N2 override release	

5.3.8.2 Parameter Group 8-4* FC MC Protocol Set

Parameter 8-43 PCD Read Configuration

Table 286: Parameter 8-43 PCD Read Configuration

8-43 PCD Read Configuration		
Default value: None	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [16]	Change during operation: True

Select the parameters to be assigned to PCDs of the telegrams. The number of available PCDs depends on the telegram type. PCDs contain the actual data values of the selected parameters.

Option	Name	Description
[0]*	None	
[1]	[1500] Operating hours	
[2]	[1501] Running hours	
[3]	[1502] kWh counter	
[4]	[1600] Control word	
[5]	[1601] Reference [Unit]	
[6]	[1602] Reference %	
[7]	[1603] Status Word	
[8]	[1605] Main actual value [%]	
[9]	[1609] Custom readout	
[10]	[1610] Power [kW]	
[11]	[1611] Power [hp]	

Option	Name	Description
[12]	[1612] Motor voltage	
[13]	[1613] Frequency	
[14]	[1614] Motor current	
[15]	[1615] Frequency [%]	
[16]	[1616] Torque [Nm]	
[17]	[1618] Motor thermal	
[18]	[1630] DC link voltage	
[19]	[1634] Heat sink temp.	
[20]	[1635] Inverter thermal	
[21]	[1638] SL controller state	
[22]	[1650] External reference	
[23]	[1652] Feedback [Unit]	
[24]	[1660] Digital input 18, 19, 27, 33	
[25]	[1661] Terminal 53 switch setting	
[26]	[1662] Analog input 53	
[27]	[1663] Termianl 54 switch setting	
[28]	[1664] Analog input 54	
[29]	[1665] Analog output 42 [mA]	
[30]	[1671] Relay output	
[31]	[1672] Counter A	
[32]	[1673] Counter B	
[33]	[1690] Alarm word	
[34]	[1692] Warning word	
[35]	[1694] Ext. status word	
[37]	[2860] RPS readout	
[39]	[1691] Alarm word 2	
[40]	[1693] Warning word 2	
[43]	[1617] Speed [RPM]	
[44]	[1666] Digital output	

5.3.8.3 Parameter Group 8-5* Digital/Bus

Parameters for configuring the control word digital/bus merging.

Parameter 8-54 Reversing Select

Table 287: Parameter 8-54 Reversing Select

8-54 Reversing Select		
Default value: Digital input	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select control of the reverse function via the terminals (digital input) and/or via the bus. This parameter is only active when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

Option	Name	Description
[0]*	Digital input	Activates a reverse command via a digital input.
[1]	Bus	Activates a reverse command via the serial communication port.
[2]	Logic AND	Activates a reverse command via the fieldbus/serial communication port, and via 1 of the digital inputs.
[3]	Logic OR	Activates a reverse command via the serial communication port or via 1 of the digital input.

5.3.9 Parameter Group 13-** Smart Logic

5.3.9.1 Parameter Group 13-1* Comparators

Comparators are used for comparing continuous variables, such as output frequency, output current, and analog inut, to fixed preset values

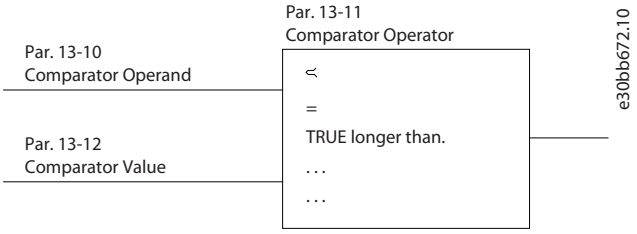

Illustration 19: Comparators

Furthermore, there are digital values that are compared to fixed time values. See the explanation in *parameter 13-10 Comparator Operand*. Comparators are evaluated once in each scan interval. Use the result (true or false) directly. All parameters in this parameter group are array parameters with index 0–5. Select index 0 to program comparator 0, select index 1 to program comparator 1, and so on.

Parameter 13-10 Comparator Operand

Table 288: Parameter 13-10 Comparator Operand

13-10 Comparator Operand		
Default value: Disabled	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the variable to be monitored by the comparator.

Option	Name	Description
[0]*	Disable	
[1]	Reference %	
[2]	Feedback %	
[3]	Motor speed	
[4]	Motor current	

Option	Name	Description
[6]	Motor power	
[7]	Motor voltage	
[12]	Analog input AI53	
[13]	Analog input AI54	
[18]	Pulse input FI29	
[20]	Alarm number	
[30]	Counter A	
[31]	Counter B	

Parameter 13-11 Comparator Operator

Table 289: Parameter 13-11 Comparator Operator

13-11 Comparator Operand		
Default value: Approx.Equal (~)	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the operator to be used in the comparison.

Option	Name	Description
[0]	Less than (<)	Select this option for the result to be true when the variable selected in *parameter 13-10 Comparator Operand* is smaller than the fixed value in *parameter 13-12 Comparator Value*. The result is false if the variable selected in *parameter 13-10 Comparator Operand* is greater than the fixed value in *parameter 13-12 Comparator Value*.
[1]*	Approx.Equal (~)	Select this option for the result of the evaluation to be true when the variable selected in *parameter 13-10 Comparator Operand* is approximately equal to the fixed value in *parameter 13-12 Comparator Value*.
[2]	Greater than (>)	Select this option for the inverse logic of *[0] Less than (<)*.

Parameter 13-12 Comparator Value

Table 290: Parameter 13-12 Comparator Value

13-12 Comparator Value		
Default value: 0	Parameter type: Range [-9999 – 9999]	Setup: 1 setup
Conversion index: -3	Data type: Int32 [6]	Change during operation: False

Enter the trigger level for the variable that is monitored by the comparator. This parameter is an array parameter containing comparator values 0–5.

5.3.10 Parameter Group 14-** Special Functions

5.3.10.1 Parameter Group 14-1* Mains On/Off

Parameters for configuring mains failure monitoring and handling.

Parameter 14-10 Mains Failure

Table 291: Parameter 14-10 Mains Failure

14-10 Mains Failure		
Default value: No functions	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select what the drive does when the mains voltage drops below the limit set in *parameter 14-11 Mains Fault Voltage Level*.

Option	Name	Description
[0]*	No function	
[1]	Coasting	

5.3.10.2 Parameter Group 14-2* Trip Reset

Parameter 14-20 Reset Mode

Table 292: Parameter 14-20 Reset Mode

14-20 Reset Mode		
Default value: Automatic reset x 10	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the reset function after tripping. Once reset, the drive can be restarted.

Option	Name	Description
[0]	Manual reset	To perform a reset via [Reset] or via the digital inputs, select *[0] Manual reset*.
[1]	Automatic reset x 1	Select *[1] Automatic reset x 1* to *[12] Automatic reset x 20* to perform 1–20 automatic resets after tripping.
[2]	Automatic reset x 2	
[3]	Automatic reset x 3	
[4]	Automatic reset x 4	
[5]	Automatic reset x 5	
[6]	Automatic reset x 6	
[7]	Automatic reset x 7	
[8]	Automatic reset x 8	
[9]	Automatic reset x 9	
[10]*	Automatic reset x 10	
[11]	Automatic reset x 15	
[12]	Automatic reset x 20	
[13]	Infinite auto reset	Select *[13] Infinite automatic reset* for continuous resetting after tripping.

Parameter 14-21 Automatic Restart Time

Table 293: Parameter 14-21 Automatic Restart Time

14-21 Automatic Restart Time		
Default value: 30 s	Parameter type: Range [0 – 600 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

To start the automatic restart function, enter the time interval from trip. This parameter is active when *parameter 14-20 Reset Mode* is set to *[1] Automatic reset x 1* to *[13] Infinite auto reset*.

5.3.10.3 Parameter Group 14-5* Environment

These parameters help the drive to operate under special environmental conditions.

Parameter 14-51 DC-Link Voltage Compensation

Table 294: Parameter 14-51 DC-Link Voltage Compensation

14-51 DC-Link Voltage Compensation		
Default value: On	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

The rectified AC-DC voltage at the DC link of the drive is associated with voltage ripples. These ripples can increase in magnitude with increased load. A compensation method is used to reduce these voltage ripples at the DC link. In field weakening, it is recommended to turn off DC-link compensation.

Option	Name	Description
[0]	Off	The overmodulation for output voltage is off to avoid torque ripple on the motor shaft.
[1]*	On	Enables the overmodulation for output voltage to obtain an output voltage up to 15% greater than the mains voltage.

Parameter 14-52 Fan Control

Table 295: Parameter 14-52 Fan Control

14-52 Fan Control		
Default value: ExpressionLimit	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

This parameter is used to select the fan control operating mode. The acoustic noise of the drive is different from running heavy load (high heat sink temperature) to running light load or standby mode.

Option	Name	Description
[0]	Auto	The fan runs with full speed for a short time and then automatically adjusts the speed according to the load and ambient temperature. The fan also runs at minimum speed even if the reference is 0 Hz due to the heat generated from the IGBT. The fan stops if sleep mode function is activated.
[5]	Constant-on mode	For on-site fan test or if the fan must run 100% speed constantly.
[6]	Constant-off mode	If convection cooling is sufficient or the drive is mounted in a demonstration panel, exhibitions, and so on. The drive trips on heat sink overtemperature if loaded more than the convection cooling allows.
[7]	On-when-Inverter-is-on-else-off Mode	The fan runs at maximum speed if in hand-on mode or if reference is above 0 Hz. The fan is stopped if sleep mode is active.

5.3.10.4 Parameter Group 14-9* Fault Settings

Parameter 14-90 Fault Level

Table 296: Parameter 14-90 Fault Level

14-90 Fault Level		
Default value: Trip w. delayed reset	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8 [8]	Change during operation: False

To customize fault levels, use this parameter. Only 2 indexes are supported, Index 7 for overcurrent faults and Index 5 for missing motor phase faults.

Option	Name	Description
[3]	Trip lock	Alarm is set to trip lock level.
[4]*	Trip w. delayed reset	Alarm is configured to trip alarm, which can be reset after a delay time. For example, if overcurrent alarm is configured to this option, it can be reset 3 minutres after the alarm is reported.
[5]	Flystart	The drive tries to catch a motor spinning when starting. If this option is selected, *parameter 1-73 Flying Start* is set to *[1] Enabled*.

5.3.11 Parameter Group 15-** Drive Information

Parameter group containing drive information, such as operating data, hardware configuration, and software versions.

5.3.11.1 Parameter Group 15-4* Drive Identification

Parameters containing read-only information about the hardware and software configuration of the drive.

Parameter 15-57 File Version

Table 297: Parameter 15-57 File Version

15-57 File Version		
Default value: 0	Parameter type: Range [0 – 255]	Setup: 1 setup
Conversion index: 0	Data type: Uint8 [3]	Change during operation: False

Shows the file version.

