Programming Guide

TR200

BAS-SVP04C-E4

May 2010

BAS-SVP04C-E4

Table of Contents

Safety

Warnings, Cautions and Notices

Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provide to alert installing contractors to potential hazards that could result in personal injury or death. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that could result in equipment or property-damage-only accidents.
Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

Warnings, Cautions and Notices appear at appropriate sections throughout this literature. Read these carefully.

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

⚠CAUTION
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE
Indicates a situation that could result in equipment or property-damage only accidents.

Note
Indicates something important to be noted by the reader.

✭	Indicates default setting

⚠WARNING
Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

High Voltage Warning

⚠WARNING

The voltage of the frequency converter is dangerous whenever it is connected to mains. Incorrect installation of the motor or frequency converter could result indeath, serious injury or damage to the equipment. Consequently, it is essential to comply with the instructions in this manual as well as local and national rules and safety regulations.

Safety Note

⚠WARNING

Failure to follow instructions below could result in death or serious injury.

Safety Regulations

1. The frequency converter must be disconnected from mains if repair work is to be carried out. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.
2. The [STOP/RESET] key on the keypad of the frequency converter does not disconnect the equipment from mains and is thus not to be used as a safety switch.
3. Correct protective earthing of the equipment must be established, the user must be protected against supply voltage, and the motor must be protected against overload in accordance with applicable national and local regulations.
4. The earth leakage currents are higher than 3.5 mA.
5. Protection against motor overload is set by par. 1-90 Motor Thermal Protection. If this function is desired, set par. 1-90 Motor Thermal Protection to data value [ETR trip] (default value) or data value [ETR warning]. Note: The function is initialized at 1.16 x rated motor current and rated motor frequency. For the North American market: The ETR functions provide class 20 motor overload protection in accordance with NEC.
6. Do not remove the plugs for the motor and mains supply while the frequency converter is connected to mains. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.
7. Please note that the frequency converter has more voltage inputs than L1, L2 and L3, when load sharing (linking of DC intermediate circuit) and external 24 Vdc have been installed. Check that all voltage inputs have been disconnected and that the necessary time has passed before commencing repair work.

Installation at high altitudes

⚠CAUTION

380 - 500 V, enclosure A, B and C: At altitudes above 2 km (6,561 ft), please contact Trane regarding PELV/Class II.
380 - 500 V, enclosure D, E and F: At altitudes above 3 km (9,842 ft), please contact Trane regarding PELV/Class II.
If the drive is to be installed over 2000m (6,561 ft) altitude, then the PELV specifications are not fulfilled anymore, i.e. the distances between components and critical parts become too small. To keep anyway the clearance for functional insulation, the risk for over-voltage must be reduced by means of external protective devices or kind of galvanic isolation. De-rating should also be taken into consideration, as cooling of the drive is not so effective at high altitude. Please contact Trane in such cases.
Failure to follow recommendations could result in death or serious injury.

⚠WARNING

Warning against Unintended Start

1. The motor can be brought to a stop by means of digital commands, bus commands, references or a local stop, while the frequency converter is connected to mains. If personal safety considerations make it necessary to ensure that no unintended start occurs, these stop functions are not sufficient.
2. While parameters are being changed, the motor may start. Consequently, the stop key [STOP/RESET] must always be activated; following which data can be modified.
3. A motor that has been stopped may start if faults occur in the electronics of the frequency converter, or if a temporary overload or a fault in the supply mains or the motor connection ceases.

Consequently, disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to follow recommendations could result in death or serious injury.

⚠WARNING

Touching the electrical parts could result in death or serious injury - even after the equipment has been disconnected from mains.

Also make sure that other voltage inputs have been disconnected, such as external 24 Vdc, load sharing (linkage of DC intermediate circuit), as well as the motor connection for kinetic back up. Refer to the Operating Instructions for further safety guidelines.
Failure to follow recommendations could result in death or serious injury.

⚠WARNING

The frequency converter DC link capacitors remain charged after power has been disconnected. To avoid an electrical shock hazard, disconnect the frequency converter from the mains before carrying out maintenance. Wait at least as follows before doing service on the frequency converter:
Failure to follow recommendations could result in death or serious injury.

Voltage (V)	Min. Waiting Time (Minutes)				
	4	15	20	30	40
200 - 240	1.1 - 3.7 kW	5.5 - 45 kW			
380 - 480	1.1 - 7.5 kW	11 - 90 kW	110 - 250 kW		315 - 1000 kW
525 - 600	1.1 - 7.5 kW	11 - 90 kW			
525 - 690		11 - 90 kW	45 - 400 kW	450 - 1400 kW	
Be aware that there may be high voltage on the DC link even when the LEDs are turned off.					

Before Commencing Repair Work

⚠WARNING

Hazardous Voltage!

1. Disconnect the frequency converter from mains
2. Disconnect DC bus terminals 88 and 89
3. Wait at least the time mentioned in section General Warning above
4. Remove motor cable

Failure to follow recommendations could result in death or serious injury.

Special Conditions

Electrical ratings:
The rating indicated on the nameplate of the frequency converter is based on a typical 3-phase mains power supply, within the specified voltage, current and temperature range, which is expected to be used in most applications.

The frequency converters also support other special applications, which affect the electrical ratings of the frequency converter.
Special conditions which affect the electrical ratings might be:

- Single phase applications
- High temperature applications which require de-rating of the electrical ratings
- Marine applications with more severe environmental conditions.

Other applications might also affect the electrical ratings.

Consult the relevant sections in this manual and in the TR200 Design Guide for information about the electrical ratings.

Installation requirements:
The overall electrical safety of the frequency converter requires special installation considerations regarding:

- Fuses and circuit breakers for over-current and short-circuit protection
- Selection of power cables (mains, motor, brake, loadsharing and relay)
- Grid configuration (grounded delta transformer leg, IT,TN, etc.)
- Safety of low-voltage ports (PELV conditions).

Consult the relevant clauses in these instructions and in the TR200 Design Guide for information about the installation requirements.

IT Mains

⚠WARNING

IT mains
Do not connect frequency converters with RFI-filters to mains supplies with a voltage between phase and earth of more than 440 V for 400 V converters and 760 V for 690 V converters.
For 400 V IT mains and delta earth (grounded leg), mains voltage may exceed 440 V between phase and earth.
For 690 V IT mains and delta earth (grounded leg), mains voltage may exceed 760 V between phase and earth.
Failure to follow recommendations could result in death or serious injury.

Par. 14-50 RFI Filter can be used to disconnect the internal RFI capacitors from the RFI filter to ground.

Software Version and Approvals: TR200

TR200
Software version:3.1x

This manual can be used with all TR200 frequency converters with software version 3.1x
The software version number can be seen from par. 15-43 Software Version.

Disposal Instruction

Equipment containing electrical components must not be disposed of together with domestic waste.
It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

Introduction

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Abbreviations

Alternating current	AC
American wire gauge	AWG
Ampere/AMP	A
Automatic Motor Adaptation	AMA
Current limit	I_{LIM}
Degrees Celsius	°C
Direct current	DC
Drive Dependent	D-TYPE
Electro Magnetic Compatibility	EMC
Electronic Thermal Relay	ETR
Frequency Converter	FC
Gram	g
Hertz	Hz
Kilohertz	kHz
Local Control Panel	keypad
Meter	m
Millihenry Inductance	mH
Milliampere	mA
Millisecond	ms
Minute	min
Trane Drive Utility	TDU
Nanofarad	nF
Newton Meters	Nm
Nominal motor current	$I_{M,N}$
Nominal motor frequency	$f_{M,N}$
Nominal motor power	$P_{M,N}$
Nominal motor voltage	$U_{M,N}$
Parameter	par.
Protective Extra Low Voltage	PELV
Printed Circuit Board	PCB
Rated Inverter Output Current	I_{INV}
Revolutions Per Minute	RPM
Regenerative terminals	Regen
Second	s
Synchronous Motor Speed	n_s
Torque limit	T_{LIM}
Volts	V
The maximum output current	$I_{DRIVE,MAX}$
The rated output current supplied by the frequency converter	$I_{DRIVE,N}$

Available Literature for TR200

- Operating Instructions provide the necessary information for getting the drive up and running.
- Operating Instructions TR200 High Power
- Design Guide entails all technical information about the drive and customer design and applications.
- Programming Guide provides information on how to programme and includes complete parameter descriptions.

x = Revision number
yy = Language code

Trane technical literature is available in print from your local Trane Sales Office or online at:
www.trane.com/vfd

Definitions

Frequency converter:

$I_{DRIVE,MAX}$
Maximum output current.

$I_{DRIVE,N}$
Rated output current supplied by the frequency converter.

$U_{DRIVE, MAX}$
Maximum output voltage.

Input:

Control command
Start and stop the connected motor by means of keypad and digital inputs.
Functions are divided into two groups.

Functions in group 1 have higher priority than functions in group 2.

Group 1	Reset, Coasting stop, Reset and Coasting stop, Quick-stop, DC braking, Stop and the [OFF] key.
Group 2	Start, Pulse start, Reversing, Start reversing, Jog and Freeze output

Motor:

Motor Running
Torque generated on output shaft and speed from zero rpm to max. speed on motor.

f_{JOG}
Motor frequency when the jog function is activated (via digital terminals).

f_M
Motor frequency.

f_{MAX}
Maximum motor frequency.

f_{MIN}
Minimum motor frequency.

$f_{M,N}$
Rated motor frequency (nameplate data).

I_M
Motor current (actual).

$I_{M,N}$
Rated motor current (nameplate data).

$n_{M,N}$
Rated motor speed (nameplate data).

n_s
Synchronous motor speed

$$n_s = \frac{2 \times \ par.\ 1 - 23 \times 60\ s}{par.\ 1 - 39}$$

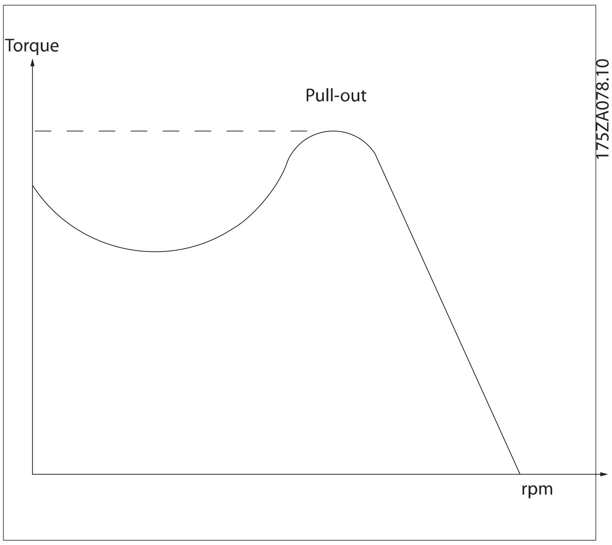
$P_{M,N}$
Rated motor power (nameplate data in kW or HP).

$T_{M,N}$
Rated torque (motor).

U_M
Instantaneous motor voltage.

$U_{M,N}$
Rated motor voltage (nameplate data).

Break-away torque



_DRIVE
The efficiency of the frequency converter is defined as the ratio between the power output and the power input.

Start-disable command
A stop command belonging to the group 1 control commands - see this group.

Stop command
See Control commands.

References:

Analog Reference
A signal transmitted to the analog inputs 53 or 54, can be voltage or current.

Binary Reference
A signal transmitted to the serial communication port.

Preset Reference
A defined preset reference to be set from -100% to +100% of the reference range. Selection of eight preset references via the digital terminals.

Pulse Reference
A pulse frequency signal transmitted to the digital inputs (terminal 29 or 33).

Ref_{MAX}
Determines the relationship between the reference input at 100% full scale value (typically 10 V, 20mA) and the resulting reference. The maximum reference value set in par. 3-03 Maximum Reference.

Ref_{MIN}
Determines the relationship between the reference input at 0% value (typically 0V, 0mA, 4mA) and the resulting reference. The minimum reference value set in par. 3-02 Minimum Reference.

Miscellaneous:

Analog Inputs
The analog inputs are used for controlling various functions of the frequency converter.
There are two types of analog inputs:
Current input, 0-20 mA and 4-20 mA
Voltage input, 0-10 V DC ()
Voltage input, -10 - +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.

Brake Resistor
The brake resistor is a module capable of absorbing the brake power generated in regenerative braking. This regenerative braking power increases the intermediate circuit voltage and a brake chopper ensures that the power is transmitted to the brake resistor.

CT Characteristics
Constant torque characteristics used for all applications such as conveyor belts, displacement pumps and cranes.

Digital Inputs
The digital inputs can be used for controlling various functions of the frequency converter.

Digital Outputs
The frequency converter features two Solid State outputs that can supply a 24 V DC (max. 40 mA) signal.

DSP
Digital Signal Processor.

ETR
Electronic Thermal Relay is a thermal load calculation based on present load and time. Its purpose is to estimate the motor temperature.

Initialising
If initialising is carried out (par. 14-22 Operation Mode), the frequency converter 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.

Keypad
The makes up a complete interface for control and programming of the frequency converter. The control panel is detachable and can be installed up to 3 metres from the frequency converter, i.e. in a front panel by means of the installation kit option.

lsb
Least significant bit.

msb
Most significant bit.

MCM
Short for Mille Circular Mil, an American measuring unit for cable cross-section. 1 MCM = 0.5067 mm^2.

On-line/Off-line Parameters
Changes to on-line parameters are activated immediately after the data value is changed. Changes to off-line parameters are not activated until you enter [OK] on the keypad.

Process PID
The PID control maintains the desired speed, pressure, temperature, etc. by adjusting the output frequency to match the varying load.

PCD
Process Control Data

Power Cycle
Switch off the mains until display (keypad) is dark – then turn power on again

RCD
Residual Current Device.

Set-up
You can save parameter settings in four Set-ups. Change between the four parameter Set-ups and edit one Set-up, while another Set-up is active.

SFAVM
Switching pattern called Stator Flux oriented Asynchronous Vector Modulation (par. 14-00 Switching Pattern).

Slip Compensation
The frequency converter compensates for the motor slip by giving the frequency a supplement that follows the measured motor load keeping the motor speed almost constant.

Smart Logic Control (SLC)
The SLC is a sequence of user defined actions executed when the associated user defined events are evaluated as true by the Smart Logic Controller. (Par. group 13-** Smart Logic Control (SLC).

STW
Status Word

Drive Standard Bus
Includes RS 485 bus with Drive protocol or MC protocol. See par. 8-30 Protocol.

Thermistor:
A temperature-dependent resistor placed where the temperature is to be monitored (frequency converter or motor).

Trip
A state entered in fault situations, e.g. if the frequency converter is subject to an over-temperature or when the frequency converter is protecting the motor, process or mechanism. Restart is prevented until the cause of the fault has disappeared and the trip state is cancelled by activating reset or, in some cases, by being programmed to reset automatically. Trip may not be used for personal safety.

Trip Locked
A state entered in fault situations when the frequency converter is protecting itself and requiring physical intervention, e.g. if the frequency converter is subject to a short circuit on the output. A locked trip can only be cancelled by cutting off mains, removing the cause of the fault, and reconnecting the frequency converter. Restart is prevented until the trip state is cancelled by activating reset or, in some cases, by being programmed to reset automatically. Trip may not be used for personal safety.

VT Characteristics
Variable torque characteristics used for pumps and fans.

VVC^{plus}
If compared with standard voltage/frequency ratio control, Voltage Vector Control (VVC^{plus}) improves the dynamics and the stability, both when the speed reference is changed and in relation to the load torque.

60° AVM
Switching pattern called 60°Asynchronous Vector Modulation (par. 14-00 Switching Pattern).

Power Factor
The power factor is the relation between I_1 and I_{RMS}.

$$Power\ \ factor\ = \frac{\sqrt{3}\ x\ U\ x\ I_1\ cos\varphi}{\sqrt{3}\ x\ U\ x\ I_{RMS}}$$

The power factor for 3-phase control:

$$= \frac{I1\ \ x\ cos\varphi 1}{I_{RMS}} = \frac{I_1}{I_{RMS}}\ since\ cos\varphi 1\ = 1$$

The power factor indicates to which extent the frequency converter imposes a load on the mains supply.
The lower the power factor, the higher the I_{RMS} for the same kW performance.

$$I_{RMS} = \sqrt{I_1^2 + I_5^2 + I_7^2} + .. + I_n^2$$

In addition, a high power factor indicates that the different harmonic currents are low.
The frequency converters' built-in DC coils produce a high power factor, which minimizes the imposed load on the mains supply.

Safety Precautions

⚠WARNING

The voltage of the frequency converter is dangerous whenever connected to mains. Incorrect installation of the motor, frequency converter or fieldbus could cause death, serious personal injury or damage to the equipment. Consequently, the instructions in this manual, as well as national and local rules and safety regulations, must be complied with.

⚠WARNING

Safety Regulations

1. The mains supply to the frequency converter must be disconnected whenever repair work is to be carried out. Check that the mains supply has been disconnected and that the necessary time has elapsed before removing motor and mains supply plugs.
2. The [OFF] button on the control panel of the frequency converter does not disconnect the mains supply and consequently it must not be used as a safety switch.
3. The equipment must be properly earthed, the user must be protected against supply voltage and the motor must be protected against overload in accordance with applicable national and local regulations.
4. The earth leakage current exceeds 3.5 mA.
5. Protection against motor overload is not included in the factory setting. If this function is desired, set par. 1-90 Motor Thermal Protection to data value ETR trip 1 [4] or data value ETR warning 1 [3].
6. Do not remove the plugs for the motor and mains supply while the frequency converter is connected to mains. Check that the mains supply has been disconnected and that the necessary time has elapsed before removing motor and mains plugs.
7. Please note that the frequency converter has more voltage sources than L1, L2 and L3, when load sharing (linking of DC intermediate circuit) or external 24 V DC are installed. Check that all voltage sources have been disconnected and that the necessary time has elapsed before commencing repair work.

Failure to follow recommendations could result in death or serious injury.

⚠WARNING

Warning against unintended start

1. The motor can be brought to a stop by means of digital commands, bus commands, references or a local stop, while the frequency converter is connected to mains. If personal safety considerations (e.g. risk of personal injury caused by contact with moving machine parts following an unintentional start) make it necessary to ensure that no unintended start occurs, these stop functions are not sufficient. In such cases the mains supply must be disconnected or the ***Safe Stop*** function must be activated.
2. The motor may start while setting the parameters. If this means that personal safety may be compromised (e.g. personal injury caused by contact with moving machine parts), motor starting must be prevented, for instance by use of the ***Safe Stop*** function or secure disconnection of the motor connection.
3. A motor that has been stopped with the mains supply connected, may start if faults occur in the electronics of the frequency converter, through temporary overload or if a fault in the power supply grid or motor connection is remedied. If unintended start must be prevented for personal safety reasons (e.g. risk of injury caused by contact with moving machine parts), the normal stop functions of the frequency converter are not sufficient. In such cases the mains supply must be disconnected or the ***Safe Stop*** function must be activated.

Consequently, disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to follow recommendations could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to follow recommendations could result in death or serious injury.

1. Control signals from, or internally within, the frequency converter may in rare cases be activated in error, be delayed or fail to occur entirely. When used in situations where safety is critical, e.g. when controlling the electromagnetic brake function of a hoist application, these control signals must not be relied on exclusively.

⚠WARNING

High Voltage
Disconnect all electric power, including remote disconnects. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that the unit is discharged. Failure to disconnect power and ensure unit is discharge before servicing could result in death or serious injury.
Also make sure that other voltage inputs have been disconnected, such as external 24 V DC, load sharing (linkage of DC intermediate circuit), as well as the motor connection for kinetic back up.
Systems where frequency converters are installed must, if necessary, be equipped with additional monitoring and protective devices according to the valid safety regulations, e.g law on mechanical tools, regulations for the prevention of accidents etc. Modifications on the frequency converters by means of the operating software are allowed.
Failure to follow recommendations could result in death or serious injury.

NOTICE

Hazardous situations shall be identified by the machine builder/ integrator who is responsible for taking necessary preventive means into consideration. Additional monitoring and protective devices may be included, always according to valid national safety regulations, e.g. law on mechanical tools, regulations for the prevention of accidents.

Protection Mode

Once a hardware limit on motor current or dc-link voltage is exceeded the frequency converter will enter “Protection mode”. “Protection mode” means a change of the PWM modulation strategy and a low switching frequency to minimize losses. This continues 10 sec after the last fault and increases the reliability and the robustness of the frequency converter while re-establishing full control of the motor.
The “Protection mode” can be disabled by setting par. 14-26 Trip Delay at Inverter Fault to zero which means that the frequency converter will trip immediately if one of the hardware limits is exceeded.

How to Programme

Local Control Panel

How to operate graphical keypad

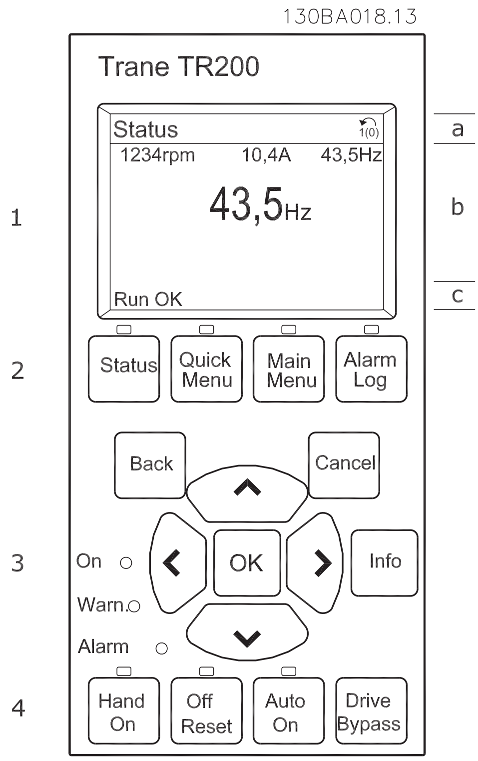
The keypad is divided into four functional groups:

1. Graphical display with Status lines.
2. Menu keys and indicator lights (LED's) - selecting mode, changing parameters and switching between display functions.
3. Navigation keys and indicator lights (LEDs).
4. Operation keys and indicator lights (LEDs).

Graphical display:
The LCD-display is back-lit with a total of 6 alpha-numeric lines. All data is displayed on the keypad which can show up to five operating variables while in [Status] mode.

Display lines:

a. **Status line:** Status messages displaying icons and graphics.
b. **Line 1-2:** Operator data lines displaying data and variables defined or chosen by the user. By pressing the [Status] key, up to one extra line can be added.
c. **Status line:** Status messages displaying text.



The display is divided into 3 sections:

Top section (a) shows the status when in status mode or up to 2 variables when not in status mode and in the case of Alarm/Warning.

The number of the Active Set-up (selected as the Active Set-up in par. 0-10 Active Set-up) is shown. When programming in another Set-up than the Active Set-up, the number of the Set-up being programmed appears to the right in brackets.

The **Middle section** (b) shows up to 5 variables with related unit, regardless of status. In case of alarm/warning, the warning is shown instead of the variables.

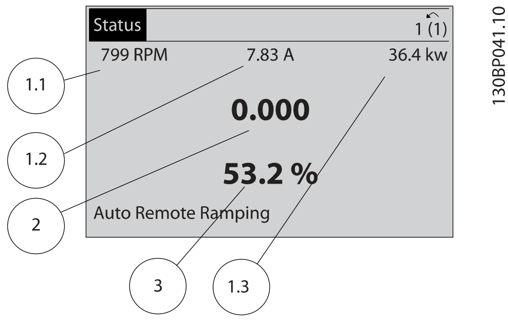
The **Bottom section** (c) always shows the state of the frequency converter in Status mode.

It is possible to toggle between three status read-out displays by pressing the [Status] key.
Operating variables with different formatting are shown in each status screen - see below.

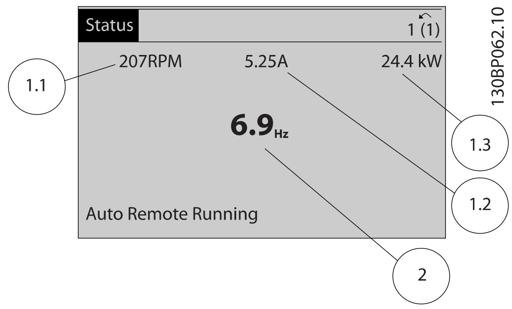
Several values or measurements can be linked to each of the displayed operating variables. The values / measurements to be displayed can be defined via par. 0-20 Display Line 1.1 Small, par. 0-21 Display Line 1.2 Small, par. 0-22 Display Line 1.3 Small, par. 0-23 Display Line 2 Large and par. 0-24 Display Line 3 Large, which can be accessed via [QUICK MENU], "Q3 Function Setups", "Q3-1 General Settings", "Q3-13 Display Settings".

Each value / measurement readout parameter selected in par. 0-20 Display Line 1.1 Small to par. 0-24 Display Line 3 Large has its own scale and number of digits after a possible decimal point. Larger numeric values are displayed with few digits after the decimal point.
Ex.: Current readout
5.25 A; 15.2 A 105 A.

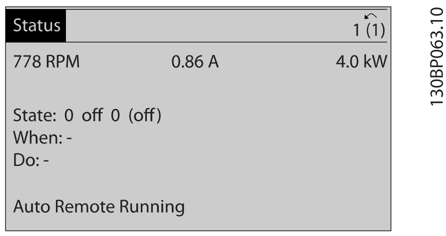
Status display I:
This read-out state is standard after start-up or initialisation.
Use [INFO] to obtain information about the value/ measurement linked to the displayed operating variables (1.1, 1.2, 1.3, 2, and 3).
See the operating variables shown in the display in this illustration. 1.1, 1.2 and 1.3 are shown in small size. 2 and 3 are shown in medium size.



Status display II:
See the operating variables (1.1, 1.2, 1.3, and 2) shown in the display in this illustration.
In the example, Speed, Motor current, Motor power and Frequency are selected as variables in the first and second lines.
1.1, 1.2 and 1.3 are shown in small size. 2 is shown in large size.

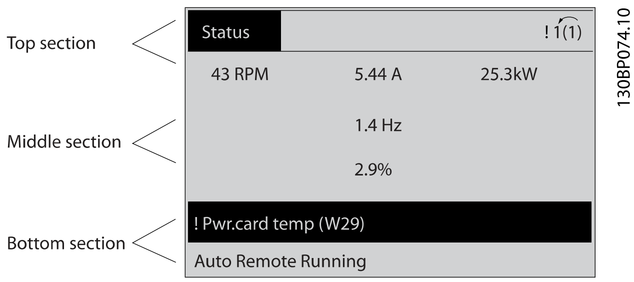


Status display III:
This state displays the event and action of the Smart Logic Control. For further information, see section *Smart Logic Control*.



Display Contrast Adjustment

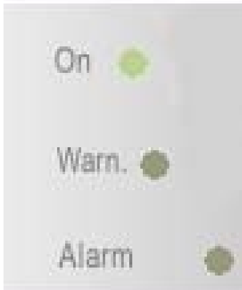
Press [status] and [▲] for darker display
Press [status] and [▼] for brighter display



Indicator lights (LEDs):

If certain threshold values are exceeded, the alarm and/or warning LED lights up. A status and alarm text appear on the control panel.
The On LED is activated when the frequency converter receives power from mains voltage, a DC bus terminal, or an external 24 V supply. At the same time, the back light is on.

- Green LED/On: Control section is working.
- Yellow LED/Warn.: Indicates a warning.
- Flashing Red LED/Alarm: Indicates an alarm.



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Keys

Menu keys
The menu keys are divided into functions. The ke below the display and indicator lamps are used f parameter set-up, including choice of display ind tion during normal operation.

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[**Status**]
indicates the status of the frequency converter and/or the motor. 3 different readouts can be chosen by pressing the [Status] key:
5 line readouts, 4 line readouts or Smart Logic Control.
Use [**Status**] for selecting the mode of display or for changing back to Display mode from either the Quick Menu mode, the Main Menu mode or Alarm mode. Also use the [Status] key to toggle single or double read-out mode.

[**Quick Menu**]
allows quick set-up of the frequency converter. **The most common TR200 functions can be programmed here.**

The [Quick Menu] consists of:
- **My Personal Menu**
- **Quick Set-up**
- **Function Set-up**
- **Changes Made**
- **Loggings**

The Function set-up provides quick and easy access to all parameters required for the majority of TR200 applications including most VAV and CAV supply and return fans, cooling tower fans, Primary, Secondary and Condenser Water Pumps and other pump, fan and compressor applications. Amongst other features it also includes parameters for selecting which variables to display on the keypad, digital preset speeds, scaling of analog references, closed loop single zone and multi-zone applications and specific functions related to Fans, Pumps and Compressors.

The Quick Menu parameters can be accessed immediately unless a password has been created via par. 0-60 Main Menu Password, par. 0-61 Access to Main Menu w/o Password, par. 0-65 Personal Menu Password or par. 0-66 Access to Personal Menu w/o Password.
It is possible to switch directly between Quick Menu mode and Main Menu mode.

[Main Menu]
is used for programming all parameters.The Main Menu parameters can be accessed immediately unless a password has been created via par. 0-60 Main Menu Password, par. 0-61 Access to Main Menu w/o Password, par. 0-65 Personal Menu Password or par. 0-66 Access to Personal Menu w/o Password. For the majority of TR200 applications it is not necessary to access the Main Menu parameters but instead the Quick Menu, Quick Set-up and Function Set-up provides the simplest and quickest access to the typical required parameters.
It is possible to switch directly between Main Menu mode and Quick Menu mode.
Parameter shortcut can be carried out by pressing down the **[Main Menu]** key for 3 seconds. The parameter shortcut allows direct access to any parameter.

[Alarm Log]
displays an Alarm list of the five latest alarms (numbered A1-A5). To obtain additional details about an alarm, use the arrow keys to manoeuvre to the alarm number and press [OK]. Information is displayed about the condition of the frequency converter before it enters the alarm mode.

The Alarm log button on the keypad allows access to both Alarm log and Maintenance log.

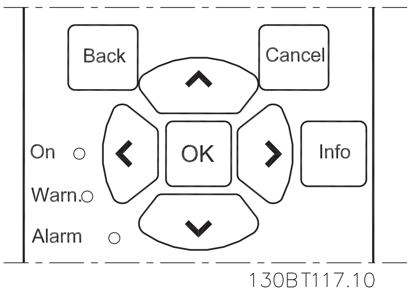
[Back]
reverts to the previous step or layer in the navigation structure.

[Cancel]
last change or command will be cancelled as long as the display has not been changed.

[Info]
displays information about a command, parameter, or function in any display window. [Info] provides detailed information when needed.
Exit Info mode by pressing either [Info], [Back], or [Cancel].

Navigation Keys
The four navigation arrows are used to navigate between the different choices available in **[Quick Menu]**, **[Main Menu]** and **[Alarm Log]**. Use the keys to move the cursor.

[OK] is used for choosing a parameter marked by the cursor and for enabling the change of a parameter.



Operation Keys for local control are found at the b tom of the control panel.

[Hand On]
enables control of the frequency converter via the GLCP. [Hand On] also starts the motor, and it is now possible to enter the motor speed data by means of the arrow keys. The key can be selected as *Enable* [1] or *Disable* [0] via par. 0-40 [Hand on] Key on LCP.
The following control signals will still be active when [Hand On] is activated:

- [Hand On] - [Off] - [Auto on]
- Reset
- Coasting stop inverse
- Reversing
- Set-up select lsb - Set-up select msb
- Stop command from serial communication
- Quick stop
- DC brake

NOTICE
External stop signals activated by means of control signals or a serial bus will override a “start” command via the keypad.

[Off]
stops the connected motor. The key can be selected as Enable [1] or Disable [0] via par. 0-41 [Off] Key on LCP. If no external stop function is selected and the [Off] key is inactive the motor can only be stopped by disconnecting the mains supply.

[Auto on]
enables the frequency converter to be controlled via the control terminals and/or serial communication. When a start signal is applied on the control terminals and/or the bus, the frequency converter will start. The key can be selected as Enable [1] or Disable [0] via par. 0-42 [Auto on] Key on LCP.

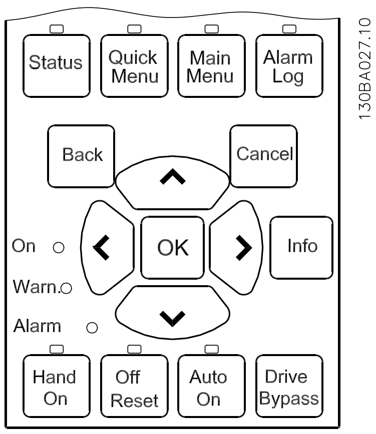
NOTICE
An active HAND-OFF-AUTO signal via the digital inputs has higher priority than the control keys [Hand on] – [Auto on].

[Reset]
is used for resetting the frequency converter after an alarm (trip). It can be selected as *Enable* [1] or *Disable* [0] via par. 0-43 [Reset] Key on LCP.

The parameter shortcut can be carried out by holding down the [Main Menu] key for 3 seconds. The parameter shortcut allows direct access to any parameter.

Quick Transfer of Parameter Settings between Multiple Frequency Converters

Once the set-up of a frequency converter is complete, we recommend that you store the data in the keypad or on a PC via MCT 10 Set-up Software Tool.



Data storage in keypad:

1. Go to par. 0-50 LCP Copy
2. Press the [OK] key
3. Select “All to keypad”
4. Press the [OK] key

All parameter settings are now stored in the keypad indicated by the progress bar. When 100% is reached, press [OK].

NOTICE

Stop the motor before performing this operation.

You can now connect the keypad to another frequency converter and copy the parameter settings to this frequency converter as well.

Data transfer from keypad to frequency converter:

1. Go to par. 0-50 LCP Copy
2. Press the [OK] key
3. Select “All from keypad”
4. Press the [OK] key

The parameter settings stored in the keypad are now transferred to the frequency converter indicated by the progress bar. When 100% is reached, press [OK].

NOTICE

Stop the motor before performing this operation.

Parameter Set-Up

The frequency converter can be used for practically all assignments, thus offering a significant number of parameters. The series offers a choice between two programming modes - the Quick Menu mode and the Main Menu mode.
The latter provides access to all parameters. The former takes the user through a few parameters making it possible to **program the majority of TR200 applications**.
Regardless of the mode of programming, you can change a parameter both in the Quick Menu mode and in the Main Menu mode.

Quick Menu Mode

Parameter Data

The keypad provides access to all parameters listed under the Quick Menus. To set parameters using the [Quick Menu] button - enter or change parameter data or settings in accordance with the following procedure:

1. Press Quick Menu button
2. Use the [▲] and [▼] buttons to find the parameter you want to change
3. Press [OK]
4. Use [▲] and [▼] buttons to select the correct parameter setting
5. Press [OK]
6. To move to a different digit within a parameter setting, use the [◄] and [►] buttons
7. Highlighted area indicates digit selected for change
8. Press [Cancel] button to disregard change, or press [OK] to accept change and enter the new setting

Example of changing parameter data

Assume parameter 22-60 is set to [Off]. However, you want to monitor the fan-belt condition - non- broken or broken - according to the following procedure:

1. Press Quick Menu key
2. Choose Function Setups with the [▼] button
3. Press [OK]
4. Choose Application Settings with the [▼] button
5. Press [OK]
6. Press [OK] again for Fan Functions
7. Choose Broken Belt Function by pressing [OK]
8. With [▼] button, choose [2] Trip

The frequency converter will now trip if a broken fan-belt is detected.

Select [My Personal Menu] to display personal parameters:

For example, you may have pre-programmed personal parameters to be in My Personal Menu during factory commissioning to make on-site commissioning/fine tuning simpler. These parameters are selected in par. 0-25 My Personal Menu. Up to 20 different parameters can be programmed in this menu.

Select [Changes Made] to get information about:

- The last 10 changes. Use the up/down navigation keys to scroll between the last 10 changed parameters.
- The changes made since default setting.

Select [Loggings]:

to get information about the display line read-outs. The information is shown as graphs.
Only display parameters selected in par. 0-20 Display Line 1.1 Small and par. 0-24 Display Line 3 Large can be viewed. It is possible to store up to 120 samples in the memory for later reference.

Quick SetupQuick Setup

Efficient Parameter Set-up for TR200 Applications:

The parameters can easily be set up for the vast majority of the TR200 applications only by using the **[Quick Setup]** option.
After pressing [Quick Menu], the different choices in the Quick Menu are listed. See also illustration 6.1 below and tables Q3-1 to Q3-4 in the following *Function Setups* section.

Example of using the Quick Setup option:

Assume you want to set the Ramp Down Time to 100 seconds:

1. Select [Quick Setup]. The first par. 0-01 Language in Quick Setup appears
2. Press [▼] repeatedly until par. 3-42 Ramp 1 Ramp Down Time appears with the default setting of 20 seconds
3. Press [OK]
4. Use the [◄] button to highlight the 3rd digit before the comma
5. Change '0' to '1' by using the [▲] button
6. Use the [►] button to highlight the digit '2'
7. Change '2' to '0' with the [▼] button
8. Press [OK]

The new ramp-down time is now set to 100 seconds.
It is recommended to do the set-up in the order listed.

⚠WARNING

A complete description of the function is found in the parameter sections of this manual.

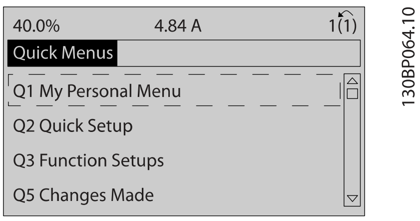


Illustration 3. 5: Quick Menu view.

The Quick Setup menu gives access to the 18 most important setup parameters of the frequency converter. After programming the frequency converter will, in most cases, be ready for operation. The 18 Quick Setup parameters are shown in the table below. A complete description of the function is given in the parameter description sections of this manual.

Parameter	[Units]
Par. 0-01 Language	
Par. 1-20 Motor Power [kW]	[kW]
Par. 1-21 Motor Power [HP]	[HP]
Par. 1-22 Motor Voltage*	[V]
Par. 1-23 Motor Frequency	[Hz]
Par. 1-24 Motor Current	[A]
Par. 1-25 Motor Nominal Speed	[RPM]
Par. 1-28 Motor Rotation Check	[Hz]
Par. 3-41 Ramp 1 Ramp up Time	[s]
Par. 3-42 Ramp 1 Ramp Down Time	[s]
Par. 4-11 Motor Speed Low Limit [RPM]	[RPM]
Par. 4-12 Motor Speed Low Limit [Hz]*	[Hz]
Par. 4-13 Motor Speed High Limit [RPM]	[RPM]
Par. 4-14 Motor Speed High Limit [Hz]*	[Hz]
Par. 3-19 Jog Speed [RPM]	[RPM]
Par. 3-11 Jog Speed [Hz]*	[Hz]
Par. 5-12 Terminal 27 Digital Input	
Par. 5-40 Function Relay**	

Table 3. 1: Quick Setup parameters

*The display showing depends on choices made in par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings. The default settings of par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings depend on which region of the world the frequency converter is supplied to but can be re-programmed as required.
** Par. 5-40 Function Relay, is an array, where one may choose between Relay1 [0] or Relay2 [1]. Standard setting is Relay1 [0] with the default choice Alarm [9].
See the parameter description in the section *Commonly Used Parameters*.
For a detailed information about settings and programming, please see the *TR200 Programming Guide*

NOTICE

If [No Operation] is selected in par. 5-12 Terminal 27 Digital Input, no connection to +24 V on terminal 27 is necessary to enable start.
If [Coast Inverse] (factory default value) is selected in par. 5-12 Terminal 27 Digital Input, a connection to +24V is necessary to enable start.

Function Set-ups

The Function set-up provides quick and easy access to all parameters required for the majority of TR200 applications including most VAV and CAV supply and return fans, cooling tower fans, Primary, Secondary and Condenser Water Pumps and other pump, fan and compressor applications.

How to access Function set-up - example

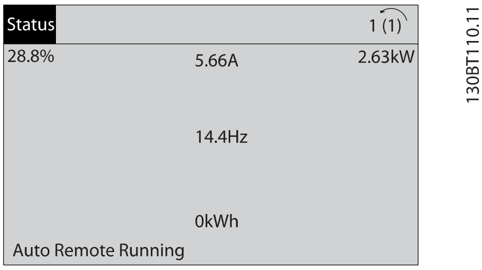


Illustration 3. 6: Step 1: Turn on the frequency converter (yellow LED lights)

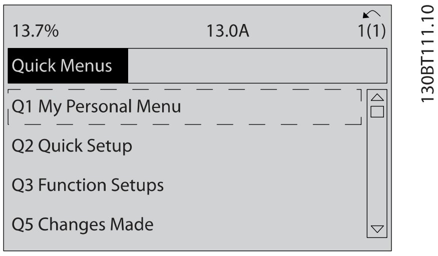


Illustration 3. 7: Step 2: Press the [Quick Menus] button (Quick Menus choices appear).

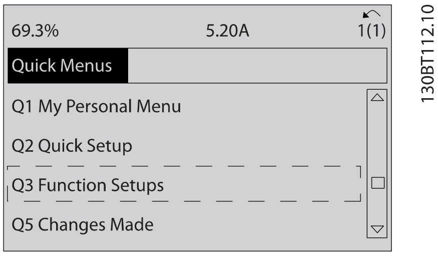


Illustration 3. 8: Step 3: Use the up/down navigation keys to scroll down to Function set-ups. Press [OK].

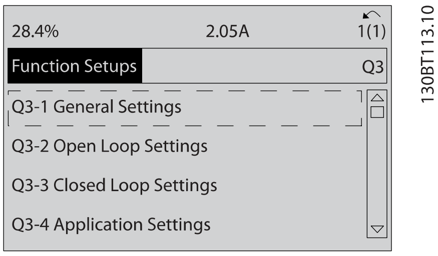


Illustration 3. 9: Step 4: Function set-ups choices appear. Choose Q3-1 *General Settings*. Press [OK].

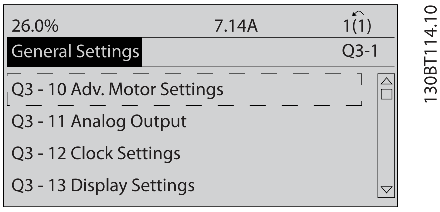


Illustration 3. 10: Step 5: Use the up/down navigation keys to scroll down to i.e. Q3-11 *Analog Outputs*. Press [OK].

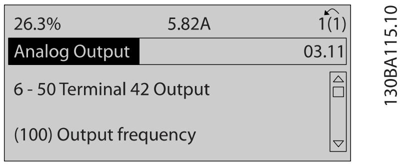


Illustration 3. 11: Step 6: Choose par. 6-50. Press [OK].

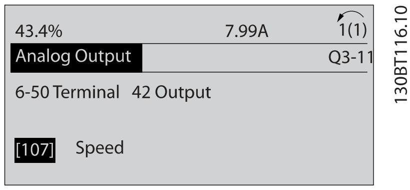


Illustration 3. 12: Step 7: Use the up/down navigation keys to select between the different choices. Press [OK].

Function Set-ups parameters

The Function Set-ups parameters are grouped in the following way:

Q3-1 General Settings			
Q3-10 Adv. Motor Settings	Q3-11 Analog Output	Q3-12 Clock Settings	Q3-13 Display Settings
Par. 1-90 Motor Thermal Protection	Par. 6-50 Terminal 42 Output	Par. 0-70 Date and Time	Par. 0-20 Display Line 1.1 Small
Par. 1-93 Thermistor Source	Par. 6-51 Terminal 42 Output Min Scale	Par. 0-71 Date Format	Par. 0-21 Display Line 1.2 Small
Par. 1-29 Automatic Motor Adaptation (AMA)	Par. 6-52 Terminal 42 Output Max Scale	Par. 0-72 Time Format	Par. 0-22 Display Line 1.3 Small
Par. 14-01 Switching Frequency		Par. 0-74 DST/Summertime	Par. 0-23 Display Line 2 Large
Par. 4-53 Warning Speed High		Par. 0-76 DST/Summertime Start	Par. 0-24 Display Line 3 Large
		Par. 0-77 DST/Summertime End	Par. 0-37 Display Text 1
			Par. 0-38 Display Text 2
			Par. 0-39 Display Text 3

Q3-2 Open Loop Settings	
Q3-20 Digital Reference	Q3-21 Analog Reference
Par. 3-02 Minimum Reference	Par. 3-02 Minimum Reference
Par. 3-03 Maximum Reference	Par. 3-03 Maximum Reference
Par. 3-10 Preset Reference	Par. 6-10 Terminal 53 Low Voltage
Par. 5-13 Terminal 29 Digital Input	Par. 6-11 Terminal 53 High Voltage
Par. 5-14 Terminal 32 Digital Input	Par. 6-12 Terminal 53 Low Current
Par. 5-15 Terminal 33 Digital Input	Par. 6-13 Terminal 53 High Current
	Par. 6-14 Terminal 53 Low Ref./Feedb. Value
	Par. 6-15 Terminal 53 High Ref./Feedb. Value

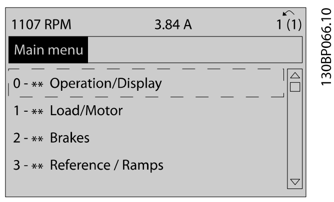
Q3-3 Closed Loop Settings	
Q3-30 Single Zone Int. Set Point	**Q3-31 Single Zone Ext. Set Point**
Par. 1-00 Configuration Mode	Par. 1-00 Configuration Mode
Par. 20-12 Reference/Feedback Unit	Par. 20-12 Reference/Feedback Unit
Par. 20-13 Minimum Reference/Feedb.	Par. 20-13 Minimum Reference/Feedb.
Par. 20-14 Maximum Reference/Feedb.	Par. 20-14 Maximum Reference/Feedb.
Par. 6-22 Terminal 54 Low Current	Par. 6-10 Terminal 53 Low Voltage
Par. 6-24 Terminal 54 Low Ref./Feedb. Value	Par. 6-11 Terminal 53 High Voltage
Par. 6-25 Terminal 54 High Ref./Feedb. Value	Par. 6-12 Terminal 53 Low Current
Par. 6-26 Terminal 54 Filter Time Constant	Par. 6-13 Terminal 53 High Current
Par. 6-27 Terminal 54 Live Zero	Par. 6-14 Terminal 53 Low Ref./Feedb. Value
Par. 6-00 Live Zero Timeout Time	Par. 6-15 Terminal 53 High Ref./Feedb. Value
Par. 6-01 Live Zero Timeout Function	Par. 6-22 Terminal 54 Low Current
Par. 20-21 Setpoint 1	Par. 6-24 Terminal 54 Low Ref./Feedb. Value
Par. 20-81 PID Normal/ Inverse Control	Par. 6-25 Terminal 54 High Ref./Feedb. Value
Par. 20-82 PID Start Speed [RPM]	Par. 6-26 Terminal 54 Filter Time Constant
Par. 20-83 PID Start Speed [Hz]	Par. 6-27 Terminal 54 Live Zero
Par. 20-93 PID Proportional Gain	Par. 6-00 Live Zero Timeout Time
Par. 20-94 PID Integral Time	Par. 6-01 Live Zero Timeout Function
Par. 20-70 Closed Loop Type	Par. 20-81 PID Normal/ Inverse Control
Par. 20-71 PID Performance	Par. 20-82 PID Start Speed [RPM]
Par. 20-72 PID Output Change	Par. 20-83 PID Start Speed [Hz]
Par. 20-73 Minimum Feedback Level	Par. 20-93 PID Proportional Gain
Par. 20-74 Maximum Feedback Level	Par. 20-94 PID Integral Time
Par. 20-79 PID Autotuning	Par. 20-70 Closed Loop Type
	Par. 20-71 PID Performance
	Par. 20-72 PID Output Change
	Par. 20-73 Minimum Feedback Level
	Par. 20-74 Maximum Feedback Level
	Par. 20-79 PID Autotuning

Q3-32 Multi Zone / Adv
Par. 1-00 Configuration Mode
Par. 3-15 Reference 1 Source
Par. 3-16 Reference 2 Source
Par. 20-00 Feedback 1 Source
Par. 20-01 Feedback 1 Conversion
Par. 20-02 Feedback 1 Source Unit
Par. 20-03 Feedback 2 Source
Par. 20-04 Feedback 2 Conversion
Par. 20-05 Feedback 2 Source Unit
Par. 20-06 Feedback 3 Source
Par. 20-07 Feedback 3 Conversion
Par. 20-08 Feedback 3 Source Unit
Par. 20-12 Reference/Feedback Unit
Par. 20-13 Minimum Reference/Feedb.
Par. 20-14 Maximum Reference/Feedb.
Par. 6-10 Terminal 53 Low Voltage
Par. 6-11 Terminal 53 High Voltage
Par. 6-12 Terminal 53 Low Current
Par. 6-13 Terminal 53 High Current
Par. 6-14 Terminal 53 Low Ref./Feedb. Value
Par. 6-15 Terminal 53 High Ref./Feedb. Value
Par. 6-16 Terminal 53 Filter Time Constant
Par. 6-17 Terminal 53 Live Zero
Par. 6-20 Terminal 54 Low Voltage
Par. 6-21 Terminal 54 High Voltage
Par. 6-22 Terminal 54 Low Current
Par. 6-23 Terminal 54 High Current
Par. 6-24 Terminal 54 Low Ref./Feedb. Value
Par. 6-25 Terminal 54 High Ref./Feedb. Value
Par. 6-26 Terminal 54 Filter Time Constant
Par. 6-27 Terminal 54 Live Zero
Par. 6-00 Live Zero Timeout Time
Par. 6-01 Live Zero Timeout Function
Par. 4-56 Warning Feedback Low
Par. 4-57 Warning Feedback High
Par. 20-20 Feedback Function
Par. 20-21 Setpoint 1
Par. 20-22 Setpoint 2
Par. 20-81 PID Normal/ Inverse Control
Par. 20-82 PID Start Speed [RPM]
Par. 20-83 PID Start Speed [Hz]
Par. 20-93 PID Proportional Gain
Par. 20-94 PID Integral Time
Par. 20-70 Closed Loop Type
Par. 20-71 PID Performance
Par. 20-72 PID Output Change
Par. 20-73 Minimum Feedback Level
Par. 20-74 Maximum Feedback Level
Par. 20-79 PID Autotuning

Q3-4 Application Settings		
Q3-40 Fan Functions	**Q3-41 Pump Functions**	**Q3-42 Compressor Functions**
Par. 22-60 Broken Belt Function	Par. 22-22 Low Speed Detection	Par. 1-03 Torque Characteristics
Par. 22-61 Broken Belt Torque	Par. 22-23 No-Flow Function	Par. 1-71 Start Delay
Par. 22-62 Broken Belt Delay	Par. 22-24 No-Flow Delay	Par. 22-75 Short Cycle Protection
Par. 4-64 Semi-Auto Bypass Set-up	Par. 22-40 Minimum Run Time	Par. 22-76 Interval between Starts
Par. 1-03 Torque Characteristics	Par. 22-41 Minimum Sleep Time	Par. 22-77 Minimum Run Time
Par. 22-22 Low Speed Detection	Par. 22-42 Wake-up Speed [RPM]	Par. 5-01 Terminal 27 Mode
Par. 22-23 No-Flow Function	Par. 22-43 Wake-up Speed [Hz]	Par. 5-02 Terminal 29 Mode
Par. 22-24 No-Flow Delay	Par. 22-44 Wake-up Ref./FB Difference	Par. 5-12 Terminal 27 Digital Input
Par. 22-40 Minimum Run Time	Par. 22-45 Setpoint Boost	Par. 5-13 Terminal 29 Digital Input
Par. 22-41 Minimum Sleep Time	Par. 22-46 Maximum Boost Time	Par. 5-40 Function Relay
Par. 22-42 Wake-up Speed [RPM]		par. 1-73 Flying Start
Par. 22-43 Wake-up Speed [Hz]		Par. 1-86 Trip Speed Low [RPM]
Par. 22-44 Wake-up Ref./FB Difference	Par. 1-03 Torque Characteristics	Par. 1-87 Trip Speed Low [Hz]
Par. 22-45 Setpoint Boost	Par. 1-73 Flying Start	
Par. 22-46 Maximum Boost Time		
Par. 2-10 Brake Function		
Par. 2-16 AC brake Max. Current		
Par. 2-17 Over-voltage Control		
Par. 1-73 Flying Start		
Par. 1-71 Start Delay		
Par. 1-80 Function at Stop		
Par. 2-00 DC Hold/Preheat Current		
Par. 4-10 Motor Speed Direction		

Main Menu Mode

Select the Main Menu mode by pressing the [Main Menu] key. The below read-out appears on the display.
The middle and bottom sections on the display show a list of parameter groups which can be chosen by toggling the up and down buttons.