5.3.12 Parameter Group 20-** Drive Closed Loop

5.3.12.1 Parameter Group 20-0* Feedback

Table 298: Parameter 20-00 Feedback 1 Source

20-00 Feedback 1 Source		
Default value: No function	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Up to 3 different feedback signals can be used to provide the feedback signal for the PID controller of the drive. This parameter defines which input is used as the source of the 1st feedback signal. Analog input X30/11 and analog input X30/12 refer to inputs on the optional General Purpose I/O board.

NOTICE

If feedback is not used, set its source to *[0] No Function*. *Parameter 20-20 Feedback Function* determines how the PID controller uses the 3 possible feedbacks.

Option	Name	Description
[0]*	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[100]	Bus feedback 1	
[101]	Bus feedback 2	

Parameter 20-00 Feedback 1 Source

5.3.12.2 Parameter Group 20-8* PI Basic Settings

Parameter 20-81 PI Normal/Inverse Control

Table 299: Parameter 20-81 PI Normal/Inverse Control

20-81 PI Normal/Inverse Control		
Default value: Normal	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select either *[0] Normal* or *[1] Inverse* to control the output speed when the process error is positive.

Option	Name	Description
[0]*	Normal	Set the process control to increase the output speed when the process error is positive.
[1]	Inverse	Reduce the output speed when the process error is positive.

5.3.13 Parameter Group 28-** Compressor Functions

When controlling compressors, there is often a need for limiting the numbers of starts. One way to limit the starts is to ensure a minimum run-time (time between a start and a stop) and a minimum interval between starts. *Parameter 28-02 Minimum Run Time* can override any normal stop command and *parameter 28-01 Interval between Starts* can override any normal start command.

5.3.13.1 Parameter Group 28-0* Short Cycle Protection

Paramter 28-02 Minimum Run Time

Table 300: Parameter 28-02 Minimum Run Time

28-02 Minimum Run Time		
Default value: 12 s	Parameter type: Range [10 - 3600 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Sets the time wanted as minimum run-time after a normal start command (start/jog/freeze). Any normal stop command is disregarded until the set time has expired. The timer starts counting following a normal start command (start/jog/freeze). A coast (inverse) or an external interlock command overrides the timer.

5.3.13.2 Parameter Group 28-1* Oil Return Management

Insufficient lubrication can be the result of oil depositing itself in pipes and bends. Return oil deposits to the crankcase by increasing velocity for short periods at regular time intervals or by ensuring adequate oil return when velocity is too low.

With oil return management enabled, the drive performs oil return by boosting the compressor speed for a selectable duration. Program the duration in *parameter 28-13 Boost Duration*. The boosts are performed if the compressor speed has been less than 40 rps (80 Hz) for too long. A text message on the LCP indicates oil return boosts.

Parameter 28-11 Low Speed Running Time

Table 301: Parameter 28-11 Low Speed Running Time

28-11 Low Speed Running Time		
Default value: 120 min	Parameter type: Range [1 - 1440 min]	Setup: 2 setups
Conversion index: 70	Data type: Uint16	Change during operation: False

Running at low speeds for extended periods may result in inadequate oil return to the compressor crankcase. Set this parameter to the maximum running time the compressor is allowed to run at a speed below 40 rps/80 Hz. If the compressor has run below ORM Min Speed Limit and the timer has expired, the oil return management is activated.

Parameter 28-12 Fixed Boost Interval

Table 302: Parameter 28-12 Fixed Boost Interval

28-12 Fixed Boost Interval		
Default value: 24 h	Parameter type: Range [1 - 168 h]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

An oil return boost is performed at fixed time intervals to complement the oil return boosts triggered by inadequate flow speeds (*parameter 28-11 Low Speed Running Time*). The fixed interval boosts ensure that oil return boosts are performed even when no boosts have occurred due to low flow speed.

Parameter 28-15 ORM Min Speed Limit [Hz]

Table 303: Parameter 28-15 ORM Min Speed Limit [Hz]

28-15 ORM Min Speed Limit [Hz]		
Default value: 80 hz	Parameter type: Range [80 - 200 hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: True

Minimum speed limit for activating the oil return management.

Parameter 28-17 ORM Boost Speed [Hz]

Table 304: Parameter 28-17 ORM Boost Speed [Hz]

28-17 ORM Boost Speed [Hz]		
Default value: 120 hz	Parameter type: Range [80 - 200 hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: True

Parameter 28-17 ORM Boost Speed [Hz] controls the speed of the compressor during oil return boost.

5.3.13.3 Parameter Group 28-4* Anti-reverse Protection

A compressor may have a preferred rotation direction and the instructions for cabling should always be followed, but the consequences of a reverse rotation are normally not fatal. Set up *parameter group 28-4* Anti-reverse Protection* to prevent reverse rotation at stop by injecting a DC brake current into the compressor a few seconds after stop followed by the eventual coast of the compressor when the discharge valve has closed.

NOTICE

The DC-brake function is not operational before any start function has completed. If there is an emergency stop before the starting sequence has completed, the compressor may rotate in reverse for a short moment after stop. Under normal circumstances, the short-cycle protection feature ensures the correct sequence.

Parameter 28-40 Reverse Protection Control

Table 305: Parameter 28-40 Reverse Protection Control

28-40 Reverse Protection Control		
Default value: Enabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Activate a DC-brake current when the compressor is stopped.

Option	Name	Description
[0]	Disabled	
[1]*	Enabled	

5.4 18–30 kW Specific Parameters

5.4.1 Parameter Group 0-** Operation and Display

5.4.1.1 Parameter Group 0-0* Basic Settings

Parameter 0-06 Grid Type

Table 306: Parameter 0-06 Grid Type

0-06 Grid Type		
Default value: –	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the grid type of the supply voltage/frequency. IT grid is a supply mains where there are no connections to ground. Delta is a supply mains where the secondary part of the transformer is delta-connected and 1 phase is connected to ground.

N O T I C E

Not all options are supported in all power sizes.

Option	Name	Description
[0]	200-240V/50Hz/IT-grid	
[1]	200-240V/50Hz/Delta	
[2]	200-240V/50Hz	
[10]	380-440V/50Hz/IT-grid	
[11]	380-440V/50Hz/Delta	
[12]	380-440V/50Hz	
[20]	440-480V/50Hz/IT-grid	
[21]	440-480V/50Hz/Delta	
[22]	440-480V/50Hz	
[100]	200-240V/60Hz/IT-grid	
[101]	200-240V/60Hz/Delta	
[102]	200-240V/60Hz	

Option	Name	Description
[110]	380-440V/60Hz/IT-grid	
[111]	380-440V/60Hz/Delta	
[112]	380-440V/60Hz	
[120]	440-480V/60Hz/IT-grid	
[121]	440-480V/60Hz/Delta	
[122]	440-480V/60Hz	

5.4.1.2 Parameter Group 0-4* LCP Keypad

Table 307: Parameter 0-40 [Hand On] key on the LCP

0-40 [Hand On] key on the LCP		
Default value: Disabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: True

Option	Name	Description
[0]*	Disabled	To avoid unintended start of the drive in hand-on mode, select *[0] Disabled*.
[1]	Enabled	[Hand On] is enabled.

5.4.2 Parameter Group 1-** Load and Motor

5.4.2.1 Parameter Group 1-1* Motor Selection

Parameter 1-13 Compressor Selection

Table 308: Parameter 1-13 Compressor Selection

1-13 Compressor Selection		
Default value: –	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

The default setting of most of the parameters in the drive (for example, compressor data, limits, ramps) depends on the compressor and system refrigerant selected for the drive. The drive selects the default compressor based on the power size and voltage range of the drive.

N O T I C E

If the compressor selection is changed, all dependent parameters reset to default and any user settings are lost.

Option	Name	Description
[21]	VZH088-R410A	
[22]	VZH117-R410A	
[23]	VZH170-R410A	
[30]	VZH088-R452B	
[31]	VZH088-R454B	

Option	Name	Description
[32]	VZH117-R452B	
[33]	VZH117-R454B	
[34]	VZH170-R452B	
[35]	VZH170-R454B	

Parameter 1-14 Damping Gain

Table 309: Parameter 1-14 Damping Gain

1-14 Damping Gain		
Default value: 120%	Parameter type: Range [0 - 250%]	Setup: 2 setup
Conversion index: 0	Data type: Int16	Change during operation: False

This parameter stabilizes the PM motor to ensure smooth and stable operation. The value of damping gain controls the dynamic performance of the PM motor. Low damping gain results in high dynamic performance and a high value results in a low dynamic performance. The dynamic performance is related to the motor data and load type. If the damping gain is too high or too low, the control becomes unstable.

5.4.2.2 Parameter Group 1-6* Load Depen. Setting

Parameter 1-66 Min. Current at Low Speed

Table 310: Parameter 1-66 Min. Current at Low Speed

1-66 Min. Current at Low Speed		
Default value: 30%	Parameter type: [30–120%]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Applies to PM motors only. Increasing the minimum current improves motor torque at low speed, but also reduces efficiency.

5.4.2.3 Parameter Group 1-7* Start Adjustments

Parameters for configuring special motor start features.

Parameter 1-75 Start Speed [Hz]

Table 311: Parameter 1-75 Start Speed [Hz]

1-75 Start Speed [Hz]		
Default value: 60 Hz	Parameter type: Range [0–500 Hz]	Setup: 2 setups
Conversion index: –	Data type: Uint16	Change during operation: False

This parameter can be used for hoist applications (cone rotor). Set a motor start speed. After the start signal, the output speed leaps to the set value. Set a start delay time in *parameter 1-71 Start Delay*.

Parameter 1-78 Compressor Start Min Speed [Hz]

Table 312: Parameter 1-78 Compressor Start Min Speed [Hz]

1-78 Compressor Start Min Speed [Hz]		
Default value: 50 Hz	Parameter type: Range [0–400 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

NOTICE

This parameter has no effect when *parameter 1-10 Motor Construction* is set to *[1] PM, non-salient SPM*.

The parameter enables high starting torque. This is a function where the current limit and torque limit are ignored during start of the motor. The time, from the start signal is given until the speed exceeds the speed set in this parameter, becomes a start zone where the current limit and motoric torque limit is set to what is maximum possible for the drive/motor combination. This parameter is normally set to the same value as *parameter 4-11 Motor Speed Low Limit [RPM]*. When set to 0, the function is inactive. In this starting zone, *parameter 3-82 Starting Ramp Up Time* is active instead of *parameter 3-41 Ramp 1 Ramp Up Time* to ensure extra acceleration during the start, and to minimize the time where the motor is operated under the minimum speed for the application. The time without protection from the current limit and torque limit must not exceed the value set in *parameter 1-79 Compressor Start Max Time to Trip*. If the value of *parameter 1-79 Compressor Start Max Time to Trip* is exceeded, the drive trips with *alarm 18, Start failed*. When this function is activated to get a fast start, *parameter 1-86 Trip Speed Low [RPM]* is also activated to protect the application from running below minimum motor speed, for example, when in current limit. This function allows high starting torque and use of a fast starting ramp. To ensure build-up of a high starting torque during the start, various tricks can be done through clever use of start delay/start speed/start current.

Parameter 1-79 Compressor Start Max Time to Trip

Table 313: Parameter 1-79 Compressor Start Max Time to Trip

1-79 Compressor Start Max Time to Trip		
Default value: 2 s	Parameter type: Range [0–10 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint8	Change during operation: False

NOTICE

This parameter has no effect when *parameter 1-10 Motor Construction* is set to *[1] PM, non-salient SPM*.

The time, from the start signal is given until the speed exceeds the speed set in *parameter 1-77 Compressor Start Max Speed [RPM]*, must not exceed the time set in this parameter. If the time set is exceeded, the drive trips with *alarm 18, Start failed*. Any time set in *parameter 1-71 Start Delay* for use of a start function must be executed within the time limit.

5.4.2.4 Parameter Group 1-8* Stop Adjustments

Parameters for configuring special motor stop features.

Parameter 1-80 Function at Stop

Table 314: Parameter 1-80 Function at Stop

1-80 Function at Stop		
Default value: [0] Coast	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select this function after a stop command or after the speed is ramped down to the settings in *parameter 1-82 Min Speed for Function at Stop [Hz]*.

Option	Name	Description
[0]*	Coast	Leaves the motor in free mode.
[1]	DC hold/Motor preheat	Energizes the motor with a DC hold current (see *parameter 2-00 DC Hold/Motor Preheat Current*.
[7]	Coast, delayed DC hold	

Parameter 1-82 Min Speed for Function at Stop [Hz]

Table 315: Parameter 1-82 Min Speed for Function at Stop [Hz]

1-82 Min Speed for Function at Stop [Hz]		
Default value: 26.7 Hz	Parameter type: Range [0–70 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

Set the output frequency at which to activate *parameter 1-80 Function at Stop*.

Parameter 1-87 Compressor Min Speed for Trip [Hz]

Table 316: Parameter 1-87 Compressor Min Speed for Trip [Hz]

1-87 Compressor Min Speed for Trip [Hz]		
Default value: 33.3 Hz	Parameter type: Range [0–200 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

N O T I C E

This parameter is only available if *parameter 0-02 Motor Speed Unit* is set to *[1] Hz*.

Enter the low limit for the motor speed at which the drive trips. If the value is 0, the function is not active. If the speed at any time after the start (or during a stop) drops below the value in the parameter, the drive trips with *alarm 49, Speed limit*.

5.4.3 Parameter Group 2-** Brakes

5.4.3.1 Parameter Group 2-0* DC Brakes

Parameters for configuring the DC brake and DC hold functions.

Parameter 2-06 Parking Current

Table 317: Parameter 2-06 Parking Current

2-06 Parking Current		
Default value: ExpressionLimit	Parameter type: Range [30–150%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

N O T I C E

Parameter 2-06 Parking Current is only active when 1 of the PM motor construction options is selected in *parameter 1-10 Motor Construction*.

Set current as a percentage of rated motor current. Active with *parameter 1-73 Flying Start*. The parking current is active during the time set in *parameter 2-07 Parking Time*.

Parameter 2-07 Parking Time

Table 318: Parameter 2-07 Parking Time

2-07 Parking Time		
Default value: 2.5 s	Parameter type: Range [0.1 – 60 s]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: False

N O T I C E

Parameter 2-07 Parking Time is only active when 1 of the PM motor construction options is selected in *parameter 1-10 Motor Construction*.

Set the duration of the parking current time set in *parameter 2-06 Parking Current*. Active with *parameter 1-73 Flying Start*.

5.4.4 Parameter Group 3-** Reference/Ramps

5.4.4.1 Parameter Group 3-1* References

Parameter 3-11 Jog Speed [Hz]

Table 319: Parameter 3-11 Jog Speed [Hz]

3-11 Jog Speed [Hz]		
Default value: 50 Hz	Parameter type: Range [0 – 500.0 Hz]	Setup: 2 setups
Conversion index: -1	Data type: Uint16	Change during operation: True

The jog speed is a fixed output speed at which the drive is running when the jog function is activated. See also *parameter 3-80 Jog Ramp Time*.

Parameter 3-16 Reference 2 Source

Table 320: Parameter 3-16 Reference 2 Source

3-16 Reference 2 Source		
Default value: No function	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select the input to be used for the 2nd reference signal. *Parameters 3-15* to *3-17* define up to 3 difference reference signals. The sum of these signals defines the actual reference. See also *parameter 1-93 Thermistor Source*.

Option	Name	Description
[0]*	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[11]	Local bus reference	

5.4.4.2 Parameter Group 3-8* Other Ramps

Parameter 3-81 Quick Stop Ramp Time

Table 321: Parameter 3-81 Quick Stop Ramp Time

3-81 Quick Stop Ramp Time		
Default value: 7.5 s	Parameter type: Range [0.05 – 3600 s]	Setup: 1 setup
Conversion index: -2	Data type: Uint32	Change during operation: False

Enter the quick stop ramp time from *parameter 1-25 Motor Nominal Speed* to 0 Hz. During ramping, no overvoltage must occur in the inverter, nor may the generated current exceed the limit in *parameter 4-18 Current Limit*. It is activated with a signal on a selected digital input or via the serial communication port.

Parameter 3-82 Starting Ramp Up Time

Table 322: Parameter 3-82 Starting Ramp Up Time

3-82 Starting Ramp Up Time		
Default value: 2 s	Parameter type: Range [0.01 – 3600 s]	Setup: 2 setups

3-82 Starting Ramp Up Time		
Conversion index: -2	Data type: Uint32	Change during operation: False

To ensure proper lubrication within the shortest possible time, a fast ramp needs to be used during start-up, until start speed is reached.

Parameter 3-83 Stopping Ramp Down Time

Table 323: Parameter 3-83 Stopping Ramp Down Time

3-83 Stopping Ramp Down Time		
Default value: 2 s	Parameter type: Range [0.01 – 3600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint32	Change during operation: False

When a stop command is applied, the speed shall ramp down.

5.4.5 Parameter Group 4-** Limits/Warnings

5.4.5.1 Parameter Group 4-1* Motor Limits

Define current and speed limits for the compressor and the reaction of the drive when the limits are exceeded.

Parameter 4-18 Current Limit

Table 324: Parameter 4-18 Current Limit

4-18 Current Limit		
Default value: ExpressionLimit	Parameter type: Range [80 – 1000]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Enter the current limit for compressor operation (in % of rated compressor current). If the value is higher than the maximum rated output from the drive, the current is still limited to the maximum output current of the drive. If a setting in *parameter 1-13 Compressor Selection* is changed, *parameter 4-18 Current Limit* is automatically reset to the default value.

5.4.5.2 Parameter Group 4-5* Adjustable Warnings

Define adjustable warning limits for current. Warnings are shown on the display, programmed output, or fieldbus.

Parameter 4-54 Warning Reference Low

Table 325: Parameter 4-54 Warning Reference Low

4-54 Warning Reference Low		
Default value: 0	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the lower reference limit. When the actual reference drops below this limit, the display indicates Ref_{LOW}. Terminals 27 and 29 could not be set to output. Only AO42/45 could be set to DO mode.

Parameter 4-55 Warning Reference High

Table 326: Parameter 4-55 Warning Reference High

4-55 Warning Reference High		
Default value: 200.333	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Use this parameter to set an upper limit for the reference range. When the actual reference exceeds this limit, the display indicates Ref_{HIGH}. Warning bit 19 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-56 Warning Feedback Low

Table 327: Parameter 4-56 Warning Feedback Low

4-56 Warning Feedback Low		
Default value: 0 ProcessCtrlUnit	Parameter type: Range [-4999 – 4999 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

When the feedback drops below this limit, the display indicates FEEDBACK LOW. Warning bit 6 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

Parameter 4-57 Warning Feedback High

Table 328: Parameter 4-57 Warning Feedback High

4-57 Warning Feedback High		
Default value: 200.333 ProcessCtrlUnit	Parameter type: Range [-4999 – 4999 ProcessCtrlUnit]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Use this parameter to set an upper limit for the feedback range. When the actual feedback exceeds this limit, the display indicates FEEDBACK HIGH. Warning bit 5 is set in *parameter 16-94 Ext. Status Word*. Output relay can be configured to indicate this warning. The LCP warning light does not light when reaching the limit set in this parameter.

5.4.6 Parameter Group 5-** Digital In/Out

5.4.6.1 Parameter Group 5-1* Digital Inputs

For an introduction to digital inputs, refer to 5.2.6.2 Parameter Group 5-1* Digital Inputs.

Parameter 5-13 Terminal 29 Digital Input

Table 329: Parameter 5-13 Terminal 29 Digital Input

5-13 Terminal 29 Digital Input		
Default value: No operation	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Parameter for configuring the input function on input terminal 19. See Table 49 for descriptions of the functions.

Option	Name	Description
[0]*	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inverse	
[4]	Quick stop inverse	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	

Option	Name	Description
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[16]	Preset ref bit 0	
[17]	Preset ref bit 1	
[18]	Preset ref bit 2	
[19]	Freeze reference	
[20]	Freeze output	
[21]	Speed up	
[22]	Speed down	
[23]	Set-up select bit 0	
[34]	Ramp bit 0	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	
[63]	Counter B (up)	
[64]	Counter B (down)	
[65]	Reset Counter B	

5.4.6.2 Parameter Group 5-4* Relays

Parameters for configuring the timing and the output functions for the relays.

Parameter 5-41 On Delay, Relay

Table 330: Parameter 5-41 On Delay, Relay

5-41 On Delay, Relay		
Default value: 1 s	Parameter type: Range [0 – 600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16 [2]	Change during operation: False

Enter the delay of the relay cut in time. Select 1 of 2 internal mechanical relays in an array function. See *parameter 5-40 Function Relay* for details.

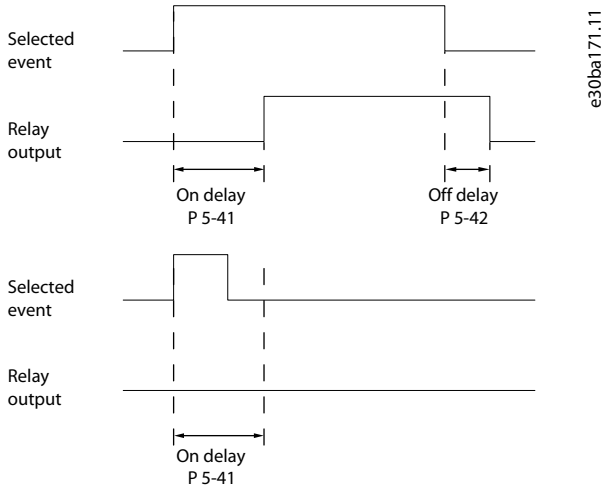

Illustration 20: On Delay, Relay

Parameter 5-42 Off Delay, Relay

Table 331: Parameter 5-42 Off Delay, Relay

5-42 Off Delay, Relay		
Default value: 1 s	Parameter type: Range [0 – 600 s]	Setup: 2 setups
Conversion index: -2	Data type: Uint16 [2]	Change during operation: False

Enter the delay of the relay cutout time. Select 1 of 2 internal mechanical relays in an array function. See *parameter 5-40 Function Relay* for details. If the selected event condition changes before a delay time expires, the relay is unaffected.