Each parameter has a name and number which remain the same regardless of the programming mode. In the Main Menu mode, the parameters are divided into groups. The first digit of the parameter number (from the left) indicates the parameter group number.

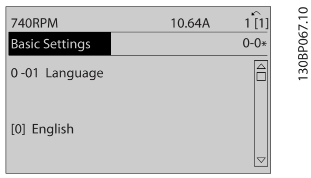
All parameters can be changed in the Main Menu. However, depending on the choice of configuration (par. 1-00 Configuration Mode), some parameters can be hidden.

Parameter Selection

In the Main Menu mode, the parameters are divided into groups. You select a parameter group by means of the navigation keys.
The following parameter groups are accessible:

Group no.	Parameter group:
0	Operation/Display
1	Load/Motor
2	Brakes
3	References/Ramps
4	Limits/Warnings
5	Digital In/Out
6	Analog In/Out
8	Comm. and Options
11	LonWorks
13	Smart Logic
14	Special Functions
15	Drive Information
16	Data Readouts
18	Data Readouts 2
20	Drive Closed Loop
21	Ext. Closed Loop
22	Application Functions
23	Time-based Functions
24	Application Functions 2

After selecting a parameter group, choose a parameter by means of the navigation keys.
The middle section on the display shows the parameter number and name as well as the selected parameter value.



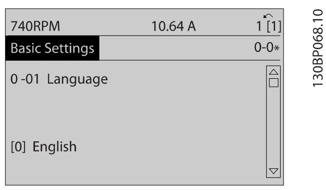
Changing Data

The procedure for changing data is the same whether you select a parameter in the Quick menu or the Main menu mode. Press [OK] to change the selected parameter.

The procedure for changing data depends on whether the selected parameter represents a numerical data value or a text value.

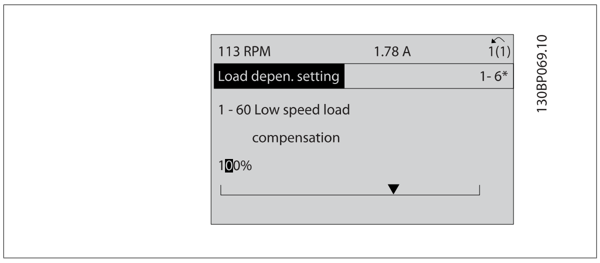
Changing a Text Value

If the selected parameter is a text value, change the text value by means of the [▲] [▼] navigation keys. The up key increases the value, and the down key decreases the value. Place the cursor on the value you want to save and press [OK].

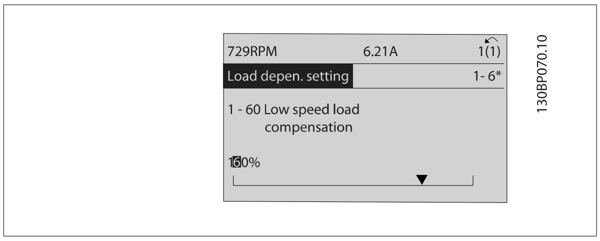


Changing a Group of Numeric Data Values

If the chosen parameter represents a numeric data value, change the chosen data value by means of the [◄] [►] navigation keys as well as the [▲] [▼] navigation keys. Use the [◄] [►] navigation keys to move the cursor horizontally.



Use the [▲] [▼] navigation keys to change the data value. The up key enlarges the data value, and the down key reduces the data value. Place the cursor on the value you want to save and press [OK].



Value, Step-by-Step

Certain parameters can be changed step by step or infinitely varying. This applies to par. 1-20 Motor Power [kW], par. 1-22 Motor Voltage and par. 1-23 Motor Frequency.

The parameters are changed both as a group of numeric data values and as numeric data values infinitely varying.

Read-out and Programming of Indexed Parameters

Parameters are indexed when placed in a rolling stack.

Par. 15-30 Alarm Log: Error Code to par. 15-33 Alarm Log: Date and Time contain a fault log which can be read out. Choose a parameter, press [OK], and use the up/down navigation keys to scroll through the value log.

Use par. 3-10 Preset Reference as another example:

Choose the parameter, press [OK], and use the up/down navigation keys keys to scroll through the indexed values. To change the parameter value, select the indexed value and press [OK]. Change the value by using the up/down keys. Press [OK] to accept the new setting. Press [CANCEL] to abort. Press [Back] to leave the parameter.

Initialisation to Default Settings

Initialise the frequency converter to default settings in two ways:

Recommended initialisation (via par. 14-22 Operation Mode)

1. Select par. 14-22 Operation Mode
2. Press [OK]
3. Select “initialisation”
4. Press [OK]
5. Cut off the mains supply and wait until the display turns off.
6. Reconnect the mains supply - the frequency converter is now reset.
7. Change par. 14-22 Operation Mode back to *Normal Operation*.

NOTICE

Resets parameters selected in Personal Menu with default factory setting.

Par. 14-22 Operation Mode initialises all except:
Par. 14-50 RFI Filter
Par. 8-30 Protocol
Par. 8-31 Address
Par. 8-32 Baud Rate
Par. 8-35 Minimum Response Delay
Par. 8-36 Maximum Response Delay
Par. 8-37 Maximum Inter-Char Delay
Par. 15-00 Operating Hours to par. 15-05 Over Volt's
Par. 15-20 Historic Log: Event to par. 15-22 Historic Log: Time
Par. 15-30 Alarm Log: Error Code to par. 15-32 Alarm Log: Time

Manual initialisation

1.	Disconnect from mains and wait until the display turns off.
2a.	Press [Status] - [Main Menu] - [OK] at the same time while power up for LCP 102, Graphical Display
2b.	Press [Menu] while power up for LCP 101, Numerical Display
3.	Release the keys after 5 s.
4.	The frequency converter is now programmed according to default settings.
This procedure initialises all except: Par. 15-00 Operating Hours; par. 15-03 Power Up's; par. 15-04 Over Temp's; par. 15-05 Over Volt's.	

NOTICE

When you carry out manual initialisation, you also reset serial communication, par. 14-50 RFI Filter and fault log settings. Removes parameters selected in par. 25-00 Cascade Controller.

NOTICE

After initialisation and power cycling, the display will not show any information until after a couple of minutes.

Parameter Description

Parameter Selection

Main Menu Structure

Parameters for the frequency converter are grouped into various parameter groups for easy selection of the correct parameters for optimized operation of the frequency converter.
The vast majority of TR200 applications can be programmed using the Quick Menu button and selecting the parameters under Quick Setup and Function Setups.
Descriptions and default settings of parameters may be found under the section Parameter Lists at the back of this manual.

0-** Operation/Display
1-** Load/Motor
2-** Brakes
3-** Reference/Ramps
4-** Limits/ Warnings
5-** Digital In/Out
6-** Analog In/Out
8-** Comm. and Options
9-** Profibus
10-** CAN Fieldbus
11-** LonWorks
13-** Smart Logic Controller
14-** Special Functions
15-** Drive Information
16-** Data Readouts
18-** Info & Readouts
20-** Drive Closed Loop
21-** Ext. Closed Loop
22-** Application Functions
23-** Time Based Functions
24-** Application Functions 2
36-** Programmable I/O Option

Main Menu - Operation and Display - Group 0

Parameters related to the fundamental functions of the frequency converter, function of the keypad buttons and configuration of the keypad display.

0-0* Basic Settings

0-01 Language		
Option:		Function:
		Defines the language to be used in the display. The frequency converter can be delivered with 2 different language packages. English and German are included in both packages. English cannot be erased or manipulated.
[0] *	English	Part of Language packages 1 - 2
[1]	Deutsch	Part of Language packages 1 - 2
[2]	Francais	Part of Language package 1
[3]	Dansk	Part of Language package 1
[4]	Spanish	Part of Language package 1
[5]	Italiano	Part of Language package 1
[6]	Svenska	Part of Language package 1
[7]	Nederlands	Part of Language package 1
[10]	Chinese	Language package 2
[20]	Suomi	Part of Language package 1
[22]	English US	Part of Language package 1
[27]	Greek	Part of Language package 1
[28]	Bras.port	Part of Language package 1
[36]	Slovenian	Part of Language package 1
[39]	Korean	Part of Language package 2
[40]	Japanese	Part of Language package 2
[41]	Turkish	Part of Language package 1
[42]	Trad.Chinese	Part of Language package 2
[43]	Bulgarian	Part of Language package 1
[44]	Srpski	Part of Language package 1
[45]	Romanian	Part of Language package 1
[46]	Magyar	Part of Language package 1
[47]	Czech	Part of Language package 1
[48]	Polski	Part of Language package 1
[49]	Russian	Part of Language package 1
[50]	Thai	Part of Language package 2

[51]	Bahasa Indonesia	Part of Language package 2

0-02 Motor Speed Unit

Option:		Function:
		This parameter cannot be adjusted while the motor is running. The display showing depends on settings in par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings. The default setting of par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings depends on which region of the world the frequency converter is supplied to, but can be re-programmed as required. NOTICE Changing the ***Motor Speed Unit*** will reset certain parameters to their initial value. It is recommended to select the motor speed unit first, before modifying other parameters.
[0]	RPM	Selects display of motor speed variables and parameters (i.e. references, feedbacks and limits) in terms of motor speed (RPM).
[1] *	Hz	Selects display of motor speed variables and parameters (i.e. references, feedbacks and limits) in terms of output frequency to the motor (Hz).

0-03 Regional Settings

Option:		Function:
		This parameter cannot be adjusted while the motor is running. The display showing depends on settings in par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings. The default setting of par. 0-02 Motor Speed Unit and par. 0-03 Regional Settings depends on which region of the world the frequency converter is supplied to but can be re-programmed as required.
[0] *	International	Sets par. 1-20 Motor Power [kW] units to [kW] and the default value of par. 1-23 Motor Frequency [50 Hz].
[1]	North America	Sets par. 1-21 Motor Power [HP] units to HP and the default value of par. 1-23 Motor Frequency to 60 Hz.

The setting not used is made invisible.

0-04 Operating State at Power-up

Option:		Function:
		Select the operating mode upon reconnection of the frequency converter to mains voltage after power down when operating in Hand (local)mode.
[0] *	Resume	Resumes operation of the frequency converter maintaining the same local reference and the same start/stop condition (applied by [Hand On]/[Off] on the keypad or Hand Start via a digital input as before the frequency converter was powered down.
[1]	Forced stop, ref=old	Uses saved reference [1] to stop the frequency converter but at the same time retain in memory the local speed reference prior to power down. After mains voltage is reconnected and after receiving a start command (using the keypad [Hand On] button or Hand Start command via a digital input) the frequency converter restarts and operates at the retained speed reference.

0-05 Local Mode Unit		
Option:		Function:
		Defines if the local reference unit should be displayed in terms of the motor shaft speed (in RPM/Hz) or as percent.
[0] *	As Motor Speed Unit	
[1]	%	

0-1* Set-up Operations

Define and control the individual parameter set-ups.
The frequency converter has four parameter setups that can be programmed independently of each other. This makes the frequency converter very flexible and able to meet the requirements of many different TR200 system control schemes often saving the cost of external control equipment. For example these can be used to program the frequency converter to operate according to one control scheme in one setup (e.g. daytime operation) and another control scheme in another setup (e.g. night set back). Alternatively they can be used by an AHU or packaged unit OEM to identically program all their factory fitted frequency converters for different equipment models within a range to have the same parameters and then during production/commissioning simply select a specific setup depending on which model within that range the frequency converter is installed on.
The active setup (i.e. the setup in which the frequency converter is currently operating) can be selected in par. 0-10 Active Set-up and is displayed in the keypad. Using Multi set-up it is possible to switch between set-ups with the frequency converter running or stopped, via digital input or serial communication commands (e.g. for night set back). If it is necessary to change setups whilst running, ensure par. 0-12 This Set-up Linked to is programmed as required. For the majority of TR200 applications it will not be necessary to program par. 0-12 This Set-up Linked to even if change of set up whilst running is required, but for very complex applications, using the full flexibility of the multiple setups, it may be required. Using par. 0-11 Programming Set-up it is possible to edit parameters within any of the setups whilst continuing the frequency converter operation in its Active Setup which can be a different setup to that being edited. Using par. 0-51 Set-up Copy it is possible to copy parameter settings between the set-ups to enable quicker commissioning if similar parameter settings are required in different set-ups.

0-10 Active Set-up		
Option:		Function:
		Select the set-up in which the frequency converter is to operate. Use par. 0-51 Set-up Copy to copy a set-up to one or all other set-ups. To avoid conflicting settings of the same parameter within two different set-ups, link the set-ups together using par. 0-12 This Set-up Linked to. Stop the frequency converter before switching between set-ups where parameters marked 'not changeable during operation' have different values. Parameters which are 'not changeable during operation' are marked FALSE in the parameter lists in the section *Parameter Lists*
[0]	Factory setup	Cannot be changed. It contains the Trane data set, and can be used as a data source when returning the other set-ups to a known state.
[1] *	Set-up 1	*Set-up 1* [1] to *Set-up 4* [4] are the four separate parameter set-ups within which all parameters can be programmed.
[2]	Set-up 2	
[3]	Set-up 3	
[4]	Set-up 4	
[9]	Multi Set-up	Is used for remote selection of set-ups using digital inputs and the serial communication port. This set-up uses the settings from par. 0-12 This Set-up Linked to.

0-11 Programming Set-up

Option:		Function:
		Select the set-up to be edited (i.e. programmed) during operation; either the active set-up or one of the inactive set-ups. The set-up number being edited is displayed in the keypad in (brackets).
[0]	Factory setup	cannot be edited but it is useful as a data source to return the other set-ups to a known state.
[1]	Set-up 1	*Set-up 1* [1] to *Set-up 4* [4] can be edited freely during operation, independently of the active set-up.
[2]	Set-up 2	
[3]	Set-up 3	
[4]	Set-up 4	
[9] *	Active Set-up	(i.e. the set-up in which the frequency converter is operating) can also be edited during operation. Editing parameters in the chosen setup would normally be done from the keypad but it is also possible from any of the serial communication ports.

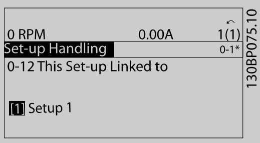
0-12 This Set-up Linked to

Option: Function:

This parameter only needs to be programmed if changing set-ups is required whilst the motor is running. It ensures that parameters which are "not changeable during operation" have the same setting in all relevant set-ups.

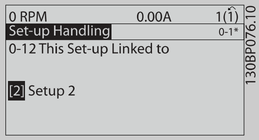
To enable conflict-free changes from one set-up to another whilst the frequency converter is running, link set-ups containing parameters which are not changeable during operation. The link will ensure synchronising of the 'not changeable during operation' parameter values when moving from one set-up to another during operation. 'Not changeable during operation' parameters can be identified by the label FALSE in the parameter lists in the section *Parameter Lists*.

The par. 0-12 This Set-up Linked to feature is used when Multi set-up in par. 0-10 Active Set-up is selected. Multi set-up can be used to move from one set-up to another during operation (i.e. while the motor is running).
Example:
Use Multi set-up to shift from Set-up 1 to Set-up 2 whilst the motor is running. Programme parameters in Set-up 1 first, then ensure that Set-up 1 and Set-up 2 are synchronised (or 'linked'). Synchronisation can be performed in two ways:
1. Change the edit set-up to *Set-up 2* [2] in par. 0-11 Programming Set-up and set par. 0-12 This Set-up Linked to to *Set-up 1* [1]. This will start the linking (synchronising) process.



OR

2. While still in Set-up 1, using par. 0-50 LCP Copy, copy Set-up 1 to Set-up 2. Then set par. 0-12 This Set-up Linked to to *Set-up 2* [2]. This will start the linking process.



After the link is complete, par. 0-13 Readout: Linked Set-ups will read {1,2} to indicate that all 'not changeable during operation' parameters are now the same in Set-up 1 and Set-up 2. If there are changes to a 'not changeable during operation' parameter, e.g. par. 1-30 Stator Resistance (Rs), in Set-up 2, they will also be changed automatically in Set-up 1. A switch between Set-up 1 and Set-up 2 during operation is now possible.

[0] *	Not linked
[1]	Set-up 1
[2]	Set-up 2
[3]	Set-up 3
[4]	Set-up 4

0-13 Readout: Linked Set-ups

Array [5]

Range:		Function:
0*	[0 - 255]	View a list of all the set-ups linked by means of par. 0-12 This Set-up Linked to. The parameter has one index for each parameter set-up. The parameter value displayed for each index represents which setups are linked to that parameter setup.

Index	keypad value
0	{0}
1	{1,2}
2	{1,2}
3	{3}
4	{4}

Table 4. 2: Example: Set-up 1 and Set-up 2 are linked

0-14 Readout: Prog. Set-ups / Channel

Range:		Function:
0*	[-2147483648 - 2147483647]	View the setting of par. 0-11 Programming Set-up for each of the four different communication channels. When the number is displayed in hex, as it is in the keypad, each number represents one channel. Numbers 1-4 represent a set-up number; 'F' means factory setting; and 'A' means active set-up. The channels are, from right to left: keypad, Drive-bus, USB, HPFB1.5. Example: The number AAAAAA21h means that the Drive-bus selected Set-up 2 in par. 0-11 Programming Set-up, the keypad selected Set-up 1 and all others used the active set-up.

0-2* Keypad Display

Define the variables displayed in the Graphical Local Control Panel.

NOTICE

Please refer to par. 0-37 Display Text 1, par. 0-38 Display Text 2 and par. 0-39 Display Text 3 for information on how to write display texts.

0-20 Display Line 1.1 Small		
Option:		Function:
		Select a variable for display in line 1, left position.
[0] *	None	No display value selected
[37]	Display Text 1	Enables an individual text string to be written, for display in the keypad or to be read via serial communication.
[38]	Display Text 2	Enables an individual text string to be written, for display in the keypad or to be read via serial communication.
[39]	Display Text 3	Enables an individual text string to be written, for display in the keypad or to be read via serial communication.
[89]	Date and Time Readout	Displays the current date and time.
[953]	Profibus Warning Word	Displays Profibus communication warnings.
[1005]	Readout Transmit Error Counter	View the number of CAN control transmission errors since the last power-up.
[1006]	Readout Receive Error Counter	View the number of CAN control receipt errors since the last power-up.
[1007]	Readout Bus Off Counter	View the number of Bus Off events since the last power-up.
[1013]	Warning Parameter	View a DeviceNet-specific warning word. One separate bit is assigned to every warning.
[1115]	LON Warning Word	Shows the LON-specific warnings.
[1117]	XIF Revision	Shows the version of the external interface file of the Neuron C chip on the LON option.
[1118]	LonWorks Revision	Shows the software version of the application program of the Neuron C chip on the LON option.
[1501]	Running Hours	View the number of running hours of the motor.
[1502]	Input kWh Counter	View the mains power consumption in kWh.
[1600]	Control Word	View the Control Word sent from the frequency converter via the serial communication port in hex code.
[1601]	Reference [Unit]	Total reference (sum of digital/analog/preset/bus/freeze ref./catch up and slow-down) in selected unit.
[1602] *	Reference [%]	Total reference (sum of digital/analog/preset/bus/freeze ref./catch up and slow-down) in percent.
[1603]	Status Word	Present status word
[1605]	Main Actual Value [%]	View the two-byte word sent with the Status word to the bus Master reporting the Main Actual Value.

[1609]	Custom Readout	View the user-defined readouts as defined in par. 0-30 Custom Readout Unit, par. 0-31 Custom Readout Min Value and par. 0-32 Custom Readout Max Value.
[1610]	Input Power [kW]	Actual power consumed by the motor in kW.
[1611]	Input Power [hp]	Actual power consumed by the motor in HP.
[1612]	Motor Voltage	Voltage supplied to the motor.
[1613]	Frequency	Motor frequency, i.e. the output frequency from the frequency converter in Hz.
[1614]	Motor Current	Phase current of the motor measured as effective value.
[1615]	Frequency [%]	Motor frequency, i.e. the output frequency from the frequency converter in percent.
[1616]	Torque [Nm]	Present motor load as a percentage of the rated motor torque.
[1617]	Speed [RPM]	Motor speed reference. Actual speed will depend on slip compensation being used (compensation set in par. 1-62 Slip Compensation). If not used, actual speed will be the value read in the display minus motor slip.
[1618]	Motor Thermal	Thermal load on the motor, calculated by the ETR function. See also parameter group 1-9* Motor Temperature.
[1622]	Torque [%]	Shows the actual torque produced, in percentage.
[1630]	DC Link Voltage	Intermediate circuit voltage in the frequency converter.
[1632]	Brake Energy /s	Present brake power transferred to an external brake resistor. Stated as an instantaneous value.
[1633]	Brake Energy /2 min	Brake power transferred to an external brake resistor. The mean power is calculated continuously for the most recent 120 seconds.
[1634]	Heatsink Temp.	Present heat sink temperature of the frequency converter. The cut-out limit is 95 ± 5° C; cutting back in occurs at 70 ± 5° C.
[1635]	Inverter Thermal	Percentage load of the inverters
[1636]	Inv. Nom. Current	Nominal current of the frequency converter
[1637]	Inv. Max. Current	Maximum current of the frequency converter
[1638]	SL Controller State	State of the event executed by the control
[1639]	Control Card Temp.	Temperature of the control card.
[1643]	Timed Actions Status	
[1650]	External Reference	Sum of the external reference as a percentage, i.e. the sum of analog/pulse/bus.
[1652]	Feedback [Unit]	Reference value from programmed digital input(s).
[1653]	Digi Pot Reference	View the contribution of the digital potentiometer to the actual reference Feedback.
[1654]	Feedback 1 [Unit]	View the value of Feedback 1. See also par. 20-0*.
[1655]	Feedback 2 [Unit]	View the value of Feedback 2. See also par. 20-0*.
[1656]	Feedback 3 [Unit]	View the value of Feedback 3. See also par. 20-0*.
[1658]	PID Output [%]	Returns the Drive Closed Loop PID controller output value in percent.

[1660]	Digital Input	Displays the status of the digital inputs. Signal low = 0; Signal high = 1. Regarding order, see par. 16-60 Digital Input. Bit 0 is at the extreme right.
[1661]	Terminal 53 Switch Setting	Setting of input terminal 53. Current = 0; Voltage = 1.
[1662]	Analog Input 53	Actual value at input 53 either as a reference or protection value.
[1663]	Terminal 54 Switch Setting	Setting of input terminal 54. Current = 0; Voltage = 1.
[1664]	Analog Input 54	Actual value at input 54 either as reference or protection value.
[1665]	Analog Output 42 [mA]	Actual value at output 42 in mA. Use par. 6-50 Terminal 42 Output to select the variable to be represented by output 42.
[1666]	Digital Output [bin]	Binary value of all digital outputs.
[1667]	Pulse Input #29 [Hz]	Actual value of the frequency applied at terminal 29 as a pulse input.
[1668]	Pulse Input #33 [Hz]	Actual value of the frequency applied at terminal 33 as a pulse input.
[1669]	Pulse Output #27 [Hz]	Actual value of pulses applied to terminal 27 in digital output mode.
[1670]	Pulse Output #29 [Hz]	Actual value of pulses applied to terminal 29 in digital output mode.
[1671]	Relay Output [bin]	View the setting of all relays.
[1672]	Counter A	View the present value of Counter A.
[1673]	Counter B	View the present value of Counter B.
[1675]	Analog In X30/11	Actual value of the signal on input X30/11 (General Purpose I/O Card. Option)
[1676]	Analog In X30/12	Actual value of the signal on input X30/12 (General Purpose I/O Card. Optional)
[1677]	Analog Out X30/8 [mA]	Actual value at output X30/8 (General Purpose I/O Card. Optional) Use par. 6-60 Terminal X30/8 Output to select the variable to be shown.
[1680]	Fieldbus CTW 1	Control word (CTW) received from the Bus Master.
[1682]	Fieldbus REF 1	Main reference value sent with control word via the serial communications network e.g. from the BMS, PLC or other master controller.
[1684]	Comm. Option STW	Extended fieldbus communication option status word.
[1685]	FC Port CTW 1	Control word (CTW) received from the Bus Master.
[1686]	FC Port REF 1	Status word (STW) sent to the Bus Master.
[1690]	Alarm Word	One or more alarms in a Hex code (used for serial communications)
[1691]	Alarm Word 2	One or more alarms in a Hex code (used for serial communications)
[1692]	Warning Word	One or more warnings in a Hex code (used for serial communications)
[1693]	Warning Word 2	One or more warnings in a Hex code (used for serial communications)
[1694]	Ext. Status Word	One or more status conditions in a Hex code (used for serial communications)
[1695]	Ext. Status Word 2	One or more status conditions in a Hex code (used for serial communications)
[1696]	Maintenance Word	The bits reflect the status for the programmed Preventive Maintenance Events in parameter group 23-1*

[1840]	Analog Input X49/1	
[1841]	Analog Input X49/3	
[1842]	Analog Input X49/5	
[1843]	Analog Out X49/7	
[1844]	Analog Out X49/9	
[1845]	Analog Out X49/11	
[1846]	X49 Digital Output [bin]	
[2117]	Ext. 1 Reference [Unit]	The value of the reference for extended Closed Loop Controller 1
[2118]	Ext. 1 Feedback [Unit]	The value of the feedback signal for extended Closed Loop Controller 1
[2119]	Ext. 1 Output [%]	The value of the output from extended Closed Loop Controller 1
[2137]	Ext. 2 Reference [Unit]	The value of the reference for extended Closed Loop Controller 2
[2138]	Ext. 2 Feedback [Unit]	The value of the feedback signal for extended Closed Loop Controller 2
[2139]	Ext. 2 Output [%]	The value of the output from extended Closed Loop Controller 2
[2157]	Ext. 3 Reference [Unit]	The value of the reference for extended Closed Loop Controller 3
[2158]	Ext. 3 Feedback [Unit]	The value of the feedback signal for extended Closed Loop Controller 3
[2159]	Ext. 3 Output [%]	The value of the output from extended Closed Loop Controller 3
[2316]	Maintenance Text	
[3110]	Bypass Status Word	
[3111]	Bypass Running Hours	
[9913]	Idle time	
[9914]	Paramdb requests in queue	
[9920]	HS Temp. (PC1)	
[9921]	HS Temp. (PC2)	
[9922]	HS Temp. (PC3)	
[9923]	HS Temp. (PC4)	
[9924]	HS Temp. (PC5)	
[9925]	HS Temp. (PC6)	
[9926]	HS Temp. (PC7)	
[9927]	HS Temp. (PC8)	

0-21 Display Line 1.2 Small

Select a variable for display in line 1, middle position.

Option:	Function:
[1614] * Motor Current	The options are the same as those listed in par. 0-20 Display Line 1.1 Small.

0-22 Display Line 1.3 Small

Select a variable for display in line 1, right position.

Option:	Function:
[1610] * Power [kW]	The options are the same as those listed in par. 0-20 Display Line 1.1 Small.

0-23 Display Line 2 Large

Select a variable for display in line 2.

Option:	Function:
[1613] * Frequency	The options are the same as those listed in par. 0-20 Display Line 1.1 Small.

0-24 Display Line 3 Large

Select a variable for display in line 3.

Option:	Function:
[1502] * kWh Counter	The options are the same as those listed in par. 0-20 Display Line 1.1 Small.

0-25 My Personal Menu

Array [20]

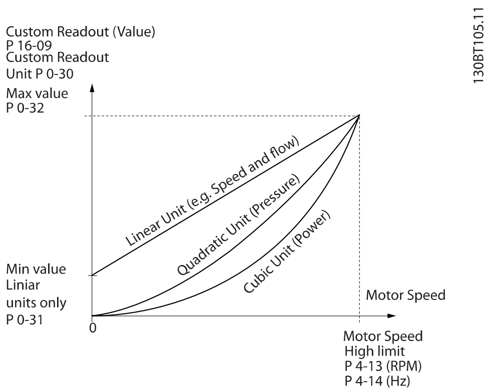
Range:	Function:
Application dependent* [0 - 9999]	Define up to 20 parameters to appear in the Q1 Personal Menu, accessible via the [Quick Menu] key on the keypad. The parameters will be displayed in the Q1 Personal Menu in the order they are programmed into this array parameter. Delete parameters by setting the value to '0000'. For example, this can be used to provide quick, simple access to just one or up to 20 parameters which require changing on a regular basis (e.g. for plant maintenance reasons) or by an OEM to enable simple commissioning of their equipment.

0-3* keypad Custom Readout

It is possible to customize the display elements for various purposes: *Custom Readout. Value proportional to speed (Linear, squared or cubed depending on unit selected in par. 0-30 Custom Readout Unit) *Display Text. Text string stored in a parameter.

Custom Readout

The calculated value to be displayed is based on settings in par. 0-30 Custom Readout Unit, par. 0-31 Custom Readout Min Value (linear only), par. 0-32 Custom Readout Max Value, par. 4-13 Motor Speed High Limit [RPM], par. 4-14 Motor Speed High Limit [Hz] and actual speed.



The relation will depend on the type of unit selected in par. 0-30 Custom Readout Unit:

Unit Type	Speed Relation
Dimensionless	Linear
Speed	
Flow, volume	
Flow, mass	
Velocity	
Length	
Temperature	
Pressure	Quadratic
Power	Cubic

0-30 Custom Readout Unit

Option:		Function:
		Program a value to be shown in the display of the keypad. The value has a linear, squared or cubed relation to speed. This relation depends on the unit selected (see table above). The actual calculated value can be read in par. 16-09 Custom Readout, and/or shown in the display be selecting Custom Readout [16-09] in par. 0-20 Display Line 1.1 Small to par. 0-24 Display Line 3 Large.
[0]		
[1] *	%	
[5]	PPM	
[10]	1/min	
[11]	RPM	
[12]	Pulse/s	
[20]	l/s	
[21]	l/min	
[22]	l/h	
[23]	m³/s	
[24]	m³/min	
[25]	m³/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]	°C	
[70]	mbar	
[71]	bar	
[72]	Pa	
[73]	kPa	
[74]	m WG	
[75]	mm Hg	
[80]	kW	

[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

0-31 Custom Readout Min Value

Range:		Function:
Application dependent*	[Application dependant]	This parameter allows the choice of the min. value of the custom defined readout (occurs at zero speed). It is only possible to select a value different to 0 when selecting a linear unit in par. 0-30 Custom Readout Unit. For Quadratic and Cubic units the minimum value will be 0.

0-32 Custom Readout Max Value

Range:		Function:
100.00 CustomReadoutUnit*	[Application dependant]	This parameter sets the max value to be shown when the speed of the motor has reached the set value for par. 4-13 Motor Speed High Limit [RPM] or par. 4-14 Motor Speed High Limit [Hz] (depends on setting in par. 0-02 Motor Speed Unit).

0-37 Display Text 1

Range:		Function:
Application dependent*	[0 - 0]	In this parameter it is possible to write an individual text string for display in the keypad or to be read via serial communication. If to be displayed permanently select Display Text 1 in par. 0-20 Display Line 1.1 Small, par. 0-21 Display Line 1.2 Small, par. 0-22 Display Line 1.3 Small, par. 0-23 Display Line 2 Large or par. 0-24 Display Line 3 Large. Use the [▲] or [▼] buttons on the keypad to change a character. Use the [◄] and [►] buttons to move the cursor. When a character is highlighted by the cursor, it can be changed. Use the [▲] or [▼] buttons on the keypad to change a character. A character can be inserted by placing the cursor between two characters and pressing [▲] or [▼].

0-38 Display Text 2

Range:		Function:
Application dependent*	[0 - 0]	In this parameter it is possible to write an individual text string for display in the keypad or to be read via serial communication. If to be displayed permanently select Display Text 2 in par. 0-20 Display Line 1.1 Small, par. 0-21 Display Line 1.2 Small, par. 0-22 Display Line 1.3 Small, par. 0-23 Display Line 2 Large or par. 0-24 Display Line 3 Large. Use the [▲] or [▼] buttons on the keypad to change a character. Use the [◄] and [►] buttons to move the cursor. When a character is highlighted by the cursor, this character can be changed. A character can be inserted by placing the cursor between two characters and pressing [▲] or [▼].

0-39 Display Text 3

Range:		Function:
Application dependent*	[0 - 0]	In this parameter it is possible to write an individual text string for display in the keypad or to be read via serial communication. If to be displayed permanently select Display Text 3 in par. 0-20 Display Line 1.1 Small,par. 0-21 Display Line 1.2 Small, par. 0-22 Display Line 1.3 Small, par. 0-23 Display Line 2 Large or par. 0-24 Display Line 3 Large. Use the [▲] or [▼] buttons on the keypad to change a character. Use the [◄] and [►] buttons to move the cursor. When a character is highlighted by the cursor, this character can be changed. A character can be inserted by placing the cursor between two characters and pressing [▲] or [▼].

0-4* keypad Keypad

Enable, disable and password protect individual keys on the keypad.

0-40 [Hand on] Key on LCP

Option:		Function:
[0]	Disabled	No function
[1] *	Enabled	[Hand on] Key enabled
[2]	Password	Avoid unauthorized start in Hand mode. If par. 0-40 [Hand on] Key on LCPis included in the My Personal Menu, then define the password in par. 0-65 Personal Menu Password. Otherwise define the password in par. 0-60 Main Menu Password.

0-41 [Off] Key on LCP

Option:		Function:
[0]	Disabled	No function
[1] *	Enabled	[Off] Key is enabled
[2]	Password	Avoid unauthorized stop. If par. 0-41 [Off] Key on LCP is included in the My Personal Menu, then define the password in par. 0-65 Personal Menu Password. Otherwise define the password in par. 0-60 Main Menu Password.

0-42 [Auto on] Key on LCP		
Option:		Function:
[0]	Disabled	No function
[1] *	Enabled	[Auto on] Key is enabled
[2]	Password	Avoid unauthorized start in Auto mode. If par. 0-42 [Auto on] Key on LCP is included in the My Personal Menu, then define the password in par. 0-65 Personal Menu Password. Otherwise define the password in par. 0-60 Main Menu Password.

0-43 [Reset] Key on LCP		
Option:		Function:
[0]	Disabled	No function
[1] *	Enabled	[Reset] Key is enabled
[2]	Password	Avoid unauthorized resetting. If par. 0-43 [Reset] Key on LCP is included in the par. 0-25 My Personal Menu, then define the password in par. 0-65 Personal Menu Password. Otherwise define the password in par. 0-60 Main Menu Password.

0-5* Copy / Save

Copy parameter settings between set-ups and to/from the keypad.

0-50 LCP Copy		
Option:		Function:
[0] *	No copy	No function
[1]	All to LCP	Copies all parameters in all set-ups from the frequency converter memory to the keypad memory. For service purposes it is recommended to copy all parameters to the keypad after commissioning.
[2]	All from LCP	Copies all parameters in all set-ups from the keypad memory to the frequency converter memory.
[3]	Size indep. from LCP	Copies only the parameters that are independent of the motor size. The latter selection can be used to programme several frequency converters with the same function without disturbing motor data which are already set.

This parameter cannot be adjusted while the motor is running.

0-51 Set-up Copy		
Option:		Function:
[0] *	No copy	No function
[1]	Copy to set-up 1	Copies all parameters in the present Programming Set-up (defined in par. 0-11 Programming Set-up) to Set-up 1.
[2]	Copy to set-up 2	Copies all parameters in the present Programming Set-up (defined in par. 0-11 Programming Set-up) to Set-up 2.
[3]	Copy to set-up 3	Copies all parameters in the present Programming Set-up (defined in par. 0-11 Programming Set-up) to Set-up 3.
[4]	Copy to set-up 4	Copies all parameters in the present Programming Set-up (defined in par. 0-11 Programming Set-up) to Set-up 4.
[9]	Copy to all	Copies the parameters in the present set-up over to each of the set-ups 1 to 4.

0-6* Password

0-60 Main Menu Password		
Range:		Function:
100*	[0 - 999]	Define the password for access to the Main Menu via the [Main Menu] key. If par. 0-61 Access to Main Menu w/o Password is set to *Full access* [0], this parameter will be ignored.

0-61 Access to Main Menu w/o Password		
Option:		Function:
[0] *	Full access	Disables password defined in par. 0-60 Main Menu Password.
[1]	Read only	Prevent unauthorized editing of Main Menu parameters.
[2]	No access	Prevent unauthorized viewing and editing of Main Menu parameters.

If *Full access* [0] is selected then par. 0-60 Main Menu Password, par. 0-65 Personal Menu Password and par. 0-66 Access to Personal Menu w/o Password will be ignored.

0-65 Personal Menu Password		
Range:		Function:
200*	[0 - 999]	Define the password for access to the My Personal Menu via the [Quick Menu] key. If par. 0-66 Access to Personal Menu w/o Password is set to *Full access* [0], this parameter will be ignored.

0-66 Access to Personal Menu w/o Password		
Option:		Function:
[0] *	Full access	Disables password defined in par. 0-65 Personal Menu Password.
[1]	Read only	Prevents unauthorized editing of My Personal Menu parameters.
[2]	No access	Prevents unauthorized viewing and editing of My Personal Menu parameters.

If par. 0-61 Access to Main Menu w/o Password is set to *Full access* [0], this parameter will be ignored.

0-7* Clock Settings

Set the time and date of the internal clock. The internal clock can be used for e.g. Timed Actions, energy log, Trend Analysis, date/time stamps on alarms, Logged data and Preventive Maintenance.
It is possible to program the clock for Daylight Saving Time / summertime, weekly working days/non-working days including 20 exceptions (holidays etc.). Although the clock settings can be set via the keypad, they can also be set along with timed actions and preventative maintenance functions using the MCT 10 software tool.

The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. If no module with back up is installed, it is recommended the clock function is only used if the frequency converter is integrated into the BMS using serial communications, with the BMS maintaining synchronization of control equipment clock times. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock has not been set properly, e.g. after a power down.

If mounting an Real Time Clock MCB 116 option card, a battery back-up of the date and time is included.

0-70 Date and Time		
Range:		Function:
Application dependent*	[Application dependant]	Sets the date and time of the internal clock. The format to be used is set in par. 0-71 Date Format and par. 0-72 Time Format.

0-71 Date Format		
Option:		Function:
		Sets the date format to be used in the keypad.
[0] *	YYYY-MM-DD	
[1] *	DD-MM-YYYY	
[2]	MM/DD/YYYY	

0-72 Time Format		
Option:		Function:
		Sets the time format to be used in the keypad.
[0] *	24 h	
[1]	12 h	

0-74 DST/Summertime		
Option:		Function:
		Choose how Daylight Saving Time/Summertime should be handled. For manual DST/Summertime enter the start date and end date in par. 0-76 DST/Summertime Start and par. 0-77 DST/Summertime End.
[0] *	Off	
[2]	Manual	

0-76 DST/Summertime Start		
Range:		Function:
Application dependent*	[Application dependant]	Sets the date and time when summertime/DST starts. The date is programmed in the format selected in par. 0-71 Date Format.

0-77 DST/Summertime End

Range:		Function:
Application dependent*	[Application dependant]	Sets the date and time when summertime/DST ends. The date is programmed in the format selected in par. 0-71 Date Format.

0-79 Clock Fault

Option:		Function:
		Enables or disables the clock warning, when the clock has not been set or has been reset due to a power-down and no backup is installed. If MCB 109 is installed “enabled” is default
[0] *	Disabled	
[1]	Enabled	

0-81 Working Days

Array with 7 elements [0] - [6] displayed below parameter number in display. Press OK and step between elements by means of ▲ and ▼ buttons on the keypad.

Option:		Function:
		Set for each weekday if it is a working day or a non-working day. First element of the array is Monday. The working days are used for Timed Actions.
[0] *	No	
[1]	Yes	

0-82 Additional Working Days

Array with 5 elements [0] - [4] displayed below parameter number in display. Press OK and step between elements by means of ▲ and▼ buttons on the keypad.

Range:		Function:
Application dependent*	[Application dependant]	Defines dates for additional working days that normally would be non-working days according to par. 0-81 Working Days.

0-83 Additional Non-Working Days

Array with 15 elements [0] - [14] displayed below parameter number in display. Press OK and step between elements by means of ▲ and▼ buttons on the keypad.

Range:		Function:
Application dependent*	[Application dependant]	Defines dates for additional working days that normally would be non-working days according to par. 0-81 Working Days.

0-89 Date and Time Readout

Range:		Function:
0*	[0 - 0]	Displays the current date and time. The date and time is updated continuously. The clock will not begin counting until a setting different from default has been made in par. 0-70 Date and Time.

Main Menu - Load and Motor - Group 1

1-0* General Settings

Define whether the frequency converter operates in open loop or closed loop.

1-00 Configuration Mode		
Option:		Function:
[0] *	Open Loop	Motor speed is determined by applying a speed reference or by setting desired speed when in Hand Mode. Open Loop is also used if the frequency converter is part of a closed loop control system based on an external PID controller providing a speed reference signal as output.
[3]	Closed Loop	Motor Speed will be determined by a reference from the built-in PID controller varying the motor speed as part of a closed loop control process (e.g. constant pressure or flow). The PID controller must be configured in par. 20-** or via the Function Setups accessed by pressing the [Quick Menus] button.

NOTICE

This parameter cannot be changed when motor is running.

NOTICE

When set for Closed Loop, the commands Reversing and Start Reversing will not reverse the direction of the motor.

1-03 Torque Characteristics		
Option:		Function:
[0] *	Compressor torque	*Compressor* [0]: For speed control of screw and scroll compressors. Provides a voltage which is optimized for a constant torque load characteristic of the motor in the entire range down to 10 Hz.
[1]	Variable torque	*Variable Torque* [1]: For speed control of centrifugal pumps and fans. Also to be used when controlling more than one motor from the same frequency converter (e.g. multiple condenser fans or cooling tower fans). Provides a voltage which is optimized for a squared torque load characteristic of the motor.
[2]	Auto Energy Optim. CT	*Auto Energy Optimization Compressor* [2]: For optimum energy efficient speed control of screw and scroll compressors. Provides a voltage which is optimized for a constant torque load characteristic of the motor in the entire range down to 15Hz but in addition the AEO feature will adapt the voltage exactly to the current load situation, thereby reducing energy consumption and audible noise from the motor. To obtain optimal performance, the motor power factor cos phi must be set correctly. This value is set in par. 14-43 Motor Cosphi. The parameter has a default value which is automatically adjusted when the motor data is programmed. These settings will typically ensure optimum motor voltage but if the motor power factor cos phi requires tuning, an AMA function can be carried out using par. 1-29 Automatic Motor Adaptation (AMA). It is very rarely necessary to adjust the motor power factor parameter manually.
[3] *	Auto Energy Optim. VT	*Auto Energy Optimization VT* [3]: For optimum energy efficient speed control of centrifugal pumps and fans. Provides a voltage which is optimized for a squared torque load characteristic of the motor but in addition the AEO feature will adapt the voltage exactly to the current load

situation, thereby reducing energy consumption and audible noise from the motor. To obtain optimal performance, the motor power factor cos phi must be set correctly. This value is set in par. 14-43 Motor Cosphi. The parameter has a default value and is automatically adjusted when the motor data is programmed. These settings will typically ensure optimum motor voltage but if the motor power factor cos phi requires tuning, an AMA function can be carried out using par. 1-29 Automatic Motor Adaptation (AMA). It is very rarely necessary to adjust the motor power factor parameter manually.

1-06 Clockwise Direction

This parameter defines the term "Clockwise" corresponding to the keypad direction arrow. Used for easy change of direction of shaft rotation without swapping motor wires. (Valid from SW version 5.84)

Option:		Function:
[0] *	Normal	Motor shaft will turn in clockwise direction when frequency converter is connected U -> U; V -> V, and W -> W to motor.
[1]	Inverse	Motor shaft will turn in counter clockwise direction when frequency converter is connected U -> U; V -> V, and W -> W to motor.

This parameter cannot be changed while the motor is running.

1-2* Motor Data

Par. group 1-2* comprises input data from the nameplate on the connected motor.

NOTICE

Changing the value of these parameters affects the setting of other parameters.

1-20 Motor Power [kW]

Range:		Function:
Application dependent*	[Application dependant]	Enter the nominal motor power in kW according to the motor nameplate data. The default value corresponds to the nominal rated output of the unit. This parameter cannot be adjusted while the motor is running. Depending on the choices made in par. 0-03 Regional Settings, either par. 1-20 Motor Power [kW] or par. 1-21 Motor Power [HP] is made invisible.

1-21 Motor Power [HP]

Range:		Function:
Application dependent*	[Application dependant]	Enter the nominal motor power in HP according to the motor nameplate data. The default value corresponds to the nominal rated output of the unit. This parameter cannot be adjusted while the motor is running. Depending on the choices made in par. 0-03 Regional Settings, either par. 1-20 Motor Power [kW] or par. 1-21 Motor Power [HP] is made invisible.

1-22 Motor Voltage

Range:		Function:
Application dependent*	[Application dependant]	Enter the nominal motor voltage according to the motor nameplate data. The default value corresponds to the nominal rated output of the unit. This parameter cannot be adjusted while the motor is running.

1-23 Motor Frequency

Range:		Function:
Application dependent*	[20 - 1000 Hz]	Select the motor frequency value from the motor nameplate data.For 87 Hz operation with 230/400 V motors, set the nameplate data for 230 V/50 Hz. Adapt par. 4-13 Motor Speed High Limit [RPM] and par. 3-03 Maximum Reference to the 87 Hz application.

NOTICE

This parameter cannot be adjusted while the motor is running.

1-24 Motor Current

Range:		Function:
Application dependent*	[Application dependant]	Enter the nominal motor current value from the motor nameplate data. This data is used for calculating motor torque, motor thermal protection etc.

NOTICE

This parameter cannot be adjusted while the motor is running.

1-25 Motor Nominal Speed

Range:		Function:
Application dependent*	[100 - 60000 RPM]	Enter the nominal motor speed value from the motor nameplate data. This data is used for calculating automatic motor compensations.

NOTICE

This parameter cannot be adjusted while the motor is running.

1-28 Motor Rotation Check		
Option:		Function:
		Following installation and connection of the motor, this function allows the correct motor rotation direction to be verified. Enabling this function overrides any bus commands or digital inputs, except External Interlock.
[0] *	Off	Motor Rotation Check is not active.
[1]	Enabled	Motor Rotation Check is enabled. Once enabled, Display shows: “Note! Motor may run in wrong direction”.

Pressing [OK], [Back] or [Cancel] will dismiss the message and display a new message: “Press [Hand on] to start the motor. Press [Cancel] to abort”. Pressing [Hand on] starts the motor at 5 Hz in forward direction and the display shows: “Motor is running. Check if motor rotation direction is correct. Press [Off] to stop the motor”. Pressing [Off] stops the motor and resets par. 1-28 Motor Rotation Check. If motor rotation direction is incorrect, two motor phase cables should be interchanged. IMPORTANT:

⚠WARNING

Hazardous Voltage!
Main power must be removed before disconnecting motor phase cables. Failure to follow recommendation could result in death or serious injury.

1-29 Automatic Motor Adaptation (AMA)		
Option:		Function:
		The AMA function optimizes dynamic motor performance by automatically optimizing the advanced motor parameters par. 1-30 Stator Resistance (Rs) to par. 1-35 Main Reactance (Xh)) while the motor is stationary.
[0] *	Off	No function
[1]	Enable complete AMA	performs AMA of the stator resistance R_S, the rotor resistance R_r, the stator leakage reactance X_1, the rotor leakage reactance X_2 and the main reactance X_h.
[2]	Enable reduced AMA	Performs a reduced AMA of the stator resistance R_s in the system only. Select this option if an LC filter is used between the frequency converter and the motor.

Activate the AMA function by pressing [Hand on] after selecting [1] or [2]. See also the item *Automatic Motor Adaptation* in the Design Guide. After a normal sequence, the display will read: “Press [OK] to finish AMA”. After pressing the [OK] key the frequency converter is ready for operation.

NOTICE

- **For the best adaptation of the frequency converter, run AMA on a cold motor**
- **AMA cannot be performed while the motor is running**

NOTICE

Avoid generating external torque during AMA.

NOTICE

If one of the settings in par. 1-2* Motor Data is changed, par. 1-30 Stator Resistance (Rs) to par. 1-39 Motor Poles, the advanced motor parameters, will return to default setting.
This parameter cannot be adjusted while the motor is running.

NOTICE

Full AMA should be run without filter only while reduced AMA should be run with filter.

See section: *Application Examples > Automatic Motor Adaptation* in the Design Guide.

1-3* Adv. Motor Data

Parameters for advanced motor data. The motor data in par. 1-30 Stator Resistance (Rs) to par. 1-39 Motor Poles must match the relevant motor in order to run the motor optimally. The default settings are figures based on common motor parameter values from normal standard motors. If the motor parameters are not set correctly, a malfunction of the frequency converter system may occur. If the motor data is not known, running an AMA (Automatic Motor Adaptation) is recommended. See the *Automatic Motor Adaptation* section. The AMA sequence will adjust all motor parameters except the moment of inertia of the rotor and the iron loss resistance (par. 1-36 Iron Loss Resistance (Rfe)).

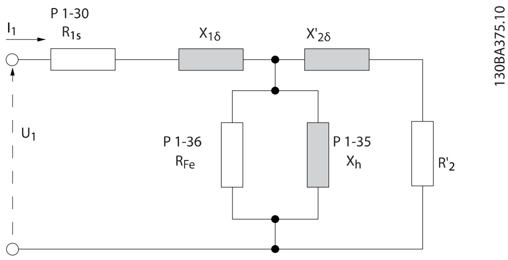


Illustration 4. 1: Motor equivalent diagram for an asynchronous motor

1-30 Stator Resistance (Rs)		
Range:		Function:
Application dependent*	[Application dependant]	Set the stator resistance value. Enter the value from a motor data sheet or perform an AMA on a cold motor. This parameter cannot be adjusted while the motor is running.