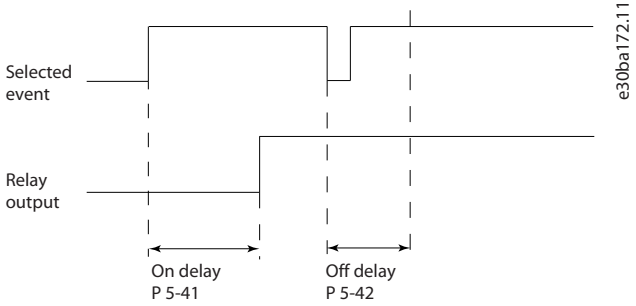

Illustration 21: Off Delay, Relay

5.4.6.3 Parameter Group 5-5* Pulse Input

The pulse input parameters are used to define an appropriate window for the impulse reference area by configuring the scaling and filter settings for the pulse inputs. Set terminal 29 (*parameter 5-13 Terminal 29 Digital Input*) to *[32] Pulse Input*. If terminal 29 is used as an input, set *parameter 5-01 Terminal 27 Mode* to *[0] Input*.

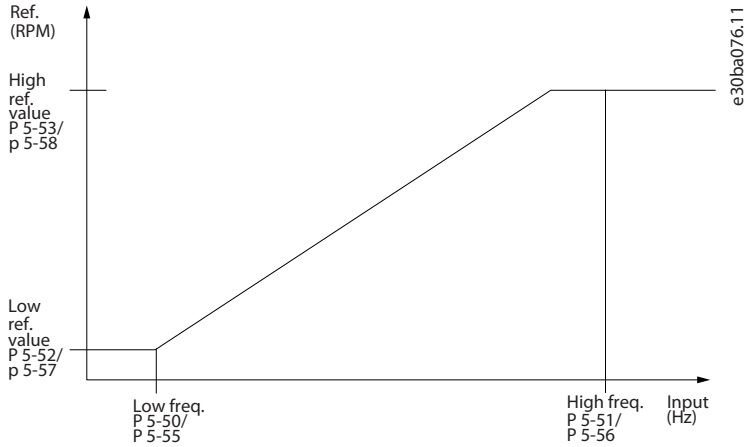

Illustration 22: Pulse Input

Parameter 5-50 Term. 29 Low Frequency

Table 332: Parameter 5-50 Term. 29 Low Frequency

5-50 Term. 29 Low Frequency		
Default value: 100 Hz	Parameter type: Range [20 – 31999 Hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Enter the low frequency limit corresponding to the low compressor shaft speed (that is, low reference value) in *parameter 5-52 Term. 29 Low Ref./Feedb. Value*.

Parameter 5-51 Term. 29 High Frequency

Table 333: Parameter 5-51 Term. 29 High Frequency

5-51 Term. 29 High Frequency		
Default value: 100 Hz	Parameter type: Range [21 – 32000 Hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint32	Change during operation: False

Enter the low frequency limit corresponding to the low compressor shaft speed (that is, low reference value) in *parameter 5-52 Term. 29 Low Ref./Feedb. Value*.

5.4.7 Parameter Group 6-** Analog In/Out

Parameter group for setting up the analog I/O configuration and the digital output.

The drive provides 2 analog inputs:

- Terminal 53
- Terminal 54

The analog inputs can be freely allocated to either voltage (0–10 V) or current input (0/4–20 mA).

5.4.7.1 Parameter Group 6-1* Analog Input 53

Parameter for configuring the scaling and limits for analog input 53 (terminal 53).

Parameter 6-10 Terminal 53 Low Voltage

Table 334: Parameter 6-10 Terminal 53 Low Voltage

6-10 Terminal 53 Low Voltage		
Default value: 0 V	Parameter type: Range 0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to *parameter 6-14 Terminal 53 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >1 V.

5.4.7.2 Parameter Group 6-2* Analog Input 54

Parameters for configuring the scaling and limits for analog input 54 (terminal 54).

Parameter 6-20 Terminal 54 Low Voltage

Table 335: Parameter 6-20 Terminal 54 Low Voltage

6-20 Terminal 54 Low Voltage		
Default value: 1 V	Parameter type: Range 0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to the low reference value set in *parameter 6-24 Terminal 54 Low Ref./Feedb. Value*. To activate *parameter 6-01 Live Zero Timeout Function*, set the value to >1 V.

Parameter 6-21 Terminal 54 High Voltage

Table 336: Parameter 6-21 Terminal 54 High Voltage

6-21 Terminal 54 High Voltage		
Default value: 5 V	Parameter type: Range [0 – 10 V]	Setup: 2 setups
Conversion index: -2	Data type: Uint16	Change during operation: False

Enter the voltage (V) that corresponds to the high reference value set in *parameter 6-25 Terminal 54 High Ref./Feedb. Value*.

Parameter 6-24 Terminal 54 Low Ref./Feedb. Value

Table 337: Parameter 6-24 Terminal 54 Low Ref./Feedb. Value

6-24 Terminal 54 Low Ref./Feedb. Value		
Default value: -1	Parameter type: Range [-4999 – 4999]	Setup: 2 setups
Conversion index: -3	Data type: Int32	Change during operation: False

Enter the reference or feedback value that corresponds to the voltage or current set in *parameter 6-10 Terminal 53 Low Voltage* and *parameter 6-12 Terminal 53 Low Current*.

Parameter 6-29 Terminal 54 Mode

Table 338: Parameter 6-29 Terminal 54 Mode

6-29 Terminal 54 Mode		
Default value: Voltage mode	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select whether terminal 54 is used for current or voltage input.

Option	Name	Description
[0]	Current mode	Terminal 54 is set for current.
[1]*	Voltage mode	Terminal 54 is set for voltage.

5.4.8 Parameter Group 8-** Communications and Options

5.4.8.1 Parameter Group 8-0* General Settings

Parameter 8-04 Control Timeout Function

Table 339: Parameter 8-04 Control Timeout Function

8-04 Control Timeout Function		
Default value: Off	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8	Change during operation: False

Select the timeout function. The timeout function is activated when the control word fails to be updated within the time specified in *parameter 8-03 Control Timeout Time*.

Option	Name	Description
[0]*	Off	
[1]	Freeze output	
[2]	Stop	
[3]	Jogging	
[4]	Max. speed	
[5]	Stop and trip	

5.4.8.2 Parameter Group 8-4* FC MC Protocol Set

Parameter 8-43 PCD Read Configuration

Table 340: Parameter 8-43 PCD Read Configuration

8-43 PCD Read Configuration		
Default value: None	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [16]	Change during operation: True

Select the parameters to be assigned to PCDs of the telegrams. The number of available PCDs depends on the telegram type. PCDs contain the actual data values of the selected parameters.

Option	Name	Description
[0]*	None	
[1]	[1500] Operating hours	
[2]	[1501] Running hours	
[3]	[1502] kWh counter	
[4]	[1600] Control word	
[5]	[1601] Reference [Unit]	
[6]	[1602] Reference %	
[7]	[1603] Status Word	
[8]	[1605] Main actual value [%]	
[9]	[1609] Custom readout	
[10]	[1610] Power [kW]	
[11]	[1611] Power [hp]	
[12]	[1612] Motor voltage	

Option	Name	Description
[13]	[1613] Frequency	
[14]	[1614] Motor current	
[15]	[1615] Frequency [%]	
[16]	[1616] Torque [Nm]	
[17]	[1618] Motor thermal	
[18]	[1630] DC link voltage	
[19]	[1634] Heat sink temp.	
[20]	[1635] Inverter thermal	
[21]	[1638] SL controller state	
[22]	[1650] External reference	
[23]	[1652] Feedback [Unit]	
[24]	[1660] Digital input 18, 19, 27, 33	
[25]	[1661] Terminal 53 switch setting	
[26]	[1662] Analog input 53	
[27]	[1663] Termianl 54 switch setting	
[28]	[1664] Analog input 54	
[29]	[1665] Analog output 42 [mA]	
[30]	[1671] Relay output	
[31]	[1672] Counter A	
[32]	[1673] Counter B	
[33]	[1690] Alarm word	
[34]	[1692] Warning word	
[35]	[1694] Ext. status word	
[37]	[2860] RPS readout	
[39]	[1691] Alarm word 2	
[40]	[1693] Warning word 2	
[43]	[1617] Speed [RPM]	
[44]	[1666] Digital output	
[81]	User define1	
[82]	User define2	
[83]	User define3	
[84]	User define4	

Option	Name	Description
[85]	User define5	
[86]	User define6	
[87]	User define7	
[88]	User define8	
[100]	[1605] Main actual value [N2]	

5.4.9 Parameter Group 13-** Smart Logic

5.4.9.1 Parameter Group 13-1* Comparators

Comparators are used for comparing continuous variables, such as output freqeuncy, output current, and analog inut, to fixed preset values

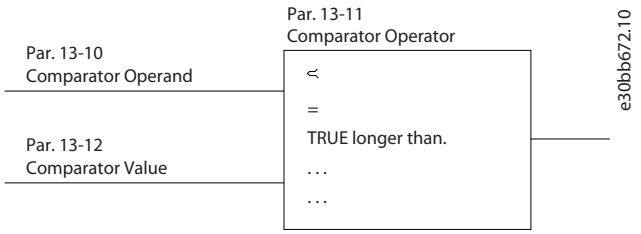

Illustration 23: Comparators

Furthermore, there are digital values that are compared to fixed time values. See the explanation in *parameter 13-10 Comparator Operand*. Comparators are evaluated once in each scan interval. Use the result (true or false) directly. All parameters in this parameter group are array parameters with index 0–5. Select index 0 to program comparator 0, select index 1 to program comparator 1, and so on.

Parameter 13-10 Comparator Operand

Table 341: Parameter 13-10 Comparator Operand

13-10 Comparator Operand		
Default value: Motor speed	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the variable to be monitored by the comparator.

Option	Name	Description
[0]	Disabled	
[1]	Reference %	
[2]	Feedback %	
[3]*	Motor speed	
[4]	Motor current	
[6]	Motor power	
[7]	Motor voltage	
[12]	Analog input AI53	
[13]	Analog input AI54	

Option	Name	Description
[18]	Pulse input FI29	
[20]	Alarm number	
[30]	Counter A	
[31]	Counter B	

Parameter 13-11 Comparator Operator

Table 342: Parameter 13-11 Comparator Operator

13-11 Comparator Operand		
Default value: Greater than (>)	Parameter type: Option	Setup: 1 setup
Conversion index: –	Data type: Uint8 [6]	Change during operation: False

Select the operator to be used in the comparison.

Option	Name	Description
[0]*	Less than (<)	Select this option for the result to be true when the variable selected in *parameter 13-10 Comparator Operand* is smaller than the fixed value in *parameter 13-12 Comparator Value*. The result is false if the variable selected in *parameter 13-10 Comparator Operand* is greater than the fixed value in *parameter 13-12 Comparator Value*.
[1]	Approx.Equal (~)	Select this option for the result of the evaluation to be true when the variable selected in *parameter 13-10 Comparator Operand* is approximately equal to the fixed value in *parameter 13-12 Comparator Value*.
[2]	Greater than (>)	Select this option for the inverse logic of *[0] Less than (<)*.

Parameter 13-12 Comparator Value

Table 343: Parameter 13-12 Comparator Value

13-12 Comparator Value		
Default value: ExpressionLimit	Parameter type: Range [-9999 – 9999]	Setup: 1 setup
Conversion index: -3	Data type: Int32 [6]	Change during operation: False

Enter the trigger level for the variable that is monitored by the comparator. This parameter is an array parameter containing comparator values 0–5.

5.4.10 Parameter Group 14-** Special Functions

5.4.10.1 Parameter Group 14-1* Mains On/Off

Parameter 14-10 Mains Failure

Table 344: Parameter 14-10 Mains Failure

14-10 Mains Failure		
Default value: Alarm	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select what the drive does when the mains voltage drops below the limit set in *parameter 14-11 Mains Fault Voltage Level*.

Option	Name	Description
[0]	No function	
[1]	Coasting	
[6]*	Alarm	

5.4.10.2 Parameter Group 14-2* Trip Reset

Parameter 14-29 Service Code

Table 345: Parameter 14-29 Service Code

14-29 Service Code		
Default value: 0	Parameter type: Range [0x7FFFFFFF]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

For use by service technicians only.

5.4.10.3 Parameter Group 14-5* Environment

Parameter 14-51 DC-Link Voltage Compensation

Table 346: Parameter 14-51 DC-Link Voltage Compensation

14-51 DC-Link Voltage Compensation		
Default value: Off	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

The rectified AC-DC voltage at the DC link of the drive is associated with voltage ripples. These ripples can increase in magnitude with increased load. A compensation method is used to reduce these voltage ripples at the DC link. In field weakening, it is recommended to turn off DC-link compensation.

Option	Name	Description
[0]*	Off	The overmodulation for output voltage is off to avoid torque ripple on the motor shaft.
[1]	On	Enables the overmodulation for output voltage to obtain an output voltage up to 15% greater than the mains voltage.

5.4.10.4 Parameter Group 14-9* Fault Settings

Parameter 14-90 Fault Level

Table 347: Parameter 14-90 Fault Level

14-90 Fault Level		
Default value: Trip w. delayed reset	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8 [8]	Change during operation: False

To customize fault levels, use this parameter. Only 2 indexes are supported, Index 7 for overcurrent faults and Index 5 for missing motor phase faults.

Option	Name	Description
[2]	Trip	Alarm is set to trip level.
[3]	Trip lock	Alarm is set to trip lock level.

Option	Name	Description
[4]*	Trip w. delayed reset	Alarm is configured to trip alarm, which can be reset after a delay time. For example, if overcurrent alarm is configured to this option, it can be reset 3 minutres after the alarm is reported.
[5]	Flystart	The drive tries to catch a motor spinning when starting. If this option is selected, *parameter 1-73 Flying Start* is set to *[1] Enabled*.

5.4.11 Parameter Group 15-** Drive Information

Parameter group containing drive information, such as operating data, hardware configuration, and software versions.

5.4.11.1 Parameter Group 15-4* Drive Identification

Parameters containing read-only information about the hardware and software configuration of the drive.

Parameter 15-57 File Version

Table 348: Parameter 15-57 File Version

15-57 File Version		
Default value: 0	Parameter type: Range [0 – 65535]	Setup: 1 setup
Conversion index: 0	Data type: Uint16 [5]	Change during operation: False

Shows the file version.

5.4.11.2 Parameter Group 15-9* Parameter Info

Parameter 15-92 Defined Parameters

Table 349: Parameter 15-92 Defined Parameters

15-92 Defined Parameters		
Default value: 0	Parameter type: Range [0 – 2000]	Setup: 1 setup
Conversion index: 0	Data type: Uint16 [44]	Change during operation: False

View a list of all defined parameters in the drive. The list ends with 0.

Parameter 15-97 Application Type

Table 350: Parameter 15-97 Application Type

15-97 Application Type		
Default value: 0	Parameter type: Range [0 – 0xFFFFFFFF]	Setup: 1 setup
Conversion index: 0	Data type: Uint32	Change during operation: False

This parameter contains data used by the VLT® Motion Control Tool MCT 10.

Parameter 15-98 Drive Identification

Table 351: Parameter 15-98 Drive Identification

15-98 Drive Identification		
Default value: 0	Parameter type: Range [0 – 56]	Setup: 1 setup
Conversion index: 0	Data type: VisibleString of length 56	Change during operation: False

This parameter contains data used by the VLT® Motion Control Tool MCT 10.

5.4.12 Parameter Group 20-** Drive Closed Loop

5.4.12.1 Parameter Group 20-0* Feedback

Parameter 20-00 Feedback 1 Source

Table 352: Parameter 20-00 Feedback 1 Source

20-00 Feedback 1 Source		
Default value: Analog input 54	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Up to 3 different feedback signals can be used to provide the feedback signal for the PID controller of the drive. This parameter defines which input is used as the source of the 1st feedback signal. Analog input X30/11 and analog input X30/12 refer to inputs on the optional General Purpose I/O board.

N O T I C E

If feedback is not used, set its source to *[0] No Function*. *Parameter 20-20 Feedback Function* determines how the PID controller uses the 3 possible feedbacks.

Option	Name	Description
[0]	No function	
[1]	Analog input 53	
[2]*	Analog input 54	
[3]	Pulse input 29	
[100]	Bus feedback 1	
[101]	Bus feedback 2	

5.4.12.2 Parameter Group 20-8* PI Basic Settings

Parameter 20-81 PI Normal/Inverse Control

Table 353: Parameter 20-81 PI Normal/Inverse Control

20-81 PI Normal/Inverse Control		
Default value: Inverse	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Select either *[0] Normal* or *[1] Inverse* to control the output speed when the process error is positive.

Option	Name	Description
[0]	Normal	Set the process control to increase the output speed when the process error is positive.
[1]*	Inverse	Reduce the output speed when the process error is positive.

5.4.13 Parameter Group 28-** Compressor Functions

When controlling compressors, there is often a need for limiting the numbers of starts. One way to limit the starts is to ensure a minimum run-time (time between a start and a stop) and a minimum interval between starts. *Parameter 28-02 Minimum Run Time* can override any normal stop command and *parameter 28-01 Interval between Starts* can override any normal start command.

5.4.13.1 Parameter Group 28-0* Short Cycle Protection

Paramter 28-02 Minimum Run Time

Table 354: Parameter 28-02 Minimum Run Time

28-02 Minimum Run Time		
Default value: 180 s	Parameter type: Range [10 - 3600 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Sets the time wanted as minimum run-time after a normal start command (start/jog/freeze). Any normal stop command is disregarded until the set time has expired. The timer starts counting following a normal start command (start/jog/freeze). A coast (inverse) or an external interlock command overrides the timer.

5.4.13.2 Parameter Group 28-1* Oil Return Management

Insufficient lubrication can be the result of oil depositing itself in pipes and bends. Return oil deposits to the crankcase by increasing velocity for short periods at regular time intervals or by ensuring adequate oil return when velocity is too low.

With oil return management enabled, the drive performs oil return by boosting the compressor speed for a selectable duration. Program the duration in *parameter 28-13 Boost Duration*. The boosts are performed if the compressor speed has been less than 40 rps (80 Hz) for too long. A text message on the LCP indicates oil return boosts.

Parameter 28-11 Low Speed Running Time

Table 355: Parameter 28-11 Low Speed Running Time

28-11 Low Speed Running Time		
Default value: 30 min	Parameter type: Range [1 - 1440 min]	Setup: 2 setups
Conversion index: 70	Data type: Uint16	Change during operation: False

Running at low speeds for extended periods may result in inadequate oil return to the compressor crankcase. Set this parameter to the maximum running time the compressor is allowed to run at a speed below 40 rps/80 Hz. If the compressor has run below ORM Min Speed Limit and the timer has expired, the oil return management is activated.

Parameter 28-12 Fixed Boost Interval

Table 356: Parameter 28-12 Fixed Boost Interval

28-12 Fixed Boost Interval		
Default value: 6 h	Parameter type: Range [1 - 168 h]	Setup: 2 setups
Conversion index: 0	Data type: Uint8	Change during operation: False

An oil return boost is performed at fixed time intervals to complement the oil return boosts triggered by inadequate flow speeds (*parameter 28-11 Low Speed Running Time*). The fixed interval boosts ensure that oil return boosts are performed even when no boosts have occurred due to low flow speed.

Parameter 28-15 ORM Min Speed Limit [Hz]

Table 357: Parameter 28-15 ORM Min Speed Limit [Hz]

28-15 ORM Min Speed Limit [Hz]		
Default value: 100 hz	Parameter type: Range [80 - 200 hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: True

Minimum speed limit for activating the oil return management.

Parameter 28-17 ORM Boost Speed [Hz]

Table 358: Parameter 28-17 ORM Boost Speed [Hz]

28-17 ORM Boost Speed[Hz]		
Default value: 140 hz	Parameter type: Range [80 - 200 hz]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: True

Parameter 28-17 ORM Boost Speed [Hz] controls the speed of the compressor during oil return boost.

5.4.13.3 Parameter Group 28-3* Crankcase Heating

A DC-hold current through the motor windings can be used as an alternative to an external crankcase heater to keep the compressor warm when stopped. The efficiency of the crankcase heating depends on the physical placing of the actual motor in the compressor. If the crankcase heating is used with Anti-Reverse Protection, the drive first brakes for the set duration followed by the heating current.

Parameter 28-30 Crankcase Heating Control

Table 359: Parameter 28-30 Crankcase Heating Control

28-30 Crankcase Heating Control		
Default value: Disabled	Parameter type: Option	Setup: 2 setups
Conversion index: –	Data type: Uint8	Change during operation: False

Activate the DC hold current when the motor is stopped. The current level is defined in *parameter 28-31 Heating DC Current*.

Option	Name	Description
[0]*	Disabled	
[1]	On	

Parameter 28-31 Heating DC Current

Table 360: Parameter 28-31 Heating DC Current

28-31 Heating DC Current		
Default value: ExpressionLimit	Parameter type: Range [0 - 70%]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

Set the DC hold current as a percentage of the rated motor current in *parameter 1-24 Motor Current*.