1-35 Main Reactance (Xh)		
Range:		Function:
Application dependent*	[Application dependant]	Set the main reactance of the motor using one of these methods: 1. Run an AMA on a cold motor. The frequency converter will measure the value from the motor. 2. Enter the X_h value manually. Obtain the value from the motor supplier. 3. Use the X_h default setting. The frequency converter establishes the setting on the basis of the motor name plate data.

NOTICE

This parameter cannot be adjusted while running.

1-36 Iron Loss Resistance (Rfe)

Range:		Function:
Application dependent*	[Application dependant]	Enter the equivalent iron loss resistance (R_{Fe}) value to compensate for iron losses in the motor. The R_{Fe} value cannot be found by performing an AMA. The R_{Fe} value is especially important in torque control applications. If R_{Fe} is unknown, leave par. 1-36 Iron Loss Resistance (Rfe) on default setting.

NOTICE
This parameter cannot be adjusted while the motor is running.

1-39 Motor Poles

Range:		Function:
Application dependent*	[2 - 100]	Enter the number of motor poles.

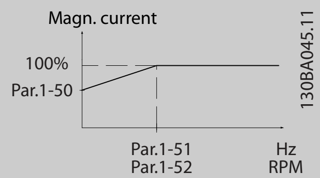
Poles	$\sim n_n$@ 50 Hz	$\sim n_n$@60 Hz
2	2700 - 2880	3250 - 3460
4	1350 - 1450	1625 - 1730
6	700 - 960	840 - 1153

The table shows the number of poles for normal speed ranges of various motor types. Define motors designed for other frequencies separately. The motor pole value is always an even number, because it refers to the total number of poles, not pairs of poles. The frequency converter creates the initial setting of par. 1-39 Motor Poles based on par. 1-23 Motor Frequency *Motor Frequency* and par. 1-25 Motor Nominal Speed *Motor Nominal Speed*.
This parameter cannot be adjusted while the motor is running.

1-5* Load Indep. Setting

1-50 Motor Magnetisation at Zero Speed

Range:		Function:
100 %*	[0 - 300 %]	Use this parameter along with par. 1-51 Min Speed Normal Magnetising [RPM] to obtain a different thermal load on the motor when running at low speed. Enter a value which is a percentage of the rated magnetizing current. If the setting is too low, the torque on the motor shaft may be reduced.



1-51 Min Speed Normal Magnetising [RPM]

Range:		Function:
Application dependent*	[10 - 300 RPM]	Set the required speed for normal magnetising current. If the speed is set lower than the motor slip speed, par. 1-50 Motor Magnetisation at Zero Speed and par. 1-51 Min Speed Normal Magnetising [RPM] are of no significance. Use this parameter along with par. 1-50 Motor Magnetisation at Zero Speed. See drawing for par. 1-50 Motor Magnetisation at Zero Speed.

1-52 Min Speed Normal Magnetising [Hz]

Range:		Function:
Application dependent*	[Application dependant]	Set the required frequency for normal magnetising current. If the frequency is set lower than the motor slip frequency, par. 1-50 Motor Magnetisation at Zero Speed and par. 1-51 Min Speed Normal Magnetising [RPM] are inactive. Use this parameter along with par. 1-50 Motor Magnetisation at Zero Speed. See drawing for par. 1-50 Motor Magnetisation at Zero Speed.

1-58 Flystart Test Pulses Current

Range:		Function:
30 %*	[0 - 200 %]	Control the percentage of the magnetizing current for the pulses used to detect the motor direction. Reducing this value will reduce the generated torque. 100% means nominal motor current. The parameter is active when par. 1-73 Flying Start is enabled. This parameter is only available in VVC^{plus}.

1-59 Flystart Test Pulses Frequency

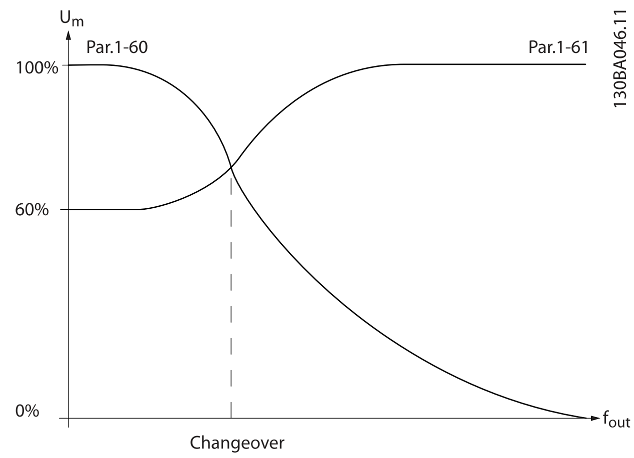
Range:		Function:
200 %*	[0 - 500 %]	Control the percentage of the frequency for the pulses used to detect the motor direction. Increasing this value will reduce the generated torque. 100% means 2 times the slip frequency. The parameter is active when par. 1-73 Flying Start is enabled. This parameter is only available in VVC^{plus}.

1-6* Load Depend. Setting

1-60 Low Speed Load Compensation

Range:		Function:
100 %*	[0 - 300 %]	Enter the % value to compensate voltage in relation to load when the motor is running at low speed and obtain the optimum U/f characteristic. The motor size determines the frequency range within which this parameter is active.

Motor size	Change over
0.25 kW - 7.5 kW	< 10 Hz
11 kW - 45 kW	< 5 Hz
55 kW - 550 kW	< 3-4 Hz



1-61 High Speed Load Compensation

Range:		Function:
100 %*	[0 - 300 %]	Enter the % value to compensate voltage in relation to load when the motor is running at high speed and obtain the optimum U/f characteristic. The motor size determines the frequency range within which this parameter is active.

Motor size	Change-over
0.25 kW - 7.5 kW	> 10 Hz
11 kW - 45 kW	< 5 Hz
55 kW - 550 kW	< 3-4 Hz

1-62 Slip Compensation

Range:		Function:
0 %*	[-500 - 500 %]	Enter the % value for slip compensation, to compensate for tolerances in the value of $n_{M,N}$. Slip compensation is calculated automatically, i.e. on the basis of the rated motor speed $n_{M,N}$.

1-63 Slip Compensation Time Constant

Range:		Function:
Application dependent*	[0.05 - 5.00 s]	Enter the slip compensation reaction speed. A high value results in slow reaction, and a low value results in quick reaction. If low-frequency resonance problems arise, use a longer time setting.

1-64 Resonance Dampening

Range:		Function:
100 %*	[0 - 500 %]	Enter the resonance dampening value. Set par. 1-64 Resonance Dampening and par. 1-65 Resonance Dampening Time Constant to help eliminate high-frequency resonance problems. To reduce resonance oscillation, increase the value of par. 1-64 Resonance Dampening.

1-65 Resonance Dampening Time Constant		
Range:		Function:
5 ms*	[5 - 50 ms]	Set par. 1-64 Resonance Dampening and par. 1-65 Resonance Dampening Time Constant to help eliminate high-frequency resonance problems. Enter the time constant that provides the best dampening.

1-7* Start Adjustments

1-71 Start Delay		
Range:		Function:
0.0 s*	[0.0 - 120.0 s]	The function selected in par. 1-80 Function at Stop is active in the delay period. Enter the time delay required before commencing acceleration.

1-73 Flying Start		
Option:		Function:
		This function makes it possible to catch a motor which is spinning freely due to a mains drop-out. When par. 1-73 Flying Start is enabled, par. 1-71 Start Delay has no function. Search direction for flying start is linked to the setting in par. 4-10 Motor Speed Direction. *Clockwise* [0]: Flying start search in clockwise direction. If not successful, a DC brake is carried out. *Both Directions* [2]: The flying start will first make a search in the direction determined by the last reference (direction). If not finding the speed it will make a search in the other direction. If not successful, a DC brake will be activated in the time set in par. 2-02 DC Braking Time. Start will then take place from 0 Hz.
[0] *	Disabled	Select *Disable* [0] if this function is not required
[1]	Enabled	Select *Enable* [1] to enable the frequency converter to “catch” and control a spinning motor.

1-8* Stop Adjustments

1-80 Function at Stop		
Option:		Function:
		Select the frequency converter function after a stop command or after the speed is ramped down to the settings in par. 1-81 Min Speed for Function at Stop [RPM].
[0] *	Coast	Leaves motor in free mode.
[1]	DC Hold/Motor Preheat	Energizes motor with a DC holding current (see par. 2-00 DC Hold/Preheat Current).

1-81 Min Speed for Function at Stop [RPM]		
Range:		Function:
Application dependent*	[0 - 600 RPM]	Set the speed at which to activate par. 1-80 Function at Stop.

1-82 Min Speed for Function at Stop [Hz]		
Range:		Function:
Application dependent*	[Application dependant]	Set the output frequency at which to activate par. 1-80 Function at Stop.

Trip at Motor Speed Low Limit

In par. 4-11 Motor Speed Low Limit [RPM] and par. 4-12 Motor Speed Low Limit [Hz] it is possible to set a minimum speed for the motor in order to ensure proper oil distribution.
In some cases e.g. if operating in current limit because of a defect in the compressor, the output motor speed can be suppressed below Motor Speed Low Limit. To prevent damage to the compressor it is possible to set trip limit. If the motor speed drops below this limit, the frequency converter will trip and issue an alarm (A49). Reset will take place according to the selected function in par. 14-20 Reset Mode.

If the trip must take place at a rather exact speed (RPM), it is recommended to set par. 0-02 Motor Speed Unit for RPM and use slip compensation, which can be set in par. 1-62 Slip Compensation.

NOTICE

To achieve the highest accuracy with the slip compensation, an Automatic Motor Adaptation (AMA) should be performed. To be enabled in par. 1-29 Automatic Motor Adaptation (AMA).

NOTICE

Trip will not be active when using a normal stop- or coast command.

1-86 Trip Speed Low [RPM]		
Range:		Function:
0 RPM*	[Application dependant]	

NOTICE

This parameter is only available if par. 0-02 Motor Speed Unit is set to [RPM].

1-87 Trip Speed Low [Hz]		
Range:		Function:
0.0 Hz*	[Application dependant]	

NOTICE

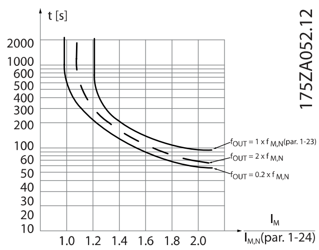
This parameter is only available if par. 0-02 Motor Speed Unit is set to [Hz].

1-9* Motor Temperature

1-90 Motor Thermal Protection

Option:		Function:
		The frequency converter determines the motor temperature for motor protection in two different ways: • Via a thermistor sensor connected to one of the analog or digital inputs (par. 1-93 Thermistor Source). • Via calculation (ETR = Electronic Thermal Relay) of the thermal load, based on the actual load and time. The calculated thermal load is compared with the rated motor current $I_{M,N}$ and the rated motor frequency $f_{M,N}$. The calculations estimate the need for a lower load at lower speed due to less cooling from the fan incorporated in the motor.
[0] *	No protection	If the motor is continuously overloaded and no warning or trip of frequency converter is wanted.
[1]	Thermistor warning	Activates a warning when the connected thermistor in the motor reacts in the event of motor over-temperature.
[2]	Thermistor trip	Stops (trips) the frequency converter when the connected thermistor in the motor reacts in the event of motor over-temperature.
[3]	ETR warning 1	
[4] *	ETR trip 1	
[5]	ETR warning 2	
[6]	ETR trip 2	
[7]	ETR warning 3	
[8]	ETR trip 3	
[9]	ETR warning 4	
[10]	ETR trip 4	

ETR (Electronic Thermal Relay) functions 1-4 will calculate the load when set-up where they were selected is active. For example ETR-3 starts calculating when set-up 3 is selected. For the North American market: The ETR functions provide class 20 motor overload protection in accordance with NEC.



⚠WARNING

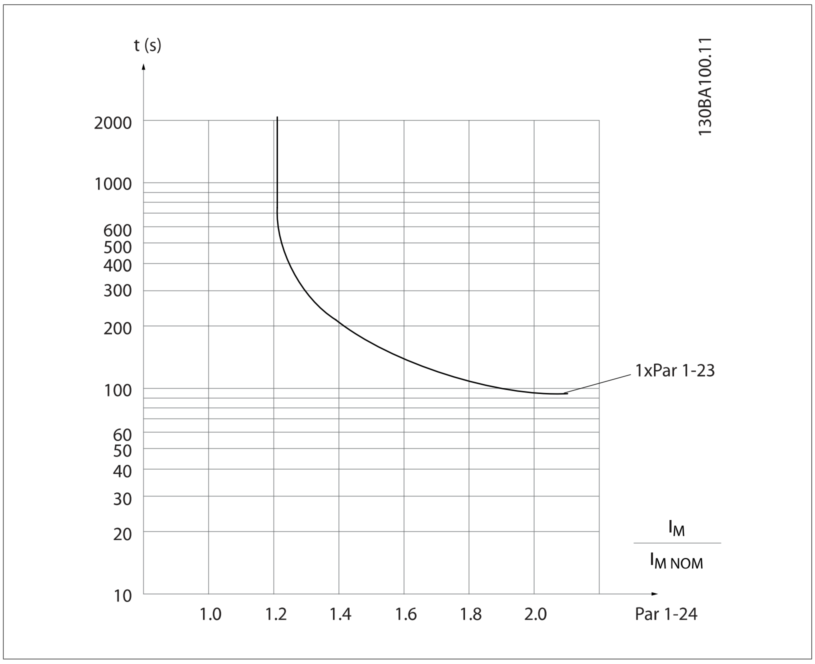
In order to maintain PELV, all connections made to the control terminals must be PELV, e.g. thermistor must be reinforced/ double insulated

NOTICE

Trane recommends using 24 VDC as thermistor supply voltage.

1-91 Motor External Fan

Option:		Function:
[0] *	No	No external fan is required, i.e. the motor is derated at low speed.
[1]	Yes	Applies an external motor fan (external ventilation), so no derating of the motor is required at low speed. The graph below is followed if the motor current is lower than nominal motor current (see par. 1-24 Motor Current). If the motor current exceeds nominal current, the operation time still decreases as if no fan were installed.



1-93 Thermistor Source

Option:		Function:
		Select the input to which the thermistor (PTC sensor) should be connected. An analog input option [1] or [2] cannot be selected if the analog input is already in use as a reference source (selected in par. 3-15 Reference 1 Source, par. 3-16 Reference 2 Source or par. 3-17 Reference 3 Source).
[0] *	None	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Digital input 18	
[4]	Digital input 19	
[5]	Digital input 32	
[6]	Digital input 33	

NOTICE

This parameter cannot be adjusted while the motor is running.

Main Menu - Brakes - Group 2

2-0* DC-Brakes

Par. group for configuring the DC brake and DC hold functions.

2-00 DC Hold/Preheat Current		
Range:		Function:
50 %*	[Application dependant]	Enter a value for holding current as a percentage of the rated motor current $I_{M,N}$ set in par. 1-24 Motor Current. 100% DC holding current corresponds to $I_{M,N}$. This parameter holds the motor (holding torque) or pre-heats the motor. This parameter is active if [1] DC hold/Preheat is selected in par. 1-80 Function at Stop.

NOTICE

The maximum value depends on the rated motor current.
Avoid 100 % current for too long. It may damage the motor.

2-01 DC Brake Current		
Range:		Function:
50 %*	[Application dependant]	Enter a value for current as a percentage of the rated motor current $I_{M,N}$, see par. 1-24 Motor Current. 100% DC braking current corresponds to $I_{M,N}$. DC brake current is applied on a stop command, when the speed is lower than the limit set in par. 2-03 DC Brake Cut In Speed [RPM]; when the DC Brake Inverse function is active; or via the serial communication port. The braking current is active during the time period set in par. 2-02 DC Braking Time.

NOTICE

The maximum value depends on the rated motor current. Avoid 100 % current for too long. It may damage the motor.

2-02 DC Braking Time		
Range:		Function:
10.0 s*	[0.0 - 60.0 s]	Set the duration of the DC braking current set in par. 2-01 DC Brake Current, once activated.

2-03 DC Brake Cut In Speed [RPM]		
Range:		Function:
Application dependent*	[Application dependant]	Set the DC brake cut-in speed for activation of the DC braking current set in par. 2-01 DC Brake Current, upon a stop command.

2-04 DC Brake Cut In Speed [Hz]		
Range:		Function:
Application dependent*	[Application dependant]	This parameter is for setting the DC brake cut in speed at which the DC braking current (par. 2-01) is to be active, in connection with a stop command.

2-13 Brake Power Monitoring

Option:		Function:
		This parameter is only active in frequency converters with an integral dynamic brake. This parameter enables monitoring of the power to the brake resistor. The power is calculated on the basis of the resistance (par. 2-11 Brake Resistor (ohm), the DC link voltage, and the resistor duty time.
[0] *	Off	No brake power monitoring is required.
[1]	Warning	Activates a warning on the display when the power transmitted over 120 s exceeds 100% of the monitoring limit (par. 2-12 Brake Power Limit (kW)). The warning disappears when the transmitted power falls below 80% of the monitoring limit.
[2]	Trip	Trips the frequency converter and displays an alarm when the calculated power exceeds 100% of the monitoring limit.
[3]	Warning and trip	Activates both of the above, including warning, trip and alarm.

If power monitoring is set to *Off* [0] or *Warning* [1], the brake function remains active even if the monitoring limit is exceeded. This may lead to thermal overload of the resistor. It is also possible to generate a warning via a relay/digital output. The measuring accuracy of the power monitoring depends on the accuracy of the resistance of the resistor (better than ± 20%).

2-15 Brake Check

Option:		Function:
		Select type of test and monitoring function to check the connection to the brake resistor, or whether a brake resistor is present, and then display a warning or an alarm in the event of a fault. The brake resistor disconnection function is tested during power-up. However the brake IGBT test is performed when there is no braking. A warning or trip disconnects the brake function. The testing sequence is as follows: 1. The DC link ripple amplitude is measured for 300 ms without braking. 2. The DC link ripple amplitude is measured for 300 ms with the brake turned on. 3. If the DC link ripple amplitude while braking is lower than the DC link ripple amplitude before braking + 1 %. Brake check failed, return a warning or alarm. 4. If the DC link ripple amplitude while braking is higher than the DC link ripple amplitude before braking + 1 %. Brake check OK.
[0] *	Off	Monitors brake resistor and brake IGBT for a short-circuit during operation. If a short-circuit occurs, a warning appears.
[1]	Warning	Monitors brake resistor and brake IGBT for a short-circuit, and to run a test for brake resistor disconnection during power-up
[2]	Trip	Monitors for a short-circuit or disconnection of the brake resistor, or a short-circuit of the brake IGBT. If a fault occurs the frequency converter cuts out while displaying an alarm (trip locked).
[3]	Stop and trip	Monitors for a short-circuit or disconnection of the brake resistor, or a short-circuit of the brake IGBT. If a fault occurs the frequency converter ramps down to coast and then trips. A trip lock alarm is displayed.
[4]	AC brake	

NOTICE

Remove a warning arising in connection with ***Off*** [0] or ***Warning*** [1] by cycling the mains supply. The fault must be corrected first. For ***Off*** [0] or ***Warning*** [1], the frequency converter keeps running even if a fault is located.

2-16 AC brake Max. Current		
Range:		Function:
100.0 %*	[0.0 - 1000.0 %]	Enter the maximum permissible current when using AC brake to avoid overheating of motor windings. The AC brake function is available in Flux mode only.

2-17 Over-voltage Control		
Option:		Function:
		Over-voltage control (OVC) reduces the risk of the frequency converter tripping due to an over voltage on the DC link caused by generative power from the load.
[0]	Disabled	No OVC required.
[2] *	Enabled	Activates OVC.

NOTICE

The ramp time is automatically adjusted to avoid tripping of the frequency converter.

Main Menu - Reference/Ramps - Group 3

3-0* Reference Limits

Parameters for setting the reference unit, limits and ranges.

Please see also parameter group 20-0* for information on settings in closed loop.

3-02 Minimum Reference

Range:		Function:
Application dependent*	[Application dependant]	Enter the Minimum Reference. The Minimum Reference is the lowest value obtainable by summing all references. The Minimum Reference value and unit matches the configuration choice made in par. 1-00 Configuration Mode and par. 20-12 Reference/Feedback Unit, respectively. NOTICE This parameter is used in open loop only.

3-03 Maximum Reference

Range:		Function:
Application dependent*	[Application dependant]	Enter the maximum acceptable value for the remote reference. The Maximum Reference value and unit matches the configuration choice made in par. 1-00 Configuration Mode and par. 20-12 Reference/Feedback Unit, respectively. NOTICE If operating with par. 1-00 Configuration Mode set for Closed Loop [3], par. 20-14 Maximum Reference/Feedb. must be used.

3-04 Reference Function

Option:		Function:
[0] *	Sum	Sums both external and preset reference sources.
[1]	External/Preset	Use either the preset or the external reference source. Shift between external and preset via a command on a digital input.

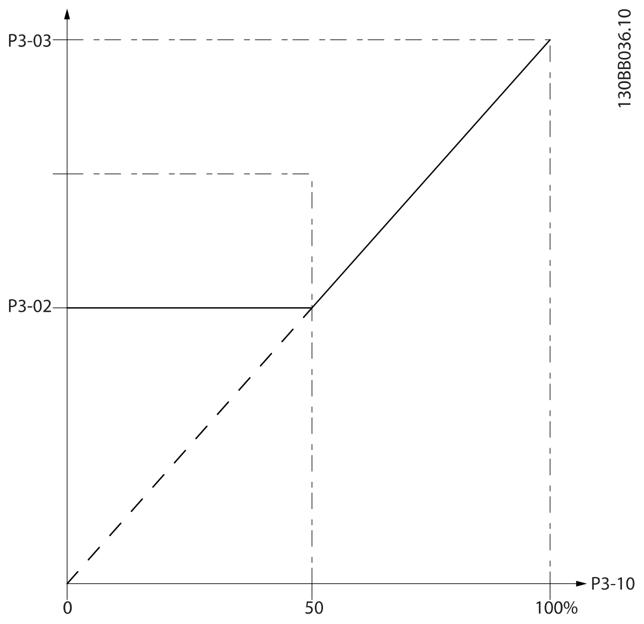
3-1* References

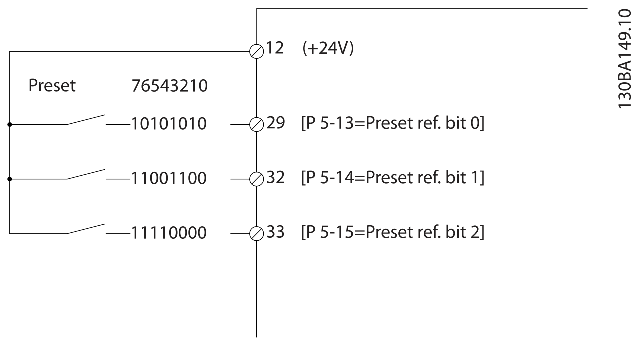
Select the preset reference(s). *Select Preset ref. bit 0 / 1 / 2* [16], [17] or [18] for the corresponding digital inputs in par. group 5-1*.

3-10 Preset Reference

Array [8]

Range:		Function:
0.00 %*	[-100.00 - 100.00 %]	Enter up to eight different preset references (0-7) in this parameter, using array programming. The preset reference is stated as a percentage of the value Ref_{MAX} (par. 3-03 Maximum Reference, for closed loop see par. 20-14 Maximum Reference/Feedb.). When using preset references, select Preset ref. bit 0 / 1 / 2 [16], [17] or [18] for the corresponding digital inputs in parameter group 5-1* Digital Inputs.





3-11 Jog Speed [Hz]

Range:		Function:
Application dependent*	[Application dependant]	The jog speed is a fixed output speed at which the frequency converter is running when the jog function is activated. See also par. 3-80 Jog Ramp Time.

3-13 Reference Site

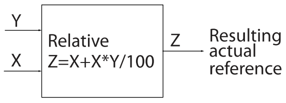
Option:		Function:
		Select which reference site to activate.
[0] *	Linked to Hand / Auto	Use local reference when in Hand mode; or remote reference when in Auto mode.
[1]	Remote	Use remote reference in both Hand mode and Auto mode.
[2]	Local	Use local reference in both Hand mode and Auto mode.

NOTICE

When set to Local [2], the frequency converter will start with this setting again following a 'power down'.

3-14 Preset Relative Reference

Range:		Function:
0.00 %*	[-100.00 - 100.00 %]	The actual reference, X, is increased or decreased with the percentage Y, set in par. 3-14 Preset Relative Reference. This results in the actual reference Z. Actual reference (X) is the sum of the inputs selected in par. 3-15 Reference 1 Source, par. 3-16 Reference 2 Source, par. 3-17 Reference 3 Source and par. 8-02 Control Source.



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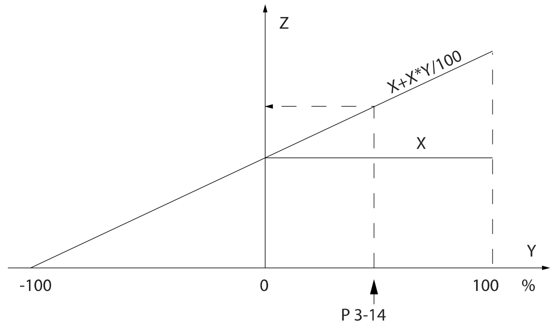

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3-15 Reference 1 Source

Option:		Function:
		Select the reference input to be used for the first reference signal. Par. 3-15 Reference 1 Source, par. 3-16 Reference 2 Source and par. 3-17 Reference 3 Source define up to three different reference signals. The sum of these reference signals defines the actual reference. This parameter cannot be adjusted while the motor is running.
[0]	No function	
[1] *	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

3-16 Reference 2 Source

Option:	Function:
	Select the reference input to be used for the second reference signal. par. 3-15 Reference 1 Source, par. 3-16 Reference 2 Source and par. 3-17 Reference 3 Source define up to three different reference signals. The sum of these reference signals defines the actual reference.

		This parameter cannot be adjusted while the motor is running.
[0]	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20] *	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

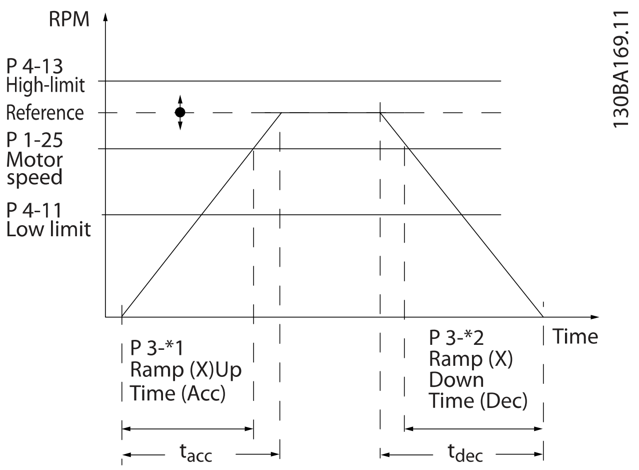
3-17 Reference 3 Source

Option:		Function:
		Select the reference input to be used for the third reference signal. par. 3-15 Reference 1 Source, par. 3-16 Reference 2 Source and par. 3-17 Reference 3 Source define up to three different reference signals. The sum of these reference signals defines the actual reference. This parameter cannot be adjusted while the motor is running.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

3-19 Jog Speed [RPM]		
Range:		Function:
Applica-tion de-pend-ent*	[Application dependant]	Enter a value for the jog speed n_{JOG}, which is a fixed output speed. The frequency converter runs at this speed when the jog function is activated. The maximum limit is defined in par. . See also par. 3-80 Jog Ramp Time.

3-4* Ramp 1

Configure the ramp parameter, ramping times, for each of the two ramps (par. 3-4* and par. 3-5*).



3-40 Ramp 1 Type		
Option:		Function:
		Select the ramp type, depending on requirements for acceleration/de-celeration. A linear ramp will give constant acceleration during ramping. An S-ramp will give non-linear acceleration, compensating for jerk in the applica-tion.
[0] *	Linear	
[1]	S-ramp Const Jerk	Acceleration with lowest possible jerk.
[2]	S-ramp Const Time	S-ramp based on the values set in par. 3-41 Ramp 1 Ramp Up Time and par. 3-42 Ramp 1 Ramp Down Time.

NOTICE

If S-ramp [1] is selected and the reference during ramping is changed the ramp time may be prolonged in order to realize a jerk free movement which may result in a longer start or stop time.
Additional adjustment of the S-ramp ratios or switching initiators may be necessary.

3-41 Ramp 1 Ramp up Time		
Range:		Function:
Application dependent*	[Application dependant]	Enter the ramp-up time, i.e. the acceleration time from 0 RPM to par. 1-25 Motor Nominal Speed. Choose a ramp-up time such that the output current does not exceed the current limit in par. 4-18 Current Limit during ramping. See ramp-down time in par. 3-42 Ramp 1 Ramp Down Time.

$$par.3-41 = \frac{tacc \times nnorm\,[\,par.1-25\,]}{ref\,[\,rpm\,]}[\,s\,]$$

3-42 Ramp 1 Ramp Down Time		
Range:		Function:
Application dependent*	[Application dependant]	Enter the ramp-down time, i.e. the deceleration time from par. 1-25 Motor Nominal Speed to 0 RPM. Choose a ramp-down time such that no overvoltage arises in the inverter due to regenerative operation of the motor, and such that the generated current does not exceed the current limit set in par. 4-18 Current Limit. See ramp-up time in par. 3-41 Ramp 1 Ramp up Time.

$$par.3-42 = \frac{tdec \times nnorm\,[\,par.1-25\,]}{ref\,[\,rpm\,]}[\,s\,]$$

3-45 Ramp 1 S-ramp Ratio at Accel. Start		
Range:		Function:
50 %*	[Application dependant]	Enter the proportion of the total ramp-up time (par. 3-41 Ramp 1 Ramp Up Time) in which the acceleration torque increases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks occurring in the application.

3-46 Ramp 1 S-ramp Ratio at Accel. End		
Range:		Function:
50 %*	[Application dependant]	Enter the proportion of the total ramp-up time (par. 3-41 Ramp 1 Ramp Up Time) in which the acceleration torque decreases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-47 Ramp 1 S-ramp Ratio at Decel. Start		
Range:		Function:
50 %*	[Application dependant]	Enter the proportion of the total ramp-down time (par. 3-42 Ramp 1 Ramp Down Time) where the deceleration torque increases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-48 Ramp 1 S-ramp Ratio at Decel. End		
Range:		Function:
50 %*	[Application dependant]	Enter the proportion of the total ramp-down time (par. 3-42 Ramp 1 Ramp Down Time) where the deceleration torque decreases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-5* Ramp 2

Choosing ramp parameters, see 3-4*.

3-51 Ramp 2 Ramp up Time

Range:		Function:
Application dependent*	[Application dependant]	Enter the ramp-up time, i.e. the acceleration time from 0 RPM to par. 1-25 Motor Nominal Speed. Choose a ramp-up time such that the output current does not exceed the current limit in par. 4-18 Current Limit during ramping. See ramp-down time in par. 3-52 Ramp 2 Ramp down Time. $$par.\ 3-51 = \frac{tacc \times nnorm\,[par.\ 1-25]}{ref\,[rpm]}\,[s]$$

3-52 Ramp 2 Ramp down Time

Range:		Function:
Application dependent*	[Application dependant]	Enter the ramp-down time, i.e. the deceleration time from par. 1-25 Motor Nominal Speed to 0 RPM. Choose a ramp-down time such that no overvoltage arises in the inverter due to regenerative operation of the motor, and such that the generated current does not exceed the current limit set in par. 4-18 Current Limit. See ramp-up time in par. 3-51 Ramp 2 Ramp up Time. $$par.3-52 = \frac{tdec \times nnorm\,[par.\ 1-25]}{ref\,[rpm]}\,[s]$$

3-55 Ramp 2 S-ramp Ratio at Accel. Start

Range:		Function:
50 %*	[1 - 99. %]	Enter the proportion of the total ramp-up time (par. 3-51 Ramp 2 Ramp Up Time) in which the acceleration torque increases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-56 Ramp 2 S-ramp Ratio at Accel. End

Range:		Function:
50 %*	[1 - 99. %]	Enter the proportion of the total ramp-up time (par. 3-51 Ramp 2 Ramp Up Time) in which the acceleration torque decreases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-57 Ramp 2 S-ramp Ratio at Decel. Start

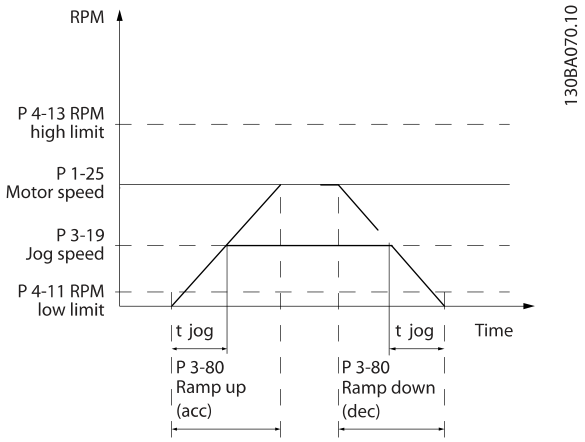
Range:		Function:
50 %*	[1 - 99. %]	Enter the proportion of the total ramp-down time (par. 3-52 Ramp 2 Ramp Down Time) where the deceleration torque increases The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-58 Ramp 2 S-ramp Ratio at Decel. End

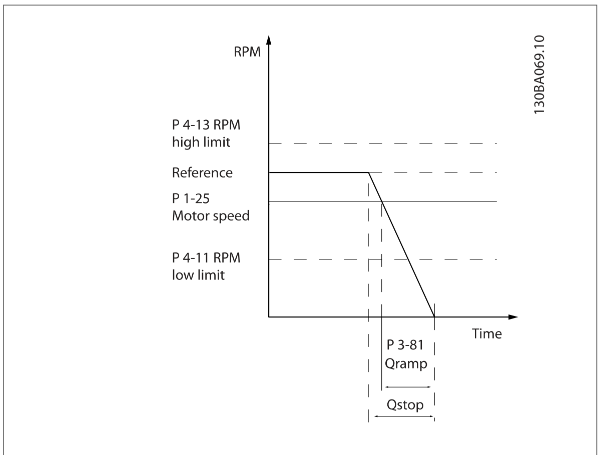
Range:		Function:
50 %*	[1 - 99. %]	Enter the proportion of the total ramp-down time (par. 3-52 Ramp 2 Ramp Down Time) where the deceleration torque decreases. The larger the percentage value, the greater the jerk compensation achieved, and thus the lower the torque jerks in the application.

3-8* Other Ramps

3-80 Jog Ramp Time		
Range:		Function:
Application dependent*	[1.00 - 3600.00 s]	Enter the jog ramp time, i.e. the acceleration/deceleration time between 0 RPM and the rated motor speed ($n_{M,N}$) (set in par. 1-25 Motor Nominal Speed). Ensure that the resultant output current required for the given jog ramp time does not exceed the current limit in par. 4-18 Current Limit. The jog ramp time starts upon activation of a jog signal via the control panel, a selected digital input, or the serial communication port. $par.\ 3-80 =$ $\frac{tjog \times nnorm\,[par.\ 1-25]}{jog\ speed\,[par.\ 3-19]}\,[s]$



3-81 Quick Stop Ramp Time		
Range:		Function:
Size related*	[1.00 - 3600.00 s]	Enter the quick–stop ramp-down time, i.e. the deceleration time from the synchronous motor speed to 0 RPM. Ensure that no resultant over-voltage will arise in the inverter due to regenerative operation of the motor required to achieve the given ramp-down time. Ensure also that the generated current required to achieve the given ramp-down time does not exceed the current limit (set in par. 4-18 Current Limit). Quick-stop is activated by means of a signal on a selected digital input, or via the serial communication port.



$$Par.\ 3-81 = \frac{t_{Qstop}\,[s]\ x\ n_s\,[RPM]}{\Delta\ jog\ ref\,(par.\ 3\ -\ 19)\,[RPM]}$$

3-9* Digital Pot.Meter

The digital potentiometer function allows the user to increase or decrease the actual reference by adjusting the set-up of the digital inputs using the functions INCREASE, DECREASE or CLEAR. To activate the function, at least one digital input must be set up to INCREASE or DECREASE.

3-90 Step Size		
Range:		Function:
0.10 %*	[0.01 - 200.00 %]	Enter the increment size required for INCREASE/DECREASE, as a percentage of the synchronous motor speed, n_s. If INCREASE/ DECREASE is activated the resulting reference will be increased / decreased by the amount set in this parameter.

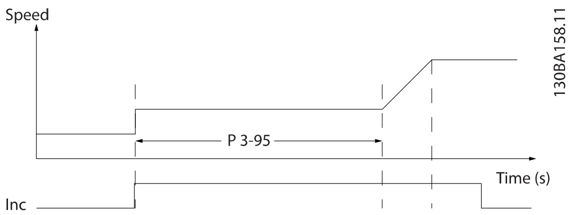
3-91 Ramp Time		
Range:		Function:
1.00 s	[0.00 - 3600.00 s]	Enter the ramp time, i.e. the time for adjustment of the reference from 0% to 100% of the specified digital potentiometer function (INCREASE, DECREASE or CLEAR). If INCREASE / DECREASE is activated for longer than the ramp delay period specified in par. 3-95 Ramp Delay the actual reference will be ramped up / down according to this ramp time. The ramp time is defined as the time used to adjust the reference by the step size specified in par. 3-90 Step Size.

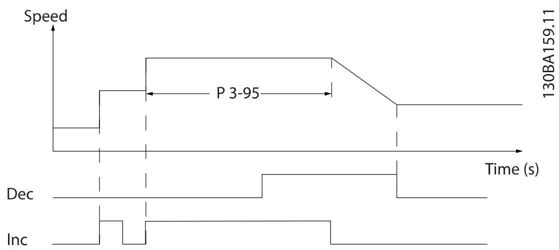
3-92 Power Restore		
Option:		Function:
[0] *	Off	Resets the Digital Potentiometer reference to 0% after power up.
[1]	On	Restores the most recent Digital Potentiometer reference at power up.

3-93 Maximum Limit		
Range:		Function:
100 %*	[-200 - 200 %]	Set the maximum permissible value for the resultant reference. This is advisable if the Digital Potentiometer is used for fine tuning of the resulting reference.

3-94 Minimum Limit		
Range:		Function:
0 %*	[-200 - 200 %]	Set the minimum permissible value for the resultant reference. This is advisable if the Digital Potentiometer is used for fine tuning of the resulting reference.

3-95 Ramp Delay		
Range:		Function:
Application dependent*	[Application dependant]	Enter the delay required from activation of the digital potentiometer function until the frequency converter starts to ramp the reference. With a delay of 0 ms, the reference starts to ramp as soon as INCREASE / DECREASE is activated. See also par. 3-91 Ramp Time.





Main Menu - Limits/Warnings - Group 4

4-1* Motor Limits

Define torque, current and speed limits for the motor, and the reaction of the frequency converter when the limits are exceeded.
A limit may generate a message on the display. A warning will always generate a message on the display or on the fieldbus. A monitoring function may initiate a warning or a trip, upon which the frequency converter will stop and generate an alarm message.

4-10 Motor Speed Direction		
Option:		Function:
		Selects the motor speed direction required. Use this parameter to prevent unwanted reversing.
[0]	Clockwise	Only operation in clockwise direction will be allowed.
[2] *	Both directions	Operation in both clockwise and anti-clockwise direction will be allowed.

NOTICE

The setting in par. 4-10 Motor Speed Direction has impact on the Flying Start in par. 1-73 Flying Start.

4-11 Motor Speed Low Limit [RPM]		
Range:		Function:
Applica-tion de-pend-ent*	[Application dependant]	Enter the minimum limit for motor speed. The Motor Speed Low Limit can be set to correspond to the manufacturer's recommended minimum motor speed. The Motor Speed Low Limit must not exceed the setting in par. 4-13 Motor Speed High Limit [RPM].

4-12 Motor Speed Low Limit [Hz]		
Range:		Function:
Applica-tion de-pend-ent*	[Application dependant]	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 par. 4-14 Motor Speed High Limit [Hz].

4-13 Motor Speed High Limit [RPM]		
Range:		Function:
Applica-tion de-pend-ent*	[Application dependant]	Enter the maximum limit for motor speed. The Motor Speed High Limit can be set to correspond to the manufacturer's maximum rated motor. The Motor Speed High Limit must exceed the setting in par. 4-11 Motor Speed Low Limit [RPM]. Only par. 4-11 Motor Speed Low Limit [RPM] or par. 4-12 Motor Speed Low Limit [Hz] will be displayed depending on other parameters in the Main Menu and depending on default settings dependant on global location.

NOTICE

Max. output frequency cannot exceed 10% of the inverter switching frequency (par. 14-01 Switching Frequency).

NOTICE

Any changes in par. 4-13 Motor Speed High Limit [RPM] will reset the value in par. 4-53 Warning Speed High to the same value as set in par. 4-13 Motor Speed High Limit [RPM].

4-14 Motor Speed High Limit [Hz]		
Range:		Function:
Application dependent*	[Application dependant]	Enter the maximum limit for motor speed. The Motor Speed High Limit can be set to correspond to the manufacturer's recommended maximum of the motor shaft. The Motor Speed High Limit must exceed the in par. 4-12 Motor Speed Low Limit [Hz]. Only par. 4-11 Motor Speed Low Limit [RPM] or par. 4-12 Motor Speed Low Limit [Hz] will be displayed depending on other parameters in the Main Menu and depending on default settings dependant on global location.

NOTICE

Max. output frequency cannot exceed 10% of the inverter switching frequency (par. 14-01 Switching Frequency).

4-16 Torque Limit Motor Mode		
Range:		Function:
110.0 %*	[Application dependant]	Enter the maximum torque limit for motor operation. The torque limit is active in the speed range up to and including the rated motor speed set in par. 1-25 Motor Nominal Speed. To protect the motor from reaching the stalling torque, the default setting is 1.1 x the rated motor torque (calculated value). See also par. 14-25 Trip Delay at Torque Limit for further details. If a setting in par. 1-00 Configuration Mode to par. 1-28 Motor Rotation Check is changed, par. 4-16 Torque Limit Motor Mode is not automatically reset to the default setting.

4-17 Torque Limit Generator Mode		
Range:		Function:
100.0 %*	[Application dependant]	Enter the maximum torque limit for generator mode operation. The torque limit is active in the speed range up to and including the rated motor speed (par. 1-25 Motor Nominal Speed). Refer to par. 14-25 Trip Delay at Torque Limit for further details. If a setting in par. 1-00 Configuration Mode to par. 1-28 Motor Rotation Check is changed, par. 4-17 Torque Limit Generator Mode is not automatically reset to the default settings.

4-18 Current Limit		
Range:		Function:
Application dependent*	[Application dependant]	Enter the current limit for motor and generator operation. To protect the motor from reaching the stalling torque, the default setting is 1.1 x the rated motor current (set in par. 1-24 Motor Current). If a setting in par. 1-00 Configuration Mode to par. 1-28 Motor Rotation Check is changed, par. 4-16 Torque Limit Motor Mode to par. 4-18 Current Limit are not automatically reset to the default settings.

4-19 Max Output Frequency		
Range:		Function:
Application dependent*	[1.0 - 1000.0 Hz]	Enter the maximum output frequency value. Par. 4-19 Max Output Frequency specifies the absolute limit on the frequency converter 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 par. 1-00 Configuration Mode. This parameter cannot be adjusted while the motor is running.

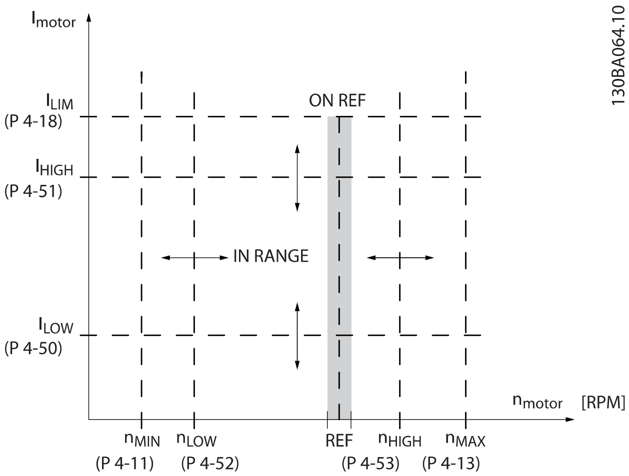
4-5* Adj. Warnings

Define adjustable warning limits for current, speed, reference and feedback.

NOTICE

Not visible in display, only in Trane Drive Utility.

Warnings are shown on display, programmed output or serial bus.



4-50 Warning Current Low		
Range:		Function:
0.00 A*	[Application dependant]	Enter the I_{LOW} value. When the motor current falls below this limit (I_{LOW}), the display reads CURRENT LOW. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02. Refer to the drawing in this section.

4-51 Warning Current High		
Range:		Function:
Application dependent*	[Application dependant]	Enter the I_{HIGH} value. When the motor current exceeds this limit (I_{HIGH}), the display reads CURRENT HIGH. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02. Refer to the drawing in this section.

4-52 Warning Speed Low		
Range:		Function:
0 RPM*	[Application dependant]	

4-53 Warning Speed High

Range:		Function:
Application dependent*	[Application dependant]	Enter the n_{HIGH} value. When the motor speed exceeds this limit (n_{HIGH}), the display reads SPEED HIGH. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02. Programme the upper signal limit of the motor speed, n_{HIGH}, within the normal working range of the frequency converter. Refer to the drawing in this section.

NOTICE

Any changes in par. 4-13 Motor Speed High Limit [RPM] will reset the value in par. 4-53 Warning Speed High to the same value as set in par. 4-13 Motor Speed High Limit [RPM].
If a different value is needed in par. 4-53 Warning Speed High, it must be set after programming of par. 4-13 Motor Speed High Limit [RPM]

4-54 Warning Reference Low

Range:		Function:
-999999.999*	[Application dependant]	Enter the lower reference limit. When the actual reference falls below this limit, the display indicates Ref Low. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02.

4-55 Warning Reference High

Range:		Function:
999999.999*	[Application dependant]	Enter the upper reference limit. When the actual reference exceeds this limit, the display reads Ref High. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02.

4-56 Warning Feedback Low

Range:		Function:
-999999.999 ProcessCtrlUnit*	[Application dependant]	Enter the lower feedback limit. When the feedback falls below this limit, the display reads Feedb Low. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02.

4-57 Warning Feedback High

Range:		Function:
999999.999 ProcessCtrlUnit*	[Application dependant]	Enter the upper feedback limit. When the feedback exceeds this limit, the display reads Feedb High. The signal outputs can be programmed to produce a status signal on terminal 27 or 29 and on relay output 01 or 02.

4-58 Missing Motor Phase Function		
Option:		Function:
		Displays an alarm in the event of a missing motor phase.
[0]	Disabled	No alarm is displayed if a missing motor phase occurs.
[2] *	Trip 1000 ms	

NOTICE
This parameter cannot be adjusted while the motor is running.

4-6* Speed Bypass

Some systems call for avoiding certain output frequencies or speeds, due to resonance problems in the system. A maximum of four frequency or speed ranges can be avoided.

4-60 Bypass Speed From [RPM]		
Array [4]		
Range:		Function:
Application dependent*	[Application dependant]	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.

4-61 Bypass Speed From [Hz]		
Array [4]		
Range:		Function:
Application dependent*	[Application dependant]	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.

4-62 Bypass Speed To [RPM]		
Array [4]		
Range:		Function:
Application dependent*	[Application dependant]	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.

4-63 Bypass Speed To [Hz]		
Array [4]		
Range:		Function:
Application dependent*	[Application dependant]	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.

Semi-Automatic Bypass Speed Set-up

The Semi-Automatic Bypass Speed Setup can be used to facilitate the programming of the frequencies to be skipped due to resonances in the system.

The following process is to be carried out:

1. Stop the motor.
2. Select Enabled in par. 4-64 Semi-Auto Bypass Set-up.
3. Press *Hand On* on the keypad to start the search for frequency bands causing resonances. The motor will ramp up according to the ramp set.
4. When sweeping through a resonance band, press *OK* on the keypad when leaving the band. The actual frequency will be stored as the first element in par. 4-62 Bypass Speed To [RPM] or par. 4-63 Bypass Speed To [Hz] (array). Repeat this for each resonance band identified at the ramp-up (maximum four can be adjusted).
5. When maximum speed has been reached, the motor will automatically begin to ramp-down. Repeat the above procedure when speed is leaving the resonance bands during the deceleration. The actual frequencies registered when pressing *OK* will be stored in par. 4-60 Bypass Speed From [RPM] or par. 4-61 Bypass Speed From [Hz].
6. When the motor has ramped down to stop, press *OK*. The par. 4-64 Semi-Auto Bypass Set-up will automatically reset to Off. The frequency converter will stay in *Hand* mode until *Off* or *Auto On* are pressed on the keypad.

If the frequencies for a certain resonance band are not registered in the right order (frequency values stored in *By Pass Speed To* are higher than those in *By Pass Speed From*) or if they do not have the same numbers of registrations for the *By Pass From* and *By Pass To*, all registrations will be cancelled and the following message is displayed: *Collected speed areas overlapping or not completely determined. Press [Cancel] to abort*.

4-64 Semi-Auto Bypass Set-up		
Option:		Function:
[0] *	Off	No function
[1]	Enabled	Starts the Semi-Automatic Bypass set-up and continue with the procedure described above.

Main Menu - Digital In/Out - Group 5

5-0* Digital I/O Mode

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

These parameters cannot be adjusted while motor is running.

5-01 Terminal 27 Mode		
Option:		Function:
[0] *	Input	Defines terminal 27 as a digital input.
[1]	Output	Defines terminal 27 as a digital output.

5-02 Terminal 29 Mode		
Option:		Function:
[0] *	Input	Defines terminal 29 as a digital input.
[1]	Output	Defines terminal 29 as a digital output.

This parameter cannot be adjusted while the motor is running.

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 frequency converter. All digital inputs can be set to the following functions:

Digital input function	Select	Terminal
No operation	[0]	All *terminal 19, 32, 33
Reset	[1]	All
Coast inverse	[2]	27
Coast and reset inverse	[3]	All
DC-brake inverse	[5]	All
Stop inverse	[6]	All
External interlock	[7]	All
Start	[8]	All *terminal 18
Latched start	[9]	All
Reversing	[10]	All
Start reversing	[11]	All
Jog	[14]	All *terminal 29
Preset reference on	[15]	All
Preset ref bit 0	[16]	All
Preset ref bit 1	[17]	All
Preset ref bit 2	[18]	All
Freeze reference	[19]	All
Freeze output	[20]	All
Speed up	[21]	All
Speed down	[22]	All
Set-up select bit 0	[23]	All
Set-up select bit 1	[24]	All
Pulse input	[32]	terminal 29, 33
Ramp bit 0	[34]	All
Mains failure inverse	[36]	All
Fire mode	[37]	All
Run Permissive	[52]	All
Hand start	[53]	All
Auto start	[54]	All
DigiPot Increase	[55]	All
DigiPot Decrease	[56]	All
DigiPot Clear	[57]	All
Counter A (up)	[60]	29, 33
Counter A (down)	[61]	29, 33
Reset Counter A	[62]	All
Counter B (up)	[63]	29, 33
Counter B (down)	[64]	29, 33
Reset Counter B	[65]	All
Sleep Mode	[66]	All
Reset Maintenance Word	[78]	All
Lead Pump Start	[120]	All
Lead Pump Alternation	[121]	All
Pump 1 Interlock	[130]	All
Pump 2 Interlock	[131]	All
Pump 3 Interlock	[132]	All

Digital Inputs, 5-1* continued

All = Terminals 18, 19, 27, 29, 32, 33, X30/2, X30/3, X30/4. X30/ are the terminals on MCB 101.

Functions dedicated to only one digital input are stated in the associated parameter.

All digital inputs can be programmed to these functions:

[0]	No operation	No reaction to signals transmitted to terminal.
[1]	Reset	Resets frequency converter after a TRIP/ALARM. Not all alarms can be reset.
[2]	Coast inverse	Leaves motor in free mode. Logic '0' => coasting stop. (Default Digital input 27): Coasting stop, inverted input (NC).
[3]	Coast and reset inverse	Reset and coasting stop Inverted input (NC). Leaves motor in free mode and resets the frequency converter. Logic '0' => coasting stop and reset.
[5]	DC-brake inverse	Inverted input for DC braking (NC). Stops motor by energizing it with a DC current for a certain time period. See par. 2-01 DC Brake Current to par. 2-03 DC Brake Cut In Speed [RPM]. The function is only active when the value in par. 2-02 DC Braking Time is different from 0. Logic '0' => DC braking.
[6]	Stop inverse	Stop Inverted function. Generates a stop function when the selected terminal goes from logical level '1' to '0'. The stop is performed according to the selected ramp time (par. 3-42 Ramp 1 Ramp Down Time, par. 3-52 Ramp 2 Ramp down Time, par. 3-62 Ramp 3 Ramp down Time, par. 3-72 Ramp 4 Ramp Down Time). NOTE: When the frequency converter is at the torque limit and has received a stop command, it may not stop by itself. To ensure that the frequency converter stops, configure a digital output to *Torque limit & stop* [27] and connect this digital output to a digital input that is configured as coast.
[7]	External Interlock	Same function as Coasting stop, inverse, but External Interlock generates the alarm message 'external fault' on the display when the terminal which is programmed for Coast Inverse is logic '0'. The alarm message will also be active via digital outputs and relay outputs, if programmed for External Interlock. The alarm can be reset using a digital input or the [RESET] key if the cause for the External Interlock has been removed. A delay can be programmed in par. 22-00 External Interlock Delay, External Interlock Time. After applying a signal to the input, the reaction described above will be delayed with the time set in par. 22-00 External Interlock Delay.
[8]	Start	Select start for a start/stop command. Logic '1' = start, logic '0' = stop. (Default Digital input 18)
[9]	Latched start	Motor starts, if a pulse is applied for min. 2 ms. Motor stops when Stop inverse is activated
[10]	Reversing	Changes direction of motor shaft rotation. Select Logic '1' to reverse. The reversing signal only changes the direction of rotation. It does not activate the start function. Select both directions in par. 4-10 Motor Speed Direction. (Default Digital input 19).
[11]	Start reversing	Used for start/stop and for reversing on the same wire. Signals on start are not allowed at the same time.
[14]	Jog	Used for activating jog speed. See par. 3-11 Jog Speed [Hz]. (Default Digital input 29)

[15]	Preset reference on	Used for shifting between external reference and preset reference. It is assumed that *External/preset* [1] has been selected in par. 3-04 Reference Function. Logic '0' = external reference active; logic '1' = one of the eight preset references is active.
[16]	Preset ref bit 0	Enables a choice between one of the eight preset references according to the table below.
[17]	Preset ref bit 1	Enables a choice between one of the eight preset references according to the table below.
[18]	Preset ref bit 2	Enables a choice between one of the eight preset references according to the table below.

Preset ref. bit	2	1	0
Preset ref. 0	0	0	0
Preset ref. 1	0	0	1
Preset ref. 2	0	1	0
Preset ref. 3	0	1	1
Preset ref. 4	1	0	0
Preset ref. 5	1	0	1
Preset ref. 6	1	1	0
Preset ref. 7	1	1	1

[19]	Freeze ref	Freezes actual reference. The frozen reference is now the point of enable/ condition for Speed up and Speed down to be used. If Speed up/down is used, the speed change always follows ramp 2 (par. 3-51 Ramp 2 Ramp up Time and par. 3-52 Ramp 2 Ramp down Time) in the range 0 - par. 3-03 Maximum Reference. (For closed loop see par. 20-14 Maximum Reference/Feedb.).
[20]	Freeze output	Freezes actual motor frequency (Hz). The frozen motor frequency is now the point of enable/condition for Speed up and Speed down to be used. If Speed up/down is used, the speed change always follows ramp 2 (par. 3-51 Ramp 2 Ramp up Time and par. 3-52 Ramp 2 Ramp down Time) in the range 0 - par. 1-23 Motor Frequency. NOTE: When Freeze output is active, the frequency converter cannot be stopped via a low 'start [13]' signal. Stop the frequency converter via a terminal programmed for Coasting inverse [2] or Coast and reset, inverse [3].
[21]	Speed up	For digital control of the up/down speed is desired (motor potentiometer). Activate this function by selecting either Freeze reference or Freeze output. When Speed up is activated for less than 400 msec. the resulting reference will be increased by 0.1 %. If Speed up is activated for more than 400 msec. the resulting reference will ramp according to Ramp 1 in par. 3-41 Ramp 1 Ramp up Time.
[22]	Speed down	Same as Speed up [21].
[23]	Set-up select bit 0	Selects one of the four set-ups. Set par. 0-10 to Multi Set-up.
[24]	Set-up select bit 1	Same as Set-up select bit 0 [23]. (Default Digital input 32)
[32]	Pulse input	Select Pulse input when using a pulse sequence as either reference or feedback. Scaling is done in parameter group 5-5*.
[34]	Ramp bit 0	Select which ramp to use. Logic "0" will select ramp 1 while logic "1" will select ramp 2.
[36]	Mains failure inverse	Select to activate function selected in par. 14-10 Mains Failure. Mains failure is active in the Logic "0" situation.
[37]	Fire mode	A signal applied will put the frequency converter into Fire Mode and all other commands will be disregarded. See 24-0* *Fire Mode*.

[52]	Run Permissive	The input terminal, for which the Run permissive has been programmed must be logic "1" before a start command can be accepted. Run permissive has a logic 'AND' function related to the terminal which is programmed for *START* [8], *Jog* [14] or *Freeze Output* [20], which means that in order to start running the motor, both conditions must be fulfilled. If Run Permissive is programmed on multiple terminals, Run permissive needs only be logic '1' on one of the terminals for the function to be carried out. The digital output signal for Run Request (*Start* [8], *Jog* [14] or *Freeze output* [20]) programmed in par. 5-3*, or par. 5-4*, will not be affected by Run Permissive. NOTE: If no Run Permissive signal is applied but either Run, Jog or Freeze commands is activated, the status line in the display will show either Run Requested, Jog Requested or Freeze Requested.
[53]	Hand start	A signal applied will put the frequency converter into Hand mode as if button *Hand On* on the keypad has been pressed and a normal stop command will be overridden. If disconnecting the signal, the motor will stop. To make any other start commands valid, another digital input must be assign to *Auto Start* and a signal applied to this. The *Hand On* and *Auto On* buttons on the keypad has no impact. The *Off* button on the keypad will override *Hand Start* and *Auto Start*. Press either the *Hand On* or *Auto On* button to make *Hand Start* and *Auto Start* active again. If no signal on neither *Hand Start* nor *Auto Start*, the motor will stop regardless of any normal Start command applied. If signal applied to both *Hand Start* and *Auto Start*, the function will be *Auto Start*. If pressing the *Off* button on the keypad the motor will stop regardless of signals on *Hand Start* and *Auto Start*.
[54]	Auto start	A signal applied will put the frequency converter into Auto mode as if the keypad button *Auto On* has been pressed. See also *Hand Start* [53]
[55]	DigiPot Increase	Uses the input as an INCREASE signal to the Digital Potentiometer function described in parameter group 3-9*
[56]	DigiPot Decrease	Uses the input as a DECREASE signal to the Digital Potentiometer function described in parameter group 3-9*
[57]	DigiPot Clear	Uses the input to CLEAR the Digital Potentiometer reference described in parameter group 3-9*
[60]	Counter A (up)	(Terminal 29 or 33 only) Input for increment counting in the SLC counter.
[61]	Counter A (down)	(Terminal 29 or 33 only) Input for decrement counting in the SLC counter.
[62]	Reset Counter A	Input for reset of counter A.
[63]	Counter B (up)	(Terminal 29 and 33 only) Input for increment counting in the SLC counter.
[64]	Counter B (down)	(Terminal 29 and 33 only) Input for decrement counting in the SLC counter.
[65]	Reset Counter B	Input for reset of counter B.
[66]	Sleep Mode	Forces frequency converter into Sleep Mode (see par. 22-4*). Reacts on the rising edge of signal applied!
[78]	Reset Preventive Maintenance Word	Resets all data in par. 16-96 Maintenance Word to 0.

5-10 Terminal 18 Digital Input

Option:		Function:
[0]	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inv	

[5]	DC-brake inverse
[6]	Stop inverse
[7]	External interlock
[8] *	Start
[9]	Latched start
[10]	Reversing
[11]	Start reversing
[14]	Jog
[15]	Preset reference on
[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
[24]	Set-up select bit 1
[34]	Ramp bit 0
[36]	Mains failure inverse
[37]	Fire Mode
[52]	Run permissive
[53]	Hand start
[54]	Auto start
[55]	DigiPot increase
[56]	DigiPot decrease
[57]	DigiPot clear
[62]	Reset Counter A
[65]	Reset Counter B
[66]	Sleep Mode
[67]	No Flow
[68]	Timed Actions Disabled
[69]	Constant OFF Actions
[70]	Constant ON Actions
[78]	Reset Maint. Word

5-11 Terminal 19 Digital Input

Same options and functions as 5-1*, except for *Pulse input*.

Option:		Function:
[0] *	No operation	

5-12 Terminal 27 Digital Input

Option:		Function:
[2] *	Coast inverse	Functions are described under 5-1* *Digital Inputs*

5-13 Terminal 29 Digital Input

Option:		Function:
		Select the function from the available digital input range and the additional options [60], [61], [63] and [64]. Counters are used in Smart Logic Control functions.This parameter is available for FC 302 only.
[14] *	Jog	Functions are described under 5-1* *Digital Inputs*

5-13 Terminal 29 Digital Input

Option:		Function:
[0]	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inv	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14] *	Jog	
[15]	Preset reference on	
[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	
[24]	Set-up select bit 1	
[30]	Counter input	
[32]	Pulse input	
[34]	Ramp bit 0	
[36]	Mains failure inverse	
[37]	Fire Mode	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[55]	DigiPot increase	
[56]	DigiPot decrease	
[57]	DigiPot clear	
[60]	Counter A (up)	
[61]	Counter A (down)	
[62]	Reset Counter A	
[63]	Counter B (up)	
[64]	Counter B (down)	

[65]	Reset Counter B
[66]	Sleep Mode
[67]	No Flow
[68]	Timed Actions Disabled
[69]	Constant OFF Actions
[70]	Constant ON Actions
[78]	Reset Maint. Word

5-14 Terminal 32 Digital Input

Option:	Function:
[0] *	No operation
[1]	Reset
[2]	Coast inverse
[3]	Coast and reset inv
[5]	DC-brake inverse
[6]	Stop inverse
[7]	External interlock
[8]	Start
[9]	Latched start
[10]	Reversing
[11]	Start reversing
[14]	Jog
[15]	Preset reference on
[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
[24]	Set-up select bit 1
[34]	Ramp bit 0
[36]	Mains failure inverse
[37]	Fire Mode
[52]	Run permissive
[53]	Hand start
[54]	Auto start
[55]	DigiPot increase
[56]	DigiPot decrease
[57]	DigiPot clear
[62]	Reset Counter A
[65]	Reset Counter B
[66]	Sleep Mode
[67]	No Flow
[68]	Timed Actions Disabled
[69]	Constant OFF Actions

[70]	Constant ON Actions
[78]	Reset Maint. Word

5-15 Terminal 33 Digital Input

Option:		Function:
[0] *	No Operation	Same options and functions as par. 5-1* *Digital Inputs*.

5-16 Terminal X30/2 Digital Input

Option:		Function:
[0] *	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inv	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[15]	Preset reference on	
[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	
[24]	Set-up select bit 1	
[34]	Ramp bit 0	
[36]	Mains failure inverse	
[37]	Fire Mode	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[55]	DigiPot increase	
[56]	DigiPot decrease	
[57]	DigiPot clear	
[62]	Reset Counter A	
[65]	Reset Counter B	
[66]	Sleep Mode	
[67]	No Flow	
[68]	Timed Actions Disabled	
[69]	Constant OFF Actions	
[70]	Constant ON Actions	
[78]	Reset Maint. Word	

5-17 Terminal X30/3 Digital Input

Option:	Function:
[0] *	No operation
[1]	Reset
[2]	Coast inverse
[3]	Coast and reset inv
[5]	DC-brake inverse
[6]	Stop inverse
[7]	External interlock
[8]	Start
[9]	Latched start
[10]	Reversing
[11]	Start reversing
[14]	Jog
[15]	Preset reference on
[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
[24]	Set-up select bit 1
[34]	Ramp bit 0
[36]	Mains failure inverse
[37]	Fire Mode
[52]	Run permissive
[53]	Hand start
[54]	Auto start
[55]	DigiPot increase
[56]	DigiPot decrease
[57]	DigiPot clear
[62]	Reset Counter A
[65]	Reset Counter B
[66]	Sleep Mode
[67]	No Flow
[68]	Timed Actions Disabled
[69]	Constant OFF Actions
[70]	Constant ON Actions
[78]	Reset Maint. Word

5-18 Terminal X30/4 Digital Input		
Option:		Function:
[0] *	No operation	
[1]	Reset	
[2]	Coast inverse	
[3]	Coast and reset inv	
[5]	DC-brake inverse	
[6]	Stop inverse	
[7]	External interlock	
[8]	Start	
[9]	Latched start	
[10]	Reversing	
[11]	Start reversing	
[14]	Jog	
[15]	Preset reference on	
[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	
[24]	Set-up select bit 1	
[34]	Ramp bit 0	
[36]	Mains failure inverse	
[37]	Fire Mode	
[52]	Run permissive	
[53]	Hand start	
[54]	Auto start	
[55]	DigiPot increase	
[56]	DigiPot decrease	
[57]	DigiPot clear	
[62]	Reset Counter A	
[65]	Reset Counter B	
[66]	Sleep Mode	
[67]	No Flow	
[68]	Timed Actions Disabled	
[69]	Constant OFF Actions	
[70]	Constant ON Actions	
[78]	Reset Maint. Word	

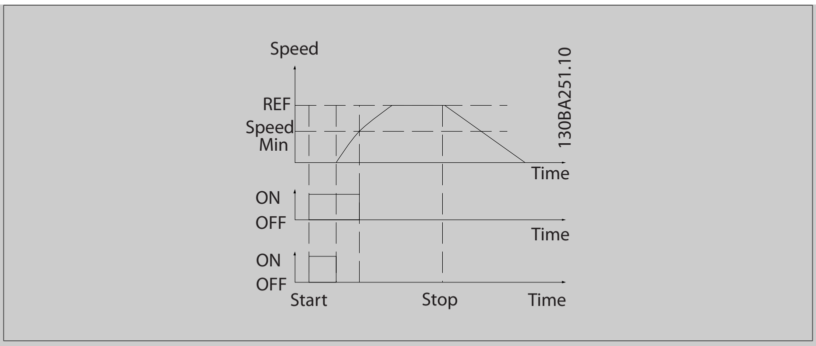
5-3* Digital Outputs

Parameters for configuring the output functions for the output terminals. The 2 solid-state digital outputs are common for terminals 27 and 29. Set the I/O function for terminal 27 in par. 5-01 Terminal 27 Mode and set the I/O function for terminal 29 in par. 5-02 Terminal 29 Mode. These parameters cannot be adjusted while the motor is running.

		The digital outputs can be programmed with these functions:
[0]	No operation	*Default for all digital outputs and relay outputs*
[1]	Control ready	The control board receives supply voltage.
[2]	Drive ready	The frequency converter is ready for operation and applies a supply signal on the control board.
[3]	Drive ready / remote control	The frequency converter is ready for operation and is in Auto On mode.
[4]	Stand-by / no warning	The frequency converter is ready for operation. No start or stop command is been given (start/disable). There are no warnings.
[5]	Running	The motor is running.
[6]	Running / no warning	The output speed is higher than the speed set in par. 1-81 Min Speed for Function at Stop [RPM]. The motor is running and there are no warnings.
[8]	Run on reference / no warning	The motor runs at reference speed.
[9]	Alarm	An alarm activates the output. There are no warnings.
[10]	Alarm or warning	An alarm or a warning activates the output.
[11]	At torque limit	The torque limit set in par. 4-16 Torque Limit Motor Mode or par. 4-17 has been exceeded.
[12]	Out of current range	The motor current is outside the range set in par. 4-18 Current Limit.
[13]	Below current, low	The motor current is lower than set in par. 4-50 Warning Current Low.
[14]	Above current, high	The motor current is higher than set in par. 4-51 Warning Current High.
[15]	Out of speed range	The output speed is outside the range set in par. 4-52 Warning Speed Low and par. 4-53 Warning Speed High.
[16]	Below speed, low	The output speed is lower than the setting in par. 4-52 Warning Speed Low.
[17]	Above speed, high	The output speed is higher than the setting in par. 4-53 Warning Speed High.
[18]	Out of feedback range	The feedback is outside the range set in par. 4-56 Warning Feedback Low and par. 4-57 Warning Feedback High.
[19]	Below feedback low	The feedback is below the limit set in par. 4-56 Warning Feedback Low.
[20]	Above feedback high	The feedback is above the limit set in par. 4-57 Warning Feedback High.
[21]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the motor, the frequency converter, the brake resistor, or the thermistor.
[25]	Reverse	*Reversing. Logic '1'* = relay activated, 24 V DC when CW rotation of the motor. Logic '0' = relay not activated, no signal, when CCW rotation of the motor.
[26]	Bus OK	Active communication (no time-out) via the serial communication port.
[27]	Torque limit and stop	Use in performing a coasting stop and in torque limit condition. If the frequency converter has received a stop signal and is at the torque limit, the signal is Logic '0'.
[28]	Brake, no warning	The brake is active and there are no warnings.
[29]	Brake ready, no fault	The brake is ready for operation and there are no faults.

[30]	Brake fault (IGBT)	The output is Logic ‘1’ when the brake IGBT is short-circuited. Use this function to protect the frequency converter if there is a fault on the brake modules. Use the output/relay to cut out the main voltage from the frequency converter.
[35]	External Interlock	External Interlock function has been activated via one of the digital inputs.
[40]	Out of ref range	
[41]	Below reference low	
[42]	Above reference high	
[45]	Bus Ctrl	
[46]	Bus Ctrl 1 if timeout	
[47]	Bus Ctrl 0 if timeout	
[55]	Pulse output	
[60]	Comparator 0	See parameter group 13-1*. If Comparator 0 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[61]	Comparator 1	See parameter group 13-1*. If Comparator 2 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[62]	Comparator 2	See parameter group 13-1*. If Comparator 2 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[63]	Comparator 3	See parameter group 13-1*. If Comparator 3 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[64]	Comparator 4	See parameter group 13-1*. If Comparator 4 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[65]	Comparator 5	See parameter group 13-1*. If Comparator 5 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[70]	Logic Rule 0	See parameter group 13-4*. If Logic Rule 0 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[71]	Logic Rule 1	See parameter group 13-4*. If Logic Rule 1 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[72]	Logic Rule 2	See parameter group 13-4*. If Logic Rule 2 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[73]	Logic Rule 3	See parameter group 13-4*. If Logic Rule 3 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[74]	Logic Rule 4	See parameter group 13-4*. If Logic Rule 4 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[75]	Logic Rule 5	See parameter group 13-4*. If Logic Rule 5 is evaluated as TRUE, the output will go high. Otherwise, it will be low.
[80]	SL Digital Output A	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [38] *Set dig. out. A high* is executed. The input will go low whenever the Smart Logic Action [32] Set dig. out. A low is executed.
[81]	SL Digital Output B	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [39] *Set dig. out. Bhigh* is executed. The input will go low whenever the Smart Logic Action [33] *Set dig. out. B low* is executed.
[82]	SL Digital Output C	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [40] *Set dig. out. C high* is executed. The input will go low whenever the Smart Logic Action [34] *Set dig. out. C low* is executed.
[83]	SL Digital Output D	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [41] *Set dig. out. D* high is executed. The input will

		go low whenever the Smart Logic Action [35] *Set dig. out. D low* is executed.
[84]	SL Digital Output E	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [42] *Set dig. out. E high* is executed. The input will go low whenever the Smart Logic Action [36] *Set dig. out. E low* is executed.
[85]	SL Digital Output F	See par. 13-52 SL Controller Action. The input will go high whenever the Smart Logic Action [43] *Set dig. out. F high* is executed. The input will go low whenever the Smart Logic Action [37] *Set dig. out. F low* is executed.
[160]	No alarm	The output is high when no alarm is present.
[161]	Running reverse	The output is high when the frequency converter is running counter clockwise (the logical product of the status bits 'running' AND 'reverse').
[165]	Local reference active	The output is high when par. 3-13 Reference Site = [2] Local or when par. 3-13 Reference Site = [0] *Linked to hand auto* at the same time as the keypad is in [Hand on] mode.
[166]	Remote reference active	The output is high when par. 3-13 Reference Site [1] or *Linked to hand/ auto* [0] while the keypad is in [Auto on] mode.
[167]	Start command active	The output is high when there is an active Start command (i.e. via digital input bus connection or [Hand on] or [Auto on], and no Stop command is active.
[168]	Drive in hand mode	The output is high when the frequency converter 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 frequency converter is in Hand on mode (as indicated by the LED light above [Auto on].
[180]	Clock Fault	The clock function has been reset to default (2000-01-01) because of a power failure.
[181]	Preventive Maintenance	One or more of the Preventive Maintenance Events programmed in par. 23-10 Maintenance Item has passed the time for the specified action in par. 23-11 Maintenance Action.
[190]	No-Flow	A No-Flow situation or Minimum Speed situation has been detected if enabled in par. 22-22 Low Speed Detection.
[191]	Dry Pump	A Dry Pump condition has been detected.
[192]	End of Curve	A pump running with max. speed for a period of time without reaching the set pressure has been detected. To enable this function please see par. 22-50 End of Curve Function.
[193]	Sleep Mode	The frequency converter/system has turned into sleep mode. See par. 22-4*.
[194]	Broken Belt	A Broken Belt condition has been detected. This function must be enabled in par. 22-60 Broken Belt Function.
[195]	Bypass Valve Control	The bypass valve control (Digital / Relay output in the frequency converter) is used for compressor systems to unload the compressor during start-up by using a bypass valve. After the start command is given the bypass valve will be open until the frequency converter reaches par. 4-11 Motor Speed Low Limit [RPM]). After the limit has been reached the bypass valve will be closed, allowing the compressor to operate normally. This procedure will not be activated again before a new start is initiated and the frequency converter speed is zero during the receiving of start signal. Par. 1-71 Start Delay can be used in order to delay the motor start. The Bypass valve control principle:



[196]	Fire Mode	The frequency converter is operating in Fire Mode. See parameter group24-0* *Fire Mode*.
[197]	Fire Mode was act.	The frequency converter has been operating in Fire Mode, but is now back in normal operation.
[198]	Drive Bypass	To be used as signal for activating an external electromechanical bypass switching the motor direct on line. See 24-1* *Drive Bypass*. ⚠CAUTION If enabling the Drive Bypass Function, the frequency converter is no longer Safety Certified (for using the Safe Stop in versions where included).

The below setting options are all related to the Cascade Controller.
Wiring diagrams and settings for parameter, see group 25-** for more details.

[200]	Full Capacity	All pumps running and at full speed
[201]	Pump1 Running	One or more of the pumps controlled by the Cascade Controller are running. The function will also depend on the setting of in par. 25-06 Number of Pumps. If set to *No* [0] Pump 1 refers to the pump controlled by relay RELAY1 etc. If set to *Yes* [1] Pump 1 refers to the pump controlled by the frequency converter only (without any of the build in relays involved) and Pump 2 to the pump controlled by the relay RELAY1. See below table:
[202]	Pump2 Running	See [201]
[203]	Pump3 Running	See [201]

Setting in par. 5-3*	Setting in par. 25-06 Number of Pumps	
	[0] No	[1] Yes
[200] Pump 1 Running	Controlled by RELAY1	Frequency Converter controlled
[201] Pump 2 Running	Controlled by RELAY2	Controlled by RELAY1
[203] Pump 3 Running	Controlled by RELAY3	Controlled by RELAY2

5-30 Terminal 27 Digital Output

Same options and functions as par. 5-3*.

Option:		Function:
[0] *	No operation	

5-31 Terminal 29 Digital Output

Same options and functions as par. 5-3*.

Option:		Function:
[0] *	No operation	

5-32 Term X30/6 Digi Out (MCB 101)		
Option:		Function:
[0] *	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive rdy/rem ctrl	
[4]	Standby / no warning	
[5]	Running	
[6]	Running / no warning	
[8]	Run on ref/no warn	
[9]	Alarm	
[10]	Alarm or warning	
[11]	At torque limit	
[12]	Out of current range	
[13]	Below current, low	
[14]	Above current, high	
[15]	Out of speed range	
[16]	Below speed, low	
[17]	Above speed, high	
[18]	Out of feedb. range	
[19]	Below feedback, low	
[20]	Above feedback, high	
[21]	Thermal warning	
[25]	Reverse	
[26]	Bus OK	
[27]	Torque limit & stop	
[28]	Brake, no brake war	
[29]	Brake ready, no fault	
[30]	Brake fault (IGBT)	
[35]	External Interlock	
[40]	Out of ref range	
[41]	Below reference, low	
[42]	Above ref, high	
[45]	Bus ctrl.	
[46]	Bus ctrl, 1 if timeout	
[47]	Bus ctrl, 0 if timeout	
[55]	Pulse output	
[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.
[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[196]	Fire Mode
[197]	Fire Mode was Act.
[198]	Drive Bypass
[220]	Run Confirmation

5-33 Term X30/7 Digi Out (MCB 101)

Option:		Function:
[0] *	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive rdy/rem ctrl	
[4]	Standby / no warning	
[5]	Running	
[6]	Running / no warning	
[8]	Run on ref/no warn	
[9]	Alarm	
[10]	Alarm or warning	
[11]	At torque limit	
[12]	Out of current range	
[13]	Below current, low	
[14]	Above current, high	
[15]	Out of speed range	
[16]	Below speed, low	
[17]	Above speed, high	
[18]	Out of feedb. range	
[19]	Below feedback, low	

[20]	Above feedback, high
[21]	Thermal warning
[25]	Reverse
[26]	Bus OK
[27]	Torque limit & stop
[28]	Brake, no brake war
[29]	Brake ready, no fault
[30]	Brake fault (IGBT)
[35]	External Interlock
[40]	Out of ref range
[41]	Below reference, low
[42]	Above ref, high
[45]	Bus ctrl.
[46]	Bus ctrl, 1 if timeout
[47]	Bus ctrl, 0 if timeout
[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.
[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[220]	Run Confirmation

5-4* Relays

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

5-40 Function Relay

Array [8]

(Relay 1 [0], Relay 2 [1]

Option MCB 105: Relay 7 [6], Relay 8 [7] and Relay 9 [8]).

Select options to define the function of the relays.

The selection of each mechanical relay is realised in an array parameter.

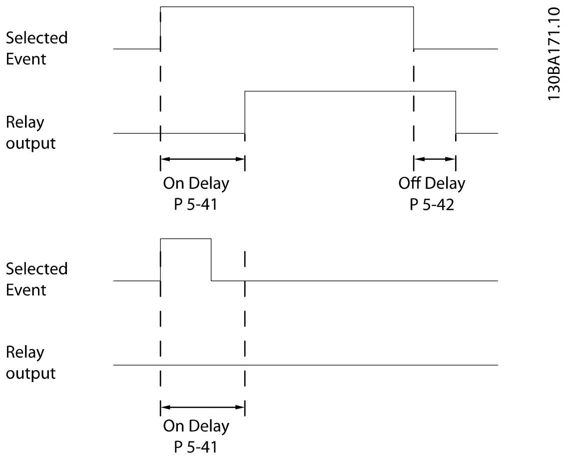
Option:		Function:
[0] *	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive rdy/rem ctrl	
[4]	Standby / no warning	
[5] *	Running	Default setting for relay 2.
[6]	Running / no warning	
[8]	Run on ref/no warn	
[9] *	Alarm	Default setting for relay 1.
[10]	Alarm or warning	
[11]	At torque limit	
[12]	Out of current range	
[13]	Below current, low	
[14]	Above current, high	
[15]	Out of speed range	
[16]	Below speed, low	
[17]	Above speed, high	
[18]	Out of feedb. range	
[19]	Below feedback, low	
[20]	Above feedback, high	
[21]	Thermal warning	
[25]	Reverse	
[26]	Bus OK	
[27]	Torque limit & stop	
[28]	Brake, no brake war	
[29]	Brake ready, no fault	
[30]	Brake fault (IGBT)	
[35]	External Interlock	
[36]	Control word bit 11	
[37]	Control word bit 12	
[40]	Out of ref range	
[41]	Below reference, low	
[42]	Above ref, high	
[45]	Bus ctrl.	
[46]	Bus ctrl, 1 if timeout	
[47]	Bus ctrl, 0 if timeout	

[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.
[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[196]	Fire Mode
[197]	Fire Mode was Act.
[198]	Drive Bypass
[220]	Run Confirmation

5-41 On Delay, Relay

Array [9], (Relay 1 [0], Relay 2 [1], Relay 3 [2], Relay 4 [3], Relay 5 [4], Relay 6 [5], Relay 7 [6], Relay 8 [7], Relay 9 [8])

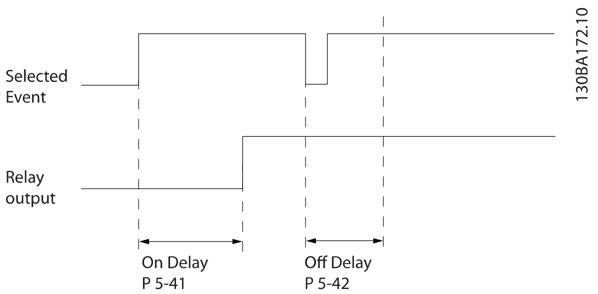
Range:		Function:
0.01 s*	[0.01 - 600.00 s]	Enter the delay of the relay cut-in time. Select one of available mechanical relays and MCB 105 in an array function. See par. 5-40 Function Relay.



5-42 Off Delay, Relay

Array [9] (Relay 1 [0], Relay 2 [1], Relay 3 [2], Relay 4 [3], Relay 5 [4], Relay 6 [5], Relay 7 [6], Relay 8 [7], Relay 9 [8])

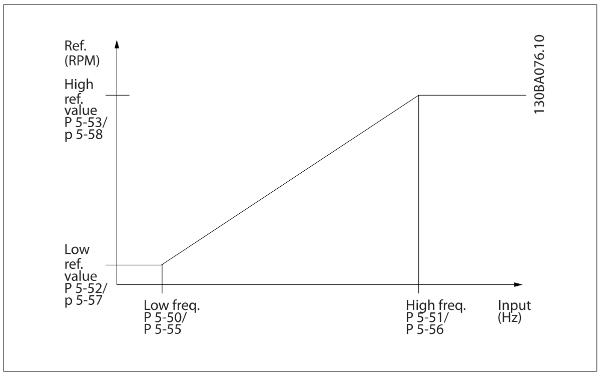
Range:		Function:
0.01 s*	[0.01 - 600.00 s]	Enter the delay of the relay cut-out time. Select one of available mechanical relays and MCB 105 in an array function. See par. 5-40 Function Relay.



If the selected Event condition changes before the on- or off delay timer expires, the relay output is unaffected.

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. Input terminals 29 or 33 act as frequency reference inputs. Set terminal 29 (par. 5-13 Terminal 29 Digital Input) or terminal 33 (par. 5-15 Terminal 33 Digital Input) to *Pulse input* [32]. If terminal 29 is used as an input, then set par. 5-02 Terminal 29 Mode to *Input* [0].



5-50 Term. 29 Low Frequency

Range:		Function:
100 Hz*	[0 - 110000 Hz]	Enter the low frequency limit corresponding to the low motor shaft speed (i.e. low reference value) in par. 5-52 Term. 29 Low Ref./Feedb. Value. Refer to the diagram in this section.

5-51 Term. 29 High Frequency

Range:		Function:
100 Hz*	[0 - 110000 Hz]	Enter the high frequency limit corresponding to the high motor shaft speed (i.e. high reference value) in par. 5-53 Term. 29 High Ref./Feedb. Value.

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

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the low reference value limit for the motor shaft speed [RPM]. This is also the lowest feedback value, see also par. 5-57 Term. 33 Low Ref./ Feedb. Value.

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

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Enter the high reference value [RPM] for the motor shaft speed and the high feedback value, see also par. 5-58 Term. 33 High Ref./Feedb. Value.

5-54 Pulse Filter Time Constant #29

Range:		Function:
100 ms*	[1 - 1000 ms]	Enter the pulse filter time constant. The pulse filter dampens oscillations of the feedback signal, which is an advantage if there is a lot of noise in the system. A high time constant value results in better dampening but also increases the time delay through the filter. This parameter cannot be adjusted while the motor is running.

5-55 Term. 33 Low Frequency	
Range:	Function:
100 Hz* [0 - 110000 Hz]	Enter the low frequency corresponding to the low motor shaft speed (i.e. low reference value) in par. 5-57 Term. 33 Low Ref./Feedb. Value.

5-56 Term. 33 High Frequency	
Range:	Function:
100 Hz* [0 - 110000 Hz]	Enter the high frequency corresponding to the high motor shaft speed (i.e. high reference value) in par. 5-58 Term. 33 High Ref./Feedb. Value.

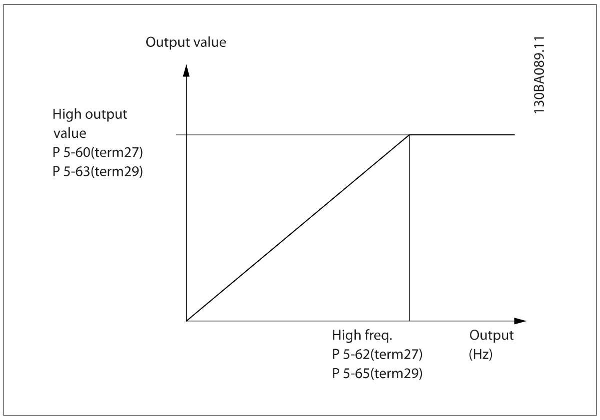
5-57 Term. 33 Low Ref./Feedb. Value	
Range:	Function:
0.000* [-999999.999 - 999999.999]	Enter the low reference value [RPM] for the motor shaft speed. This is also the low feedback value, see also par. 5-52 Term. 29 Low Ref./Feedb. Value.

5-58 Term. 33 High Ref./Feedb. Value	
Range:	Function:
100.000 * [-999999.999 - 999999.999]	Enter the high reference value [RPM] for the motor shaft speed. See also par. 5-53 Term. 29 High Ref./Feedb. Value.

5-59 Pulse Filter Time Constant #33	
Range:	Function:
100 ms* [1 - 1000 ms]	Enter the pulse filter time constant. The low-pass filter reduces the influence on and dampens oscillations on the feedback signal from the control. This is an advantage, e.g. if there is a great amount on noise in the system. This parameter cannot be adjusted while the motor is running.

5-6* Pulse Outputs

Parameters for configuring the scaling and output functions of pulse outputs. The pulse outputs are designated to terminals 27 or 29. Select terminal 27 output in par. 5-01 Terminal 27 Mode and terminal 29 output in par. 5-02 Terminal 29 Mode.



Options for readout output variables:

[0]	No operation
[45]	Bus ctrl.
[48]	Bus ctrl., timeout
[100]	Output frequency
[101]	Reference
[102]	Feedback
[103]	Motor current
[104]	Torque relative to limit
[105]	Torque relative to rated
[106]	Power
[107]	Speed
[108]	Torque
[109]	Max Out Freq
[113]	Ext. Closed Loop
[114]	Ext. Closed Loop
[115]	Ext. Closed Loop

5-62 Pulse Output Max Freq #27

Set the maximum frequency for terminal 27, corresponding to the output variable selected in par. 5-60 Terminal 27 Pulse Output Variable.

This parameter cannot be adjusted while the motor is running.

Range:		Function:
5000 Hz*	[0 - 32000 Hz]	

5-63 Terminal 29 Pulse Output Variable

Option:		Function:
[0] *	No operation	
[45]	Bus ctrl.	
[48]	Bus ctrl., timeout	
[100]	Output freq. 0-100	
[101]	Reference Min-Max	
[102]	Feedback +-200%	
[103]	Motor cur. 0-Imax	
[104]	Torque 0-Tlim	
[105]	Torque 0-Tnom	
[106]	Power 0-Pnom	
[107]	Speed 0-HighLim	
[113]	Ext. Closed Loop 1	
[114]	Ext. Closed Loop 2	
[115]	Ext. Closed Loop 3	

5-65 Pulse Output Max Freq #29

Set the maximum frequency for terminal 29 corresponding to the output variable set in par. 5-63 Terminal 29 Pulse Output Variable.
This parameter cannot be adjusted while the motor is running.

Range:		Function:
5000 Hz*	[0 - 32000 Hz]	

5-68 Pulse Output Max Freq #X30/6

Select the maximum frequency on terminal X30/6 referring to the output variable in par. 5-66 Terminal X30/6 Pulse Output Variable. This parameter cannot be adjusted while the motor is running.
This parameter is active when option module MCB 101 is mounted in the frequency converter.

Range:		Function:
5000 Hz*	[0 - 32000 Hz]	

5-9* Bus Controlled

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

5-90 Digital & Relay Bus Control

Range:		Function:
0*	[0 - 2147483647]	This parameter holds the state of the digital outputs and relays that is controlled by bus. A logical '1' indicates that the output is high or active. A logical '0' indicates that the output is low or inactive.

Bit 0	CC Digital Output Terminal 27
Bit 1	CC Digital Output Terminal 29
Bit 2	GPIO Digital Output Terminal X 30/6
Bit 3	GPIO Digital Output Terminal X 30/7
Bit 4	CC Relay 1 output terminal
Bit 5	CC Relay 2 output terminal
Bit 6	Option B Relay 1 output terminal
Bit 7	Option B Relay 2 output terminal
Bit 8	Option B Relay 3 output terminal
Bit 9-15	Reserved for future terminals
Bit 16	Option C Relay 1 output terminal
Bit 17	Option C Relay 2 output terminal
Bit 18	Option C Relay 3 output terminal
Bit 19	Option C Relay 4 output terminal
Bit 20	Option C Relay 5 output terminal
Bit 21	Option C Relay 6 output terminal
Bit 22	Option C Relay 7 output terminal
Bit 23	Option C Relay 8 output terminal
Bit 24-31	Reserved for future terminals

5-93 Pulse Out #27 Bus Control

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 27, when it is configured as [Bus Controlled].

5-94 Pulse Out #27 Timeout Preset

Range:	Function:
0.00 %* [0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 27, when it is configured as [Bus Controlled Timeout] and timeout is detected.

5-95 Pulse Out #29 Bus Control

Range:	Function:
0.00 %* [0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 29, when it is configured as [Bus Controlled].

5-96 Pulse Out #29 Timeout Preset

Range:	Function:
0.00 %* [0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 29, when it is configured as [Bus Controlled Timeout] and timeout is detected

5-97 Pulse Out #X30/6 Bus Control

Range:	Function:
0.00 %* [0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 27, when it is configured as [Bus Controlled.

5-98 Pulse Out #X30/6 Timeout Preset

Range:	Function:
0.00 %* [0.00 - 100.00 %]	Contains the frequency to apply to the digital output terminal 6, when it is configured as [Bus Controlled Timeout] and time-out is detected.

Main Menu - Analog In/Out - Group 6

Parameter group for setting up the analog I/O configuration.
The frequency converter is equipped with 2 analog inputs: Terminal 53 and 54. The analog inputs can freely be allocated to either voltage (0 - 10 V) or current input (0/4 - 20 mA)

NOTICE

Thermistors may be connected to either an analog or a digital input.

6-00 Live Zero Timeout Time

Range:		Function:
10 s*	[1 - 99 s]	Enter the Live Zero Time-out time period. Live Zero Time-out Time is active for analog inputs, i.e. terminal 53 or terminal 54, used as reference or feedback sources. If the reference signal value associated with the selected current input falls below 50% of the value set in par. 6-10 Terminal 53 Low Voltage, par. 6-12 Terminal 53 Low Current, par. 6-20 Terminal 54 Low Voltage or par. 6-22 Terminal 54 Low Current for a time period longer than the time set in par. 6-00 Live Zero Timeout Time, the function selected in par. 6-01 Live Zero Timeout Function will be activated.

6-01 Live Zero Timeout Function

Option: | Function:

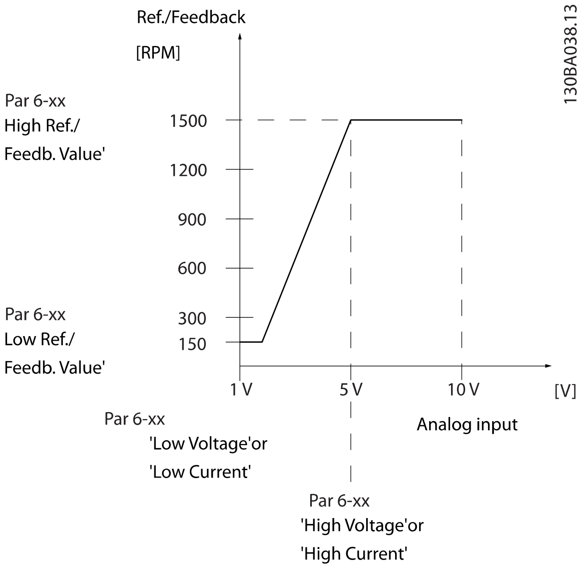
Select the time-out function. The function set in par. 6-01 Live Zero Timeout Function will be activated if the input signal on terminal 53 or 54 is below 50% of the value in par. 6-10 Terminal 53 Low Voltage, par. 6-12 Terminal 53 Low Current, par. 6-20 Terminal 54 Low Voltage or par. 6-22 Terminal 54 Low Current for a time period defined in par. 6-00 Live Zero Timeout Time. If several time-outs occur simultaneously, the frequency converter prioritises the time-out functions as follows:

1. Par. 6-01 Live Zero Timeout Function
2. Par. 8-04 Control Timeout Function

The output frequency of the frequency converter can be:

- [1] frozen at the present value
- [2] overruled to stop
- [3] overruled to jog speed
- [4] overruled to max. speed
- [5] overruled to stop with subsequent trip

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



6-02 Fire Mode Live Zero Timeout Function		
Option:		Function:
		The function set in par. 6-01 Live Zero Timeout Function will be activated if the input signal on analogue inputs is below 50% of the value defined in parameter group 6-1* to 6-6* "Terminal xx Low Current" or "Terminal xx Low Voltage" for a time period defined in par. 6-00 Live Zero Timeout Time.
[0] *	Off	
[1]	Freeze output	
[2]	Stop	
[3]	Jogging	
[4]	Max. speed	

6-1* Analog Input 1

Parameters for configuring the scaling and limits for analog input 1 (terminal 53).

6-10 Terminal 53 Low Voltage		
Range:		Function:
0.07 V*	[Application dependant]	Enter the low voltage value. This analog input scaling value should correspond to the low reference/feedback value set in par. 6-14 Terminal 53 Low Ref./Feedb. Value.

6-11 Terminal 53 High Voltage		
Range:		Function:
10.00 V*	[Application dependant]	Enter the high voltage value. This analog input scaling value should correspond to the high reference/feedback value set in par. 6-15 Terminal 53 High Ref./Feedb. Value.

6-12 Terminal 53 Low Current		
Range:		Function:
4.00 mA*	[Application dependant]	Enter the low current value. This reference signal should correspond to the low reference/feedback value, set in par. 6-14 Terminal 53 Low Ref./Feedb. Value. The value must be set at >2 mA in order to activate the Live Zero Time-out Function in par. 6-01 Live Zero Timeout Function.

6-13 Terminal 53 High Current		
Range:		Function:
20.00 mA*	[Application dependant]	Enter the high current value corresponding to the high reference/feedback set in par. 6-15 Terminal 53 High Ref./Feedb. Value.

6-14 Terminal 53 Low Ref./Feedb. Value		
Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the analog input scaling value that corresponds to the low voltage/low current set in par. 6-10 Terminal 53 Low Voltage and par. 6-12 Terminal 53 Low Current.

6-15 Terminal 53 High Ref./Feedb. Value		
Range:		Function:
Application dependent*	[-999999.999 - 999999.999]	Enter the analog input scaling value that corresponds to the high voltage/high current value set in par. 6-11 Terminal 53 High Voltage and par. 6-13 Terminal 53 High Current.

6-16 Terminal 53 Filter Time Constant		
Range:		Function:
0.001 s*	[0.001 - 10.000 s]	Enter the time constant. This 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. This parameter cannot be adjusted while the motor is running.

6-17 Terminal 53 Live Zero		
Option:		Function:
		This parameter makes it possible to disable the Live Zero monitoring. E.g. to be used if the analog outputs are used as part of a de-central I/O system (e.g. when not as part of any frequency converter related control functions, but feeding a Building Management system with data).
[0]	Disabled	
[1] *	Enabled	

6-2* Analog Input 2

Parameters for configuring the scaling and limits for analog input 2 (terminal 54).

6-20 Terminal 54 Low Voltage		
Range:		Function:
0.07 V*	[Application dependant]	Enter the low voltage value. This analog input scaling value should correspond to the low reference/feedback value, set in par. 6-24 Terminal 54 Low Ref./Feedb. Value.

6-21 Terminal 54 High Voltage

Range:		Function:
10.00 V*	[Application dependant]	Enter the high voltage value. This analog input scaling value should correspond to the high reference/feedback value set in par. 6-25 Terminal 54 High Ref./Feedb. Value.

6-22 Terminal 54 Low Current

Range:		Function:
4.00 mA*	[Application dependant]	Enter the low current value. This reference signal should correspond to the low reference/feedback value, set in par. 6-24 Terminal 54 Low Ref./Feedb. Value. The value must be set at >2 mA in order to activate the Live Zero Time-out Function in par. 6-01 Live Zero Timeout Function.

6-23 Terminal 54 High Current

Range:		Function:
20.00 mA*	[Application dependant]	Enter the high current value corresponding to the high reference/feedback value set in par. 6-25 Terminal 54 High Ref./Feedb. Value.

6-24 Terminal 54 Low Ref./Feedb. Value

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the analog input scaling value that corresponds to the low voltage/low current value set in par. 6-20 Terminal 54 Low Voltage and par. 6-22 Terminal 54 Low Current.

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

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Enter the analog input scaling value that corresponds to the high voltage/high current value set in par. 6-21 Terminal 54 High Voltage and par. 6-23 Terminal 54 High Current.

6-26 Terminal 54 Filter Time Constant

Range:		Function:
0.001 s*	[0.001 - 10.000 s]	Enter the time constant. This 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. This parameter cannot be adjusted while the motor is running.

6-27 Terminal 54 Live Zero

Option:		Function:
		This parameter makes it possible to disable the Live Zero monitoring. E.g. to be used if the analog outputs are used as part of a de-central I/O system (e.g. when not as part of any frequency converter related control functions, but feeding a Building Management System with data).
[0]	Disabled	
[1] *	Enabled	

6-3* Analog Input 3 MCB 101

Par. group for configuring the scale and limits for analog input 3 (X30/11) placed on option module MCB 101.

6-30 Terminal X30/11 Low Voltage

Range:		Function:
0.07 V*	[Application dependant]	Sets the analog input scaling value to correspond to the low reference/ feedback value (set in par. 6-34 Term. X30/11 Low Ref./Feedb. Value).

6-31 Terminal X30/11 High Voltage

Range:		Function:
10.00 V*	[Application dependant]	Sets the analog input scaling value to correspond to the high reference/ feedback value (set in par. 6-35 Term. X30/11 High Ref./Feedb. Value).

6-34 Term. X30/11 Low Ref./Feedb. Value

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Sets the analog input scaling value to correspond to the low voltage value (set in par. 6-30 Terminal X30/11 Low Voltage).

6-35 Term. X30/11 High Ref./Feedb. Value

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Sets the analog input scaling value to correspond to the high voltage value (set in par. 6-31 Terminal X30/11 High Voltage).

6-36 Term. X30/11 Filter Time Constant

Range:		Function:
0.001 s*	[0.001 - 10.000 s]	A 1st order digital low pass filter time constant for suppressing electrical noise on terminal X30/11. Par. 6-36 Term. X30/11 Filter Time Constant cannot be changed while the motor is running.

6-37 Term. X30/11 Live Zero

Option:		Function:
		This parameter makes it possible to disable the Live Zero monitoring. E.g. to be used if the analog outputs are used as part of a decentral I/O system (e.g. when not part of any frequency converter related control functions, but feeding a Building Management System with data).
[0] *	Disabled	
[1] *	Enabled	

6-4* Analog Input 4 MCB 101

Par. group for configuring the scale and limits for analog input 4 (X30/12) placed on option module MCB 101.

6-40 Terminal X30/12 Low Voltage

Range:		Function:
0.07 V*	[Application dependant]	Sets the analog input scaling value to correspond to the low reference/ feedback value set in par. 6-44 Term. X30/12 Low Ref./Feedb. Value.

6-41 Terminal X30/12 High Voltage

Range:		Function:
10.00 V*	[Application dependant]	Sets the analog input scaling value to correspond to the high reference/ feedback value set in par. 6-45 Term. X30/12 High Ref./Feedb. Value.

6-44 Term. X30/12 Low Ref./Feedb. Value

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Sets the analog output scaling value to correspond to the low voltage value set in par. 6-40 Terminal X30/12 Low Voltage.