Parameter 28-32 Crankcase Heating Delayed

Table 361: Parameter 28-32 Crankcase Heating Delayed

28-32 Crankcase Heating Delayed		
Default value: 5 s	Parameter type: Range [5 - 65535 s]	Setup: 2 setups
Conversion index: 0	Data type: Uint16	Change during operation: False

This time defines the delay after a stop and until crankcase heating is applied to the compressor.

6 Troubleshooting

6.1 Warnings and Alarms

A warning or an alarm is signaled by the relevant indicator on the front of the drive and indicated by a code on the display.

A warning remains active until its cause is no longer present. Under certain circumstances, operation of the compressor may still be continued. Warning messages may be critical.

In the event of an alarm, the drive has tripped. To restart operation, reset alarms once their cause has been rectified.

This may be done in 4 ways:

- By pressing [Reset].
- Via a digital input with the Reset function.
- Via serial communication.
- By resetting automatically using the [Auto Reset] function, see *parameter 14-20 Reset Mode*.

A trip is the action following an alarm. The trip coasts the compressor and is reset by pressing [Reset] or by a digital input (*parameter group 5-1* Digital Inputs*). The original event that caused an alarm cannot damage the drive or cause dangerous conditions. A trip lock is an action when an alarm occurs, which could damage the drive or connected parts. A trip lock situation can only be reset by cycling power.

Table 362: Indicator Lights

Status	Color
Warning	Constant yellow light
Alarm	Flashing red light

The alarm words, warning words and extended status words can be read out via serial bus or optional fieldbus for diagnosis. See also *parameter 16-90 Alarm Word*, *parameter 16-92 Warning Word*, and *parameter 16-94 Ext. Status Word*.

N O T I C E

MOTOR RESTART

After a manual reset pressing [Reset], press [Auto On] or [Hand On] to restart the motor.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip-locked, see Table 363.

⚠ C A U T I O N ⚠

ALARM RESET

Alarms that are trip-locked offer extra protection, meaning that the mains supply must be switched off before the alarm can be reset. After being switched back on, the drive is no longer blocked and may be reset as described above once the cause has been rectified.

Alarms that are not trip-locked can also be reset using the automatic reset function in *parameter 14-20 Reset Mode* (Warning: automatic wake-up is possible!) Table 363 specifies whether a warning occurs before an alarm, or whether to show a warning or an alarm for a given fault.

Table 363: Warnings and Alarms

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
2	16	Live zero error	X	X		Signal on terminal 53 or 54 is less than 50% of the value set in *parameter 6-10 Terminal 53 Low Voltage*, *parameter 6-12 Terminal 53 Low Current*, *parameter 6-20 Terminal 54 Low Voltage*, or *parameter 6-22 Ter-*

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
						minal 54 Low Current. See also *parameter group 6-0* Analog I/O Mode*.
3	15	No motor	X			No motor is connected.
4	14	Mains ph. loss	X	X	X	Missing phase on the supply side or too high voltage imbalance. Check the supply voltage. See *parameter 14-12 Response to Mains Imbalance*.
7	11	DC over volt	X	X		DC-link voltage exceeds limit.
8	10	DC under volt	X	X		DC-link voltage drops below *voltage warning low limit*.
9	9	Inverter overld.	X	X		More than 100 % load for too long.
10	8	Motor ETR over	X(1)	X		The compressor is too hot due to more than 100% load for too long.
11	7	Motor th over	X	X		The thermistor or the thermistor connection is disconnected.
13	5	Overcurrent	X	X	X	Inverter peak current limit is exceeded.
14	2	Earth Fault	X	X	X	Discharge from output phases to ground.
16	12	Short Circuit		X	X	Short circuit in the motor or on the motor terminals.
17	4	Ctrl. word TO	X	X		No communication to the drive. See *parameter group 8-0* General Settings*.
18	42 (*parameter 16-91 Alarm Word 2*)	Start failed		X		The speed has not been able to exceed *parameter 1-78 Motor Start Min Speed [Hz]* during start within the allowed time.
30	19	U phase loss		X	X(1)	Motor phase U is missing. Check the phase. For 6–10 kW drives: See *parameter 4-58 Missing Motor Phase Function*.
31	20	V phase loss		X	X(1)	Motor phase V is missing. Check the phase. For 6–10 kW drives: See *parameter 4-58 Missing Motor Phase Function*.
32	21	W phase loss		X	X(1)	Motor phase W is missing. Check the phase. For 6–10 kW drives: See *parameter 4-58 Missing Motor Phase Function*.
36	24	Mains failure	X	X		Supply voltage to the drive is lost.
38	17	Internal fault		X	X	Contact the local Danfoss supplier.

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
44	48	Earth Fault DESAT		X	X	Discharge from output phases to ground, using the value of *parameter 15-31 InternalFaultReason* if possible.
46	33	Gate drive voltage fault		X	X	The supply on the power card is out of range.
47	23	24V supply low	X	X	X	24 V DC may be overloaded.
49	43	Speed limit		X		The compressor runs at a speed lower than specified in *parameter 1-87 Compressor Min Speed for Trip [Hz]*.
50	15	AMA calibration		X		AMA calibration failed
51	15	AMA check U_{nom},I_{nom}		X		Motor voltage, current and power configured wrong in parameters.
52	15	AMA low,I_{nom}		X		Motor current too low.
53	15	AMA big motor		X		Motor is too large for the AMA to be performed.
54	15	AMA small mot		X		Motor is too small for the AMA to be performed.
55	15	AMA par. range		X		Parameter values found is outside of the acceptable range.
56	15	AMA interrupt		X		The AMA is interrupted by user.
57	15	AMA timeout		X		The AMA takes too long time to complete.
58	15	AMA internal		X		Contact the local Danfoss supplier.
59	25/57	Current limit	X	X		The current is higher than the value in *parameter 4-18 Current Limit*.
60	44	External interlock		X		External interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for external interlock and reset the drive (via serial communication, digital I/O, or by pressing [Off/Reset]).
69	1	Pwr. Card Temp	X	X	X	The temperature sensor on the power card is either too hot or too cold.
79		Undefined	X	X		Power size configuration fault on the power card.
80	29	Drive initialised		X		All parameter settings are initialized to default settings.
87	47	Auto DC Braking	X			The drive is auto DC braking.

Fault number	Alarm/ Warning bit number	Fault text	Warning	Alarm	Trip locked	Cause of problem
95	40	Broken belt	X	X		The torque is below the torque level set for no load indicating a broken belt.
96	32	Start delayed	X			Power to the drive has been on for a shorter time than specified in *parameter 28-01 Interval Between Starts* twice.
97	33	Stop delayed	X			Stopping the motor has been delayed due to short cycle protection is active.
99	54	Locked rotor		X		The rotor is blocked or cannot run due to heavy load.
126	15	Motor Rotating		X		High back EMF voltage. Stop the rotor of the PM motor.
127	61	Back EMF too high	X			The drive cannot start the motor due to the rotor running at a higher speed than normal condition.
208	68	ORM Fault		X	X	Running in hand mode with low speed for too long time.

[1] Only applicable for 6–10 kW.

6.2 Warning Words

Table 364: Warning Words

Bit	Hex	Dec	Parameter 16-92 Warning Word	Parameter 16-93 Warning Word 2
0	1	1	Brake Check	Start Delayed
1	2	2	Pwr.Card Temp	Stop Delayed
2	4	4	Earth Fault	0
3	8	8	Ctrl. Card Temp	0
4	10	16	Ctrl. Word TO	0
5	20	32	Over Current	0
6	40	64	0	0
7	80	128	Motor Th. Over	0
8	100	256	Motor ETR Over	0
9	200	512	Inverter Overld.	0
10	400	1024	DC under Volt	0
11	800	2048	DC over Volt.	0
12	1000	4096	0	0
13	2000	8192	0	0
14	4000	16384	Mains ph. loss	0

Bit	Hex	Dec	Parameter 16-92 Warning Word	Parameter 16-93 Warning Word 2
15	8000	32768	No motor	Auto DC Braking
16	10000	65536	Live Zero Error	0
17	20000	131072	0	0
18	40000	262144	0	Fans Warning
19	80000	524288	0	0
20	100000	1048576	0	Overload T27
21	200000	2097152	0	Overload T29
22	400000	4194304	0	Memory Module
23	800000	8388608	0	0
24	1000000	16777216	Mains Failure	0
25	2000000	33554432	Current Limit	0
26	4000000	67108864	Low temp	0
27	8000000	134217728	0	0
28	10000000	268435456	0	Feedback Fault
29	20000000	536870912	0	Back-EMF too High
30	40000000	1073741824	0	0
31	80000000	2147483648	0	0

Note that 0 in the table indicates that this status word is not supported.

6.3 Alarm Words

Table 365: Alarm Words

Bit	Hex	Dec	Parameter 16-90 Alarm Word	Parameter 16-91 Alarm Word 2	Parameter 16-97 Alarm Word 3
0	1	1	0	0	0
1	2	2	Pwr. card temp	Gate drive voltage fault	0
2	4	4	Earth fault	0	0
3	8	8	0	0	0
4	10	16	Ctrl. word TO	0	ORM fault
5	20	32	Overcurrent	0	0
6	40	64	0	0	0
7	80	128	Motor th. over	0	0
8	100	256	Motor ETR over	0	0
9	200	512	Inverter overld.	0	0
10	400	1024	DC under volt	Start failed	0

Bit	Hex	Dec	Parameter 16-90 Alarm Word	Parameter 16-91 Alarm Word 2	Parameter 16-97 Alarm Word 3
11	800	2048	DC over volt.	Speed limit	0
12	1000	4096	Short circuit	External interlock	0
13	2000	8192	0	0	0
14	4000	16384	Mains ph. loss	0	0
15	8000	32768	AMA not OK	0	0
16	10000	65536	Live zero error	0	0
17	20000	131072	Internal fault	0	0
18	40000	262144	0	0	0
19	80000	524288	U phase loss	0	0
20	100000	1048576	V phase loss	0	0
21	200000	2097152	W phase loss	0	0
22	400000	4194304	0	Locked rotor	0
23	800000	8388608	Control voltage fault	0	0
24	1000000	16777216	Mains failure	0	0
25	2000000	33554432	0	0	0
26	4000000	67108864	0	0	0
27	8000000	134217728	0	0	0
28	10000000	268435456	0	0	0
29	20000000	536870912	Drive Initialised	0	0
30	40000000	1073741824	0	0	0
31	80000000	2147483648	0	0	0

6.4 Extended Status Words

Table 366: Extended Status Words

Bit	Hex	Dec	Parameter 16-94 Ext. Status Word	Parameter 16-95 Ext. Status Word 2
0	1	1	Ramping	Off
1	2	2	AMA running	Hand/Auto
2	4	4	Start CW/CCW	0
3	8	8	0	0
4	10	16	0	0
5	20	32	Feedback high	0
6	40	64	Feedback low	0
7	80	128	Output current high	Control Ready

Bit	Hex	Dec	Parameter 16-94 Ext. Status Word	Parameter 16-95 Ext. Status Word 2
8	100	256	Output current low	Drive Ready
9	200	512	Output frequency high	Quick Stop
10	400	1024	Output frequency low	DC Brake
11	800	2048	0	Stop
12	1000	4096	0	0
13	2000	8192	Braking	Freeze Output Request
14	4000	16384	0	Freeze Output
15	8000	32768	OVC active	Jog Request
16	10000	65536	AC brake	Jog
17	20000	131072	0	Start request
18	40000	262144	0	Start
19	80000	524288	Reference high	0
20	100000	1048576	Reference low	Start Delay
21	200000	2097152	0	0
22	400000	4194304	0	0
23	800000	8388608	0	Running
24	1000000	16777216	Oil boost	Bypass
25	2000000	33554432	0	0
26	4000000	67108864	0	0
27	8000000	134217728	0	0
28	10000000	268435456	0	FlyStart Active
29	20000000	536870912	0	0
30	40000000	1073741824	0	0
31	80000000	2147483648	Database busy	0

6.5 Descriptions of Warnings and Alarms

6.5.1 WARNING/ALARM 2, Live Zero Error

Cause

This warning or alarm only appears if programmed in *parameter 6-01 Live Zero Timeout Function*. The signal on 1 of the analog inputs is less than 50% of the minimum value programmed for that input. Broken wiring or a faulty device sending the signal can cause this condition.