6-45 Term. X30/12 High Ref./Feedb. Value

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Sets the analog input scaling value to correspond to the high voltage value set in par. 6-41 Terminal X30/12 High Voltage.

6-46 Term. X30/12 Filter Time Constant

Range:		Function:
0.001 s*	[0.001 - 10.000 s]	A 1st order digital low pass filter time constant for suppressing electrical noise on terminal X30/12. Par. 6-46 Term. X30/12 Filter Time Constant cannot be changed while the motor is running.

6-47 Term. X30/12 Live Zero

Option:		Function:
		This parameter makes it possible to disable the Live Zero monitoring. E.g. to be used if the analog outputs are used as part of a decentral I/O system (e.g. when not part of any frequency converter related control functions, but feeding a Building Management System with data)
[0] *	Disabled	
[1] *	Enabled	

6-5* Analog Output 1

Parameters for configuring the scaling and limits for analog output 1, i.e. Terminal 42. Analog outputs are current outputs: 0/4 – 20 mA. Common terminal (terminal 39) is the same terminal and has the same electrical potential for analog common and digital common connection. Resolution on analog output is 12 bit.

6-50 Terminal 42 Output

Option:		Function:
		Select the function of Terminal 42 as an analog current output. A motor current of 20 mA corresponds to I_{max}.
[0] *	No operation	
[100]	Output freq. 0-100	0 - 100 Hz, (0-20 mA)

[101]	Reference Min-Max	Minimum reference - Maximum reference, (0-20 mA)
[102]	Feedback +-200%	-200% to +200% of par. 20-14 Maximum Reference/Feedb., (0-20 mA)
[103]	Motor cur. 0-Imax	0 - Inverter Max. Current (par. 16-37 Inv. Max. Current), (0-20 mA)
[104]	Torque 0-Tlim	0 - Torque limit (par. 4-16 Torque Limit Motor Mode), (0-20 mA)
[105]	Torque 0-Tnom	0 - Motor rated torque, (0-20 mA)
[106]	Power 0-Pnom	0 - Motor rated power, (0-20 mA)
[107] *	Speed 0-HighLim	0 - Speed High Limit (par. 4-13 Motor Speed High Limit [RPM] and par. 4-14 Motor Speed High Limit [Hz]), (0-20 mA)
[113]	Ext. Closed Loop 1	0 - 100%, (0-20 mA)
[114]	Ext. Closed Loop 2	0 - 100%, (0-20 mA)
[115]	Ext. Closed Loop 3	0 - 100%, (0-20 mA)
[130]	Out frq 0-100 4-20mA	0 - 100 Hz
[131]	Reference 4-20mA	Minimum Reference - Maximum Reference
[132]	Feedback 4-20mA	-200% to +200% of par. 20-14 Maximum Reference/Feedb.
[133]	Motor cur. 4-20mA	0 - Inverter Max. Current (par. 16-37 Inv. Max. Current)
[134]	Torq.0-lim 4-20 mA	0 - Torque limit (par. 4-16 Torque Limit Motor Mode)
[135]	Torq.0-nom 4-20mA	0 - Motor rated torque
[136]	Power 4-20mA	0 - Motor rated power
[137]	Speed 4-20mA	0 - Speed High Limit (4-13 and 4-14)
[139]	Bus ctrl.	0 - 100%, (0-20 mA)
[140]	Bus ctrl. 4-20 mA	0 - 100%
[141]	Bus ctrl t.o.	0 - 100%, (0-20 mA)
[142]	Bus ctrl t.o. 4-20mA	0 - 100%
[143]	Ext. CL 1 4-20mA	0 - 100%
[144]	Ext. CL 2 4-20mA	0 - 100%
[145]	Ext. CL 3 4-20mA	0 - 100%

NOTICE

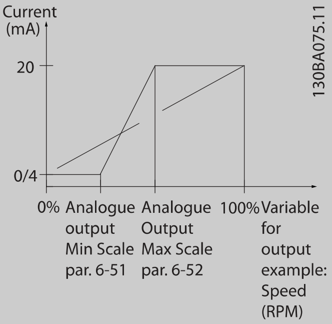
Values for setting the Minimum Reference is found in open loop par. 3-02 Minimum Reference and for closed loop par. 20-13 Minimum Reference/Feedb. - values for maximum reference for open loop is found in par. 3-03 Maximum Reference and for closed loop par. 20-14 Maximum Reference/Feedb..

6-51 Terminal 42 Output Min Scale

Range:		Function:
0.00 %*	[0.00 - 200.00 %]	Scale for the minimum output (0 or 4 mA) of the analogue signal at terminal 42. Set the value to be the **percentage** of the full range of the variable selected in par. 6-50 Terminal 42 Output.

6-52 Terminal 42 Output Max Scale

Range:		Function:
100.00 %*	[0.00 - 200.00 %]	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 par. 6-50 Terminal 42 Output.

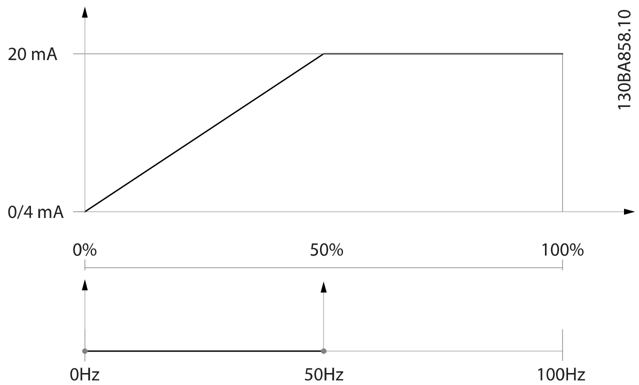


It is possible to get a value lower than 20 mA at full scale by programming values >100% by using a formula as follows:

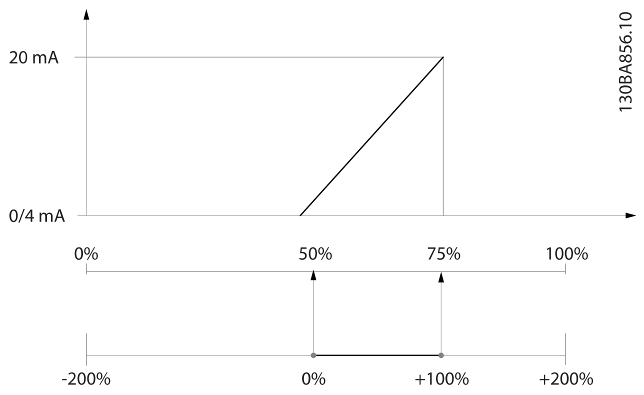
$$20\ mA\ /\ desired\ maximum\ current \times 100\ \%$$

$$i.e.\ 10mA:\ \frac{20\ mA}{10\ mA} \times 100\ \% = 200\ \%$$

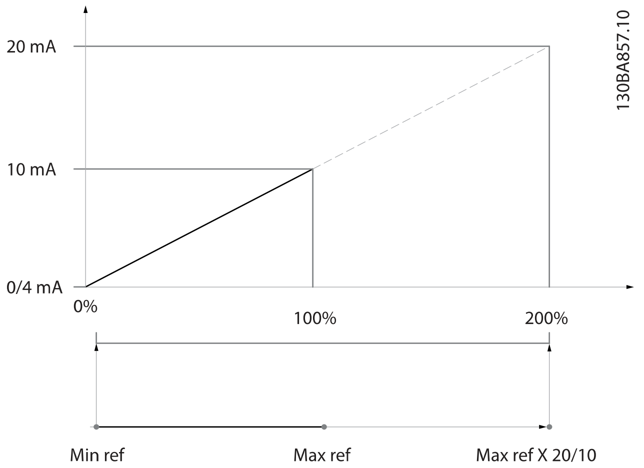
EXAMPLE 1:
Variable value= OUTPUT FREQUENCY, range = 0-100 Hz
Range needed for output = 0-50 Hz
Output signal 0 or 4 mA is needed at 0 Hz (0% of range) - set par. 6-51 Terminal 42 Output Min Scale to 0%
Output signal 20 mA is needed at 50 Hz (50% of range) - set par. 6-52 Terminal 42 Output Max Scale to 50%



EXAMPLE 2:
Variable= FEEDBACK, range= -200% to +200%
Range needed for output= 0-100%
Output signal 0 or 4 mA is needed at 0% (50% of range) - set par. 6-51 Terminal 42 Output Min Scale to 50%
Output signal 20 mA is needed at 100% (75% of range) - set par. 6-52 Terminal 42 Output Max Scale to 75%



EXAMPLE 3:
Variable value= REFERENCE, range= Min ref - Max ref
Range needed for output= Min ref (0%) - Max ref (100%), 0-10 mA
Output signal 0 or 4 mA is needed at Min ref - set par. 6-51 Terminal 42 Output Min Scale to 0%
Output signal 10 mA is needed at Max ref (100% of range) - set par. 6-52 Terminal 42 Output Max Scale to 200% (20 mA / 10 mA x 100%=200%).



6-53 Terminal 42 Output Bus Control	
Range:	Function:
0.00 %* [0.00 - 100.00 %]	Holds the level of Output 42 if controlled by bus.

6-54 Terminal 42 Output Timeout Preset	
Range:	Function:
0.00 %* [0.00 - 100.00 %]	Holds the preset level of Output 42. In case of a bus timeout and a timeout function is selected in par. 6-50 Terminal 42 Output the output will preset to this level.

6-6* Analog Output 2 MCB 101

Analog outputs are current outputs: 0/4 - 20 mA. Common terminal (terminal X30/8) is the same terminal and electrical potential for analog common connection. Resolution on analog output is 12 bit.

6-60 Terminal X30/8 Output		
Option:		Function:
[0] *	No operation	
[100]	Output freq. 0-100	
[101]	Reference Min-Max	
[102]	Feedback +-200%	
[103]	Motor cur. 0-Imax	
[104]	Torque 0-Tlim	
[105]	Torque 0-Tnom	
[106]	Power 0-Pnom	
[107]	Speed 0-HighLim	
[113]	Ext. Closed Loop 1	
[114]	Ext. Closed Loop 2	
[115]	Ext. Closed Loop 3	
[130]	Out frq 0-100 4-20mA	
[131]	Reference 4-20mA	
[132]	Feedback 4-20mA	
[133]	Motor cur. 4-20mA	
[134]	Torq.0-lim 4-20 mA	
[135]	Torq.0-nom 4-20mA	
[136]	Power 4-20mA	
[137]	Speed 4-20mA	
[139]	Bus ctrl.	
[140]	Bus ctrl. 4-20 mA	
[141]	Bus ctrl t.o.	
[142]	Bus ctrl t.o. 4-20mA	
[143]	Ext. CL 1 4-20mA	
[144]	Ext. CL 2 4-20mA	
[145]	Ext. CL 3 4-20mA	

6-61 Terminal X30/8 Min. Scale

Range:		Function:
0.00 %*	[0.00 - 200.00 %]	Scales the minimum output of the selected analog signal on terminal X30/8. Scale the minimum value as a percentage of the maximum signal value, i.e. 0 mA (or 0 Hz) is desired at 25% of the maximum output value and 25% is programmed. The value can never be higher than the corresponding setting in par. 6-62 Terminal X30/8 Max. Scale if value is below 100%. This parameter is active when option module MCB 101 is mounted in the frequency converter.

6-62 Terminal X30/8 Max. Scale

Range:		Function:
100.00 %*	[0.00 - 200.00 %]	Scales the maximum output of the selected analog signal on terminal X30/8. Scale the value to the desired maximum value of the current signal output. Scale the output to give a lower current than 20 mA at full scale or 20 mA at an output below 100% of the maximum signal value. If 20 mA is the desired output current at a value between 0 - 100% of the ful-scale output, program the percentage value in the parameter, i.e. 50% = 20 mA. If a current between 4 and 20 mA is desired at maximum output (100%), calculate the percentage value as follows: $20\ mA\ /\ desired\ maximum\ current \times 100\ \%$ $i.e.\ 10\ mA: \frac{20\ mA}{10\ mA} \times 100\ \% = 200\ \%$

6-63 Terminal X30/8 Output Bus Control

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to apply to the output terminal, when it is configured as [Bus Controlled].

6-64 Terminal X30/8 Output Timeout Preset

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to apply to the output terminal, when it is configured as [Bus Controlled Timeout] and time-out is detected.

Main Menu - Communications and Options - Group 8

8-0* General Settings

8-01 Control Site		
Option:		Function:
		The setting in this parameter overrides the settings in par. 8-50 Coasting Select to par. 8-56 Preset Reference Select.
[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.

8-02 Control Source		
Option:		Function:
		Select the source of the control word: one of two serial interfaces or four installed options. During initial power-up, the frequency converter automatically sets this parameter to *Option A* [3] if it detects a valid fieldbus option installed in slot A. If the option is removed, the frequency converter detects a change in the configuration, sets par. 8-02 Control Source back to default setting *FC Port*, and the frequency converter then trips. If an option is installed after initial power-up, the setting of par. 8-02 Control Source will not change but the frequency converter will trip and display: Alarm 67 *Option Changed*.
[0]	None	
[1]	FC Port	
[2]	USB Port	
[3] *	Option A	
[4]	Option B	
[5]	Option C0	
[6]	Option C1	
[30]	External Can	

This parameter cannot be adjusted while the motor is running.

8-03 Control Timeout Time		
Range:		Function:
Application dependent*	[1.0 - 18000.0 s]	Enter the maximum time expected to pass between the reception of two consecutive telegrams. If this time is exceeded, it indicates that the serial communication has stopped. The function selected in par. 8-04 Control Timeout Function *Control Time-out Function* will then be carried out. In BACnet the control timeout is only triggered if some specific objects are written. The object list hold information on the objects that triggers the control timeout: Analog Outputs Binary Outputs AV0 AV1

		AV2
		AV4
		BV1
		BV2
		BV3
		BV4
		BV5
		Multistate Outputs

8-04 Control Timeout Function

Option:		Function:
		Select the time-out function. The time-out function is activated when the control word fails to be updated within the time period specified in par. 8-03 Control Timeout Time. Choice [20] only appears after setting the Metasys N2 protocol.
[0] *	Off	
[1]	Freeze output	
[2]	Stop	
[3]	Jogging	
[4]	Max. speed	
[5]	Stop and trip	
[7]	Select setup 1	
[8]	Select setup 2	
[9]	Select setup 3	
[10]	Select setup 4	
[20]	N2 Override Release	

8-05 End-of-Timeout Function

Option:		Function:
		Select the action after receiving a valid control word following a time-out. This parameter is active only when par. 8-04 Control Timeout Function is set to [Set-up 1-4].
[0]	Hold set-up	Retains the set-up selected in par. 8-04 Control Timeout Function and displays a warning, until par. 8-06 Reset Control Timeout toggles. Then the frequency converter resumes its original set-up.
[1] *	Resume set-up	Resumes the set-up active prior to the time-out.

8-06 Reset Control Timeout

Option:		Function:
		This parameter is active only when the choice *Hold set-up* [0] has been selected in par. 8-05 End-of-Timeout Function .
[0] *	Do not reset	Retains the set-up specified in par. 8-04 Control Timeout Function, [Select setup 1-4] following a control time-out.
[1]	Do reset	Returns the frequency converter to the original set-up following a control word time-out. When the value is set to *Do reset* [1], the frequency converter performs the reset and then immediately reverts to the *Do not reset* [0] setting.

8-07 Diagnosis Trigger		
Option:		Function:
		This parameter has no function for BACnet.
[0] *	Disable	
[1]	Trigger on alarms	
[2]	Trigger alarm/warn.	

8-1* Ctrl. Word Settings

8-10 Control Profile		
Option:		Function:
		Select the interpretation of the control and status words corresponding to the installed fieldbus. Only the selections valid for the fieldbus installed in slot A will be visible in the keypad display.
[0] *	FC profile	
[1]	PROFIdrive profile	
[5]	ODVA	
[7]	CANopen DSP 402	

8-13 Configurable Status Word STW		
Option:		Function:
		This parameter enables configuration of bits 12 – 15 in the status word.
[0]	No function	
[1] *	Profile Default	Function corresponds to the profile default selected in par. 8-10 Control Profile.
[2]	Alarm 68 Only	Only set in case of an Alarm 68.
[3]	Trip excl Alarm 68	Set in case of a trip, except if the trip is executed by an Alarm 68.
[16]	T37 DI status	The bit indicates the status of terminal 37. "0" indicates T37 is low (safe stop) "1" indicates T37 is high (normal)

8-3* Drive Port Settings

8-30 Protocol		
Option:		Function:
		Protocol selection for the integrated Drive (standard) Port (RS485) on the control card. Parameter group 8-7* is only visible when Drive Option [9] is chosen.
[0] *	FC	Communication according to the Drive Protocol as described in the *TR200 Design Guide, RS485 Installation and Set-up* .
[1]	FC MC	Same as Drive [0] but to be used when downloading SW to the frequency converter or uploading dll file (covering information regarding parameters available in the frequency converter and their inter-dependencies) to Trane Drive Utility, TDU.
[2]	Modbus RTU	Communication according to the Modbus RTU protocol as described in the *TR200 Design Guide, RS485 Installation and Set-up* .

[3]	Metasys N2	Communication protocol. The N2 software protocol is designed to be general in nature in order to accommodate the unique properties each device may have. Please see separate manual *TR200 MetasysMG. 12.NX.YY.*
[4]	FLN	Communication according to the Apogee FLN P1 protocol.
[5]	BACnet	
[9]	FC Option	To be used when a gateway is connected to the integrated RS485 port, e.g. the BACnet gateway. Following changes will take place: -Address for the Drive port will be set to 1 and par. 8-31 Address, is now used to set the address for the gateway on the network, e.g. BACnet. -Baud rate for the Drive port will be set to a fixed value (115.200 Baud) and par. 8-32 Baud Rate, is now used to set the baud rate for the network port (e.g. BACnet) on the gateway.
[20]	LEN	

Further details can be found in the Metasys manual.

8-31 Address

Range:		Function:
Application dependent*	[Application dependant]	Enter the address for the Drive (standard) port. Valid range: 1 - 126.

8-33 Parity / Stop Bits

Option:		Function:
		Parity and Stop Bits for the protocol par. 8-30 Protocol using the Drive Port. For some of the protocols, not all options will be visible. Default depends on the protocol selected.
[0] *	Even Parity, 1 Stop Bit	
[1]	Odd Parity, 1 Stop Bit	
[2]	No Parity, 1 Stop Bit	
[3]	No Parity, 2 Stop Bits	

0-34 Estimated cycle time

Range:		Function:
0 ms*	[0 - 1000000 ms]	In a noisy environments, the interface may be blocked by due to overload of bad frames. This parameter specifies the time between two consecutive frames on the network. If the interface does not detect valid frames in that time it flushes the receive buffer.

8-35 Minimum Response Delay

Range:		Function:
Application dependent*	[Application dependant]	

8-36 Maximum Response Delay		
Range:		Function:
Application dependent*	[Application dependant]	

8-37 Maximum Inter-Char Delay		
Range:		Function:
Application dependent*	[Application dependant]	

8-4* Telegram Selection

8-40 Telegram Selection		
Option:		Function:
		Enables use of freely configurable telegrams or standard telegrams for the Drive port.
[1] *	Standard telegram 1	
[101]	PPO 1	
[102]	PPO 2	
[103]	PPO 3	
[104]	PPO 4	
[105]	PPO 5	
[106]	PPO 6	
[107]	PPO 7	
[108]	PPO 8	
[200]	Custom telegram 1	

0-42 PCD Write Configuration		
Option:		Function:
[0]	None	Select the parameters to be assigned to PCD's telegrams. The number of available PCDs depends on the telegram type. The values in PCD's will then be written to the selected parameters as data values.
[7]	Accel Time 1	
[8]	Decel Time 1	
[15]	Motor Speed High Limit [Hz]	
[16]	Motor Speed Low Limit [Hz]	
[17]	Motor Speed High Limit [RPM]	
[18]	Motor Speed Low Limit [RPM]	
[40]	Torque Limiter (Driving)	
[41]	Torque Limiter (Braking)	
[52]	Minimum Reference	
[53]	Maximum Reference	

[110]	Accel Time 2
[111]	Decel Time 2
[190]	Digital & Relay Bus Control
[193]	Pulse Out #27 Bus Control
[195]	Pulse Out #29 Bus Control
[197]	Pulse Out #X30/6 Bus Control
[222]	Jog Accel/Decel Time
[223]	Quick Stop Decel Time
[653]	Terminal 42 Output Bus Control
[663]	Terminal X30/8 Bus Control
[673]	Terminal X45/1 Bus Control
[683]	Terminal X45/3 Bus Control
[890]	Bus Jog 1 Speed
[891]	Bus Jog 2 Speed
[1280]	Fieldbus CTW 1
[1282]	Fieldbus REF 1

O-43 PCD Read Configuration

Option:		Function:
[0]	None	Select the parameters to be assigned to PCD's of the telegrams. The number of available PCDs depends on the telegram type. PCDs contain the actual data values of the selected parameters.
[1200]	Control Word	
[1201]	Reference [Unit]	
[1202]	Reference %	
[1203]	Status Word	
[1205]	Main Actual Value [%]	
[1209]	Custom Readout	
[1210]	Power [kW]	
[1211]	Power [hp]	
[1212]	Motor Voltage	
[1213]	Frequency	
[1214]	Motor Current	
[1215]	Frequency [%]	
[1216]	Torque [Nm]	
[1217]	Speed [RPM]	
[1218]	Motor Thermal	
[1219]	KTY sensor temperature	
[1220]	Motor Angle	
[1222]	Torque [%]	
[1225]	Torque [Nm] High	
[1230]	DC Link Voltage	
[1232]	Brake Energy /s	

[1233]	Brake Energy /2 min
[1234]	Heatsink Temp.
[1235]	Drive Thermal
[1238]	Logic Controller State
[1239]	Control Card Temp.
[1250]	External Reference
[1251]	Pulse Reference
[1252]	Feedback [Unit]
[1253]	Digi Pot Reference
[1260]	Digital Input
[1261]	Terminal 53 Switch Setting
[1262]	Analog Input 53
[1263]	Terminal 54 Switch Setting
[1264]	Analog Input 54
[1265]	Analog Output 42 [mA]
[1266]	Digital Output [bin]
[1267]	Freq. Input #29 [Hz]
[1268]	Freq. Input #33 [Hz]
[1269]	Pulse Output #27 [Hz]
[1270]	Pulse Output #29 [Hz]
[1271]	Relay Output [bin]
[1272]	Counter A
[1273]	Counter B
[1274]	Prec. Stop Counter
[1275]	Analog In X30/11
[1276]	Analog In X30/12
[1277]	Analog Out X30/8 [mA]
[1278]	Analog Out X45/1 [mA]
[1279]	Analog Out X45/3 [mA]
[1284]	Comm. Option STW
[1285]	Drive Port CTW 1
[1290]	Alarm Word
[1291]	Alarm Word 2
[1292]	Warning Word
[1293]	Warning Word 2
[1294]	Ext. Status Word
[1500]	Operating Hours
[1501]	Running Hours
[1502]	kWh Counter

8-5* Digital/Bus

Parameters for configuring the control word Digital/Bus merging.

NOTE: This parameter is active only when par. 8-01 Control Site is set to [0] *Digital and control word*.

8-50 Coasting Select		
Option:		Function:
		Select control of the coasting function via the terminals (digital input) and/or via the bus.
[0]	Digital input	Activates Start command via a digital input.
[1]	Bus	Activates Start command via the serial communication port or fieldbus option.
[2]	Logic AND	Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] *	Logic OR	Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.

8-52 DC Brake Select		
Option:		Function:
		Select control of the DC brake via the terminals (digital input) and/or via the fieldbus.
[0]	Digital input	Activates Start command via a digital input.
[1]	Bus	Activates Start command via the serial communication port or fieldbus option.
[2]	Logic AND	Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] *	Logic OR	Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.

8-53 Start Select		
Option:		Function:
		Select control of the frequency converter start function via the terminals (digital input) and/or via the fieldbus.
[0]	Digital input	Activates Start command via a digital input.
[1]	Bus	Activates Start command via the serial communication port or fieldbus option.
[2]	Logic AND	Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] *	Logic OR	Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.

8-54 Reversing Select		
Option:		Function:
		Select control of the frequency converter reverse function via the terminals (digital input) and/or via the fieldbus.
[0] *	Digital input	Activates Reverse command via a digital input.
[1]	Bus	Activates Reverse command via the serial communication port or fieldbus option.
[2]	Logic AND	Activates Reverse command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.

[3]	Logic OR	Activates Reverse command via the fieldbus/serial communication port OR via one of the digital inputs.

This parameter is active only when par. 8-01 Control Site is set to [0] ***Digital and control word***.

8-55 Set-up Select		
Option:		Function:
		Select control of the frequency converter set-up selection via the terminals (digital input) and/or via the fieldbus.
[0]	Digital input	Activates the set-up selection via a digital input.
[1]	Bus	Activates the set-up selection via the serial communication port or fieldbus option.
[2]	Logic AND	Activates the set-up selection via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] *	Logic OR	Activate the set-up selection via the fieldbus/serial communication port OR via one of the digital inputs.

8-56 Preset Reference Select		
Option:		Function:
		Select control of the frequency converter Preset Reference selection via the terminals (digital input) and/or via the fieldbus.
[0]	Digital input	Activates Preset Reference selection via a digital input.
[1]	Bus	Activates Preset Reference selection via the serial communication port or fieldbus option.
[2]	Logic AND	Activates Preset Reference selection via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] *	Logic OR	Activates the Preset Reference selection via the fieldbus/serial communication port OR via one of the digital inputs.

8-7* BACnet

8-70 BACnet Device Instance		
Range:		Function:
[5] *	BACnet used	
1025*	[0 - 4194302]	Enter a unique ID number for the BACnet device.

NOTICE

This parameter is active only when par. 8-30 Protocol is set to [5] ***BACnet*** or [9] ***FC Option***.

8-72 MS/TP Max Masters

Range:		Function:
[5] *	BACnet used	
127*	[0 - 127]	Define the address of the master which holds the highest address in this network. Decreasing this value optimises polling for the token.

NOTICE

This parameter is active only when par. 8-30 Protocol is set to [5] ***BACnet*** or [9] ***FC Option***.

8-73 MS/TP Max Info Frames

Range:		Function:
1*	[1 - 65534]	Define how many info/data frames the device is allowed to send while holding the token.
[5] *	BACnet used	

NOTICE

This parameter is active only when par. 8-30 Protocol is set to [5] ***BACnet*** or [9] ***FC Option***.

8-74 "I-Am" Service

Option:		Function:
[0] *	Send at power-up	
[1]	Continuously	Choose whether the device should send the "I-Am" service message only at power-up or continuously with an interval of approx. 1 min.
[5] *	BACnet used	

NOTICE

This parameter is active only when par. 8-30 Protocol is set to [5] ***BACnet*** or [9] ***FC Option***.

8-75 Initialisation Password

Range:		Function:
[5] *	BACnet used	
Application dependent*	[1 - 1]	Enter the password needed for execution of Drive Re-initialisation from BACnet.

NOTICE

This parameter is active only when par. 8-30 Protocol is set to [5] ***BACnet*** or [9] ***FC Option***.

8-8* Drive Port Diagnostics

These parameters are used for monitoring the Bus communication via the Drive Port.

8-80 Bus Message Count

Range:		Function:
0*	[0 - 0]	This parameter shows the number of valid telegrams detected on the bus.

8-81 Bus Error Count

Range:		Function:
0*	[0 - 0]	This parameter shows the number of telegrams with faults (e.g. CRC fault), detected on the bus.

8-82 Slave Messages Rcvd

Range:		Function:
0*	[0 - 0]	This parameter shows the number of valid telegrams addressed to the slave, sent by the frequency converter.

8-83 Slave Error Count

Range:		Function:
0*	[0 - 0]	This parameter shows the number of error telegrams, which could not be executed by the frequency converter.

8-84 Slave Messages Sent

Range:		Function:
0*	[0 - 0]	

8-85 Slave Timeout Errors

Range:		Function:
0*	[0 - 0]	

8-9* Bus Jog

8-90 Bus Jog 1 Speed

Range:		Function:
100 RPM*	[Application dependant]	Enter the jog speed. This is a fixed jog speed activated via the serial port or fieldbus option.

8-91 Bus Jog 2 Speed

Range:		Function:
200 RPM*	[Application dependant]	Enter the jog speed. This is a fixed jog speed activated via the serial port or fieldbus option.

8-94 Bus Feedback 1

Range:		Function:
0*	[-200 - 200]	Write a feedback to this parameter via the serial communication port or fieldbus option. This parameter must be selected in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source or par. 20-06 Feedback 3 Source as a feedback source.

8-95 Bus Feedback 2

Range:		Function:
0*	[-200 - 200]	See par. 8-94 Bus Feedback 1 for further details.

8-96 Bus Feedback 3

Range:		Function:
0*	[-200 - 200]	See par. 8-94 Bus Feedback 1 for further details.

Main Menu - LonWorks - Group 11

Parameter group for all LonWorks specific parameters.
Parameters related to LonWorks ID.

11-00 Neuron ID

Range:		Function:
0*	[0 - 0]	View the Neuron chip's unique Neuron ID number.

11-01 Domain

Range:		Function:
1*	[0 - 255]	

11-02 Subnet ID

Range:		Function:
0*	[0 - 255]	

11-03 Node ID

Range:		Function:
0*	[0 - 255]	

11-10 Drive Profile

Option:		Function:
		This parameter allows selecting between LONMARK Functional Profiles.
[0] *	VSD profile	The Trane Profile and the Node Object are common for all profiles.
[1]	Pump controller	

11-15 LON Warning Word

Range:		Function:
0*	[0 - 65535]	This parameter contains the LON specific warnings.

Bit	Status
0	Internal fault
1	Internal fault
2	Internal fault
3	Internal fault
4	Internal fault
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Changeable types
10	Initialization error
11	Internal communication error
12	Software revision mismatch
13	Bus not active
14	Option not present
15	LON input (nvi/nci) exceeds limits

11-17 XIF Revision

Range:		Function:
0*	[0 - 0]	This parameter contains the version of the external interface file on the Neuron C chip on the LON option.

11-18 LonWorks Revision

Range:		Function:
0*	[0 - 0]	This parameter contains the software version of the application program on the Neuron C chip on the LON option.

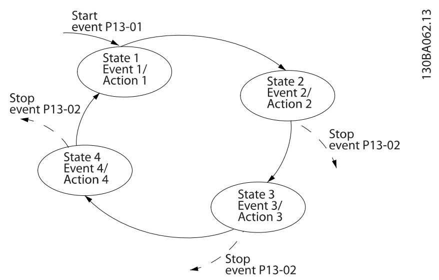
11-21 Store Data Values

Option:		Function:
		This parameter is used to activate storing of data in non-volatile memory.
[0] *	Off	Store function is inactive.
[2]	Store all setups	Stores all parameter values in the E^2PROM. The value returns to *Off* when all parameter values have been stored.

Main Menu - Smart Logic - Group 13

13-** Prog. Features Prog. Features

Smart Logic Control (SLC) is essentially a sequence of user defined actions (see par. 13-52 SL Controller Action [x]) executed by the SLC when the associated user defined *event* (see par. 13-51 SL Controller Event [x]) is evaluated as TRUE by the SLC. Events and *actions* are each numbered and linked together in pairs. This means that when *event* [0] is fulfilled (attains the value TRUE), *action* [0] is executed. After this, the conditions of *event* [1] will be evaluated and if evaluated TRUE, *action* [1] will be executed and so on. Only one *event* will be 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* will be evaluated. This means that when the SLC starts, it evaluates *event* [0] (and only *event* [0]) each scan interval. Only when *event* [0] is evaluated TRUE, will the SLC execute *action* [0] and start evaluating *event* [1]. It is possible to programme from 1 to 20 *events* and *actions*.
When the last *event* / *action* has been executed, the sequence starts over again from *event* [0] / *action* [0]. The illustration shows an example with three event / actions:



Starting and stopping the SLC:
Starting and stopping the SLC can be done by selecting *On* [1] or *Off* [0] in par. 13-00 SL Controller Mode. The SLC always starts in state 0 (where it evaluates *event* [0]). The SLC starts when the Start Event (defined in par. 13-01 Start Event) is evaluated as TRUE (provided that *On* [1] is selected in par. 13-00 SL Controller Mode). The SLC stops when the *Stop Event* (par. 13-02 Stop Event) is TRUE. Par. 13-03 Reset SLC resets all SLC parameters and starts programming from scratch.

13-0* SLC Settings

Use the SLC settings to activate, deactivate and reset the Smart Logic Control sequence. The logic functions and comparators are always running in the background, which opens for separate control of digital inputs and outputs. .

13-00 SL Controller Mode

Option:		Function:
[0]	Off	Disables the Smart Logic Controller.
[1]	On	Enables the Smart Logic Controller.

13-01 Start Event

Option:		Function:
		Select the boolean (TRUE or FALSE) input to activate Smart Logic Control.
[0] *	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value TRUE in the logic rule.
[2]	Running	See parameter group 5-3* for further description.
[3]	In range	See parameter group 5-3* for further description.

[4]	On reference	See parameter group 5-3* for further description.
[5]	Torque limit	See parameter group 5-3* for further description.
[6]	Current limit	See parameter group 5-3* for further description.
[7]	Out of current range	See parameter group 5-3* for further description.
[8]	Below I low	See parameter group 5-3* for further description.
[9]	Above I high	See parameter group 5-3* for further description.
[10]	Out of speed range	
[11]	Below speed low	See parameter group 5-3* for further description.
[12]	Above speed high	See parameter group 5-3* for further description.
[13]	Out of feedb. range	
[14]	Below feedb. low	
[15]	Above feedb. high	
[16]	Thermal warning	See parameter group 5-3* for further description.
[17]	Mains out of range	See parameter group 5-3* for further description.
[18]	Reversing	See parameter group 5-3* for further description.
[19]	Warning	See parameter group 5-3* for further description.
[20]	Alarm (trip)	See parameter group 5-3* for further description.
[21]	Alarm (trip lock)	See parameter group 5-3* for further description.
[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 logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of logic rule 3 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).
[37]	Digital input DI32	Use the value of DI32 in the logic rule (High = TRUE).
[38]	Digital input DI33	Use the value of DI33 in the logic rule (High = TRUE).
[39]	Start command	This event is TRUE if the frequency converter is started by any means (either via digital input, field bus or other).
[40]	Drive stopped	This event is TRUE if the frequency converter is stopped or coasted by any means (either via digital input, fieldbus or other).
[41]	Reset Trip	This event is TRUE if the frequency converter is tripped (but not trip-locked) and the reset button is pressed.

[42]	Auto Reset Trip	This event is TRUE if the frequency converter is tripped (but not trip-locked) and an Automatic Reset is issued.
[43]	OK Key	This event is TRUE if the OK key on the keypad is pressed.
[44]	Reset Key	This event is TRUE if the Reset key on the keypad is pressed.
[45]	Left Key	This event is TRUE if the Left key on the keypad is pressed.
[46]	Right Key	This event is TRUE if the Right key on the keypad is pressed.
[47]	Up Key	This event is TRUE if the Up key on the keypad is pressed.
[48]	Down Key	This event is TRUE if the Down key on the keypad is pressed.
[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.

13-02 Stop Event

Option:		Function:
		Select the boolean (TRUE or FALSE) input to deactivate Smart Logic Control.
[0] *	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value TRUE in the logic rule.
[2]	Running	See parameter group 5-3* for further description.
[3]	In range	See parameter group 5-3* for further description.
[4]	On reference	See parameter group 5-3* for further description.
[5]	Torque limit	See parameter group 5-3* for further description.
[6]	Current limit	See parameter group 5-3* for further description.
[7]	Out of current range	See parameter group 5-3* for further description.
[8]	Below I low	See parameter group 5-3* for further description.
[9]	Above I high	See parameter group 5-3* for further description.
[10]	Out of speed range	
[11]	Below speed low	See parameter group 5-3* for further description.
[12]	Above speed high	See parameter group 5-3* for further description.
[13]	Out of feedb. range	See parameter group 5-3* for further description.
[14]	Below feedb. low	See parameter group 5-3* for further description.
[15]	Above feedb. high	See parameter group 5-3* for further description.
[16]	Thermal warning	See parameter group 5-3* for further description.
[17]	Mains out of range	See parameter group 5-3* for further description.
[18]	Reversing	See parameter group 5-3* for further description.
[19]	Warning	See parameter group 5-3* for further description.
[20]	Alarm (trip)	See parameter group 5-3* for further description.

[21]	Alarm (trip lock)	See parameter group 5-3* for further description.
[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 logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of logic rule 3 in the logic rule.
[30]	SL Time-out 0	Use the result of timer 0 in the logic rule.
[31]	SL Time-out 1	Use the result of timer 1 in the logic rule.
[32]	SL Time-out 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).
[37]	Digital input DI32	Use the value of DI32 in the logic rule (High = TRUE).
[38]	Digital input DI33	Use the value of DI33 in the logic rule (High = TRUE).
[39]	Start command	This event is TRUE if the frequency converter is started by any means (either via digital input, fieldbus or other).
[40]	Drive stopped	This event is TRUE if the frequency converter is stopped or coasted by any means (either via digital input, fieldbus or other).
[41]	Reset Trip	This event is TRUE if the frequency converter is tripped (but not trip-locked) and the reset button is pressed.
[42]	Auto Reset Trip	This event is TRUE if the frequency converter is tripped (but not trip-locked) and an Automatic Reset is issued.
[43]	OK Key	This event is TRUE if the OK key on the keypad is pressed.
[44]	Reset Key	This event is TRUE if the Reset key on the keypad is pressed.
[45]	Left Key	This event is TRUE if the Left key on the keypad is pressed.
[46]	Right Key	This event is TRUE if the Right key on the keypad is pressed.
[47]	Up Key	This event is TRUE if the Up key on the keypad is pressed.
[48]	Down Key	This event is TRUE if the Down key on the keypad is pressed.
[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 Time-out 3	Use the result of timer 3 in the logic rule.

[71]	SL Time-out 4	Use the result of timer 4 in the logic rule.
[72]	SL Time-out 5	Use the result of timer 5 in the logic rule.
[73]	SL Time-out 6	Use the result of timer 6 in the logic rule.
[74]	SL Time-out 7	Use the result of timer 7 in the logic rule.
[80]	No Flow	
[81]	Dry Pump	
[82]	End of Curve	
[83]	Broken Belt	

13-03 Reset SLC		
Option:		Function:
[0] *	Do not reset SLC	Retains programmed settings in all group 13 parameters (13-*).
[1]	Reset SLC	Resets all group 13 parameters (13-*) to default settings.

13-1* Comparators

Comparators are used for comparing continuous variables (i.e. output frequency, output current, analog input etc.) to fixed preset values. In addition, there are digital values that will be compared to fixed time values. See explanation in par. 13-10 Comparator Operand. Comparators are evaluated once in each scan interval. Use the result (TRUE or FALSE) directly. All parameters in this Par. group are array parameters with index 0 to 5. Select index 0 to programme Comparator 0, select index 1 to programme Comparator 1, and so on.

13-10 Comparator Operand		
Array [4]		
Option:		Function:
		Select the variable to be monitored by the comparator.
[0] *	DISABLED	
[1]	Reference	
[2]	Feedback	
[3]	Motor speed	
[4]	Motor current	
[5]	Motor torque	
[6]	Motor power	
[7]	Motor voltage	
[8]	DC-link voltage	
[9]	Motor thermal	
[10]	Drive thermal	
[11]	Heat sink temp.	
[12]	Analog input AI53	
[13]	Analog input AI54	
[14]	Analog input AIFB10	
[15]	Analog input AIS24V	
[17]	Analog input AICCT	
[18]	Pulse input FI29	
[19]	Pulse input FI33	
[20]	Alarm number	
[21]	Warning number	

[30]	Counter A
[31]	Counter B
[40]	Analog Input x42/1
[41]	Analog Input x42/3
[42]	Analog Input x42/5
[43]	Analog input X49/1
[44]	Analog input X49/3
[45]	Analog input X49/5
[50]	FALSE
[51]	TRUE
[52]	Control ready
[53]	Drive ready
[54]	Running
[55]	Reversing
[56]	In range
[60]	On reference
[61]	Below reference, low
[62]	Above ref, high
[65]	Torque limit
[66]	Current limit
[67]	Out of current range
[68]	Below I low
[69]	Above I high
[70]	Out of speed range
[71]	Below speed low
[72]	Above speed high
[75]	Out of feedb. range
[76]	Below feedb. low
[77]	Above feedb. high
[80]	Thermal warning
[82]	Mains out of range
[85]	Warning
[86]	Alarm (trip)
[87]	Alarm (trip lock)
[90]	Bus OK
[91]	Torque limit & stop
[92]	Brake fault (IGBT)
[93]	Mech. brake control
[94]	Safe stop active
[100]	Comparator 0
[101]	Comparator 1
[102]	Comparator 2
[103]	Comparator 3
[104]	Comparator 4
[105]	Comparator 5
[110]	Logic rule 0
[111]	Logic rule 1

[112]	Logic rule 2
[113]	Logic rule 3
[114]	Logic rule 4
[115]	Logic rule 5
[120]	SL Time-out 0
[121]	SL Time-out 1
[122]	SL Time-out 2
[123]	SL Time-out 3
[124]	SL Time-out 4
[125]	SL Time-out 5
[126]	SL Time-out 6
[127]	SL Time-out 7
[130]	Digital input DI18
[131]	Digital input DI19
[132]	Digital input DI27
[133]	Digital input DI29
[134]	Digital input DI32
[135]	Digital input DI33
[150]	SL digital output A
[151]	SL digital output B
[152]	SL digital output C
[153]	SL digital output D
[154]	SL digital output E
[155]	SL digital output F
[160]	Relay 1
[161]	Relay 2
[180]	Local ref. active
[181]	Remote ref. active
[182]	Start command
[183]	Drive stopped
[185]	Drive in hand mode
[186]	Drive in auto mode
[187]	Start command given
[190]	Digital input x30 2
[191]	Digital input x30 3
[192]	Digital input x30 4
[203]	Run Confirmation

13-11 Comparator Operator

Array [6]

Option:		Function:
[0] *	<	Select < [0] for the result of the evaluation to be TRUE, when the variable selected in par. 13-10 Comparator Operand is smaller than the fixed value in par. 13-12 Comparator Value. The result will be FALSE, if the variable selected in par. 13-10 Comparator Operand is greater than the fixed value in par. 13-12 Comparator Value.
[1]	≈ (equal)	Select ≈ [1] for the result of the evaluation to be TRUE, when the variable selected in par. 13-10 Comparator Operand is approximately equal to the fixed value in par. 13-12 Comparator Value.
[2]	>	Select > [2] for the inverse logic of option < [0].
[5]	TRUE longer than..	
[6]	FALSE longer than..	
[7]	TRUE shorter than..	
[8]	FALSE shorter than..	

13-12 Comparator Value

Array [6]

Range:		Function:
Application dependent*	[-100000.000 - 100000.000]	Enter the 'trigger level' for the variable that is monitored by this comparator. This is an array parameter containing comparator values 0 to 5.

13-2* Timers

Use the result (TRUE or FALSE) from *timers* directly to define an *event* (see par. 13-51 SL Controller Event), or as boolean input in a *logic rule* (see par. 13-40 Logic Rule Boolean 1, par. 13-42 Logic Rule Boolean 2 or par. 13-44 Logic Rule Boolean 3). A timer is only FALSE when started by an action (i.e. Start timer 1 [29]) until the timer value entered in this parameter is elapsed. Then it becomes TRUE again.
All parameters in this Par. group are array parameters with index 0 to 2. Select index 0 to program Timer 0, select index 1 to program Timer 1, and so on.

13-20 SL Controller Timer

Array [3]

Range:		Function:
Application dependent*	[Application dependant]	Enter the value to define the duration of the FALSE output from the programmed timer. A timer is only FALSE if it is started by an action (i.e. *Start timer 1* [29]) and until the given timer value has elapsed.

13-4* Logic Rules

Combine up to three 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 par. 13-40 Logic Rule Boolean 1, par. 13-42 Logic Rule Boolean 2 and par. 13-44 Logic Rule Boolean 3. Define the operators used to logically combine the selected inputs in par. 13-41 Logic Rule Operator 1 and par. 13-43 Logic Rule Operator 2.

Priority of calculation

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

13-40 Logic Rule Boolean 1

Array [6]

Option:		Function:
[0] *	False	Enters the fixed value of FALSE in the logic rule.
[1]	True	Enters the fixed value TRUE in the logic rule.
[2]	Running	See parameter group 5-3* for further description.
[3]	In range	See parameter group 5-3* for further description.
[4]	On reference	See parameter group 5-3* for further description.
[5]	Torque limit	See parameter group 5-3* for further description.
[6]	Current limit	See parameter group 5-3* for further description.
[7]	Out of current range	See parameter group 5-3* for further description.
[8]	Below I low	See parameter group 5-3* for further description.
[9]	Above I high	See parameter group 5-3* for further description.
[10]	Out of speed range	
[11]	Below speed low	See parameter group 5-3* for further description.
[12]	Above speed high	See parameter group 5-3* for further description.
[13]	Out of feedb. range	See parameter group 5-3* for further description.
[14]	Below feedb. low	See parameter group 5-3* for further description.
[15]	Above feedb. high	See parameter group 5-3* for further description.
[16]	Thermal warning	See parameter group 5-3* for further description.
[17]	Mains out of range	See parameter group for further description.
[18]	Reversing	See parameter group 5-3* for further description.
[19]	Warning	See parameter group 5-3* for further description.
[20]	Alarm (trip)	See parameter group 5-3* for further description.
[21]	Alarm (trip lock)	See parameter group 5-3* for further description.
[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 logic rule 0 in the logic rule.
[27]	Logic rule 1	Use the result of logic rule 1 in the logic rule.
[28]	Logic rule 2	Use the result of logic rule 2 in the logic rule.
[29]	Logic rule 3	Use the result of logic rule 3 in the logic rule.
[30]	SL Time-out 0	Use the result of timer 0 in the logic rule.
[31]	SL Time-out 1	Use the result of timer 1 in the logic rule.
[32]	SL Time-out 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).
[37]	Digital input DI32	Use the value of DI32 in the logic rule (High = TRUE).
[38]	Digital input DI33	Use the value of DI33 in the logic rule (High = TRUE).
[39]	Start command	This logic rule is TRUE if the frequency converter is started by any means (either via digital input, field bus or other).
[40]	Drive stopped	This logic rule is TRUE if the frequency converter is stopped or coasted by any means (either via digital input, fieldbus or other).
[41]	Reset Trip	This logic rule is TRUE if the frequency converter is tripped (but not trip-locked) and the reset button is pressed.
[42]	Auto Reset Trip	This logic rule is TRUE if the frequency converter is tripped (but not trip-locked) and an Automatic Reset is issued.
[43]	OK Key	This logic rule is TRUE if the OK key on the keypad is pressed.
[44]	Reset Key	This logic rule is TRUE if the Reset key on the keypad is pressed.
[45]	Left Key	This logic rule is TRUE if the Left key on the keypad is pressed.
[46]	Right Key	This logic rule is TRUE if the Right key on the keypad is pressed.
[47]	Up Key	This logic rule is TRUE if the Up key on the keypad is pressed.
[48]	Down Key	This logic rule is TRUE if the Down key on the keypad is pressed.
[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 Time-out 3	Use the result of timer 3 in the logic rule.
[71]	SL Time-out 4	Use the result of timer 4 in the logic rule.
[72]	SL Time-out 5	Use the result of timer 5 in the logic rule.
[73]	SL Time-out 6	Use the result of timer 6 in the logic rule.
[74]	SL Time-out 7	Use the result of timer 7 in the logic rule.

[80]	No Flow
[81]	Dry Pump
[82]	End of Curve
[83]	Broken Belt

13-41 Logic Rule Operator 1

Array [6]

Option:		Function:
		Select the first logical operator to use on the Boolean inputs from par. 13-40 Logic Rule Boolean 1 and par. 13-42 Logic Rule Boolean 2. [13 -XX] signifies the boolean input of par. group 13-*.
[0] *	DISABLED	Ignores par. 13-42 Logic Rule Boolean 2, par. 13-43 Logic Rule Operator 2, and par. 13-44 Logic Rule Boolean 3.
[1]	AND	Evaluates the expression [13-40] AND [13-42].
[2]	OR	evaluates the expression [13-40] OR[13-42].
[3]	AND NOT	evaluates the expression [13-40] AND NOT [13-42].
[4]	OR NOT	evaluates the expression [13-40] OR NOT [13-42].
[5]	NOT AND	evaluates the expression NOT [13-40] AND [13-42].
[6]	NOT OR	evaluates the expression NOT [13-40] OR [13-42].
[7]	NOT AND NOT	evaluates the expression NOT [13-40] AND NOT [13-42].
[8]	NOT OR NOT	evaluates the expression NOT [13-40] OR NOT [13-42].

13-42 Logic Rule Boolean 2

Array [6]

Option:		Function:
		Select the second boolean (TRUE or FALSE) input for the selected logic rule. See par. 13-40 Logic Rule Boolean 1 for further descriptions of choices and their functions.
[0] *	False	
[1]	True	
[2]	Running	
[3]	In range	
[4]	On reference	
[5]	Torque limit	
[6]	Current limit	
[7]	Out of current range	
[8]	Below I low	
[9]	Above I high	
[10]	Out of speed range	
[11]	Below speed low	
[12]	Above speed high	
[13]	Out of feedb. range	
[14]	Below feedb. low	
[15]	Above feedb. high	

[16]	Thermal warning
[17]	Mains out of range
[18]	Reversing
[19]	Warning
[20]	Alarm (trip)
[21]	Alarm (trip lock)
[22]	Comparator 0
[23]	Comparator 1
[24]	Comparator 2
[25]	Comparator 3
[26]	Logic rule 0
[27]	Logic rule 1
[28]	Logic rule 2
[29]	Logic rule 3
[30]	SL Time-out 0
[31]	SL Time-out 1
[32]	SL Time-out 2
[33]	Digital input DI18
[34]	Digital input DI19
[35]	Digital input DI27
[36]	Digital input DI29
[37]	Digital input DI32
[38]	Digital input DI33
[39]	Start command
[40]	Drive stopped
[41]	Reset Trip
[42]	Auto Reset Trip
[43]	OK Key
[44]	Reset Key
[45]	Left Key
[46]	Right Key
[47]	Up Key
[48]	Down Key
[50]	Comparator 4
[51]	Comparator 5
[60]	Logic rule 4
[61]	Logic rule 5
[70]	SL Time-out 3
[71]	SL Time-out 4
[72]	SL Time-out 5
[73]	SL Time-out 6
[74]	SL Time-out 7
[80]	No Flow
[81]	Dry Pump
[82]	End of Curve
[83]	Broken Belt

13-43 Logic Rule Operator 2

Array [6]

Option:		Function:
		Select the second logical operator to be used on the boolean input calculated in par. 13-40 Logic Rule Boolean 1, par. 13-41 Logic Rule Operator 1, and par. 13-42 Logic Rule Boolean 2, and the boolean input coming from par. 13-42 Logic Rule Boolean 2. [13-44] signifies the boolean input of par. 13-44 Logic Rule Boolean 3. [13-40/13-42] signifies the boolean input calculated in par. 13-40 Logic Rule Boolean 1, par. 13-41 Logic Rule Operator 1, and par. 13-42 Logic Rule Boolean 2. DISABLED [0] (factory setting). select this option to ignore par. 13-44 Logic Rule Boolean 3.
[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	

13-44 Logic Rule Boolean 3

Array [6]

Option:		Function:
		Select the third boolean (TRUE or FALSE) input for the selected logic rule. See par. 13-40 Logic Rule Boolean 1 for further descriptions of choices and their functions.
[0] *	False	
[1]	True	
[2]	Running	
[3]	In range	
[4]	On reference	
[5]	Torque limit	
[6]	Current limit	
[7]	Out of current range	
[8]	Below I low	
[9]	Above I high	
[10]	Out of speed range	
[11]	Below speed low	
[12]	Above speed high	
[13]	Out of feedb. range	
[14]	Below feedb. low	
[15]	Above feedb. high	
[16]	Thermal warning	
[17]	Mains out of range	
[18]	Reversing	
[19]	Warning	

[20]	Alarm (trip)
[21]	Alarm (trip lock)
[22]	Comparator 0
[23]	Comparator 1
[24]	Comparator 2
[25]	Comparator 3
[26]	Logic rule 0
[27]	Logic rule 1
[28]	Logic rule 2
[29]	Logic rule 3
[30]	SL Time-out 0
[31]	SL Time-out 1
[32]	SL Time-out 2
[33]	Digital input DI18
[34]	Digital input DI19
[35]	Digital input DI27
[36]	Digital input DI29
[37]	Digital input DI32
[38]	Digital input DI33
[39]	Start command
[40]	Drive stopped
[41]	Reset Trip
[42]	Auto Reset Trip
[43]	OK Key
[44]	Reset Key
[45]	Left Key
[46]	Right Key
[47]	Up Key
[48]	Down Key
[50]	Comparator 4
[51]	Comparator 5
[60]	Logic rule 4
[61]	Logic rule 5
[70]	SL Time-out 3
[71]	SL Time-out 4
[72]	SL Time-out 5
[73]	SL Time-out 6
[74]	SL Time-out 7
[80]	No Flow
[81]	Dry Pump
[82]	End of Curve
[83]	Broken Belt

13-5* States

13-51 SL Controller Event

Array [20]

Option:		Function:
		Select the boolean input (TRUE or FALSE) to define the Smart Logic Controller event. See par. 13-02 Stop Event for further descriptions of choices and their functions.
[0] *	False	
[1]	True	
[2]	Running	
[3]	In range	
[4]	On reference	
[5]	Torque limit	
[6]	Current limit	
[7]	Out of current range	
[8]	Below I low	
[9]	Above I high	
[10]	Out of speed range	
[11]	Below speed low	
[12]	Above speed high	
[13]	Out of feedb. range	
[14]	Below feedb. low	
[15]	Above feedb. high	
[16]	Thermal warning	
[17]	Mains out of range	
[18]	Reversing	
[19]	Warning	
[20]	Alarm (trip)	
[21]	Alarm (trip lock)	
[22]	Comparator 0	
[23]	Comparator 1	
[24]	Comparator 2	
[25]	Comparator 3	
[26]	Logic rule 0	
[27]	Logic rule 1	
[28]	Logic rule 2	
[29]	Logic rule 3	
[30]	SL Time-out 0	
[31]	SL Time-out 1	
[32]	SL Time-out 2	
[33]	Digital input DI18	
[34]	Digital input DI19	
[35]	Digital input DI27	
[36]	Digital input DI29	
[37]	Digital input DI32	

[38]	Digital input DI33
[39]	Start command
[40]	Drive stopped
[41]	Reset Trip
[42]	Auto Reset Trip
[43]	OK Key
[44]	Reset Key
[45]	Left Key
[46]	Right Key
[47]	Up Key
[48]	Down Key
[50]	Comparator 4
[51]	Comparator 5
[60]	Logic rule 4
[61]	Logic rule 5
[70]	SL Time-out 3
[71]	SL Time-out 4
[72]	SL Time-out 5
[73]	SL Time-out 6
[74]	SL Time-out 7
[80]	No Flow
[81]	Dry Pump
[82]	End of Curve
[83]	Broken Belt

13-52 SL Controller Action

Array [20]

Option:		Function:
		Select the action corresponding to the SLC event. Actions are executed when the corresponding event (defined in par. 13-51 SL Controller Event) is evaluated as true. The following actions are available for selection:
[0] *	Disabled	
[1]	No action	
[2]	Select set-up 1	Changes the active set-up (par. 0-10 Active Set-up) to ‘1’.
[3]	Select set-up 2	Changes the active set-up (par. 0-10 Active Set-up) to ‘2’.
[4]	Select set-up 3	Changes the active set-up (par. 0-10 Active Set-up) to ‘3’.
[5]	Select set-up 4	Changes the active set-up (par. 0-10 Active Set-up) to ‘4’. If the set-up is changed, it will merge with other set-up commands coming from either the digital inputs or via a fieldbus.
[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	Selects preset reference 7. If the active preset reference is changed, it will merge 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 frequency converter.
[23]	Run reverse	Issues a start reverse command to the frequency converter.
[24]	Stop	Issues a stop command to the frequency converter.
[26]	DC Brake	Issues a DC stop command to the frequency converter.
[27]	Coast	The frequency converter coasts immediately. All stop commands including the coast command stop the SLC.
[28]	Freeze output	Freezes the output frequency of the frequency converter.
[29]	Start timer 0	Starts timer 0, see par. 13-20 SL Controller Timer for further description.
[30]	Start timer 1	Starts timer 1, see par. 13-20 SL Controller Timer for further description.
[31]	Start timer 2	Starts timer 2, see par. 13-20 SL Controller Timer for further description.
[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).
[36]	Set digital out E low	Any output with 'digital output 5' selected is low (off).
[37]	Set digital out F low	Any output with 'digital output 6' selected is low (off).
[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).
[42]	Set digital out E high	Any output with 'digital output 5' selected is high (closed).
[43]	Set digital out F high	Any output with 'digital output 6' selected is high (closed).
[60]	Reset Counter A	Resets Counter A to zero.
[61]	Reset Counter B	Resets Counter A to zero.
[70]	Start Timer 3	Starts timer 3, see par. 13-20 SL Controller Timer for further description.
[71]	Start Timer 4	Starts timer 4, see par. 13-20 SL Controller Timer for further description.
[72]	Start Timer 5	Starts timer 5, see par. 13-20 SL Controller Timer for further description.
[73]	Start Timer 6	Starts timer 6, see par. 13-20 SL Controller Timer for further description.
[74]	Start Timer 7	Starts timer 7, see par. 13-20 SL Controller Timer for further description.
[80]	Sleep Mode	

Main Menu - Special Functions - Group 14

14-0* Inverter Switching

14-00 Switching Pattern		
Option:		Function:
		Select the switching pattern: 60° AVM or SFAVM.
[0] *	60 AVM	
[1]	SFAVM	

14-01 Switching Frequency		
Option:		Function:
		Select the inverter switching frequency. Changing the switching frequency can help to reduce acoustic noise from the motor. NOTE: The output frequency value of the frequency converter must never exceed 1/10 of the switching frequency. When the motor is running, adjust the switching frequency in par. 14-01 Switching Frequency until the motor is as noiseless as possible. See also par. 14-00 Switching Pattern and the section *Derating*.
[0]	1.0 kHz	
[1]	1.5 kHz	
[2]	2.0 kHz	
[3]	2.5 kHz	
[4]	3.0 kHz	
[5]	3.5 kHz	
[6]	4.0 kHz	
[7] *	5.0 kHz	
[8]	6.0 kHz	
[9]	7.0 kHz	
[10]	8.0 kHz	
[11]	10.0 kHz	
[12]	12.0 kHz	
[13]	14.0 kHz	
[14]	16.0 kHz	

14-03 Overmodulation		
Option:		Function:
[0]	Off	Selects no over-modulation of the output voltage in order to avoid torque ripple on the motor shaft.
[1] *	On	The over-modulation 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 over-syncronous range (from 0% at nominal speed rising to approximately 12% at double nominal speed).

14-04 PWM Random		
Option:		Function:
[0] *	Off	No change of the acoustic motor switching noise.
[1]	On	Transforms the acoustic motor switching noise from a clear ringing tone to a less noticeable 'white' noise. This is achieved by slightly and randomly altering the synchronism of the pulse width modulated output phases.

14-1* Mains On/Off

Parameters for configuring mains failure monitoring and handling.

14-10 Mains Failure		
Option:		Function:
		Select the function at which the frequency converter must act, when the threshold set in par. 14-11 Mains Voltage at Mains Fault has been reached or a *Mains Failure Inverse* command is activated via one of the digital inputs (par. 5-1*).
[0] *	No function	The energy left in the capacitor bank will be used to "drive" the motor, but will be discharged.
[1]	Ctrl. ramp-down	The frequency converter will perform a controlled ramp down. Par. 2-10 Brake Function must be set to *Off* [0].
[3]	Coasting	The inverter will turn off and the capacitor bank will back up the control card then ensuring a faster restart when mains reconnected (at short power zags).
[4]	Kinetic back-up	The frequency converter will ride through by controlling speed for generative operation of the motor utilizing the moment of inertia of the system as long as sufficient energy is present.

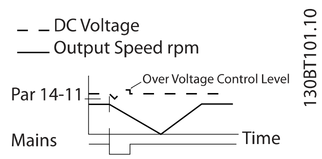


Illustration 4. 2: Controlled Ramp down - short mains failure. Ramping down to stop followed by ramping up to reference.

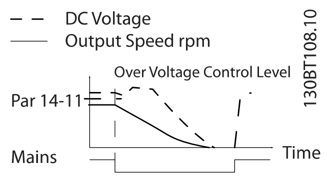


Illustration 4. 3: Controlled Ramp down, longer mains failure. Ramping down as long as the energy in the system allows for it, then the motor is coasted.

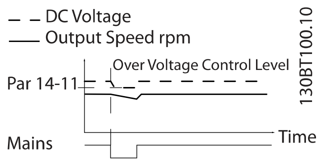


Illustration 4. 4: Kinetic Back-up, short mains failure. Ride through as long as the energy in the system allows for it.

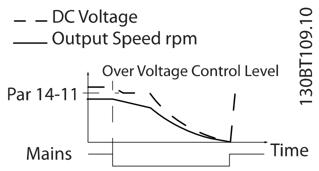


Illustration 4. 5: Kinetic Back-up, longer mains failure. The motor is coasted as soon as the energy in the system is too low.

14-11 Mains Voltage at Mains Fault

14-11 Mains Voltage at Mains Fault		
Range:		Function:
Application dependent*	[180 - 600 V]	This parameter defines the threshold voltage at which the selected function in par. 14-10 Mains Failure should be activated. The detection level is at a faktor sqrt(2) of the value in 14-11.

14-12 Function at Mains Imbalance		
Option:		Function:
		Operation under severe main imbalance conditions reduces the lifetime of the motor. Conditions are considered severe if the motor is operated continuously near nominal load (e.g. a pump or fan running near full speed). When a severe mains imbalance is detected:
[0] *	Trip	Select *Trip* [0] to trip the frequency converter.
[1]	Warning	Select *Warning* [1] to issue a warning.
[2]	Disabled	Select *Disabled* [2] for no action.
[3]	Derate	Select *Derate* [3] for derating the frequency converter.

14-2* Trip Reset

Parameters for configuring auto reset handling, special trip handling and control card self test or initialisation.

14-20 Reset Mode		
Option:		Function:
		Select the reset function after tripping. Once reset, the frequency converter can be restarted.
[0] *	Manual reset	Select *Manual reset* [0], to perform a reset via [RESET] or via the digital inputs.
[1]	Automatic reset x 1	Select *Automatic reset x 1...x20* [1]-[12] to perform between one and twenty 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 *Infinite Automatic Reset* [13] for continuous resetting after tripping.

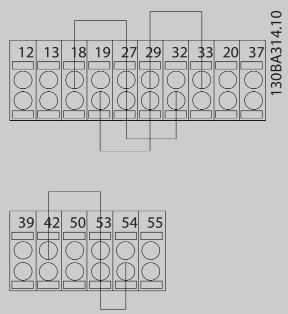
NOTICE

The motor may start without warning. If the specified number of AUTOMATIC RESETs is reached within 10 minutes, the frequency converter enters Manual reset [0] mode. After the Manual reset is performed, the setting of par. 14-20 Reset Mode reverts to the original selection. If the number of automatic resets is not reached within 10 minutes, or when a Manual reset is performed, the internal AUTOMATIC RESET counter returns to zero.

Note
Automatic reset will also be active for resetting safe stop function.

Note
The setting in par. 14-20 Reset Mode is disregarded in case of Fire Mode being active (see par. 24-0*, Fire Mode).

14-21 Automatic Restart Time		
Range:		Function:
10 s*	[0 - 600 s]	Enter the time interval from trip to start of the automatic reset function. This parameter is active when par. 14-20 Reset Mode is set to *Automatic reset* [1] - [13].

14-22 Operation Mode		
Option:		Function:
		Use this parameter to specify normal operation, to perform tests or to initialise all parameters except par. 15-03 Power Up's, par. 15-04 Over Temp's and par. 15-05 Over Volt's. This function is active only when the power is cycled (power off-power on) to the frequency converter.
[0] *	Normal operation	Select *Normal operation* [0] for normal operation of the frequency converter with the motor in the selected application.
[1]	Control card test	Select *Control card test* [1] to test the analog and digital inputs and outputs and the +10 V control voltage. The test requires a test connector with internal connections. Use the following procedure for the control card test: 1. Select *Control card test* [1]. 2. Disconnect the mains supply and wait for the light in the display to go out. 3. Set switches S201 (A53) and S202 (A54) = 'ON' / I. 4. Insert the test plug (see below). 5. Connect to mains supply. 6. Carry out various tests. 7. The results are displayed on the keypad and the frequency converter moves into an infinite loop. 8. Par. 14-22 Operation Mode is automatically set to Normal operation. Carry out a power cycle to start up in Normal operation after a control card test. **If the test is OK:** keypad read-out: Control Card OK. Disconnect the mains supply and remove the test plug. The green LED on the control card will light up. **If the test fails:** keypad read-out: Control Card I/O failure. Replace the frequency converter or control card. The red LED on the control card is turned on. To test the plugs, connect/group the following terminals as shown below: (18 - 27 - 32), (19 - 29 - 33) and (42 - 53 - 54). 
[2]	Initialisation	Select *Initialisation* [2] to reset all parameter values to default settings, except for par. 15-03 Power Up's, par. 15-04 Over Temp's and par. 15-05 Over Volt's. The frequency converter will reset during the next power-up.

		Par. 14-22 Operation Mode will also revert to the default setting *Normal operation* [0].
[3]	Boot mode	

14-23 Typecode Setting		
Option:		Function:
		Typecode re-writing. Use this parameter to set the typecode matching the specific drive.

14-25 Trip Delay at Torque Limit		
Range:		Function:
60 s*	[0 - 60 s]	Enter the torque limit trip delay in seconds. When the output torque reaches the torque limits (par. 4-16 Torque Limit Motor Mode and par. 4-17 Torque Limit Generator Mode), a warning is triggered. When the torque limit warning has been continuously present for the period specified in this parameter, the frequency converter trips. Disable the trip delay by setting the parameter to 60 s = OFF. Thermal frequency converter monitoring will still remain active.

14-26 Trip Delay at Inverter Fault		
Range:		Function:
Application dependent*	[0 - 35 s]	When the frequency converter detects an over-voltage in the set time trip will be effected after the set time.

14-28 Production Settings		
Option:		Function:
[0] *	No action	
[1]	Service reset	
[2]	Set Production Mode	

14-29 Service Code		
Range:		Function:
0*	[-2147483647 - 2147483647]	Service use only.

14-3* Current Limit Control

The frequency converter features an integral Current Limit Controller which is activated when the motor current, and thus the torque, is higher than the torque limits set in par. 4-16 Torque Limit Motor Mode and par. 4-17 Torque Limit Generator Mode.
When the current limit is reached during motor operation or regenerative operation, the frequency converter will try to reduce torque below the preset torque limits as quickly as possible without losing control of the motor.
While the current control is active, the frequency converter can only be stopped by setting a digital input to *Coast inverse* [2] or *Coast and reset inv.* [3]. Any signal on terminals 18 to 33 will not be active until the frequency converter is no longer near the current limit.
By using a digital input set to *Coast inverse* [2] or *Coast and reset inv.* [3], the motor does not use the ramp down time, since the frequency converter is coasted.

14-30 Current Lim Ctrl, Proportional Gain		
Range:		Function:
100 %*	[0 - 500 %]	Enter the proportional gain value for the current limit controller. Selection of a high value makes the controller react faster. Too high a setting leads to controller instability.

14-31 Current Lim Ctrl, Integration Time		
Range:		Function:
0.020 s*	[0.002 - 2.000 s]	Controls the current limit control integration time. Setting it to a lower value makes it react faster. A setting too low leads to control instability.

14-32 Current Lim Ctrl, Filter Time		
Range:		Function:
26.0 ms*	[1.0 - 100.0 ms]	

14-4* Energy Optimising

Parameters for adjusting the energy optimisation level in both Variable Torque (VT) and Automatic Energy Optimization (AEO) mode.

Automatic Energy Optimization is only active if par. 1-03 Torque Characteristics, is set for either *Auto Energy Optim. Compressor* [2] or *Auto Energy Optim. VT* [3].

14-40 VT Level		
Range:		Function:
66 %*	[40 - 90 %]	Enter the level of motor magnetisation at low speed. Selection of a low value reduces energy loss in the motor, but also reduces load capability. This parameter cannot be adjusted while the motor is running.

14-41 AEO Minimum Magnetisation		
Range:		Function:
Application dependent*	[40 - 75 %]	Enter the minimum allowable magnetisation for AEO. Selection of a low value reduces energy loss in the motor, but can also reduce resistance to sudden load changes.

14-42 Minimum AEO Frequency		
Range:		Function:
10 Hz*	[5 - 40 Hz]	Enter the minimum frequency at which the Automatic Energy Optimisation (AEO) is to be active.

14-43 Motor Cosphi		
Range:		Function:
Application dependent*	[0.40 - 0.95]	The Cos(phi) setpoint is automatically set for optimum AEO performance during AMA. This parameter should normally not be altered. However in some situations it may be necessary to enter a new value to fine-tune.

14-5* Environment

These parameters help the frequency converter to operate under special environmental conditions.

14-50 RFI Filter

Option:		Function:
[0]	Off	Select *Off* [0] only if the frequency converter is fed by an isolated mains source (IT mains). In this mode, the internal RFI filter capacitors between chassis and the mains RFI filter circuit are cut-out to reduce the ground capacity currents.
[1] *	On	Select *On* [1] to ensure that the frequency converter complies with EMC standards.

14-51 DC Link Compensation

Option:		Function:
[0]	Off	Disables DC Link Compensation.
[1] *	On	Enables DC Link Compensation.

14-52 Fan Control

Option:		Function:
		Select the minimum speed of the main fan.
[0] *	Auto	Select Auto [0] to run the fan only when the internal temperature of the frequency converter is in the range +35°C to approximately +55°C. The fan will run at low speed at +35°C and at full speed at approximately +55°C.
[1]	On 50%	
[2]	On 75%	
[3]	On 100%	

14-53 Fan Monitor

Option:		Function:
		Select which reaction the frequency converter should take in case a fan fault is detected.
[0]	Disabled	
[1] *	Warning	
[2]	Trip	

14-55 Output Filter

Option:		Function:
[0] *	No Filter	
[1]	Sine-Wave Filter	
[2]	Sine-Wave Filter Fixed	

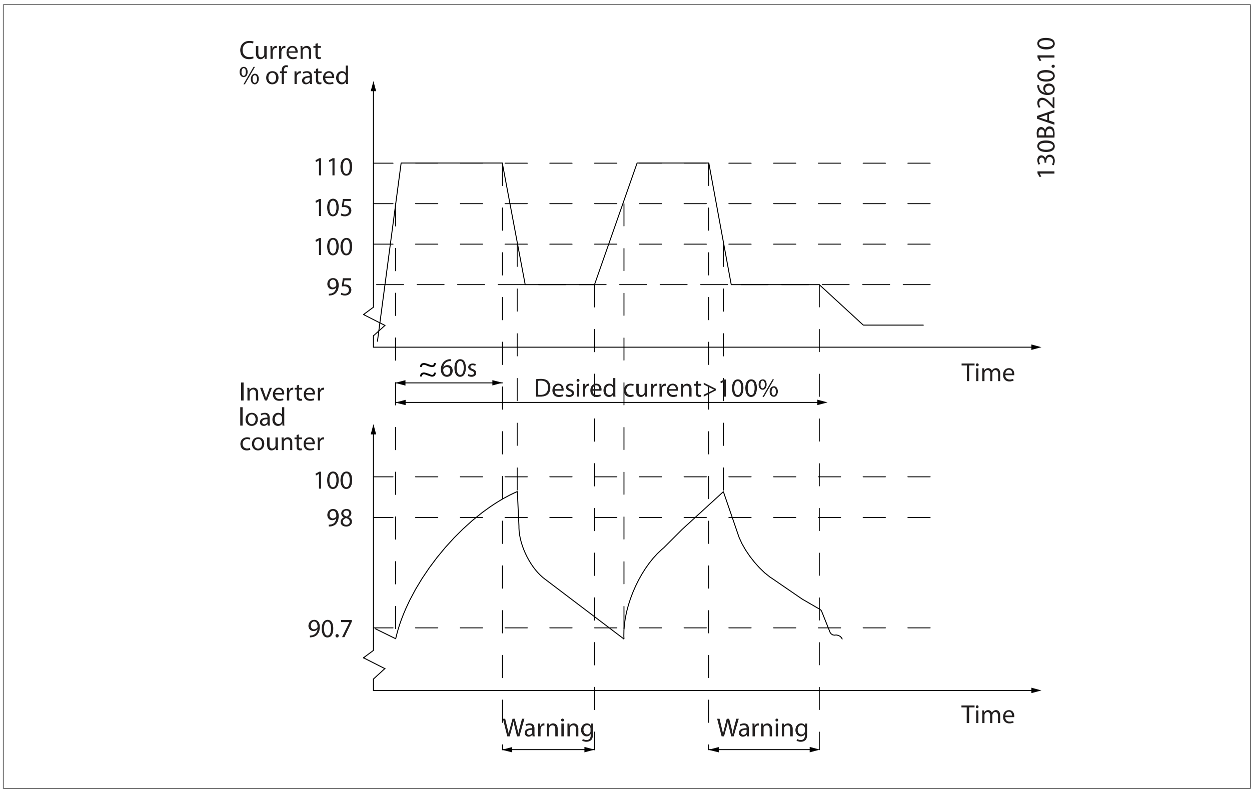
14-6* Auto Derate

This group contains parameters for derating the frequency converter in case of high temperature.

14-60 Function at Over Temperature		
Option:		Function:
		If either heatsink or control card temperature exceeds a factory-programmed temperature limit, a warning will be activated. If the temperature increases further, select whether the frequency converter should trip (trip locked) or derate the output current.
[0] *	Trip	The frequency converter will trip (trip locked) and generate an alarm. Power must be cycled to reset the alarm, but will not allow restart of the motor until the heat sink temperature has dropped below the alarm limit.
[1]	Derate	If the critical temperature is exceeded the output current will be reduced until the allowable temperature has been reached.

No Trip at Inverter Overload

In some pump systems, the frequency converter has not been sized properly to yield the current needed in all points of the operational flow-head characteristic. At these points, the pump will need a current higher than the rated current of the frequency converter. The frequency converter can yield 110% of the rated current continuously for 60 sec. If still overloaded, the frequency converter will normally trip (causing the pump to stop by coasting) and provide an alarm.



It may be preferable to run the pump at reduced speed for a while in case it is not possible to run continuously with demanded capacity.

Select *Function at Inverter Overload*, par. 14-61 Function at Inverter Overload to automatically reduce pump speed until the output current is below 100% of the rated current (set in par. 14-62 Inv. Overload Derate Current).

The *Function at Inverter Overload* is an alternative to letting the frequency converter trip.

The frequency converter estimates the load on the power section by means of an inverter load counter, which will cause a warning at 98% and a reset of the warning at 90%. At the value 100%, the frequency converter trips and provides an alarm.
Status for the counter can be read in par. 16-35 Inverter Thermal.

If par. 14-61 Function at Inverter Overload is set to Derate, the pump speed will be reduced when the counter exceeds 98, and stay reduced until the counter has dropped below 90.7.
If par. 14-62 Inv. Overload Derate Current is set e.g. to 95% a steady overload will cause the pump speed to fluctuate between values corresponding to 110% and 95% of rated output current for the frequency converter.

14-61 Function at Inverter Overload

Option:		Function:
		Is used in case of steady overload beyond the thermal limits (110% for 60 sec.).
[0] *	Trip	Choose Trip [0] to make the frequency converter trip and provide an alarm.
[1]	Derate	Derate [1] to reduce pump speed in order to decrease the load on the power section and allowing this to cool down.

14-62 Inv. Overload Derate Current

Range:		Function:
95 %*	[50 - 100 %]	Defines the desired current level (in % of rated output current for the frequency converter) when running with reduced pump speed after load on the frequency converter has exceeded the allowable limit (110% for 60 sec.).

Main Menu - Drive Information - Group 15

Par. group containing frequency converter information such as operating data, hardware configuration and software versions.

15-0* Operating Data

15-00 Operating Hours

Range:		Function:
0 h*	[0 - 2147483647 h]	View how many hours the frequency converter has run. The value is saved when the frequency converter is turned off.

15-01 Running Hours

Range:		Function:
0 h*	[0 - 2147483647 h]	View how many hours the motor has run. Reset the counter in par. 15-07 Reset Running Hours Counter. The value is saved when the frequency converter is turned off.

15-02 Input kWh Counter

Range:		Function:
0 kWh*	[0 - 2147483647 kWh]	Registering the power consumption of the motor as a mean value over one hour. Reset the counter in par. 15-06 Reset kWh Counter.

15-03 Power Up's

Range:		Function:
0*	[0 - 2147483647]	View the number of times the frequency converter has been powered up.

15-04 Over Temp's

Range:		Function:
0*	[0 - 65535]	View the number of frequency converter temperature faults which have occurred.

15-05 Over Volt's

Range:		Function:
0*	[0 - 65535]	View the number of frequency converter overvoltages which have occurred.

15-06 Reset kWh Counter

Option:		Function:
[0] *	Do not reset	Select *Do not reset* [0] if no reset of the kWh counter is desired.
[1]	Reset counter	Select *Reset* [1] and press [OK] to reset the kWh counter to zero (see par. 15-02 Input kWh Counter).

NOTICE

The reset is carried out by pressing [OK].

15-07 Reset Running Hours Counter		
Option:		Function:
[0] *	Do not reset	Select *Do not reset* [0] if no reset of the Running Hours counter is desired.
[1]	Reset counter	Select *Reset counter* [1] and press [OK] to reset the Running Hours counter (par. 15-01 Running Hours) and par. 15-08 Number of Starts to zero (see also par. 15-01 Running Hours).

15-08 Number of Starts		
Range:		Function:
0*	[0 - 2147483647]	This is a read out parameter only. The counter shows the numbers of starts and stops caused by a normal Start/Stop command and/or when entering/leaving sleep mode.

NOTICE

This parameter will be reset when resetting par. 15-07 Reset Running Hours Counter.

15-1* Data Log Settings

The Data Log enables continuous logging of up to 4 data sources (par. 15-10 Logging Source) at individual rates (par. 15-11 Logging Interval). A trigger event (par. 15-12 Trigger Event) and window (par. 15-14 Samples Before Trigger) are used to start and stop the logging conditionally.

15-10 Logging Source		
Array [4]		
Option:		Function:
		Select which variables are to be logged.
[0] *	None	
[1600]	Control Word	
[1601]	Reference [Unit]	
[1602]	Reference [%]	
[1603]	Status Word	
[1610]	Input Power [kW]	
[1611]	Input Power [hp]	
[1612]	Motor Voltage	
[1613]	Frequency	
[1614]	Motor Current	
[1616]	Torque [Nm]	
[1617]	Speed [RPM]	
[1618]	Motor Thermal	
[1622]	Torque [%]	
[1630]	DC Link Voltage	
[1632]	Brake Energy /s	
[1633]	Brake Energy /2 min	
[1634]	Heatsink Temp.	
[1635]	Inverter Thermal	
[1650]	External Reference	
[1652]	Feedback [Unit]	
[1654]	Feedback 1 [Unit]	

[1655]	Feedback 2 [Unit]
[1656]	Feedback 3 [Unit]
[1660]	Digital Input
[1662]	Analog Input 53
[1664]	Analog Input 54
[1665]	Analog Output 42 [mA]
[1666]	Digital Output [bin]
[1675]	Analog In X30/11
[1676]	Analog In X30/12
[1677]	Analog Out X30/8 [mA]
[1690]	Alarm Word
[1691]	Alarm Word 2
[1692]	Warning Word
[1693]	Warning Word 2
[1694]	Ext. Status Word
[1695]	Ext. Status Word 2
[1840]	Analog Input X49/1
[1841]	Analog Input X49/3
[1842]	Analog Input X49/5
[1843]	Analog Out X49/7
[1844]	Analog Out X49/9
[1845]	Analog Out X49/11
[1846]	X49 Digital Output [bin]
[3110]	Bypass Status Word

15-11 Logging Interval

Range:		Function:
Application dependent*	[Application dependant]	Enter the interval in milliseconds between each sampling of the variables to be logged.

15-12 Trigger Event

Option:		Function:
		Selects the trigger event. When the trigger event occurs, a window is applied to freeze the log. The log will then retain a specified percentage of samples before the occurrence of the trigger event (par. 15-14 Samples Before Trigger).
[0] *	False	
[1]	True	
[2]	Running	
[3]	In range	
[4]	On reference	
[5]	Torque limit	
[6]	Current limit	
[7]	Out of current range	
[8]	Below I low	
[9]	Above I high	
[10]	Out of speed range	

[11]	Below speed low
[12]	Above speed high
[13]	Out of feedb. range
[14]	Below feedb. low
[15]	Above feedb. high
[16]	Thermal warning
[17]	Mains out of range
[18]	Reversing
[19]	Warning
[20]	Alarm (trip)
[21]	Alarm (trip lock)
[22]	Comparator 0
[23]	Comparator 1
[24]	Comparator 2
[25]	Comparator 3
[26]	Logic rule 0
[27]	Logic rule 1
[28]	Logic rule 2
[29]	Logic rule 3
[33]	Digital input DI18
[34]	Digital input DI19
[35]	Digital input DI27
[36]	Digital input DI29
[37]	Digital input DI32
[38]	Digital input DI33
[50]	Comparator 4
[51]	Comparator 5
[60]	Logic rule 4
[61]	Logic rule 5

15-13 Logging Mode

Option:		Function:
[0] *	Log always	Select *Log always* [0] for continuous logging.
[1]	Log once on trigger	Select *Log once on trigger* [1] to conditionally start and stop logging using par. 15-12 Trigger Event and par. 15-14 Samples Before Trigger.

15-14 Samples Before Trigger

Range:		Function:
50*	[0 - 100]	Enter the percentage of all samples prior to a trigger event which are to be retained in the log. See also par. 15-12 Trigger Event and par. 15-13 Logging Mode.

15-2* Historic Log

View up to 50 logged data items via the array parameters in this par. group. For all parameters in the group, [0] is the most recent data and [49] the oldest data. Data is logged every time an *event* occurs (not to be confused with SLC events). *Events* in this context are defined as a change in one of the following areas:

1. Digital input
2. Digital outputs (not monitored in this SW release)
3. Warning word
4. Alarm word
5. Status word
6. Control word
7. Extended status word

Events are logged with value, and time stamp in msec. The time interval between two events depends on how often *events* occur (maximum once every scan time). Data logging is continuous but if an alarm occurs, the log is saved and the values can be viewed on the display. This feature is useful, for example when carrying out service following a trip. View the historic log contained in this parameter via the serial communication port or via the display.

15-20 Historic Log: Event

Array [50]

Range:		Function:
0*	[0 - 255]	View the event type of the logged events.

15-21 Historic Log: Value

Array [50]

Range:		Function:
0*	[0 - 2147483647]	View the value of the logged event. Interpret the event values according to this table:

Digtal input	Decimal value. See par. 16-60 Digital Input for description after converting to binary value.
Digital output (not monitored in this SW release)	Decimal value. See par. 16-66 Digital Output [bin] for description after converting to binary value.
Warning word	Decimal value. See par. 16-92 Warning Word for description.
Alarm word	Decimal value. See par. 16-90 Alarm Word for description.
Status word	Decimal value. See par. 16-03 Status Word for description after converting to binary value.
Control word	Decimal value. See par. 16-00 Control Word for description.
Extended status word	Decimal value. See par. 16-94 Ext. Status Word for description.

15-22 Historic Log: Time

Array [50]

Range:		Function:
0 ms*	[0 - 2147483647 ms]	View the time at which the logged event occurred. Time is measured in ms since frequency converter start. The max. value corresponds to approx. 24 days which means that the count will restart at zero after this time period.

15-23 Historic Log: Date and Time

Range:		Function:
Application dependent*	[Application dependant]	Array parameter; Date & Time 0 - 49: This parameter shows at which time the logged event occurred.

15-3* Alarm Log

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

15-30 Alarm Log: Error Code

Array [10]

Range:		Function:
0*	[0 - 255]	View the error code and look up its meaning in the *Troubleshooting* chapter.

15-31 Alarm Log: Value

Array [10]

Range:		Function:
0*	[-32767 - 32767]	View an extra description of the error. This parameter is mostly used in combination with alarm 38 'internal fault'.

15-32 Alarm Log: Time

Array [10]

Range:		Function:
0 s*	[0 - 2147483647 s]	View the time when the logged event occurred. Time is measured in seconds from frequency converter start-up.

15-33 Alarm Log: Date and Time

Range:		Function:
Application dependent*	[Application dependant]	Array parameter; Date & Time 0 - 9: This parameter shows at which time the logged event occurred.

15-4* Drive Identification

Parameters containing read only information about the hardware and software configuration of the frequency converter.

15-40 FC Type		
Range:		Function:
0*	[0 - 0]	View the FC type. The read-out is identical to the frequency converter series power field of the type code definition, characters 1-6.

15-41 Power Section		
Range:		Function:
0*	[0 - 0]	View the FC type. The read-out is identical to the frequency converter series power field of the type code definition, characters 7-10.

15-42 Voltage		
Range:		Function:
0*	[0 - 0]	View the FC type. The read-out is identical to the frequency converter series power field of the type code definition, characters 11-12.

15-43 Software Version		
Range:		Function:
0*	[0 - 0]	View the combined SW version (or 'package version') consisting of power SW and control SW.

15-44 Ordered Typecode String		
Range:		Function:
0*	[0 - 0]	View the type code string used for re-ordering the frequency converter in its original configuration.

15-45 Actual Typecode String		
Range:		Function:
0*	[0 - 0]	View the actual type code string.

15-46 Frequency Converter Ordering No		
Range:		Function:
0*	[0 - 0]	View the 8-digit ordering number used for re-ordering the frequency converter in its original configuration.

15-47 Power Card Ordering No		
Range:		Function:
0*	[0 - 0]	View the power card ordering number.

15-48 LCP Id No		
Range:		Function:
0*	[0 - 0]	View the keypad ID number.

15-49 SW ID Control Card		
Range:		Function:
0*	[0 - 0]	View the control card software version number.

15-50 SW ID Power Card

Range:		Function:
0*	[0 - 0]	View the power card software version number.

15-51 Frequency Converter Serial Number

Range:		Function:
0*	[0 - 0]	View the frequency converter serial number.

15-53 Power Card Serial Number

Range:		Function:
0*	[0 - 0]	View the power card serial number.

15-59 CSIV Filename

Range:		Function:
Application dependent*	[0 - 0]	CSIV Filename readout.

15-6* Option Ident.

This read-only par. group contains information about the hardware and software configuration of the options installed in slots A, B C0 and C1.

15-60 Option Mounted

Range:		Function:
0*	[0 - 0]	View the installed option type.

15-61 Option SW Version

Range:		Function:
0*	[0 - 0]	View the installed option software version.

15-62 Option Ordering No

Range:		Function:
0*	[0 - 0]	Shows the ordering number for the installed options.

15-63 Option Serial No

Range:		Function:
0*	[0 - 0]	View the installed option serial number.

15-70 Option in Slot A

Range:		Function:
0*	[0 - 0]	View the type code string for the option installed in slot A, and a translation of the type code string. E.g. for type code string 'AX' the translation is 'No option'.

15-71 Slot A Option SW Version

Range:		Function:
0*	[0 - 0]	View the software version for the option installed in slot A.

15-72 Option in Slot B

Range:		Function:
0*	[0 - 0]	View the type code string for the option installed in slot B, and a translation of the type code string. E.g. for type code string 'BX' the translation is 'No option'.

15-73 Slot B Option SW Version

Range:		Function:
0*	[0 - 0]	View the software version for the option installed in slot B.

15-74 Option in Slot C0

Range:		Function:
0*	[0 - 0]	View the type code string for the option installed in slot C, and a translation of the type code string. E.g. for type code string 'CXXXX' the translation is 'No option'.

15-75 Slot C0 Option SW Version

Range:		Function:
0*	[0 - 0]	View the software version for the option installed in slot C.

15-76 Option in Slot C1

Range:		Function:
0*	[0 - 0]	Shows the typecode string for the options (CXXXX if no option) and the translation i.e. >No option<.

15-77 Slot C1 Option SW Version

Range:		Function:
0*	[0 - 0]	Software version for the installed option in option slot C.

15-9* Parameter Info

15-92 Defined Parameters

Array [1000]

Range:		Function:
0*	[0 - 9999]	View a list of all defined parameters in the frequency converter. The list ends with 0.

15-93 Modified Parameters

Array [1000]

Range:		Function:
0*	[0 - 9999]	View a list of the parameters that have been changed from their default setting. The list ends with 0. Changes may not be visible until up to 30 seconds after implementation.

15-98 Drive Identification

Range:		Function:
0*	[0 - 0]	

15-99 Parameter Metadata

Array [23]

Range:		Function:
0*	[0 - 9999]	This parameter contains data used by the Trane Drive Utility software tool.

Main Menu - Data Readouts - Group 16

16-0* General Status

16-00 Control Word		
Range:		Function:
0*	[0 - 65535]	View the Control word sent from the frequency converter via the serial communication port in hex code.

16-01 Reference [Unit]		
Range:		Function:
0.000 ReferenceFeedbackUnit*	[-999999.000 - 999999.000 ReferenceFeedbackUnit]	View the present reference value applied on impulse or analog basis in the unit resulting from the configuration selected in par. 1-00 Configuration Mode (Hz, Nm or RPM).

16-02 Reference [%]		
Range:		Function:
0.0 %*	[-200.0 - 200.0 %]	View the total reference. The total reference is the sum of digital, analog, preset, bus, and freeze references, plus catch-up and slow-down.

16-03 Status Word		
Range:		Function:
0*	[0 - 65535]	View the Status word sent from the frequency converter via the serial communication port in hex code.

16-05 Main Actual Value [%]		
Range:		Function:
0.00 %*	[-100.00 - 100.00 %]	View the two-byte word sent with the Status word to the bus Master reporting the Main Actual Value.

16-09 Custom Readout		
Range:		Function:
0.00 CustomReadoutUnit*	[-999999.99 - 999999.99 CustomReadoutUnit]	View the user-defined readouts as defined in par. 0-30 Custom Readout Unit, par. 0-31 Custom Readout Min Value and par. 0-32 Custom Readout Max Value.

16-1* Motor Status

16-10 Input Power [kW]		
Range:		Function:
0.00 kW*	[0.00 - 10000.00 kW]	Displays motor power in kW. The value shown is calculated on the basis of the actual motor voltage and motor current. The value is filtered, and therefore approx. 30 ms may pass from when an input value changes to when the data read-out values change. The resolution of read-out value on fieldbus is in 10 W steps.

16-11 Input Power [hp]

Range:		Function:
0.00 hp*	[0.00 - 10000.00 hp]	View the motor power in HP. The value shown is calculated on the basis of the actual motor voltage and motor current. The value is filtered, and therefore approximately 30 ms may pass from when an input value changes to when the data read-out values change.

16-12 Motor Voltage

Range:		Function:
0.0 V*	[0.0 - 6000.0 V]	View the motor voltage, a calculated value used for controlling the motor.

16-13 Frequency

Range:		Function:
0.0 Hz*	[0.0 - 6500.0 Hz]	View the motor frequency, without resonance dampening.

16-14 Motor Current

Range:		Function:
0.00 A*	[0.00 - 10000.00 A]	View the motor current measured as a mean value, IRMS. The value is filtered, and thus approximately 30 ms may pass from when an input value changes to when the data read-out values change.

16-15 Frequency [%]

Range:		Function:
0.00 %*	[-100.00 - 100.00 %]	View a two-byte word reporting the actual motor frequency (without resonance dampening) as a percentage (scale 0000-4000 Hex) of par. 4-19 Max Output Frequency.

16-16 Torque [Nm]

Range:		Function:
0.0 Nm*	[-30000.0 - 30000.0 Nm]	View the torque value with sign, applied to the motor shaft. Linearity is not exact between 110% motor current and torque in relation to the rated torque. Some motors supply more than 160% torque. Consequently, the min. value and the max. value will depend on the max. motor current as well as the motor used. The value is filtered, and thus approx. 1.3 seconds may pass from when an input changes value to when the data read-out values change.

16-17 Speed [RPM]

Range:		Function:
0 RPM*	[-30000 - 30000 RPM]	View the actual motor RPM.

16-18 Motor Thermal

Range:		Function:
0 %*	[0 - 100 %]	View the calculated thermal load on the motor. The cut-out limit is 100%. The basis for calculation is the ETR function selected in par. 1-90 Motor Thermal Protection.

16-22 Torque [%]		
Range:		Function:
0 %*	[-200 - 200 %]	This is a read out 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 par. 1-20 Motor Power [kW] or par. 1-21 Motor Power [HP] and par. 1-25 Motor Nominal Speed. This is the value monitored by the *Broken Belt Function* set in par. 22-6*.

16-3* Drive Status

16-30 DC Link Voltage		
Range:		Function:
0 V*	[0 - 10000 V]	View a measured value. The value is filtered with an 30 ms time constant.

16-32 Brake Energy /s		
Range:		Function:
0.000 kW*	[0.000 - 10000.000 kW]	View the brake power transmitted to an external brake resistor, stated as an instantaneous value.

16-33 Brake Energy /2 min		
Range:		Function:
0.000 kW*	[0.000 - 10000.000 kW]	View the brake power transmitted to an external brake resistor. The mean power is calculated on an average basis for the most recent 120 seconds.

16-34 Heatsink Temp.		
Range:		Function:
0 C*	[0 - 255 C]	View the frequency converter heatsink temperature. The cut-out limit is 90 ± 5 °C, and the motor cuts back in at 60 ± 5 °C.

16-35 Inverter Thermal		
Range:		Function:
0 %*	[0 - 100 %]	View the percentage load on the inverter.

16-36 Inv. Nom. Current		
Range:		Function:
Application dependent*	[0.01 - 10000.00 A]	View the inverter nominal current, which should match the nameplate data on the connected motor. The data are used for calculation of torque, motor protection, etc.

16-37 Inv. Max. Current		
Range:		Function:
Application dependent*	[0.01 - 10000.00 A]	View the inverter maximum current, which should match the nameplate data on the connected motor. The data are used for calculation of torque, motor protection, etc.

16-38 SL Controller State		
Range:		Function:
0*	[0 - 100]	View the state of the event under execution by the SL controller.

16-39 Control Card Temp.		
Range:		Function:
0 C*	[0 - 100 C]	View the temperature on the control card, stated in °C.

16-40 Logging Buffer Full		
Option:		Function:
		View whether the logging buffer is full (see par. group 15-1*). The logging buffer will never be full when par. 15-13 Logging Mode is set to *Log always* [0].
[0] *	No	
[1]	Yes	

16-43 Timed Actions Status		
View the timed actions mode.		
Option:		Function:
[0] *	Timed Actions Auto	
[1]	Timed Actions Disabled	
[2]	Constant On Actions	
[3]	Constant Off Actions	

16-49 Current Fault Source		
Range:		Function:
0*	[0 - 8]	Value indicates source of current fault, including: short circuit, over current and phase imbalance (from left): [1-4] Inverter, [5-8] Rectifier, [0] No fault recorded

After a short circuit alarm (imax2) or over current alarm (imax1 or phase imbalance) this will contain the power card number associated with the alarm. It only holds one number so it will indicate the highest priority power card number (master first). The value will persist on power cycle but if a new alarm occurs it will be overwritten with the new power card number (even if it a lower priority number). The value will only be cleared when the alarm log is cleared (i.e. a 3-finger reset would reset the readout to 0).

16-5* Ref. & Feedb.

16-50 External Reference		
Range:		Function:
0.0*	[-200.0 - 200.0]	View the total reference, the sum of digital, analog, preset, bus and freeze references, plus catch-up and slow-down.

16-52 Feedback [Unit]		
Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	View value of resulting feedback value after processing of Feedback 1-3 (see par. 16-54 Feedback 1 [Unit], par. 16-55 Feedback 2 [Unit] and par. 16-56) in the feedback manager. See par. 20-0* *Feedback*. The value is limited by settings in par. 20-13 and par. 20-14. Units as set in par. 20-12 Reference/Feedback Unit.

16-53 Digi Pot Reference		
Range:		Function:
0.00*	[-200.00 - 200.00]	View the contribution of the Digital Potentiometer to the actual reference.

16-54 Feedback 1 [Unit]

Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	View value of Feedback 1, see par. 20-0* *Feedback*. The value is limited by settings in par. 20-13 Minimum Reference/Feedb. and par. 20-14 Maximum Reference/Feedb.. Units as set in par. 20-12 Reference/Feedback Unit.

16-55 Feedback 2 [Unit]

Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	View value of Feedback 2, see par. 20-0* *Feedback*. The value is limited by settings in par. 20-13 and par. 20-14. Units as set in par. 20-12 Reference/Feedback Unit.

16-56 Feedback 3 [Unit]

Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	View value of Feedback 3, see parameter group 20-0* *Feedback*. The value is limited by settings in par. 20-13 Minimum Reference/Feedb. and par. 20-14 Maximum Reference/Feedb.. Units as set in par. 20-12 Reference/Feedback Unit.

16-58 PID Output [%]

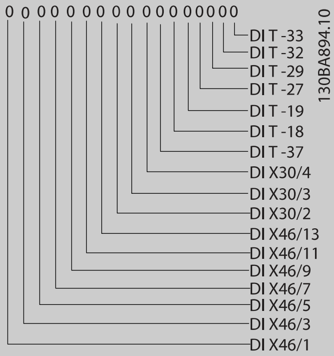
Range:		Function:
0.0 %*	[0.0 - 100.0 %]	This parameter returns the Drive Closed Loop PID controller output value in percent.

16-6* Inputs and Outputs

16-60 Digital Input

Range:		Function:
0*	[0 - 1023]	View the signal states from the active digital inputs. Example: Input 18 corresponds to bit no. 5, ‘0’ = no signal, ‘1’ = connected signal. Bit 6 works in the opposite way, on = '0', off = '1' (safe stop input).

Bit 0	Digital input term. 33
Bit 1	Digital input term. 32
Bit 2	Digital input term. 29
Bit 3	Digital input term. 27
Bit 4	Digital input term. 19
Bit 5	Digital input term. 18
Bit 6	Digital input term. 37
Bit 7	Digital input GP I/O term. X30/4
Bit 8	Digital input GP I/O term. X30/3
Bit 9	Digital input GP I/O term. X30/2
Bit 10-63	Reserved for future terminals



16-61 Terminal 53 Switch Setting

Option:		Function:
		View the setting of input terminal 53. Current = 0; Voltage = 1.
[0] *	Current	
[1]	Voltage	
[2]	Pt 1000 [°C]	
[3]	Pt 1000 [°F]	
[4]	Ni 1000 [°C]	
[5]	Ni 1000 [°F]	

16-62 Analog Input 53

Range:		Function:
0.000*	[-20.000 - 20.000]	View the actual value at input 53.

16-63 Terminal 54 Switch Setting

Option:		Function:
		View the setting of input terminal 54. Current = 0; Voltage = 1.
[0] *	Current	
[1]	Voltage	
[2]	Pt 1000 [°C]	
[3]	Pt 1000 [°F]	
[4]	Ni 1000 [°C]	
[5]	Ni 1000 [°F]	

16-64 Analog Input 54

Range:		Function:
0.000*	[-20.000 - 20.000]	View the actual value at input 54.

16-65 Analog Output 42 [mA]

Range:		Function:
0.000*	[0.000 - 30.000]	View the actual value at output 42 in mA. The value shown reflects the selection in par. 6-50 Terminal 42 Output.

16-66 Digital Output [bin]

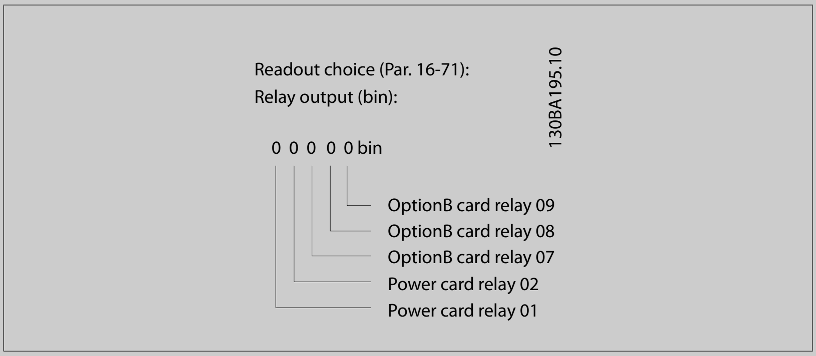
Range:		Function:
0*	[0 - 15]	View the binary value of all digital outputs.

16-70 Pulse Output #29 [Hz]

Range:		Function:
0*	[0 - 40000]	View the actual value of pulses to terminal 29 in digital output mode.

16-71 Relay Output [bin]

Range:		Function:
0*	[0 - 511]	View the settings of all relays.



16-72 Counter A

Range:		Function:
0*	[-2147483648 - 2147483647]	View the present value of Counter A. Counters are useful as comparator operands, see par. 13-10 Comparator Operand. The value can be reset or changed either via digital inputs (parameter group 5-1*) or by using an SLC action (par. 13-52 SL Controller Action).

16-73 Counter B

Range:		Function:
0*	[-2147483648 - 2147483647]	View the present value of Counter B. Counters are useful as comparator operands (par. 13-10 Comparator Operand). The value can be reset or changed either via digital inputs (parameter group 5-1*) or by using an SLC action (par. 13-52 SL Controller Action).

16-75 Analog In X30/11

Range:		Function:
0.000*	[-20.000 - 20.000]	View the actual value at input X30/11 of MCB 101.