Troubleshooting

- Check connections on all analog input terminals.
  - Control card terminals 53 and 54 for signals, terminal 55 common.
- Check that the drive programming and switch settings match the analog signal type.

6.5.2 WARNING/ALARM 3, No Motor

Cause

No motor is connected to the output of the drive.

Troubleshooting

- Check the cable connection between the drive and the motor.

6.5.3 WARNING/ALARM 4, Mains Phase Loss

Cause

A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears for a fault in the input rectifier. Options are programmed in *parameter 14-12 Function at Mains Imbalance*.

Troubleshooting

- Check the supply voltage and supply currents to the drive.

6.5.4 WARNING/ALARM 7, DC Overvoltage

Cause

If the DC-link voltage exceeds the limit, the drive trips after a certain time.

Troubleshooting

- Extend the ramp time.
- Activate the functions in *parameter 2-10 Brake Function*.

6.5.5 WARNING/ALARM 8, DC Undervoltage

Cause

If the DC-link voltage drops below the undervoltage limit, the drive trips after a fixed time delay. The time delay varies with unit size.

Troubleshooting

- Check that the supply voltage matches the drive voltage.
- Perform an input voltage test.

6.5.6 WARNING/ALARM 9, Inverter Overload

Cause

The drive is about to cut out because of an overload (too high current for too long). The counter for electronic, thermal inverter protection issues a warning at 90% and trips at 100%, while giving an alarm. The drive cannot be reset until the counter is below 90%.

The fault occurs when the drive has run with more than 100% overload for too long.

Troubleshooting

- Compare the output current shown on the LCP with the drive rated current.
- Compare the output current shown on the LCP with measured motor current.
- Show the thermal drive load on the LCP and monitor the value. When running above the drive continuous current rating, the counter increases. When running below the drive continuous current rating, the counter decreases.

N O T I C E

– See the derating section in the design guide for more details, if a high switching frequency is required.

6.5.7 WARNING/ALARM 10, Motor Overload Temperature

Cause

According to the electronic thermal protection (ETR), the motor is too hot. Select whether the drive issues a warning or an alarm when the counter reaches 100% in *parameter 1-90 Motor Thermal Protection*. The fault occurs when the motor runs with more than 100% overload for too long.

For 18–30 kW: This protection is always enabled as an alarm. If the protection is triggered more than 10 repeated times, auto reset transitions to require a manual operation to clear the alarm.

Troubleshooting

- Check if the motor is overheating.
- Check if the motor is mechanically overloaded.
- Check that the motor current set in *parameter 1-24 Motor Current* is correct.
- Ensure that the motor data in parameters 1-20 to 1-25 is set correctly.
- Run AMA in *parameter 1-29 Automatic Motor Adaption (AMA)*.

6.5.8 WARNING/ALARM 11, Motor Thermistor Over Temp

Cause

Check whether the thermistor connection is disconnected. Select whether the drive issues a warning or an alarm in *parameter 1-90 Motor Thermal Protection*.

Troubleshooting

- Check for motor overheating.
- Check if the motor is mechanically overloaded.
- Check that the thermistor is connected correctly.
- If using a thermal switch or thermistor, check that the programming of *parameter 1-93 Thermistor Source* matches sensor wiring.

6.5.9 WARNING/ALARM 13, Over current

Cause

The inverter peak current limit is exceeded. The warning lasts about 1.5 s, then the drive trips and issues an alarm.

Troubleshooting

- This fault may be caused by shock loading or fast acceleration with high inertia loads.
- Turn off the drive. Check if the motor shaft can be turned.
- Check that the motor size matches the drive.
- Incorrect motor data in *parameters 1-20* through *1-25*.

6.5.10 ALARM 14, Earth (Ground) Fault

Cause

There is a discharge from the output phases to ground, either in the cable between the drive and the motor or in the motor itself.

Troubleshooting

- Turn off the drive and remove the ground fault.
- Check for ground faults in the motor by measuring the resistance to ground of the motor cables and the motor with a megohmmeter.

6.5.11 ALARM 16, Short Circuit

Cause

There is short-circuiting in the motor or motor wiring.

Troubleshooting

Remove the power to the drive and repair the short circuit.

6.5.12 WARNING/ALARM 17, Control Word Timeout

Cause

There is no communication to the drive. The warning is only active when *parameter 8-04 Control Word Timeout Function* is NOT set to *Off*.

If *parameter 8-04 Control Word Timeout Function* is set to *Stop and trip*, a warning appears, and the drive ramps down until it trips, while giving an alarm.

Troubleshooting

- Check the connections on the serial communication cable.
- Increase *parameter 8-03 Control Word Timeout Time*.
- Check the operation of the communication equipment.
- Verify that proper EMC installation was performed.

6.5.13 ALARM 18, Start Failed

Cause

The speed has not been able to exceed *parameter 1-77 Compressor Start Max Speed [RPM]* during start within the allowed time (set in *parameter 1-79 Compressor Max Time to Trip*).

Troubleshooting

- Check if the motor is blocked.
- Check fan resistance.

6.5.14 ALARM 30, Motor Phase U Missing

Cause

Motor phase U between the drive and the motor is missing.

For 18–30 kW: If the protection is triggered more than 10 repeated times, auto reset transitions to require a manual operation to clear the alarm.

Troubleshooting

- Turn off the drive and check motor phase U.

6.5.15 ALARM 31, Motor Phase V Missing

Cause

Motor phase V between the drive and the motor is missing.

For 18–30 kW: If the protection is triggered more than 10 repeated times, auto reset transitions to require a manual operation to clear the alarm.

Troubleshooting

- Turn off the drive and check motor phase V.

6.5.16 ALARM 32, Motor Phase W Missing

Cause

Motor phase W between the drive and the motor is missing.

For 18–30 kW: If the protection is triggered more than 10 repeated times, auto reset transitions to require a manual operation to clear the alarm.

Troubleshooting

- Turn off the drive and check motor phase W.

6.5.17 WARNING/ALARM 36, Mains Failure

Cause

This warning/alarm is only active if the supply voltage to the drive is lost and *parameter 14-10 Mains Failure* is not set to *[0] No Function*.

Troubleshooting

- Check the fuses to the drive and mains supply to the unit.

6.5.18 ALARM 38, Internal Fault

Cause

An internal error has occurred and a fault number is shown.

Troubleshooting

- It may be necessary to contact the Danfoss supplier or Danfoss service department.

6.5.19 ALARM 44, Earth Fault II

Cause

There is a discharge from the output phases to ground, either in the cable between the drive and the motor or in the motor itself.

Troubleshooting

- Turn off the drive and remove the ground fault.
- Measure the resistance to ground of the motor cables and the motor with a megohmmeter to check for a ground fault in the motor.

6.5.20 ALARM 46, Gate Drive Voltage Low

Cause

The supply on the power card is out of range.

Contact the Danfoss supplier or Danfoss service department.

Troubleshooting

- Contact the Danfoss supplier or Danfoss service department.

6.5.21 ALARM 47, Control Voltage Fault

Cause

The 24 V DC is measured on the control card. The external 24 V DC back-up supply may be overloaded

Troubleshooting

- Contact the Danfoss supplier or Danfoss service department.

6.5.22 ALARM 49, Min. Speed Limit

Cause

When the speed is not within the specified range in *parameter 4-11 Motor Speed Low Limit [RPM]* and *parameter 4-13 Motor Speed High Limit [RPM]*, the drive shows a warning. When the speed is below the specified limit in *parameter 1-86 Trip Speed Low [RPM]* (except when starting or stopping), the drive trips.

Troubleshooting

- Check the settings in *parameter 4-11 Motor Speed Low Limit [RPM]* and *parameter 4-13 Motor Speed High Limit [RPM]*.

6.5.23 ALARM 50, AMA Calibration Failed

Cause

A calibration error has occurred.

Troubleshooting

- Contact the Danfoss supplier or Danfoss service department.

6.5.24 ALARM 51, AMA Check Unom and Inom

Cause

The settings for motor voltage, motor current, and motor power are wrong.

Troubleshooting

- Check the settings in *parameters 1-20* to *1-25*.

6.5.25 ALARM 52, AMA Low Inom

Cause

The motor current is too low.

Troubleshooting

- Check the settings in *parameter 1-24 Motor Current*.

6.5.26 ALARM 53, AMA Motor Too Big

Cause

The motor is too big for the AMA to operate.

Troubleshooting

- Check the settings in *parameter group 1-2* Motor Data*.

6.5.27 ALARM 54, AMA Motor Too Small

Cause

The motor is too small for the AMA to operate.

Troubleshooting

- Check the settings in *parameter group 1-2* Motor Data*.

6.5.28 ALARM 55, AMA Parameter Out of Range

Cause

The AMA cannot run because the paramenter values of the motor are out of the acceptable range.

Troubleshooting

- Check the settings in *parameter group 1-2* Motor Data*.

6.5.29 ALARM 56, AMA Interrupted by User

Cause

The AMA is manually interrupted.

Troubleshooting

- Re-run th AMA calibration.

6.5.30 ALARM 57, AMA Timeout

Cause

The AMA takes too long time to complete.

Troubleshooting

- Try to restart the AMA. Repeated restarts can overheat the motor.

6.5.31 ALARM 58, AMA Internal Fault

Cause

An internal fault has occurred in the drive.

Troubleshooting

- Contact the Danfoss supplier or Danfoss service department.

6.5.32 WARNING 59, Current Limit

Cause

The current is higher than the value in *parameter 4-18 Current Limit*.

Troubleshooting

- Check the settings in *parameter group 1-1* Motor Selection*.
- Check the settings in *parameter group 1-2* Motor Data*.