16-76 Analog In X30/12

Range:		Function:
0.000*	[-20.000 - 20.000]	View the actual value at input X30/12 of MCB 101.

16-77 Analog Out X30/8 [mA]

Range:		Function:
0.000*	[0.000 - 30.000]	View the actual value at input X30/8 in mA.

16-8* Fieldbus & Drive Port

Parameters for reporting the BUS references and control words.

16-80 Fieldbus CTW 1

Range:		Function:
0*	[0 - 65535]	View the two-byte Control word (CTW) received from the Bus-Master. Interpretation of the Control word depends on the fieldbus option installed and the Control word profile selected in par. 8-10 Control Profile. For more information please refer to the relevant fieldbus manual.

16-82 Fieldbus REF 1

Range:		Function:
0*	[-200 - 200]	View the two-byte word sent with the control word form the Bus-Master to set the reference value. For more information please refer to the relevant fieldbus manual.

16-84 Comm. Option STW

Range:		Function:
0*	[0 - 65535]	View the extended fieldbus comm. option status word. For more information please refer to the relevant fieldbus manual.

16-85 FC Port CTW 1

Range:		Function:
0*	[0 - 65535]	View the two-byte Control word (CTW) received from the Bus-Master. Interpretation of the control word depends on the fieldbus option installed and the Control word profile selected in par. 8-10 Control Profile.

16-86 FC Port REF 1

Range:		Function:
0*	[-200 - 200]	View the two-byte Status word (STW) sent to the Bus-Master. Interpretation of the Status word depends on the fieldbus option installed and the Control word profile selected in par. 8-10 Control Profile.

16-9* Diagnosis Read-Outs

16-90 Alarm Word		
Range:		Function:
0*	[0 - 4294967295]	View the alarm word sent via the serial communication port in hex code.

16-91 Alarm Word 2		
Range:		Function:
0*	[0 - 4294967295]	View the alarm word 2 sent via the serial communication port in hex code.

16-92 Warning Word		
Range:		Function:
0*	[0 - 4294967295]	View the warning word sent via the serial communication port in hex code.

16-93 Warning Word 2		
Range:		Function:
0*	[0 - 4294967295]	View the warning word 2 sent via the serial communication port in hex code.

16-94 Ext. Status Word		
Range:		Function:
0*	[0 - 4294967295]	Returns the extended status word sent via the serial communication port in hex code.

16-95 Ext. Status Word 2		
Range:		Function:
0*	[0 - 4294967295]	Returns the extended warning word 2 sent via the serial communication port in hex code.

16-96 Maintenance Word		
Range:		Function:
0*	[0 - 4294967295]	

Main Menu - Data Readouts 2 - Group 18

18-0* Maintenance Log

This group contains the last 10 Preventive Maintenance events. Maintenance Log 0 is the latest and Maintenance Log 9 the oldest.
By selecting one of the logs and pressing [OK], the Maintenance Item, Action and time of the occurrence can be found in par. 18-00 Maintenance Log: Item – par. 18-03 Maintenance Log: Date and Time.

The Alarm log button on the keypad allows access to both Alarm log and Maintenance log.

18-00 Maintenance Log: Item

Array [10]. Array parameter; Error code 0 - 9: The meaning of the error code can be found in the Troubleshooting section of the Design Guide.

Range:		Function:
0*	[0 - 255]	Locate the meaning of the Maintenance Item in the description of par. 23-10 Maintenance Item .

18-01 Maintenance Log: Action

Array [10]. Array parameter; Error code 0 - 9: The meaning of the error code can be found in the Troubleshooting section of the Design Guide.

Range:		Function:
0*	[0 - 255]	Locate the meaning of the Maintenance Item in the description of par. 23-11 Maintenance Action

18-02 Maintenance Log: Time

Array [10]. Array parameter; Time 0 - 9: This parameter shows at which time the logged event occurred. Time is measured in seconds since start of the frequency converter.

Range:		Function:
0 s*	[0 - 2147483647 s]	Shows when the logged event occurred. Time is measured in seconds since last power-up.

18-03 Maintenance Log: Date and Time

Array [10]

Range:		Function:
Application dependent*	[Application dependant]	Shows when the logged event occurred. This requires that the date and time is programmed in par. 0-70 Date and Time. Date format depends on the setting in par. 0-71 Date Format, while the time format depends on the setting in par. 0-72 Time Format. The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock has not been set properly, e.g. after a power down. Incorrect setting of the clock will affect the time stamps for the Maintenance Events.

When mounting an Analog I/O MCB 115 option card, a battery back-up of date and time is included.

18-1* Fire Mode Log

The log covers the latest 10 faults which have been suppressed by the Fire Mode function. See *par. 24-0*, Fire Mode*. The log can be viewed either via the below parameters or by pressing the Alarm Log button on the keypad and select Fire Mode Log. It is not possible to reset the Fire Mode Log.

18-10 Fire Mode Log: Event		
Range:		Function:
0*	[0 - 255]	This parameter contains an array with 10 elements. The number read represent an error code, which corresponds to a specific alarm. This can be found in the Troubleshooting section in the Design Guide.

18-11 Fire Mode Log: Time		
Range:		Function:
0 s*	[0 - 2147483647 s]	This parameter contains an array with 10 elements. The parameter shows at which time the logged event occurred. Time is measured in seconds since the first start of the motor.

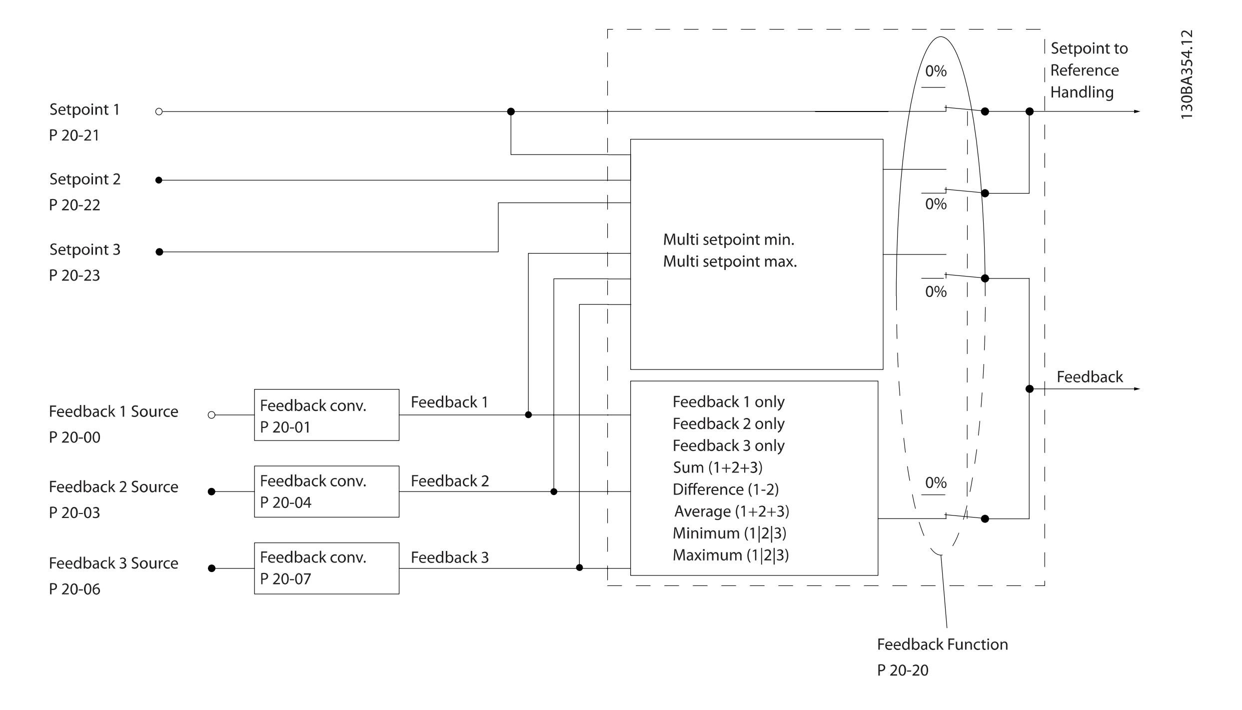
18-12 Fire Mode Log: Date and Time		
Range:		Function:
Application dependent*	[Application dependant]	This parameter contains an array with 10 elements. The parameter shows at which date and time the logged event occurred. The function relies on that the actual date and time has been set in par. 0-70 Date and Time. Note: There is no build in battery back up of the clock. An external back up must be used, eg the one in the MCB 115 Analog I/O option card. See Clock Settings, 0-7*.

Main Menu - Drive Closed Loop - Group 20

This parameter group is used for configuring the closed loop PID Controller, that controls the output frequency of the frequency converter.

20-0* Feedback

This parameter group is used to configure the feedback signal for the frequency converter’s closed loop PID Controller. Whether the frequency converter is in Closed Loop Mode or Open Loop Mode, the feedback signals can also be shown on the frequency converter’s display, be used to control a frequency converter analog output, and be transmitted over various serial communication protocols.



20-00 Feedback 1 Source

Option:		Function:
		Up to three different feedback signals can be used to provide the feedback signal for the frequency converter's PID Controller. This parameter defines which input will be used as the source of the first feedback signal. Analog input X30/11 and Analog input X30/12 refer to inputs on the optional General Purpose I/O board.
[0]	No function	
[1]	Analog input 53	
[2] *	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	
[100]	Bus feedback 1	
[101]	Bus feedback 2	
[102]	Bus feedback 3	

NOTE: If a feedback is not used, its source must be set to *No Function* [0]. Par. 20-20 Feedback Function determines how the three possible feedbacks will be used by the PID Controller.

20-01 Feedback 1 Conversion

Option:		Function:
		This parameter allows a conversion function to be applied to Feedback 1.
[0] *	Linear	*Linear* [0] has no effect on the feedback.
[1]	Square root	*Square root* [1] is commonly used when a pressure sensor is used to provide flow feedback (($flow \propto \sqrt{pressure}$)).
[2]	Pressure to temperature	*Pressure to temperature* [2] is used in compressor applications to provide temperature feedback using a pressure sensor. The temperature of the refrigerant is calculated using the following formula: $Temperature = \frac{A2}{(ln(Pe+1) - A1)} - A3,$ where A1, A2 and A3 are refrigerant-specific constants. The refrigerant must be selected in par. 20-30 Refrigerant. Par. 20-21 Setpoint 1 through par. 20-23 Setpoint 3 allow the values of A1, A2 and A3 to be entered for a refrigerant that is not listed in par. 20-30 Refrigerant.

20-02 Feedback 1 Source Unit

Option:		Function:
		This parameter determines the unit that is used for this Feedback Source, prior to applying the feedback conversion of par. 20-01 Feedback 1 Conversion. This unit is not used by the PID Controller.
[0] *		
[1]	%	
[5]	PPM	
[10]	1/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]	°C	
[70]	mbar	
[71]	bar	
[72]	Pa	
[73]	kPa	

[74]	m WG
[75]	mm Hg
[80]	kW
[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

NOTICE

This parameter is only available when using pressure to temperature feedback conversion.
If the choice Linear [0] is selected in par. 20-01 Feedback 1 Conversion, then the setting of any choice in par. 20-02 Feedback 1 Source Unit does not matter as conversion will be one-to-one.

20-03 Feedback 2 Source

Option:		Function:
		See par. 20-00 Feedback 1 Source for details.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	
[100]	Bus feedback 1	
[101]	Bus feedback 2	
[102]	Bus feedback 3	

20-04 Feedback 2 Conversion

Option:		Function:
		See par. 20-01 Feedback 1 Conversion for details.
[0] *	Linear	
[1]	Square root	
[2]	Pressure to temperature	

20-05 Feedback 2 Source Unit

Option:		Function:
[0] *		
[1]	%	
[5]	PPM	
[10]	1/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]	°C
[70]	mbar
[71]	bar
[72]	Pa
[73]	kPa
[74]	m WG
[75]	mm Hg
[80]	kW
[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

20-06 Feedback 3 Source

Option:		Function:
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	

[100]	Bus feedback 1
[101]	Bus feedback 2
[102]	Bus feedback 3

20-07 Feedback 3 Conversion

Option:		Function:
		See par. 20-01 Feedback 1 Conversion for details.
[0] *	Linear	
[1]	Square root	
[2]	Pressure to temperature	

20-08 Feedback 3 Source Unit

Option:		Function:
[0] *		
[1]	%	
[5]	PPM	
[10]	1/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]	°C	
[70]	mbar	
[71]	bar	
[72]	Pa	
[73]	kPa	
[74]	m WG	
[75]	mm Hg	
[80]	kW	
[120]	GPM	
[121]	gal/s	
[122]	gal/min	
[123]	gal/h	
[124]	CFM	
[125]	ft^3/s	

[126]	ft³/min
[127]	ft³/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in²
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

20-12 Reference/Feedback Unit

Option:	Function:
	See par. 20-02 Feedback 1 Source Unit for details.

20-13 Minimum Reference/Feedb.

Range:		Function:
0.000 ProcessCtrlUnit*	[Application dependant]	Enter the desired minimum value for the remote reference when operating with par. 1-00 Configuration Mode set for Closed Loop [3] operation. Units are set in par. 20-12 Reference/Feedback Unit. Minimum feedback will be -200% of either the value set in par. 20-13 Minimum Reference/Feedb. or in par. 20-14 Maximum Reference/Feedb., which ever numeric value is the highest.

NOTICE

If operating with par. 1-00 Configuration Mode set for Open Loop [0], par. 3-02 Minimum Reference must be used.

20-14 Maximum Reference/Feedb.

Range:		Function:
100.000 ProcessCtrlUnit*	[Application dependant]	Enter the maximum reference/feedback for closed loop operation. The setting determines the highest value obtainable by summing all reference sources for closed loop operation. The setting determines 100% feedback in open and closed loop (total feedback range: -200% to +200%).

NOTICE

If operating with par. 1-00 Configuration Mode set for Open Loop [0], par. 3-03 Maximum Reference must be used.

NOTICE

The dynamics of the PID controller will depend on the value set in this parameter. Please see also par. 20-93 PID Proportional Gain.
Par. 20-13 and par. 20-14 also determine the feedback range when using feedback for display readout with par. 1-00 Configuration Mode set for Open Loop [0]. Same condition as above.

20-2* Feedback & Setpoint

This parameter group is used to determine how the frequency converter's PID Controller will use the three possible feedback signals to control the output frequency of the frequency converter. This group is also used to store the three internal setpoint references.

20-20 Feedback Function		
Option:		Function:
		This parameter determines how the three possible feedbacks will be used to control the output frequency of the frequency converter.
[0]	Sum	*Sum* [0] sets up the PID Controller to use the sum of Feedback 1, Feedback 2 and Feedback 3 as the feedback. NOTICE Any unused feedbacks must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source, or par. 20-06 Feedback 3 Source. The sum of Setpoint 1 and any other references that are enabled (see par. group 3-1*) will be used as the PID Controller's set-point reference.
[1]	Difference	*Difference* [1] sets up the PID controller to use the difference between Feedback 1 and Feedback 2 as the feedback. Feedback 3 will not be used with this selection. Only Setpoint 1 will be used. The sum of Setpoint 1 and any other references that are enabled (see par. group 3-1*) will be used as the PID controller's set-point reference.
[2]	Average	*Average* [2] sets up the PID Controller to use the average of Feedback 1, Feedback 2 and Feedback 3 as the feedback. NOTICE Any unused feedbacks must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source, or par. 20-06 Feedback 3 Source. The sum of Setpoint 1 and any other references that are enabled (see par. group 3-1*) will be used as the PID Controller's set-point reference.
[3] *	Minimum	*Minimum* [3] sets up the PID Controller to compare Feedback 1, Feedback 2 and Feedback 3 and use the lowest value as the feedback. NOTICE Any unused feedbacks must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source, or par. 20-06 Feedback 3 Source. Only setpoint 1 will be used. The sum of Setpoint 1 and any other references that are enabled (see par. group 3-1*) will be used as the PID Controller's setpoint reference.
[4]	Maximum	*Maximum* [4] sets up the PID Controller to compare Feedback 1, Feedback 2 and Feedback 3 and use the highest value as the feedback. NOTICE Any unused feedbacks must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source, or par. 20-06 Feedback 3 Source. Only Setpoint 1 will be used. The sum of Setpoint 1 and any other references that are enabled (see par. group 3-1*) will be used as the PID Controller's setpoint reference.

[5]	Multi Setpoint Min	*Multi-setpoint minimum* [5] sets up the PID Controller to calculate the difference between Feedback 1 and Setpoint 1, Feedback 2 and Setpoint 2, and Feedback 3 and Setpoint 3. It will use the feedback/setpoint pair in which the feedback is the farthest below its corresponding setpoint reference. If all feedback signals are above their corresponding setpoints, the PID Controller will use the feedback/setpoint pair in which the difference between the feedback and setpoint is the least. NOTICE If only two feedback signals are used, the feedback that is not to be used must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source or par. 20-06 Feedback 3 Source. Note that each setpoint reference will be the sum of its respective parameter value (par. 20-21 Setpoint 1, par. 20-22 Setpoint 2 and par. 20-23 Setpoint 3) and any other references that are enabled (see par. group 3-1*).
[6]	Multi Setpoint Max	*Multi-setpoint maximum* [6] sets up the PID Controller to calculate the difference between Feedback 1 and Setpoint 1, Feedback 2 and Setpoint 2, and Feedback 3 and Setpoint 3. It will use the feedback/setpoint pair in which the feedback is farthest above its corresponding setpoint reference. If all feedback signals are below their corresponding setpoints, the PID Controller will use the feedback/setpoint pair in which the difference between the feedback and the setpoint reference is the least. NOTICE If only two feedback signals are used, the feedback that is not to be used must be set to ***No Function*** in par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source or par. 20-06 Feedback 3 Source. Note that each setpoint reference will be the sum of its respective parameter value (par. 20-21 Setpoint 1, par. 20-22 Setpoint 2 and par. 20-23 Setpoint 3) and any other references that are enabled (see parameter group 3-1*).

NOTICE

Any unused feedback must be set to “No function” in its Feedback Source parameter: Par. 20-00 Feedback 1 Source, par. 20-03 Feedback 2 Source or par. 20-06 Feedback 3 Source.

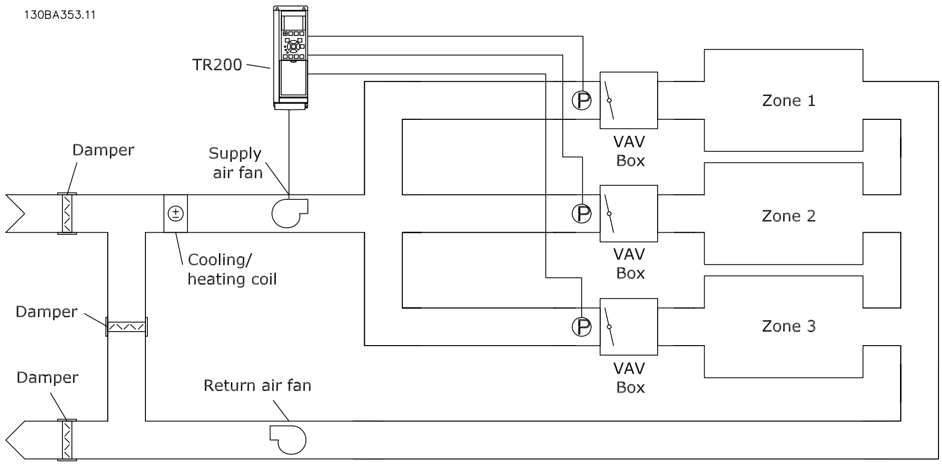
The feedback resulting from the function selected in par. 20-20 Feedback Function will be used by the PID Controller to control the output frequency of the frequency converter. This feedback can also be shown on the frequency converter’s display, be used to control a frequency converter's analog output, and be transmitted over various serial communication protocols.

The frequency converter can be configured to handle multi zone applications. Two different multi zone applications are supported:

- Multi zone, single setpoint
- Multi zone, multi setpoint

The difference between the two is illustrated by the following examples:

Example 1 – Multi zone, single setpoint
In an office building, a VAV (variable air volume) TR200 system must ensure a minimum pressure at selected VAV boxes. Due to the varying pressure losses in each duct, the pressure at each VAV box cannot be assumed to be the same. The minimum pressure required is the same for all VAV boxes. This control method can be set up by setting par. 20-20 Feedback Function to option [3], Minimum, and entering the desired pressure in par. 20-21 Setpoint 1. The PID Controller will increase the speed of the fan if any one feedback is below the setpoint and decrease the speed of the fan if all feedbacks are above the setpoint.



Example 2 – Multi zone, multi setpoint
The previous example can be used to illustrate the use of multi zone, multi setpoint control. If the zones require different pressures for each VAV box, each setpoint may be specified in par. 20-21 Setpoint 1, par. 20-22 Setpoint 2 and par. 20-23 Setpoint 3. By selecting *Multi setpoint minimum*, [5], in par. 20-20 Feedback Function, the PID Controller will increase the speed of the fan if any one of the feedbacks is below its setpoint and decrease the speed of the fan if all feedbacks are above their individual setpoints.

20-21 Setpoint 1

Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	Setpoint 1 is used in Closed Loop Mode to enter a setpoint reference that is used by the frequency converter's PID Controller. See the description of par. 20-20 Feedback Function. NOTICE Setpoint reference entered here is added to any other references that are enabled (see par. group 3-1*).

20-22 Setpoint 2		
Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	Setpoint 2 is used in Closed Loop Mode to enter a setpoint reference that may be used by the frequency converter's PID Controller. See the description of *Feedback Function*, par. 20-20 Feedback Function.

NOTICE

The set-point reference entered here is added to any other references that are enabled (see par. group 3-1*).

20-23 Setpoint 3		
Range:		Function:
0.000 ProcessCtrlUnit*	[-999999.999 - 999999.999 ProcessCtrlUnit]	Setpoint 3 is used in Closed Loop Mode to enter a setpoint reference that may be used by the frequency converter's PID Controller. See the description of par. 20-20 Feedback Function. **NOTICE** The setpoint reference entered here is added to any other references that are enabled (see parameter group 3-1*).

20-3* Feedback Adv. Conversion

In air conditioning compressor applications it is often useful to control the system based on the temperature of the refrigerant. However, it is generally more convenient to directly measure its pressure. This parameter group allows the frequency converter's PID Controller to convert refrigerant pressure measurements into temperature values.

20-30 Refrigerant		
Option:		Function:
		Select the refrigerant used in the compressor application. This parameter must be specified correctly for the pressure to temperature conversion to be accurate. If the refrigerant used is not listed in choices [0] through [6], select *User defined* [7]. Then, use par. 20-31 User Defined Refrigerant A1, par. 20-32 User Defined Refrigerant A2 and par. 20-33 User Defined Refrigerant A3 to provide A1, A2 and A3 for the equation below: $Temperature = \frac{A2}{(ln(Pe+1) - A1)} - A3$
[0] *	R22	
[1]	R134a	
[2]	R404A	
[3]	R407C	
[4]	R410A	
[5]	R502	
[6]	R744	
[7]	User defined	

20-31 User Defined Refrigerant A1

Range:	Function:
10.0000 * [8.0000 - 12.0000]	Use this parameter to enter the value of coefficient A1 when par. 20-30 Refrigerant is set to *User defined* [7].

20-32 User Defined Refrigerant A2

Range:	Function:
-2250.00 * [-3000.00 - -1500.00]	Use this parameter to enter the value of coefficient A2 when par. 20-30 Refrigerant is set to *User defined* [7].

20-33 User Defined Refrigerant A3

Range:	Function:
250.000 * [200.000 - 300.000]	Use this parameter to enter the value of coefficient A3 when par. 20-30 Refrigerant is set to *User defined* [7].

20-34 Fan 1 Area [m2]

Range:	Function:
	Used for setting the area of the air ducts in connection with feedback conversion pressure/velocity to flow. The unit (m^2) is determined by the setting of par. 0-03 Regional Settings. Fan 1 is used with feedback 1. In case of flow difference control, set par. 20-20 Feedback Function to [1] Difference, if flow fan 1 – flow fan 2 is to be controlled.
0.500 m2* [0.000 - 10.000 m2]	

20-35 Fan 1 Area [in2]

Range:	Function:
	Used for setting the area of the air ducts in connection with feedback conversion pressure/velocity to flow. The unit (in^2) is determined by the setting of par. 0-03 Regional Settings. Fan 1 is used with feedback 1. In case of flow difference control, set par. 20-20 Feedback Function to [1] Difference, if flow fan 1 – flow fan 2 is to be controlled.
750 in2* [0 - 15000 in2]	

20-36 Fan 2 Area [m2]

Range:	Function:
	Used for setting the area of the air ducts in connection with feedback conversion pressure/velocity to flow. The unit (m^2) is determined by the setting of par. 0-03 Regional Settings. Fan 2 is used with feedback 2. In case of flow difference control, set par. 20-20 Feedback Function to [1] Difference, if flow fan 1 – flow fan 2 is to be controlled.
0.500 m2* [0.000 - 10.000 m2]	

20-37 Fan 2 Area [in2]

Range:	Function:
	Used for setting the area of the air ducts in connection with feedback conversion pressure/velocity to flow. The unit (in^2) is determined by the setting of par. 0-03 Regional Settings. Fan 2 is used with feedback 2. In case of flow difference control, set par. 20-20 Feedback Function to [1] Difference, if flow fan 1 – flow fan 2 is to be controlled.
750 in2* [0 - 15000 in2]	

20-38 Air Density Factor [%]		
Range:		Function:
100 %*	[50 - 150 %]	Set the air density factor for conversion from pressure to flow in % relative to the air density at sea level at 20 °C (100% ~ 1,2 kg/m^3).

20-7* PID autotuning

The frequency converter PID Closed Loop controller (parameters 20-**, Closed Loop) can be auto-tuned, simplifying and saving time during commissioning, whilst ensuring accurate PID control adjustment. To use autotuning it is necessary for the frequency converter to be configured for closed loop in par. 1-00 Configuration Mode.

A Graphical Local Control Panel (keypad) must be used in order to react on messages during the auto-tuning sequence.

Enabling par. 20-79 PID Autotuning, puts the frequency converter into auto-tuning mode. The keypad then directs the user with on-screen instructions.

The fan/pump is started by pressing [Auto On] button on the keypad and applying a start signal. The speed is adjusted manually by pressing the [▲] or [▼] navigation keys on the keypad to a level where the feedback is around the system set-point.

NOTICE

It is not possible to run the motor at maximum or minimum speed, when manually adjusting the motor speed due to the need of giving the motor a step in the speed during auto-tuning.

PID auto-tuning functions by introducing step changes whilst operating at a steady state and then monitoring the feedback. From the feedback response, the required values for par. 20-93 PID Proportional Gain and par. 20-94 PID Integral Time are calculated. Par. 20-95 PID Differentiation Time is set to value 0 (zero). Par. 20-81 PID Normal/ Inverse Control is determined during tuning process.

These calculated values are presented on the keypad and the user can decide whether to accept or reject them. Once accepted, the values are written to the relevant parameters and auto-tuning mode is disabled in par. 20-79 PID Autotuning. Depending on the system being controlled the time required to carry out auto-tuning could be several minutes.
It is advised to set the ramp times in par. 3-41 Ramp 1 Ramp up Time, par. 3-42 Ramp 1 Ramp Down Time or par. 3-51 Ramp 2 Ramp up Time and par. 3-52 Ramp 2 Ramp down Time according to the load inertia before carrying out PID autotuning. If PID autotuning is carried out with slow ramp times, the auto-tuned parameters will typically result in very slow control. Excessive feedback sensor noise should be removed using the input filter (parameter groups 6-** and 5-5*, Terminal 53/54 Filter Time Constant/Pulse Filter Time Constant #29/33) before activating PID autotuning. In order to obtain the most accurate controller parameters, it is advised to carry out PID autotuning, when the application is running in typical operation, i.e. with a typical load.

20-70 Closed Loop Type

Option:		Function:
		This parameter defines the application response. The default mode should be sufficient for most applications. If the application response speed is known, it can be selected here. This will decrease the time needed for carrying out PID autotuning. The setting has no impact on the value of the tuned parameters and is used only for the autotuning sequence.
[0] *	Auto	
[1]	Fast Pressure	
[2]	Slow Pressure	
[3]	Fast Temperature	
[4]	Slow Temperature	

20-71 PID Performance

Option:		Function:
[0] *	Normal	Normal setting of this parameter will be suitable for pressure control in fan systems.
[1]	Fast	Fast setting would generally be used in pumping systems, where a faster control response is desirable.

20-72 PID Output Change

Range:		Function:
0.10*	[0.01 - 0.50]	This parameter sets the magnitude of step change during autotuning. The value is a percentage of full speed. I.e. if maximum output frequency inpar. 4-13 Motor Speed High Limit [RPM]/par. 4-14 Motor Speed High Limit [Hz] is set to 50Hz, 0.10 is 10% of 50Hz, which is 5Hz. This parameter should be set to a value resulting in feedback changes of between 10% and 20% for best tuning accuracy.

20-73 Minimum Feedback Level

Range:		Function:
-999999.000 ProcessCtrlUnit*	[Application dependant]	The minimum allowable feedback level should be entered here in User units as defined in par. 20-12 Reference/Feedback Unit. If the level falls below par. 20-73 Minimum Feedback Level, autotuning is aborted and an error message will appear on the keypad.

20-74 Maximum Feedback Level

Range:		Function:
999999.000 ProcessCtrlUnit*	[Application dependant]	The maximum allowable feedback level should be entered here in User units as defined in par. 20-12 Reference/Feedback Unit. If the level rises above par. 20-74 Maximum Feedback Level, autotuning is aborted and an error message will appear on the keypad.

20-79 PID Autotuning

Option:		Function:
		This parameter starts the PID autotuning sequence. Once the autotuning has successfully completed and the settings have been accepted or rejected by the user, by pressing [OK] or [Cancel] buttons on the keypad at the end of tuning, this parameter is reset to [0] Disabled.

[0] *	Disabled
[1]	Enabled

20-8* PID Basic Settings

This parameter group is used to configure the basic operation of the frequency converter's PID Controller, including how it responds to a feedback that is above or below the setpoint, the speed at which it first starts functioning, and when it will indicate that the system has reached the setpoint.

20-81 PID Normal/ Inverse Control		
Option:		Function:
[0] *	Normal	*Normal* [0] causes the frequency converter's output frequency to decrease when the feedback is greater than the setpoint reference. This is common for pressure-controlled supply fan and pump applications.
[1]	Inverse	*Inverse* [1] causes the frequency converter's output frequency to increase when the feedback is greater than the setpoint reference. This is common for temperature-controlled cooling applications, such as cooling towers.

20-82 PID Start Speed [RPM]		
Range:		Function:
Application dependent*	[Application dependant]	When the frequency converter is first started, it initially ramps up to this output speed in Open Loop Mode, following the active Ramp Up Time. When the output speed programmed here is reached, the frequency converter will automatically switch to Closed Loop Mode and the PID Controller will begin to function. This is useful in applications in which the driven load must first quickly accelerate to a minimum speed when it is started. NOTICE This parameter will only be visible if par. 0-02 Motor Speed Unit is set to [0], RPM.

20-83 PID Start Speed [Hz]		
Range:		Function:
Application dependent*	[Application dependant]	When the frequency converter is first started, it initially ramps up to this output frequency in Open Loop Mode, following the active Ramp Up Time. When the output frequency programmed here is reached, the frequency converter will automatically switch to Closed Loop Mode and the PID Controller will begin to function. This is useful in applications in which the driven load must first quickly accelerate to a minimum speed when it is started. NOTICE This parameter will only be visible if par. 0-02 Motor Speed Unit is set to [1], Hz.

20-84 On Reference Bandwidth		
Range:		Function:
5 %*	[0 - 200 %]	When the difference between the feedback and the setpoint reference is less than the value of this parameter, the frequency converter's display will show "Run on Reference". This status can be communicated externally by programming the function of a digital output for *Run on Reference/No Warning* [8]. In addition, for serial communications, the On Reference status bit of the frequency converter's Status Word will be high (1). The *On Reference Bandwidth* is calculated as a percentage of the setpoint reference.

20-9* PID Controller

This group provides the ability to manually adjust this PID Controller. By adjusting the PID Controller parameters the control performance may be improved. See section **PID** in the TR200 Design Guide, *MG.11.Bx.yy* for guidelines on adjusting the PID Controller parameters.

20-91 PID Anti Windup		
Option:		Function:
[0]	Off	*Off* [0] The integrator will continue to change value also after output has reached one of the extremes. This can afterwards cause a delay of change of the output of the controller.
[1] *	On	*On* [1] The integrator will be locked if the output of the built in PID controller has reached one of the extremes (min or max value) and therefore not able to add further change to the value of the process parameter controlled. This allows the controller to respond more quickly when it again can control the system.

20-93 PID Proportional Gain		
Range:		Function:
0.50*	[0.00 - 10.00]	

If (Error x Gain) jumps with a value equal to what is set in par. 20-14 Maximum Reference/Feedb. the PID controller will try to change the output speed equal to what is set in par. 4-13 Motor Speed High Limit [RPM] / par. 4-14 Motor Speed High Limit [Hz] but in practice of course limited by this setting.
The proportional band (error causing output to change from 0-100%) can be calculated by means of the formula:

$$\left(\frac{1}{Proportional\ \ Gain}\right) \times (Max\ \ Reference)$$

NOTICE

Always set the desired for par. 20-14 Maximum Reference/Feedb. before setting the values for the PID controller in parameter group 20-9*.

20-94 PID Integral Time

Range:	Function:
20.00 s* [0.01 - 10000.00 s]	Over time, the integrator accumulates a contribution to the output from the PID controller as long as there is a deviation between the Reference/ Setpoint and feedback signals. The contribution is proportional to the size of the deviation. This ensures that the deviation (error) approaches zero. Quick response on any deviation is obtained when the integral time is set to a low value. Setting it too low, however, may cause the control to become unstable. The value set, is the time needed for the integrator to add the same contribution as the proportional part for a certain deviation. If the value is set to 10,000, the controller will act as a pure proportional controller with a P-band based on the value set in par. 20-93 PID Proportional Gain. When no deviation is present, the output from the proportional controller will be 0.

20-95 PID Differentiation Time

Range:	Function:
0.00 s* [0.00 - 10.00 s]	The differentiator monitors the rate of change of the feedback. If the feedback is changing quickly, it will adjust the output of the PID Controller to reduce the rate of change of the feedback. Quick PID Controller response is obtained when this value is large. However, if too large of a value is used, the frequency converter's output frequency may become unstable. Differentiation time is useful is situations where extremely fast frequency converter response and precise speed control are required. It can be difficult to adjust this for proper system control. Differentiation time is not commonly used in TR200 applications. Therefore, it is generally best to leave this parameter at 0 or OFF.

20-96 PID Diff. Gain Limit

Range:	Function:
5.0* [1.0 - 50.0]	The differential function of a PID Controller responds to the rate of change of the feedback. As a result, an abrupt change in the feedback can cause the differential function to make a very large change in the PID Controller's output. This parameter limits the maximum effect that the PID Controller's differential function can produce. A smaller value reduces the maximum effect of the PID Controller's differential function. This parameter is only active when par. 20-95 PID Differentiation Time is not set to OFF (0 s).

Main Menu - Extended Closed Loop - Group 21

The TR200 offers 3 Extended Closed Loop PID controllers in addition to the PID Controller. These can be configured independently to control either external actuators (valves, dampers etc.) or be used together with the internal PID Controller to improve the dynamic responses to setpoint changes or load disturbances.

The Extended Closed Loop PID controllers may be interconnected or connected to the PID Closed Loop controller to form a dual loop configuration.

In order to control a modulating device (e.g. a valve motor), this device must be a positioning servo motor with built-in electronics accepting either a 0-10V (signal from Analog I/O card MCB 115) or a 0/4-20 mA (signal from Control Card and/or General Purpose I/O card MCB 101) control signal.
The output function can be programmed in the following parameters:

- Control Card, terminal 42: Par. 6-50 Terminal 42 Output (setting [113]...[115] or [149]...[151], Ext. Closed Loop 1/2/3
- General Purpose I/O card MCB 101, terminal X30/8: Par. 6-60 Terminal X30/8 Output, (setting [113]...[115] or [149]...[151], Ext. Closed Loop 1/2/3

General Purpose I/O card and Analog I/O card are optional cards.

21-0* Extended CL autotuning

The extended PID Closed Loop PID controllers (*parameter group 21-**, Ext. Closed Loop*) can each be autotuned, simplifying and saving time during commissioning, whilst ensuring accurate PID control adjustment.

To use PID autotuning it is necessary for the relevant Extended PID controller to have been configured for the application.

A graphical Local Control Panel (keypad) must be used in order to react on messages during the autotuning sequence.

Enabling autotuning par. 21-09 PID Autotuning puts the relevant PID controller into PID autotuning mode. The keypad then directs the user with on-screen instructions.

PID autotuning functions by introducing step changes and then monitoring the feedback. From the feedback response, the required values for PID Proportional Gain, par. 21-21 Ext. 1 Proportional Gain for EXT CL 1, par. 21-41 Ext. 2 Proportional Gain for EXT CL 2 and par. 21-61 Ext. 3 Proportional Gain for EXT CL 3 and Integral Time, par. 21-22 Ext. 1 Integral Time for EXT CL 1, par. 21-42 Ext. 2 Integral Time for EXT CL 2 and par. 21-62 Ext. 3 Integral Time for EXT CL 3 are calculated. PID Differentiation Time, par. 21-23 Ext. 1 Differentation Time for EXT CL 1, par. 21-43 Ext. 2 Differentation Time for EXT CL 2 and par. 21-63 Ext. 3 Differentation Time for EXT CL 3 are set to value 0 (zero). Normal / Inverse, par. 21-20 Ext. 1 Normal/Inverse Control for EXT CL 1, par. 21-40 Ext. 2 Normal/Inverse Control for EXT CL 2 and par. 21-60 Ext. 3 Normal/Inverse Control for EXT CL 3 are determined during the tuning process.

These calculated values are presented on the keypad and the user can decide whether to accept or reject them. Once accepted, the values are written to the relevant parameters and PID autotuning mode is disabled in par. 21-09 PID Autotuning. Depending on the system being controlled the time required to carry out PID autotuning could be several minutes.

Excessive feedback sensor noise should be removed using the input filter (parameter groups 6-** and 5-5*, Terminal 53/54 Filter Time Constant/Pulse Filter Time Constant #29/33) before activating PID autotuning.

21-00 Closed Loop Type

Option:		Function:
		This parameter defines the application response. The default mode should be sufficient for most applications. If the relative application speed is known, it can be selected here. This will decrease the time needed for carrying out PID Autotuning. The setting has no impact on the value of the tuned parameters and is used only for the PID auto-tuning sequence.
[0] *	Auto	
[1]	Fast Pressure	
[2]	Slow Pressure	
[3]	Fast Temperature	
[4]	Slow Temperature	

21-01 PID Performance

Option:		Function:
[0] *	Normal	Normal setting of this parameter will be suitable for pressure control in fan systems.
[1]	Fast	Fast setting would generally be used in pumping systems, where a faster control response is desirable.

21-02 PID Output Change

Range:		Function:
0.10*	[0.01 - 0.50]	This parameter sets the magnitude of step change during autotuning. The value is a percentage of full operating range. I.e. if maximum analog output voltage is set to 10 V, 0.10 is 10% of 10 V, which is 1 V. This parameter should be set to a value resulting in feedback changes of between 10% and 20% for best tuning accuracy.

21-03 Minimum Feedback Level

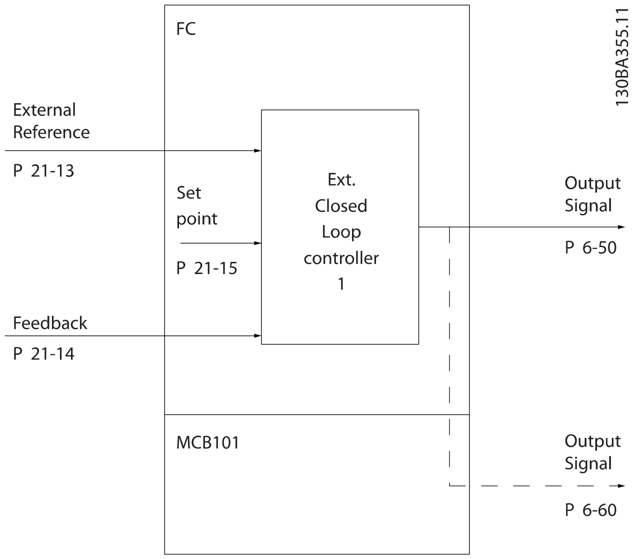
Range:		Function:
-999999.000*	[Application dependant]	The minimum allowable feedback level should be entered here in User Units as defined in par. 21-10 Ext. 1 Ref./Feedback Unit for EXT CL 1, par. 21-30 Ext. 2 Ref./Feedback Unit for EXT CL 2 or par. 21-50 Ext. 3 Ref./Feedback Unit for EXT CL 3. If the level falls below par. 21-03 Minimum Feedback Level, PID autotuning is aborted and an error message will appear on the keypad.

21-04 Maximum Feedback Level

Range:		Function:
999999.000*	[Application dependant]	The maximum allowable feedback level should be entered here in User units as defined in par. 21-10 Ext. 1 Ref./Feedback Unit for EXT CL 1, par. 21-30 Ext. 2 Ref./Feedback Unit for EXT CL 2 or par. 21-50 Ext. 3 Ref./Feedback Unit for EXT CL 3 If the level rises above par. 21-04 Maximum Feedback Level, PID autotuning is aborted and an error message will appear on the keypad.

21-09 PID Autotuning		
Option:		Function:
		This parameter enables selection of the Extended PID controller to be autotuned and starts the PID autotuning for that controller. Once the autotuning has successfully completed and the settings have been accepted or rejected by the user, by pressing [OK] or [Cancel] buttons on the keypad at the end of tuning, this parameter is reset to [0] Disabled.
[0] *	Disabled	
[1]	Enabled Ext CL 1 PID	
[2]	Enabled Ext CL 2 PID	
[3]	Enabled Ext CL 3 PID	

21-1* Closed Loop 1 Ref/Feedback



21-10 Ext. 1 Ref./Feedback Unit		
Option:		Function:
		Select the unit for the reference and feedback.
[0]		
[1] *	%	
[5]	PPM	
[10]	1/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]	°C
[70]	mbar
[71]	bar
[72]	Pa
[73]	kPa
[74]	m WG
[75]	mm Hg
[80]	kW
[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

21-11 Ext. 1 Minimum Reference

Range:		Function:
0.000 ExtPID1Unit*	[Application dependant]	Select the minimum for the Closed Loop 1 Controller.

21-12 Ext. 1 Maximum Reference

Range:		Function:
100.000 ExtPID1Unit*	[Application dependant]	Select the maximum for the Closed Loop 1 Controller. The dynamics of the PID controller will depend on the value set in this parameter. Please see also par. 21-21 Ext. 1 Proportional Gain.

21-13 Ext. 1 Reference Source

Option:		Function:
		This parameter defines which input on the frequency converter should be treated as the source of the reference signal for the Closed Loop 1 Controller. Analog input X30/11 and Analog input X30/12 refer to inputs on the General Purpose I/O.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

21-14 Ext. 1 Feedback Source

Option:		Function:
		This parameter defines which input on the frequency converter should be treated as the source of the feedback signal for the Closed Loop 1 controller. Analog input X30/11 and Analog input X30/12 refer to inputs on the General Purpose I/O .
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	
[100]	Bus feedback 1	
[101]	Bus feedback 2	
[102]	Bus feedback 3	

21-15 Ext. 1 Setpoint		
Range:		Function:
0.000 ExtPID1Unit*	[-999999.999 - 999999.999 ExtPID1Unit]	The setpoint reference is used in extended 1 closed loop. Ext.1 Setpoint is added to the value from the Ext.1 Reference source selected in par. 21-13 Ext. 1 Reference Source.

21-17 Ext. 1 Reference [Unit]		
Range:		Function:
0.000 ExtPID1Unit*	[-999999.999 - 999999.999 ExtPID1Unit]	Readout of the reference value for the Closed Loop 1 Controller.

21-18 Ext. 1 Feedback [Unit]		
Range:		Function:
0.000 ExtPID1Unit*	[-999999.999 - 999999.999 ExtPID1Unit]	Readout of the feedback value for the Closed Loop 1 Controller.

21-19 Ext. 1 Output [%]		
Range:		Function:
0 %*	[0 - 100 %]	Readout of the output value for the Closed Loop 1 Controller.

21-2* Closed Loop 1 PID

21-20 Ext. 1 Normal/Inverse Control		
Option:		Function:
[0] *	Normal	Select *Normal* [0] if the output should be reduced when feedback is higher than the reference.
[1]	Inverse	Select *Inverse* [1] if the output should be increased when feedback is higher than the reference.

21-21 Ext. 1 Proportional Gain		
Range:		Function:
0.01*	[0.00 - 10.00]	

If (Error x Gain) jumps with a value equal to what is set in par. 20-14 Maximum Reference/Feedb., the PID controller will try to change the output speed equal to what is set in par. 4-13/4-14, Motor Speed High Limit, but in practice of course limited by this setting.
The proportional band (error causing output to change from 0-100%) can be calculated by means of the formula:

$$\left(\frac{1}{Proportional\ \ Gain}\right) \times (Max\ \ Reference)$$

Note
Always set the desired for par. 20-14 Maximum Reference/Feedb. before setting the values for the PID controller in parameter group 20-9*.

21-22 Ext. 1 Integral Time		
Range:		Function:
10000.0 0 s*	[0.01 - 10000.00 s]	Over time, the integrator accumulates a contribution to the output from the PID controller as long as there is a deviation between the Reference/ Setpoint and feedback signals. The contribution is proportional to the size of the deviation. This ensures that the deviation (error) approaches zero. Quick response on any deviation is obtained when the integral time is set to a low value. Setting it too low, however, may cause the control to become unstable. The value set, is the time needed for the integrator to add the same contribution as the proportional part for a certain deviation. If the value is set to 10,000, the controller will act as a pure proportional controller with a P-band based on the value set in par. 20-93 PID Proportional Gain. When no deviation is present, the output from the proportional controller will be 0.

21-23 Ext. 1 Differentation Time		
Range:		Function:
0.00 s*	[0.00 - 10.00 s]	The differentiator does not react to a constant error. It only provides a gain when the feedback changes. The quicker the feedback changes, the stronger the gain from the differentiator.

21-24 Ext. 1 Dif. Gain Limit		
Range:		Function:
5.0*	[1.0 - 50.0]	Set a limit for the differentiator gain (DG). The DG will increase if there are fast changes. Limit the DG to obtain a pure differentiator gain at slow changes and a constant differentiator gain where quick changes occur.

21-3* Closed Loop 2 Ref/Fb

21-30 Ext. 2 Ref./Feedback Unit		
Option:		Function:
		See par. 21-10 Ext. 1 Ref./Feedback Unit for details
[0]		
[1] *	%	
[5]	PPM	
[10]	1/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]	°C
[70]	mbar
[71]	bar
[72]	Pa
[73]	kPa
[74]	m WG
[75]	mm Hg
[80]	kW
[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

21-31 Ext. 2 Minimum Reference

Range:		Function:
0.000 ExtPID2Unit*	[Application dependant]	See par. 21-11 Ext. 1 Minimum Reference for details.

21-32 Ext. 2 Maximum Reference

Range:		Function:
100.000 ExtPID2Unit*	[Application dependant]	See par. 21-12 Ext. 1 Maximum Reference for details.

21-33 Ext. 2 Reference Source

Option:		Function:
		See par. 21-13 Ext. 1 Reference Source for details.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

21-34 Ext. 2 Feedback Source

Option:		Function:
		See par. 21-14 Ext. 1 Feedback Source for details.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	
[100]	Bus feedback 1	
[101]	Bus feedback 2	
[102]	Bus feedback 3	

21-35 Ext. 2 Setpoint

Range:		Function:
0.000 ExtPID2Unit*	[-999999.999 - 999999.999 ExtPID2Unit]	See par. 21-15 Ext. 1 Setpoint for details.

21-37 Ext. 2 Reference [Unit]		
Range:		Function:
0.000 ExtPID2Unit*	[-999999.999 - 999999.999 ExtPID2Unit]	See par. 21-17 Ext. 1 Reference [Unit], *Ext. 1 Reference [Unit]*, for details.

21-38 Ext. 2 Feedback [Unit]		
Range:		Function:
0.000 ExtPID2Unit*	[-999999.999 - 999999.999 ExtPID2Unit]	See par. 21-18 Ext. 1 Feedback [Unit] for details.

21-39 Ext. 2 Output [%]		
Range:		Function:
0 %*	[0 - 100 %]	See par. 21-19 Ext. 1 Output [%] for details.

21-4* Closed Loop 2 PID

21-40 Ext. 2 Normal/Inverse Control		
Option:		Function:
		See par. 21-20 Ext. 1 Normal/Inverse Control for details.
[0] *	Normal	
[1]	Inverse	

21-41 Ext. 2 Proportional Gain		
Range:		Function:
0.01*	[0.00 - 10.00]	See par. 21-21 Ext. 1 Proportional Gain for details.

21-42 Ext. 2 Integral Time		
Range:		Function:
10000.00 s*	[0.01 - 10000.00 s]	See par. 21-22 Ext. 1 Integral Time for details.

21-43 Ext. 2 Differentation Time		
Range:		Function:
0.00 s*	[0.00 - 10.00 s]	See par. 21-23 Ext. 1 Differentation Time for details.

21-44 Ext. 2 Dif. Gain Limit		
Range:		Function:
5.0*	[1.0 - 50.0]	See par. 21-24 Ext. 1 Dif. Gain Limit for details.

21-5* Closed Loop 3 Ref/Fb

21-50 Ext. 3 Ref./Feedback Unit		
Option:		Function:
		See par. 21-10 Ext. 1 Ref./Feedback Unit for details.
[0]		
[1] *	%	
[5]	PPM	

[10]	1/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]	°C
[70]	mbar
[71]	bar
[72]	Pa
[73]	kPa
[74]	m WG
[75]	mm Hg
[80]	kW
[120]	GPM
[121]	gal/s
[122]	gal/min
[123]	gal/h
[124]	CFM
[125]	ft^3/s
[126]	ft^3/min
[127]	ft^3/h
[130]	lb/s
[131]	lb/min
[132]	lb/h
[140]	ft/s
[141]	ft/min
[145]	ft
[160]	°F
[170]	psi
[171]	lb/in^2
[172]	in WG
[173]	ft WG
[174]	in Hg
[180]	HP

21-51 Ext. 3 Minimum Reference

Range:		Function:
0.000 Ex-tPID3Unit*	[Application dependant]	See par. 21-11 Ext. 1 Minimum Reference for details.

21-52 Ext. 3 Maximum Reference

Range:		Function:
100.000 Ex-tPID3Unit*	[Application dependant]	See par. 21-12 Ext. 1 Maximum Reference for details.