6.5.33 WARNING 60, External Interlock

Cause

External interlock has been activated

Troubleshooting

- To resume normal operation, apply 24 V DC to the terminal programmed for external interlock.
- Reset the drive (via serial communication, digital I/O, or by pressing [Reset]).

6.5.34 ALARM 69, Power Card Temperature

Cause

The temperature sensor on the power card is either too hot or too cold.

Troubleshooting

- Check that the ambient operating temperature is within the limits.
- Check for clogged filters.
- Check fan operation.
- Check the power card.

6.5.35 ALARM 80, Drive Initialized to Default Value

Cause

Parameter settings are initialized to default settings after a manual reset.

6.5.36 WARNING 87, Auto DC Braking

Cause

The drive is auto DC braking.

Troubleshooting

- Check the settings in *parameter 0-07 Auto DC Braking*.

6.5.37 ALARM 96, Start Delayed

The drive power has been on in a shorter time than specified in *Parameter 28-01 Interval between Starts* twice.

Troubleshooting

- Troubleshoot the system.
- Reset the drive when the fault is cleared.

6.5.38 ALARM 99, Locked Rotor

Cause

The rotor is blocked.

For 18–30 kW: If the protection is triggered more than 10 repeated times, auto reset transitions to require a manual operation to clear the alarm.

Troubleshooting

- Ensure that the rotor can operate freely.
- Check the settings in *parameter group 1-1* Motor Selection*.
- Check the settings in *parameter group 1-2* Motor Data*.

6.5.39 ALARM 126, Motor Rotating

Cause

High back EMF voltage.

Troubleshooting

- Stop the rotor of the PM motor.

6.5.40 WARNING 127, Back EMF Too High

Cause

This warning applies to PM motors only. When the back EMF exceeds 90% x U_{invmax} (overvoltage threshold) and does not drop to normal level within 5 s, this warning is reported. The warning remains until the back EMF returns to a normal level.

Troubleshooting

- Check the settings in *parameter group 1-2* Motor Data*.

6.5.41 ALARM 208, ORM Fault

Cause

If running in Hand mode with low speed for too long time the oil return management function stops the drive to protect the motor.

Troubleshooting

When running in Hand mode, ensure the motor speed is boosted according to settings in *parameters 28-** Compressor Functions*.

6.6 LCP Errors Messages

LCP errors are not warnings or alarms. They do not affect the operation of the drive. An LCP error on the LCP is shown in Illustration 24.

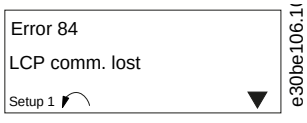

Illustration 24: LCP Error Example

Table 367: LCP Error List

LCP error code	Error message	Description
Err 84	LCP comm. Lost	Communication between the LCP and the drive is lost.

LCP error code	Error message	Description
Err 85	Key disabled	The LCP key is disabled. One of the LCP keys has been disabled in *parameter group 0-4* LCP Keypad*.
Err 86	LCP copy failed	Data copy failure. This error occurs when data is copied from drive to LCP, or from LCP to drive (*parameter 0-50 LCP Copy*).
Err 88	Data not compatible	LCP data incompatible. This error occurs when data is being copied from LCP to drive (*parameter 0-50 LCP Copy*). The typical reason is that data is moved between drive and LCP that have major software differences.
Err 89	Read only	Parameter read only. An operation is issued via LCP to write a value to a parameter that is read-only.
Err 90	Database busy	The parameter database of the drive is busy.
Err 91	Parameter invalid	The parameter value that is input via the LCP is invalid.
Err 92	Exceeds limits	The parameter value that is input via the LCP exceeds limits.
Err 93	Motor is running	The LCP copy operation cannot be performed when the drive is running.
Err 95	Not while running	The parameter cannot be changed while the drive is running.
Err 96	Password rejected	The password that is input via the LCP is incorrect.

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A

Analog reference

A signal transmitted to the analog inputs 53 or 54 (voltage or current).

- Current input: 0–20 mA and 4–20 mA
- Voltage input: 0–10 V DC

Analog inputs

The analog inputs are used for controlling various functions of the drive.
There are 2 types of analog inputs:
Current input, 0–20 mA, and 4–20 mA
Voltage input, 0 V DC to +10 V DC

Analog outputs

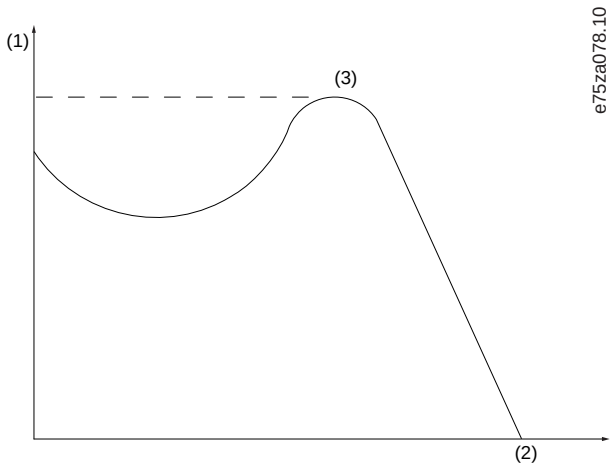
The analog outputs can supply a signal of 0–20 mA, 4–20 mA.

Automatic motor adaptation, AMA

AMA algorithm determines the electrical parameters for the connected motor at standstill.

B

Break-away torque



Bus reference

A signal transmitted to the serial communication port (FC port).

C

Control command

Start and stop the connected compressor with LCP and digital inputs.
Functions are divided into 2 groups.
Functions in group 1 have higher priority than functions in group 2.

Group 1	Reset, coast stop, reset and coast stop, quick stop, DC brake, stop, the [OFF] key.
Group 2	Start, pulse start, reversing, start reversing, jog, freeze output.

D

Digital inputs

The digital inputs can be used for controlling various functions of the drive.

Digital outputs

The drive features 2 solid-state outputs that can supply a 24 V DC (maximum 40 mA) signal.

E

ETR — Electronic thermal relay is a thermal load calculation based on present load and time. Its purpose is to estimate the motor temperature.

F

f_M — Motor frequency.

$f_{M,N}$ — Rated motor frequency (nameplate data).

f_{MAX} — Maximum compressor frequency.

f_{MIN} — Minimum compressor frequency.

f_{jog} — Motor frequency when the jog function is activated (via digital terminals).

I

I_M — Motor current (actual).

$I_{M,N}$ — Rated motor current (nameplate data).

$I_{VLT,MAX}$ — Maximum output current.

$I_{VLT,N}$ — Rated output current supplied by the drive.

Initializing — If initializing is carried out *parameter 14-22 Operation Mode*, the drive returns to the default setting.

Intermittent duty cycle — An intermittent duty rating refers to a sequence of duty cycles. Each cycle consists of an on-load and an off-load period. The operation can be either periodic duty or non-periodic duty.

L

LCP — The local control panel makes up a complete interface for control and programming of the drive. The control panel is detachable and can be installed up to 3 m (10 ft) from the drive, that is, in a front panel with the installation kit option.

lsb — Least significant bit.

M

MCM — Short for "mille circular mil", an American measuring unit for cable cross-section. 1 MCM=0.5067 mm^2

msb — Most significant bit.

N

$n_{M,N}$ — Nominal motor speed (nameplate data).

O

Online/offline parameters — Changes to online parameters are activated immediately after the data value is changed. Press [OK] to activate changes to off-line parameters.

P

PI controller — The PI controller maintains the required speed, pressure, temperature, and so on, by adjusting the output frequency to match the varying load.

$P_{M,N}$ — Rated motor power (nameplate data in kW or hp).

Power factor — The power factor is the relation between I_1 and I_{RMS}.

$$\text{Power factor} = \frac{\sqrt{3} \times U \times I_{1\cos\phi}}{\sqrt{3} \times U \times I_{\text{RMS}}}$$

The power factor for 3-phase control:

$$\text{Power factor} = \frac{I_1 \times \cos\phi 1}{I_{\text{RMS}}} = \frac{I_1}{I_{\text{RMS}}} \text{ since } \cos\phi 1 = 1$$

The power factor indicates to which extent the drive imposes a load on the mains supply.

The lower the power factor, the higher the I_{RMS} for the same kW performance.

$$I_{\text{RMS}} = \sqrt{I_1^2 + I_5^2 + I_7^2 + .. + I_n^2}$$

In addition, a high-power factor indicates that the different harmonic currents are low.

The DC coils in the drive produce a high-power factor, which minimizes the imposed load on the mains supply.

Preset reference

A defined preset reference to be set from -100% to +100% of the reference range. Selection of 8 preset references via the digital terminals.

R

RCD

Residual-current device.

Ref_{MAX}

Determines the relationship between the reference input at 100% full scale value (typically 10 V, 20 mA) and the resulting reference. The maximum reference value is set in *parameter 3-03 Maximum Reference*.

Ref_{MIN}

Determines the relationship between the reference input at 0% value (typically 0 V, 0 mA, 4 mA) and the resulting reference. The minimum reference value is set in *parameter 3-02 Minimum Reference*.

Relay outputs

The drive features 2 programmable relay outputs.

S

SLC

The SLC (smart logic control) is a sequence of user-defined actions executed when the associated user-defined events are evaluated as true by the SLC. (See *parameter group 13-** Smart Logic Control*).

Set-up

Save parameter settings in 4 set-ups. Change between the 4 parameter set-ups and edit 1 set-up, while another set-up is active.

Slip compensation

The drive compensates for the compressor slip by giving the frequency a supplement that follows the measured compressor load keeping the compressor speed almost constant.

Start-disable command

A stop command belonging to Group 1 control commands, see the table Function Groups under *Control Command*.

Stop command

A stop command belonging to Group 1 control commands, see the table Function Groups under *Control Command*.

T

Thermistor

A temperature-dependent resistor placed on the drive or the compressor.

Trip

A state entered in fault situations, for example, if the drive is subject to an overtemperature or when the drive is protecting the compressor, process, or mechanism. The drive prevents a restart until the cause of the fault has disappeared. To cancel the trip state, restart the drive. Do not use the trip state for personal safety.

Trip lock	The drive enters this state in fault situations to protect itself. The drive requires physical intervention, for example when there is a short circuit on the output. A trip lock can only be canceled by disconnecting mains, removing the cause of the fault, and reconnecting the drive. Restart is prevented until the trip state is canceled by activating reset or, sometimes, by being programmed to reset automatically. Do not use the trip lock state for personal safety.

U

U_M	Instant motor voltage.
$U_{M,N}$	Rated motor voltage (nameplate data).
$U_{VLT,MAX}$	Maximum output voltage.

V

VT characteristics	Variable torque characteristics used for pumps and fans.
VVC$^+$	If compared with standard voltage/frequency ratio control, Voltage Vector Control (VVC$^+$) improves the dynamics and the stability, both when the speed reference is changed and in relation to the load torque.

H

η_{VLT}	The efficiency of the drive is defined as the ratio between the power output and the power input.

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