21-53 Ext. 3 Reference Source

Option:		Function:
		See par. 21-13 Ext. 1 Reference Source for details.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	
[26]	Analog Input X49/1	
[27]	Analog Input X49/3	
[28]	Analog Input X49/5	
[30]	Ext. Closed Loop 1	
[31]	Ext. Closed Loop 2	
[32]	Ext. Closed Loop 3	

21-54 Ext. 3 Feedback Source

Option:		Function:
		See par. 21-14 Ext. 1 Feedback Source for details.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[3]	Pulse input 29	
[4]	Pulse input 33	
[7]	Analog input X30/11	
[8]	Analog input X30/12	
[9]	Analog Input X42/1	
[10]	Analog Input X42/3	
[11]	Analog Input X42/5	
[12]	Analog Input X49/1	
[13]	Analog Input X49/3	
[14]	Analog Input X49/5	
[100]	Bus feedback 1	
[101]	Bus feedback 2	
[102]	Bus feedback 3	

21-55 Ext. 3 Setpoint

Range:		Function:
0.000 ExtPID3Unit*	[-999999.999 - 999999.999 ExtPID3Unit]	See par. 21-15 Ext. 1 Setpoint for details.

21-57 Ext. 3 Reference [Unit]

Range:		Function:
0.000 ExtPID3Unit*	[-999999.999 - 999999.999 ExtPID3Unit]	See par. 21-17 Ext. 1 Reference [Unit] for details.

21-58 Ext. 3 Feedback [Unit]

Range:		Function:
0.000 ExtPID3Unit*	[-999999.999 - 999999.999 ExtPID3Unit]	See par. 21-18 Ext. 1 Feedback [Unit] for details.

21-59 Ext. 3 Output [%]

Range:		Function:
0 %*	[0 - 100 %]	See par. 21-19 Ext. 1 Output [%] for details.

21-6* Closed Loop 3 PID

21-60 Ext. 3 Normal/Inverse Control

Option:		Function:
		See par. 21-20 Ext. 1 Normal/Inverse Control for details.
[0] *	Normal	
[1]	Inverse	

21-61 Ext. 3 Proportional Gain

Range:		Function:
0.01*	[0.00 - 10.00]	See par. 21-21 Ext. 1 Proportional Gain for details.

21-62 Ext. 3 Integral Time

Range:		Function:
10000.00 s*	[0.01 - 10000.00 s]	See par. 21-22 Ext. 1 Integral Time for details.

21-63 Ext. 3 Differentation Time

Range:		Function:
0.00 s*	[0.00 - 10.00 s]	See par. 21-23 Ext. 1 Differentation Time for details.

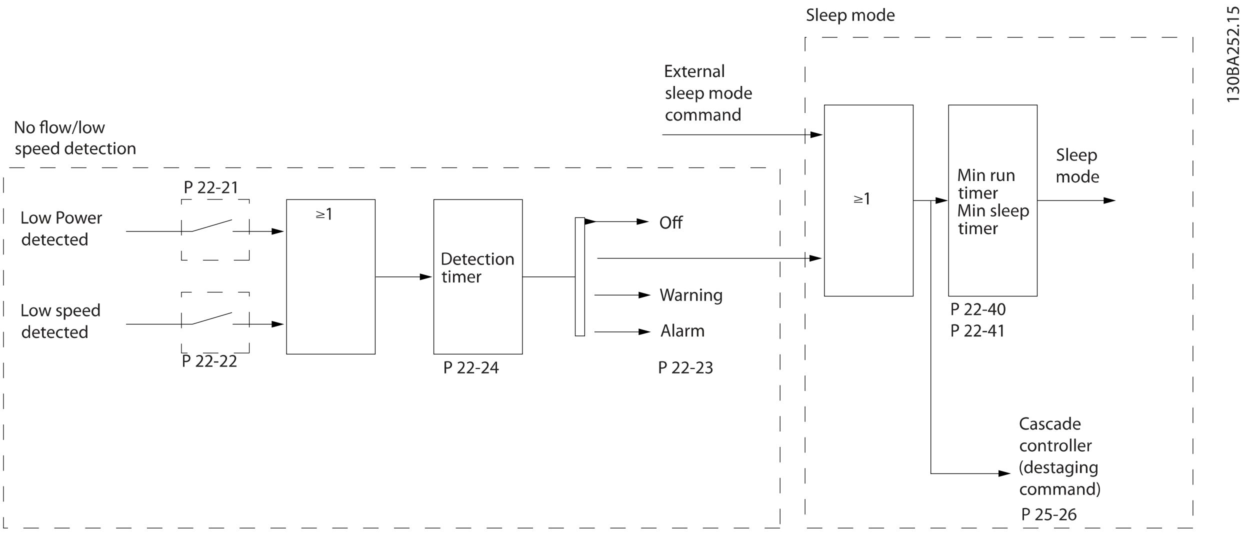
21-64 Ext. 3 Dif. Gain Limit

Range:		Function:
5.0*	[1.0 - 50.0]	See par. 21-24 Ext. 1 Dif. Gain Limit for details.

Main Menu - Application Functions - Group 22

This group contains parameters used for monitoring TR200 applications.

22-00 External Interlock Delay		
Range:		Function:
0 s*	[0 - 600 s]	Only relevant if one of the digital inputs in parameter group 5-1* has been programmed for *External Interlock* [7]. The External Interlock Timer will introduce a delay after the signal has been removed from the digital input programmed for External Interlock, before reaction takes place.



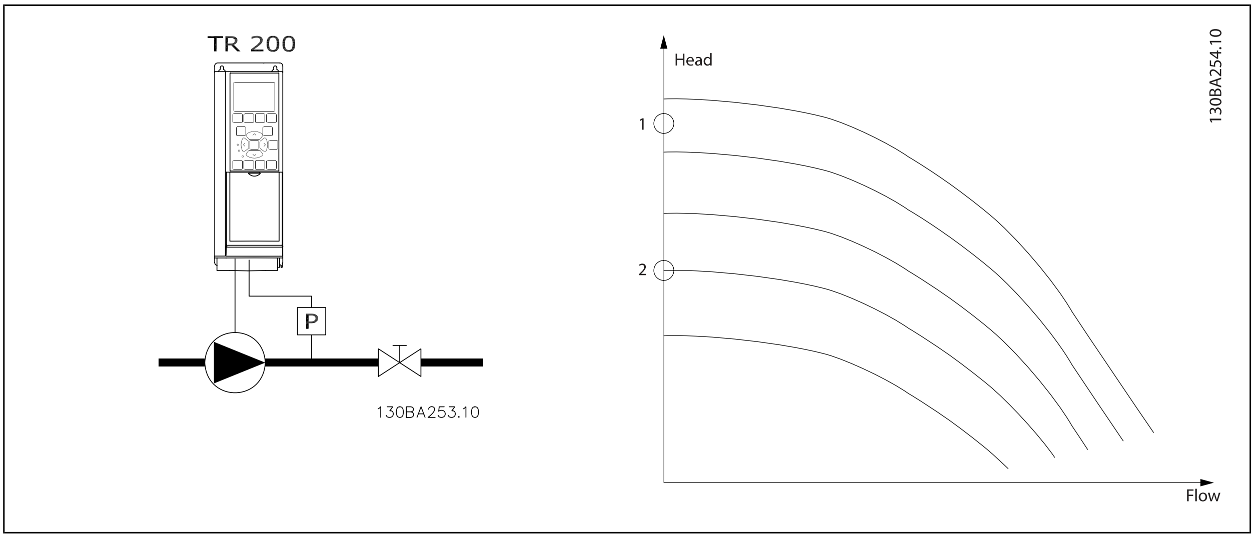
The frequency converter includes functions for detecting if the load conditions in the system allow the motor to be stopped:
*Low Power Detection
*Low Speed Detection
One of these two signals must be active for a set time (par. 22-24 No-Flow Delay) before selected action takes place. Possible actions to select (par. 22-23 No-Flow Function): No action, Warning, Alarm, Sleep Mode.

<u>No Flow Detection:</u>
This function is used for detecting a no flow situation in pump systems where all valves can be closed. Can be used both when controlled by the integrated PI controller in the frequency converter or an external PI controller. Actual configuration must be programmed in par. 1-00 Configuration Mode.
Configuration mode for

- Integrated PI Controller: Closed Loop
- External PI Controller: Open Loop

NOTICE

Carry out No Flow tuning before setting the PI controller parameters!



No Flow Detection is based on the measurement of speed and power. For a certain speed the frequency converter calculates the power at no flow.
This coherence is based on the adjustment of two sets of speed and associated power at no flow. By monitoring the power it is possible to detect no flow conditions in systems with fluctuating suction pressure or if the pump has a flat characteristic towards low speed.

NOTICE

If to use the integrated PI controller, carry out No Flow tuning before setting the PI controller parameters!

Low speed detection:
Low Speed Detection gives a signal if the motor is operating with minimum speed as set in par. 4-11 Motor Speed Low Limit [RPM] or par. 4-12 Motor Speed Low Limit [Hz]. Actions are common with No Flow Detection (individual selection not possible).
The use of Low Speed Detection is not limited to systems with a no flow situation, but can be used in any system where operation at minimum speed allows for a stop of the motor until the load calls for a speed higher than minimum speed, e.g. systems with fans and compressors.

NOTICE

In pump systems ensure that the minimum speed in par. 4-11 Motor Speed Low Limit [RPM] or par. 4-12 Motor Speed Low Limit [Hz] has been set high enough for detection as the pump can run with a rather high speed even with valves closed.

Dry pump detection:
No Flow Detection can also be used for detecting if the pump has run dry (low power consumption-high speed).
Can be used with both the integrated PI controller and an external PI controller.
The condition for Dry Pump signal:

- Power consumption below no flow level

and

- Pump running at maximum speed or maximum reference open loop, whichever is lowest.

22-22 Low Speed Detection

Option:		Function:
[0] *	Disabled	
[1]	Enabled	Select Enabled for detecting when the motor operates with a speed as set in par. 4-11 Motor Speed Low Limit [RPM] or par. 4-12 Motor Speed Low Limit [Hz].

22-23 No-Flow Function

Common actions for Low Power Detection and Low Speed Detection (Individual selections not possible).

Option:		Function:
[0] *	Off	
[1]	Sleep Mode	The drive will enter Sleep Mode and stop when a No Flow condition is detected. See parameter group 22-4* for programming options for Sleep Mode.
[2]	Warning	The drive will continue to run, but activate a No-Flow Warning [W92]. A drive digital output or a serial communication bus can communicate a warning to other equipment.
[3]	Alarm	The drive will stop running and activate a No-Flow Alarm [A 92]. A drive digital output or a serial communication bus can communicate an alarm to other equipment.

NOTICE

Do not set par. 14-20 Reset Mode, to [13] Infinite auto reset, when par. 22-23 No-Flow Functionis set to [3] Alarm. Doing so will cause the drive to continuously cycle between running and stopping when a No Flow condition is detected.

NOTICE

If the drive is equipped with a constant speed bypass with an automatic bypass function that starts the bypass if the drive experiences a persistent alarm condition, be sure to disable the bypass's automatic bypass function, if [3] Alarm is selected as the No-Flow Function.

22-24 No-Flow Delay

Range:		Function:
10 s*	[1 - 600 s]	Set the time Low Power/Low Speed must stay detected to activate signal for actions. If detection disappears before run out of the timer, the timer will be reset.

22-4* Sleep Mode

If the load on the system allows for stop of the motor and the load is monitored, the motor can be stopped by activating the Sleep Mode function. This is not a normal Stop command, but ramps the motor down to 0 RPM and stops energizing the motor. When in Sleep Mode certain conditions are monitored to find out when load has been applied to the system again.

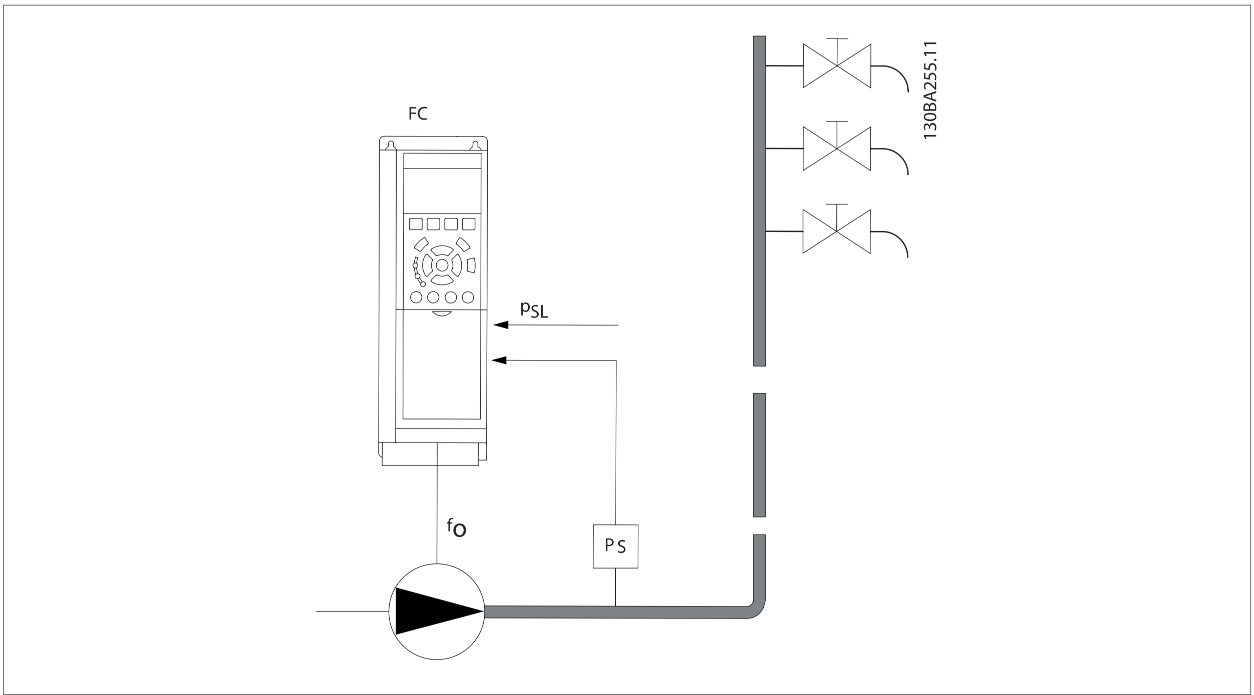
Sleep Mode can be activated either from the No Flow Detection/Minimum Speed Detection (must be programmed via parameters for No-Flow Detection, see the signal flow-diagram in parameter group 22-2*, No-Flow Detection) or via an external signal applied to one of the digital inputs (must be programmed via the parameters for configuration of the digital inputs, par. 5-1* selecting [66] Sleep Mode). Sleep mode is activated only when no wake-up conditions are present.
To make it possible to use e.g. an electro-mechanical flow switch to detect a no flow condition and activate Sleep Mode, the action takes place at raising edge of the external signal applied (otherwise the frequency converter would never come out of Sleep Mode again as the signal would be steady connected).

NOTICE

If Sleep Mode is to be based on No Flow Detection/Minimum Speed, remember to choose Sleep Mode [1] in par. 22-23 No-Flow Function.

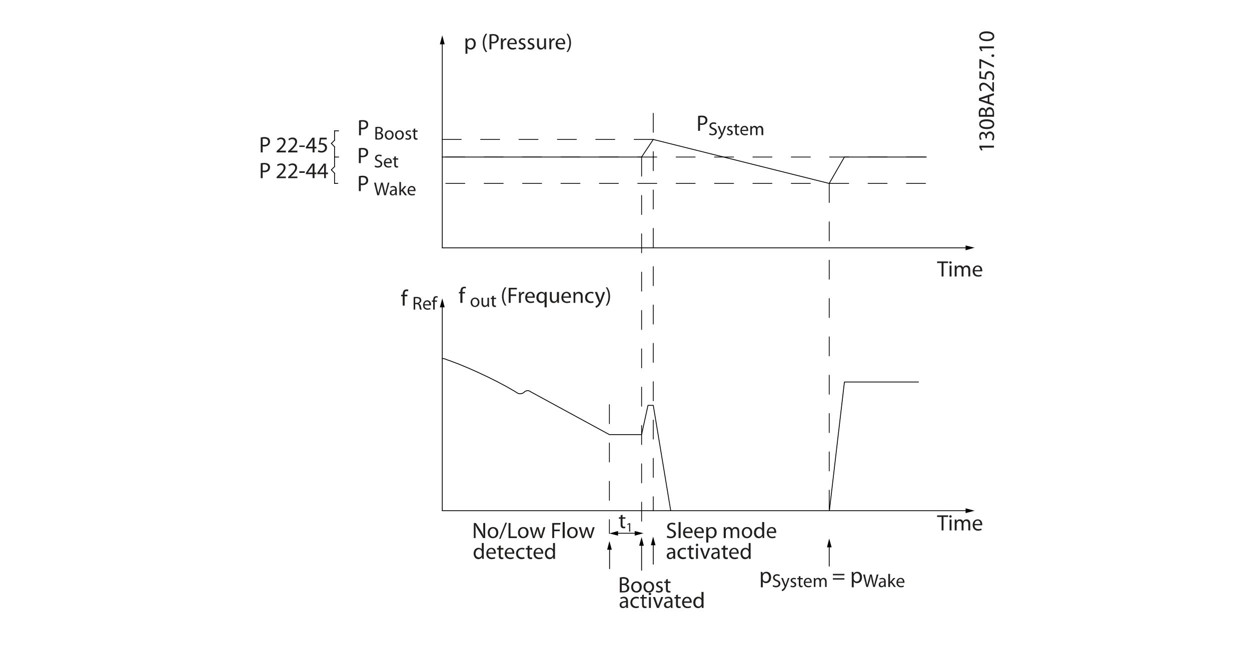
When entering Sleep Mode, the lower status line in the Local Control Panel shows Sleep Mode.

See also signal flow chart in section 22-2* *No Flow Detection*.
There are three different ways of using the Sleep Mode function:

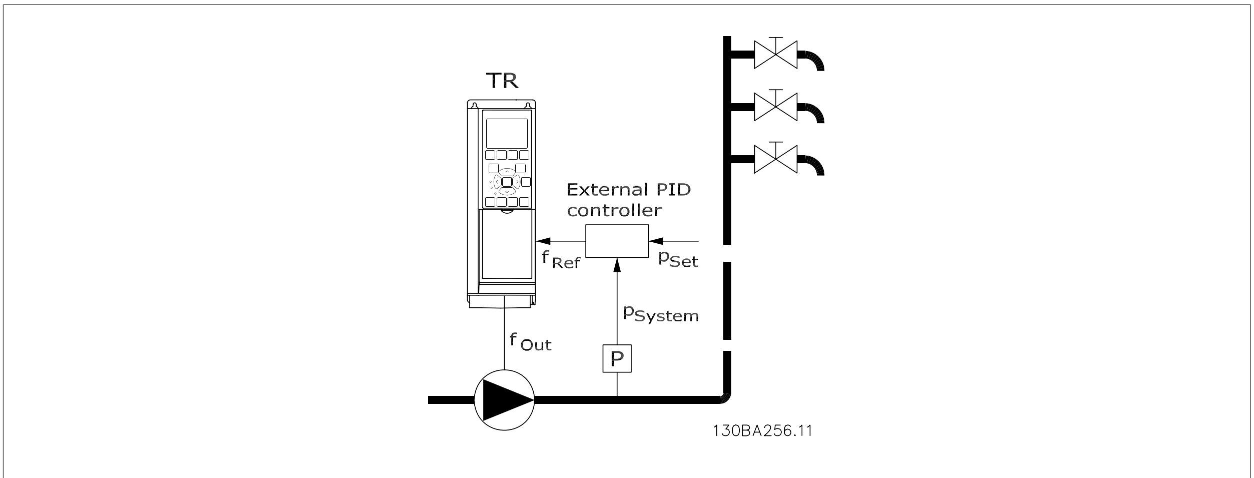


1) Systems where the integrated PI controller is used for controlling pressure or temperature e.g. boost systems with a pressure feed back signal applied to the frequency converter from a pressure transducer. Par. 1-00 Configuration Mode must be set for Closed Loop and the PI Controller configured for desired reference and feed back signals.

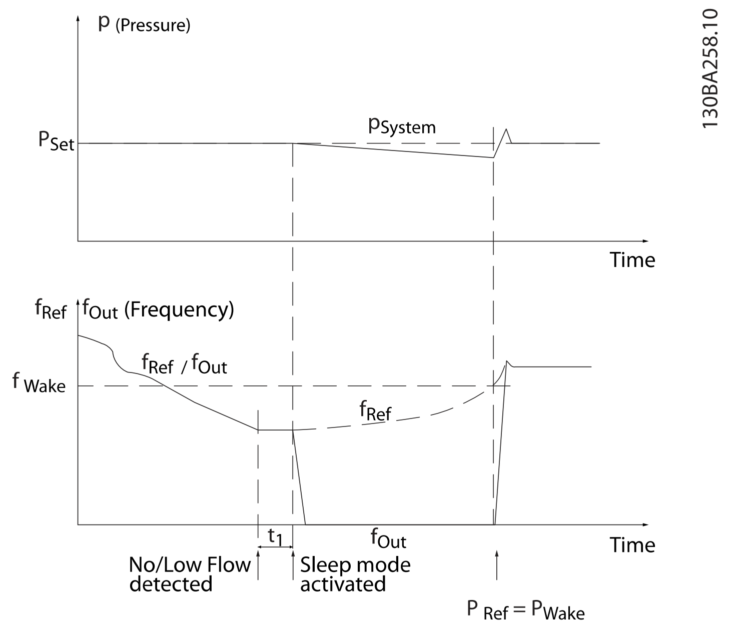
Example: Boost system.



If no flow is detected, the frequency converter will increase the set point for pressure to ensure a slight over pressure in the system (boost to be set in par. 22-45 Setpoint Boost).
The feedback from the pressure transducer is monitored and when this pressure has dropped with a set percentage below the normal set point for pressure (Pset), the motor will ramp up again and pressure will be controlled for reaching the set value (Pset).



2) In systems where the pressure or temperature is controlled by an external PI controller, the wake up conditions can not be based on feedback from the pressure/temperature transducer as the setpoint is not known. In the example with a boost system, desired pressure Pset is not known. Par. 1-00 Configuration Mode must be set for Open Loop.
Example: Boost system.



When low power or low speed is detected the motor is stopped, but the reference signal (f_{ref}) from the external controller is still monitored and because of the low pressure created, the controller will increase the reference signal to gain pressure. When the reference signal has reached a set value f_{wake} the motor restarts.

Configuration possibilities, overview:

	Internal PI Controller (par. 1-00 Configuration Mode: Closed loop)		External PI Controller or manual control (par. 1-00 Configuration Mode: Open loop)	
	Sleep mode	Wake up	Sleep mode	Wake up
No Flow detection (pumps only)	Yes		Yes (except manual setting of speed)	
Low speed detection	Yes		Yes	
External signal	Yes		Yes	
Pressure/Temperature (transmitter connected)		Yes		No
Output frequency		No		Yes

NOTICE

Sleep Mode will not be active when Local Reference is active (set speed manually by means of arrow buttons on the keypad). See par. 3-13 Reference Site.
Does not work in Hand-mode. Auto set-up in open loop must be carried out before setting input/output in closed loop.

22-40 Minimum Run Time

Range:		Function:
10 s*	[0 - 600 s]	Set the desired minimum running time for the motor after a start command (digital input or Bus) before entering Sleep Mode.

22-41 Minimum Sleep Time

Range:		Function:
10 s*	[0 - 600 s]	Set the desired Minimum Time for staying in Sleep Mode. This will override any wake up conditions.

22-42 Wake-up Speed [RPM]

Range:		Function:
Application dependent*	[Application dependant]	To be used if par. 0-02 Motor Speed Unit has been set for RPM (parameter not visible if Hz selected). Only to be used if par. 1-00 Configuration Mode is set for Open Loop and speed reference is applied by an external controller. Set the reference speed at which the Sleep Mode should be cancelled.

22-43 Wake-up Speed [Hz]

Range:		Function:
Application dependent*	[Application dependant]	To be used if par. 0-02 Motor Speed Unit, has been set for Hz (parameter not visible if RPM selected). Only to be used if par. 1-00 Configuration Mode, is set for Open Loop and speed reference is applied by an external controller controlling the pressure. Set the reference speed at which the Sleep Mode should be cancelled.

22-44 Wake-up Ref./FB Difference

Range:		Function:
10 %*	[0 - 100 %]	Only to be used if par. 1-00 Configuration Mode is set for Closed Loop and the integrated PI controller is used for controlling the pressure. Set the pressure drop allowed in percentage of set point for the pressure (Pset) before cancelling the Sleep Mode.

NOTICE

If used in application where the integrated PI controller is set for inverse control (e.g. cooling tower applications) in par. 20-71 PID Performance, the value set in par. 22-44 Wake-up Ref./FB Difference will automatically be added.

22-45 Setpoint Boost

Range:		Function:
0 %*	[-100 - 100 %]	Only to be used if par. 1-00 Configuration Mode, is set for Closed Loop and the integrated PI controller is used. In systems with e.g. constant pressure control, it is advantageous to increase the system pressure before the motor is stopped. This will extend the time in which the motor is stopped and help to avoid frequent start/stop. Set the desired over pressure/temperature in percentage of set point for the pressure (Pset)/temperature before entering the Sleep Mode. If setting for 5%, the boost pressure will be Pset*1.05. The negative values can be used for e.g. cooling tower control where a negative change is needed.

22-46 Maximum Boost Time

Range:		Function:
60 s*	[0 - 600 s]	Only to be used if par. 1-00 Configuration Mode is set for Closed Loop and the integrated PI controller is used for controlling the pressure. Set the maximum time for which boost mode will be allowed. If the set time is exceeded, Sleep Mode will be entered, not waiting for the set boost pressure to be reached.

22-6* Broken Belt Detection

The Broken Belt Detection can be used in both closed and open loop systems for pumps, fans and compressors. If the estimated motor torque is below the broken belt torque value (par. 22-61 Broken Belt Torque) and the frequency converter output frequency is above or equal to 15 Hz, the broken belt function (par. 22-60 Broken Belt Function) is performed

22-60 Broken Belt Function		
Selects the action to be performed if the Broken Belt condition is detected		
Option:		Function:
[0] *	Off	
[1]	Warning	The drive will continue to run, but activate a Broken Belt Warning [W95]. A drive digital output or a serial communication bus can communicate a warning to other equipment.
[2]	Trip	The drive will stop running and activate a Broken Belt alarm [A 95]. A drive digital output or a serial communication bus can communicate an alarm to other equipment.

NOTICE

Do not set par. 14-20 Reset Mode, to [13] Infinite auto reset, when par. 22-60 Broken Belt Function is set to [2] Trip. Doing so will cause the drive to continuously cycle between running and stopping when a broken belt condition is detected.

NOTICE

If the drive is equipped with a constant speed bypass with an automatic bypass function that starts the bypass if the drive experiences a persistent alarm condition, be sure to disable the bypass's automatic bypass function, if [2] Trip is selected as the Broken Belt Function.

22-61 Broken Belt Torque		
Range:		Function:
10 %*	[0 - 100 %]	Sets the broken belt torque as a percentage of the rated motor torque.

22-62 Broken Belt Delay		
Range:		Function:
10 s	[0 - 600 s]	Sets the time for which the Broken Belt conditions must be active before carrying out the action selected in par. 22-60 Broken Belt Function.

22-7* Short Cycle Protection

When controlling refrigeration compressors, often there will be a need for limiting the numbers of starts. One way to do this is to ensure a minimum run time (time between a start and a stop) and a minimum interval between starts.
This means that any normal stop command can be overridden by the *Minimum Run Time* function (par. 22-77 Minimum Run Time) and any normal start command (Start/Jog/Freeze) can be overridden by the *Interval Between Starts* function (par. 22-76 Interval between Starts).
None of the two functions are active if *Hand On* or *Off* modes have been activated via the keypad. If selecting *Hand On* or *Off*, the two timers will be reset to 0, and not start counting until *Auto* is pressed and an active start command applied.

22-75 Short Cycle Protection

Option:		Function:
[0] *	Disabled	Timer set in par. 22-76 Interval between Starts is disabled.
[1]	Enabled	Timer set in par. 22-76 Interval between Starts is enabled.

22-76 Interval between Starts

Range:		Function:
Application dependent*	[Application dependant]	Sets the time desired as minimum time between two starts. Any normal start command (Start/Jog/Freeze) will be disregarded until the timer has expired.

22-77 Minimum Run Time

Range:		Function:
0 s*	[Application dependant]	Sets the time desired as minimum run time after a normal start command (Start/Jog/Freeze). Any normal stop command will be disregarded until the set time has expired. The timer will start counting following a normal start command (Start/Jog/Freeze). The timer will be overridden by a Coast (Inverse) or an External Interlock command.

NOTICE

Does not work in cascade mode.

Main Menu - Time-based Functions - Group 23

23-0* Timed Actions

Use *Timed Actions* for actions needing to be performed on a daily or weekly basis, e.g. different references for working hours / non-working hours. Up to 10 Timed Actions can be programmed in the frequency converter. The Timed Action number is selected from the list when entering parameter group 23-0* from the keypad. Par. 23-00 ON Time – par. 23-04 Occurrence then refer to the selected Timed Action number. Each Timed Action is divided into an ON time and an OFF time, in which two different actions may be performed.

NOTICE
The clock (parameter group 0-7*) must be correctly programmed for Timed Actions to function correctly.

NOTICE
When mounting an Analog I/O MCB 109 option card, a battery back up of the date and time is included.

23-00 ON Time

Array [10]

Range:		Function:
Application dependent*	[Application dependant]	Sets the ON time for the Timed Action. **NOTICE** The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock has not been set properly, e.g. after a power down.

23-01 ON Action

Arra [10]

Option:		Function:
		Select the action during ON Time. See par. 13-52 SL Controller Action for descriptions of the options.
[0] *	Disabled	
[1]	No action	
[2]	Select set-up 1	
[3]	Select set-up 2	
[4]	Select set-up 3	
[5]	Select set-up 4	
[10]	Select preset ref 0	
[11]	Select preset ref 1	
[12]	Select preset ref 2	
[13]	Select preset ref 3	
[14]	Select preset ref 4	
[15]	Select preset ref 5	
[16]	Select preset ref 6	
[17]	Select preset ref 7	
[18]	Select ramp 1	

[19]	Select ramp 2
[22]	Run
[23]	Run reverse
[24]	Stop
[26]	DC Brake
[27]	Coast
[32]	Set digital out A low
[33]	Set digital out B low
[34]	Set digital out C low
[35]	Set digital out D low
[36]	Set digital out E low
[37]	Set digital out F low
[38]	Set digital out A high
[39]	Set digital out B high
[40]	Set digital out C high
[41]	Set digital out D high
[42]	Set digital out E high
[43]	Set digital out F high
[60]	Reset Counter A
[61]	Reset Counter B
[80]	Sleep Mode

23-02 OFF Time

Array [10]

Range:		Function:
Application dependent*	[Application dependant]	Sets the OFF time for the Timed Action. NOTICE The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock has not been set properly, e.g. after a power down.

23-03 OFF Action

Array [10]

Option:		Function:
		Select the action during OFF Time. See par. 13-52 SL Controller Action for descriptions of the options.
[0] *	Disabled	
[1] *	No action	
[2]	Select set-up 1	
[3]	Select set-up 2	
[4]	Select set-up 3	
[5]	Select set-up 4	
[10]	Select preset ref 0	
[11]	Select preset ref 1	
[12]	Select preset ref 2	

[13]	Select preset ref 3
[14]	Select preset ref 4
[15]	Select preset ref 5
[16]	Select preset ref 6
[17]	Select preset ref 7
[18]	Select ramp 1
[19]	Select ramp 2
[22]	Run
[23]	Run reverse
[24]	Stop
[26]	DC Brake
[27]	Coast
[32]	Set digital out A low
[33]	Set digital out B low
[34]	Set digital out C low
[35]	Set digital out D low
[36]	Set digital out E low
[37]	Set digital out F low
[38]	Set digital out A high
[39]	Set digital out B high
[40]	Set digital out C high
[41]	Set digital out D high
[42]	Set digital out E high
[43]	Set digital out F high
[60]	Reset Counter A
[61]	Reset Counter B
[80]	Sleep Mode

23-04 Occurrence

Array [10]

Option:		Function:
		Select which day(s) the Timed Action applies to. Specify working/non-working days in par. 0-81 Working Days, par. 0-82 Additional Working Days and par. 0-83 Additional Non-Working Days.
[0] *	All days	
[1]	Working days	
[2]	Non-working days	
[3]	Monday	
[4]	Tuesday	
[5]	Wednesday	
[6]	Thursday	
[7]	Friday	
[8]	Saturday	
[9]	Sunday	

23-08 Timed Actions Mode

Used to enable and disable automatic timed actions.

Option:		Function:
[0] *	Timed Actions Auto	Enable timed actions.
[1]	Timed Actions Disabled	Disable timed actions, normal operation according to control commands.
[2]	Constant On Actions	Disable timed actions. Constant On Actions activated.
[3]	Constant Off Actions	Disable timed actions. Constant Off Actions activated.

23-09 Timed Actions Reactivation

Option:		Function:
[0]	Disabled	
[1] *	Enabled	

23-1* Maintenance

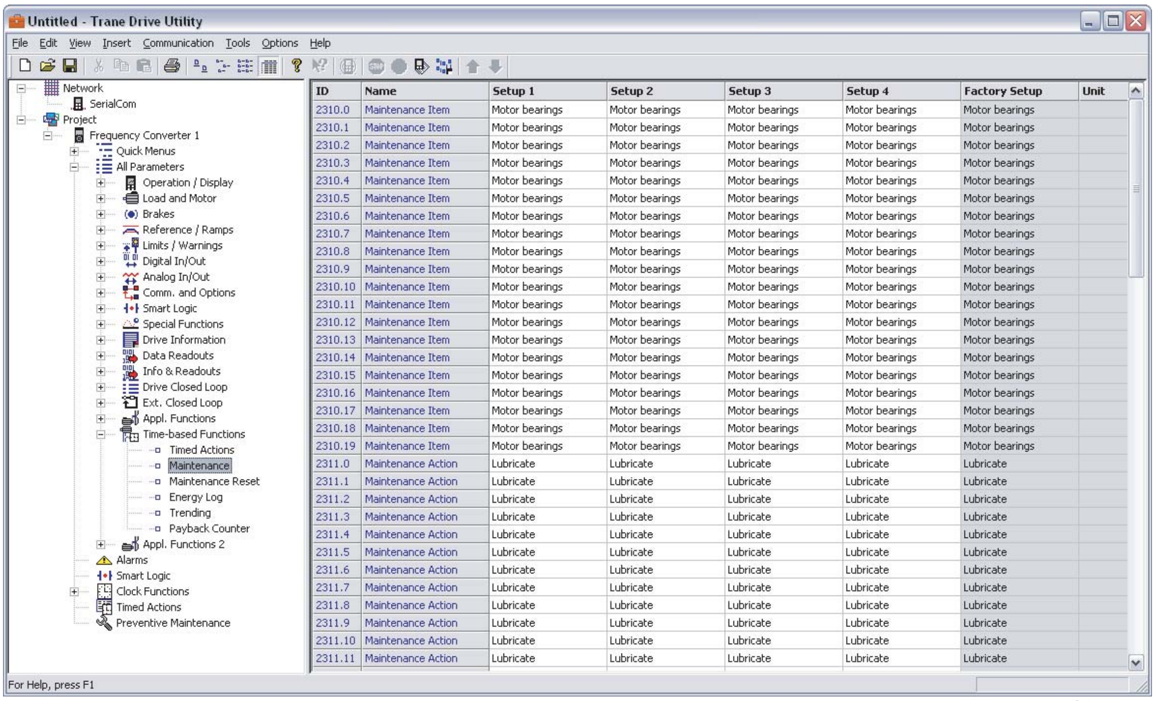
Wear and tear calls for periodic inspection and service of elements in the application, e.g. motor bearings, feedback sensors and seals or filters. With Preventive Maintenance the service intervals may be programmed into the frequency converter. The frequency converter will give a message when maintenance is required. 20 Preventive Maintenance Events can be programmed into the frequency converter. For each Event the following must be specified:

- Maintenance item (e.g. "Motor Bearings")
- Maintenance action (e.g. "Replace")
- Maintenance Time Base (e.g. "Running Hours" or a specific date and time)
- Maintenance Time Interval or the date and time of next maintenance

NOTICE

To disable a Preventive Maintenance Event the associated par. 23-12 Maintenance Time Base must be set to ***Disabled*** [0].

Preventive Maintenance can be programmed from the keypad, but use of the PC-based Motion Control Tool Trane Drive Utility is recommended.



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The keypad indicates (with a wrench-icon and an "M") when it is time for a Preventive Maintenance Action, and can be programmed to be indicated on a digital output in parameter group 5-3*. The Preventive Maintenance Status may be read in par. 16-96 Maintenance Word. A Preventive Maintenance indication can be reset from a digital input, the Drive bus or manually from the keypad through par. 23-15 Reset Maintenance Word.

A Maintenance Log with the latest 10 loggings can be read from parameter group 18-0* and via the Alarm log button on the keypad after selecting Maintenance Log.

NOTICE

The Preventive Maintenance Events are defined in a 20 element array. Hence each Preventive Maintenance Event must use the same array element index in par. 23-10 Maintenance Item to par. 23-14 Maintenance Date and Time.

23-10 Maintenance Item

Option:	Function:
	Array with 20 elements displayed below parameter number in the display. Press [OK] and step between elements by means of and buttons on the keypad. Select the item to be associated with the Preventive Maintenance Event.
[1] *	Motor bearings
[2]	Fan bearings
[3]	Pump bearings
[4]	Valve
[5]	Pressure transmitter
[6]	Flow transmitter
[7]	Temperature transm.
[8]	Pump seals
[9]	Fan belt

[10]	Filter
[11]	Drive cooling fan
[12]	System health check
[13]	Warranty
[20]	Maintenance Text 0
[21]	Maintenance Text 1
[22]	Maintenance Text 2
[23]	Maintenance Text 3
[24]	Maintenance Text 4
[25]	Maintenance Text 5

23-11 Maintenance Action

Option:		Function:
		Select the action to be associated with the Preventive Maintenance Event.
[1] *	Lubricate	
[2]	Clean	
[3]	Replace	
[4]	Inspect/Check	
[5]	Overhaul	
[6]	Renew	
[7]	Check	
[20]	Maintenance Text 0	
[21]	Maintenance Text 1	
[22]	Maintenance Text 2	
[23]	Maintenance Text 3	
[24]	Maintenance Text 4	
[25]	Maintenance Text 5	

23-12 Maintenance Time Base

Option:		Function:
		Select the time base to be associated with the Preventive Maintenance Event.
[0] *	Disabled	*Disabled* [0] must be used when disabling the Preventive Maintenance Event.
[1]	Running Hours	*Running Hours* [1] is the number of hours the motor has been running. Running hours are not reset at power-on. The *Maintenance Time Interval* must be specified in par. 23-13 Maintenance Time Interval.
[2]	Operating Hours	*Operating Hours* [2] is the number of hours the frequency converter has been running. Operating hours are not reset at power-on. The *Maintenance Time Interval* must be specified in par. 23-13 Maintenance Time Interval.
[3]	Date & Time	*Date & Time* [3] uses the internal clock. The date and time of the next maintenance occurrence must be specified in par. 23-14 Maintenance Date and Time.

23-13 Maintenance Time Interval

Range:		Function:
1 h*	[1 - 2147483647 h]	Set the interval associated with the current Preventive Maintenance Event. This parameter is only used if *Running Hours* [1] or *Operating Hours* [2] is selected in par. 23-12 Maintenance Time Base. The timer is reset from par. 23-15 Reset Maintenance Word. **Example:** A Preventive Maintenance Event is set up Monday at 8:00. Par. 23-12 Maintenance Time Base is *Operating hours* [2] and par. 23-13 Maintenance Time Interval is 7 x 24 hours=168 hours. Next Maintenance Event will be indicated the following Monday at 8:00. If this Maintenance Event is not reset until Tuesday at 9:00, the next occurrence will be the following Tuesday at 9:00.

23-14 Maintenance Date and Time

Range:		Function:
Application dependent*	[Application dependant]	Set the date and time for next maintenance occurrence if the Preventive Maintenance Event is based on date/time. Date format depends on the setting in par. 0-71 Date Format while the time format depends on the setting in par. 0-72 Time Format. **NOTICE** The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down. In par. 0-79 Clock Fault it is possible to program for a Warning in case the clock has not been set properly, e.g. after a power down. The time set must be at least one hour from the actual time! **NOTICE** When mounting an Analog I/O MCB 115 option card, a battery back up of the date and time is included.

23-15 Reset Maintenance Word

Option:		Function:
		Set this parameter to *Do reset* [1] to reset the Maintenance Word in par. 16-96 Maintenance Word and reset the message displayed in the keypad. This parameter will change back to *Do not reset* [0] when pressing OK.
[0] *	Do not reset	
[1]	Do reset	

NOTICE

When messages are reset - Maintenance Item, Action and Maintenance Date/Time are not cancelled.
Par. 23-12 Maintenance Time Base is set to Disabled [0].

23-16 Maintenance Text

Range:		Function:
0*	[0 - 0]	

23-5* Energy Log

The frequency converter is continuously accumulating the consumption of the motor controlled, based on the actual power yielded by the frequency converter.

These data can be used for an Energy Log function allowing the user to compare and structure the information about the energy consumption related to time.

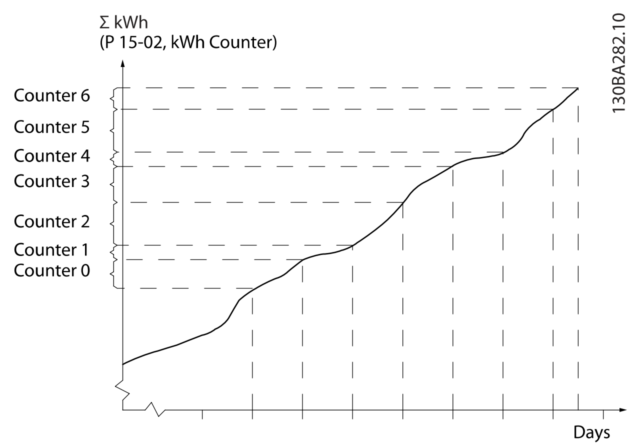
There are basically two functions:

- Data related to a pre-programmed period, defined by a set date and time for start
- Data related to a predefined period back in time e.g. last seven days within the pre-programmed period

For each of the above two functions, the data are stored in a number of counters allowing for selecting time frame and a split on hours, days or weeks.
The period/split (resolution) can be set in par. 23-50 Energy Log Resolution.

The data are based on the value registered by the kWh counter in the frequency converter. This counter value can be read in par. 15-02 Input kWh Counter containing the accumulated value since the first power up or latest reset of the counter (par. 15-06 Reset kWh Counter).

All data for the Energy Log are stored in counters which can be read from par. 23-53 Energy Log.



Counter 00 will always contain the oldest data. A counter will cover a period from XX:00 to XX:59 if hours or 00:00 to 23:59 if days.
If logging either the last hours or last days, the counters will shift contents at XX:00 every hour or at 00:00 every day.
Counter with highest index will always be subject to update (containing data for the actual hour since XX:00 or the actual day since 00:00).

The contents of counters can be displayed as bars on keypad. Select *Quick Menu*, *Loggings*, *Energy Log: Trending Continued Bin / Trending Timed Bin / Trending Comparison*.

23-50 Energy Log Resolution		
Option:		Function:
		Select the desired type of period for logging of consumption. Hour of Day [0] , Day of Week [1] or Day of Month [2]. The counters contain the logging data from the programmed date/time for start (par. 23-51 Period Start) and the numbers of hours/days as programmed for (par. 23-50 Energy Log Resolution). The logging will start on the date programmed in par. 23-51 Period Start, and continue until one day/week/month has gone. Last 24 Hours [5], Last 7 Days [6] or Last 5 Weeks [7]. The counters contain data for one day, one week or five weeks back in time and up to the actual time. The logging will start at the date programmed in par. 23-51 Period Start. In all cases the period split will refer to Operating Hours (time where frequency converter is powered up).
[0]	Hour of Day	
[1]	Day of Week	
[2]	Day of Month	
[5] *	Last 24 Hours	
[6]	Last 7 Days	
[7]	Last 5 Weeks	

NOTICE

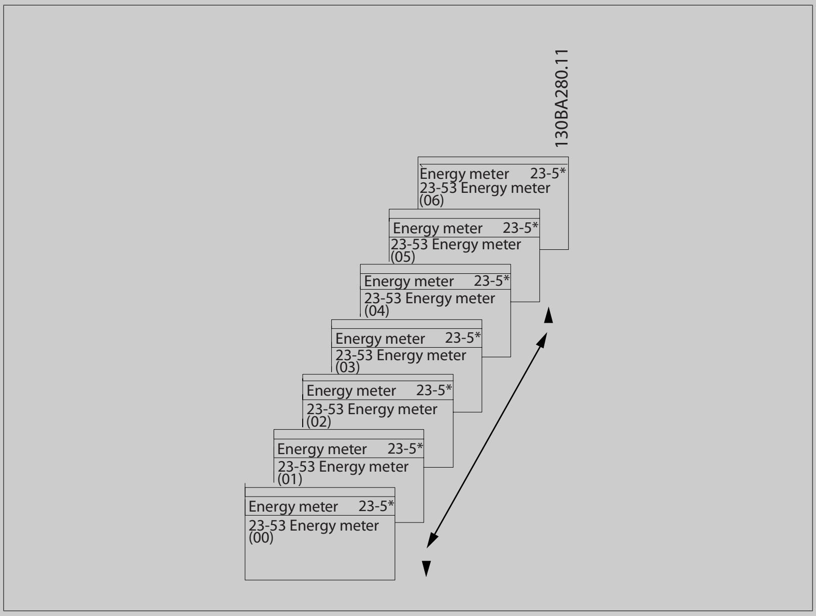
The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. Consequently the logging will be stopped until date/time is readjusted in par. 0-70 Date and Time. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock not has been set properly, e.g. after a power down.

23-51 Period Start		
Range:		Function:
Application dependent*	[Application dependant]	Set the date and time at which the Energy Log starts update of the counters. First data will be stored in counter [00] and start at the time/date programmed in this parameter. Date format will depend on setting in par. 0-71 Date Format and time format on setting in par. 0-72 Time Format.

NOTICE

When mounting an Analog I/O MCB 115 option card, a battery back up of the date and time is included.

23-53 Energy Log		
Range:		Function:
0*	[0 - 4294967295]	Array with a number of elements equal to the number of counters ([00]-[xx] below parameter number in display). Press OK and Step between elements by means of ▲ and ▼ buttons on the Local Control Panel. Array elements:



Data from latest period is stored in the counter with the highest index. At power down all counter values are stored and resumed at next power up.

NOTICE

All counters are automatically reset when changing the setting in par. 23-50 Energy Log Resolution. At overflow the update of the counters will stop at maximum value.

NOTICE

When mounting an Analog I/O MCB 115 option card, a battery back up of the date and time is included.

23-54 Reset Energy Log		
Option:		Function:
		Select *Do reset* [1] to reset all values in the Energy Log counters shown in par. 23-53 Energy Log. After pressing OK the setting of the parameter value will automatically change to *Do not reset* [0].
[0] *	Do not reset	
[1]	Do reset	

23-6* Trending

Trending is used to monitor a process variable over a period of time and record how often the data falls into each of ten user-defined data ranges. This is a convenient tool to get a quick overview indicating where to put focus for improvement of operation.

Two sets of data for Trending can be created in order to make it possible to compare current values for a selected operating variable with data for a certain reference period, for the same variable. This reference period can be pre-programmed (par. 23-63 Timed Period Start and par. 23-64 Timed Period Stop). The two sets of data can be read from par. 23-61 Continuous Bin Data (current) and par. 23-62 Timed Bin Data (reference).

It is possible to create Trending for following operation variables:

- Power
- Current
- Output frequency
- Motor Speed

The Trending function includes ten counters (forming a bin) for each set of data containing the numbers of registrations reflecting how often the operating variable is within each of ten pre-defined intervals. The sorting is based on a relative value of the variable.

The relative value for the operating variable is

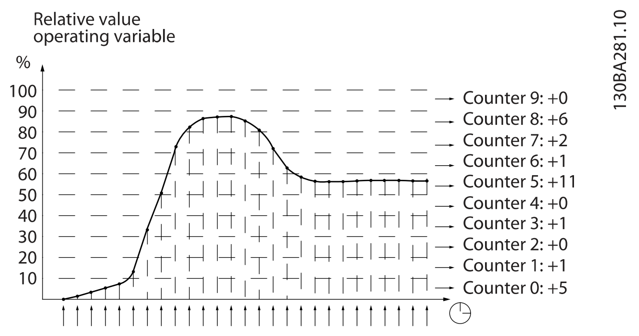
Actual/Rated * 100%

for Power and Current and

Actual/Max * 100%

for Output Frequency and Motor Speed.

The size of each interval can be adjusted individually, but will default be 10% for each. Power and Current can exceed rated value, but those registrations will be included in 90%-100% (MAX) counter.



Once a second, the value of the operating variable selected is registered. If a value has been registered to equal 13%, the counter "10% - <20%" will be updated with the value "1". If the value stays at 13% for 10s, then "10" will be added to the counter value.

The contents of counters can be displayed as bars on keypad. Select *Quick Menu>Loggings*: *Trending Continued Bin / Trending Timed Bin / Trending Comparison*.

NOTICE

The counters starts counting whenever the frequency converter is powered-up. Power cycle shortly after a reset will zero the counters. EEProm data are updated once per hour.

23-60 Trend Variable

Option:		Function:
		Select the desired operating variable to be monitored for Trending.
[0] *	Power [kW]	Power yielded to the motor. Reference for the relative value is the rated motor power programmed in par. 1-20 Motor Power [kW] or par. 1-21 Motor Power [HP]. Actual value can be read in par. 16-10 Input Power [kW] or par. 16-11 Input Power [hp].
[1]	Current [A]	Output current to the motor. Reference for the relative value is the rated motor current programmed in par. 1-24 Motor Current. Actual value can be read in par. 16-14 Motor Current.
[2]	Frequency [Hz]	Output frequency to the motor. Reference for the relative value is the maximum output frequency programmed in par. 4-14 Motor Speed High Limit [Hz]. Actual value can be read in par. 16-13 Frequency.
[3]	Motor Speed [RPM]	Speed of the motor. Reference for relative value is the maximum motor speed programmed in par. 4-13 Motor Speed High Limit [RPM].

23-61 Continuous Bin Data

Range:		Function:
0*	[0 - 4294967295]	Array with 10 elements ([0]-[9] below parameter number in display). Press OK and step between elements by means of ▲ and ▼ buttons on the keypad. 10 counters with the frequency of occurrence for the operating variable monitored, sorted according to the following intervals: Counter [0]: 0% - <10% Counter [1]: 10% - <20% Counter [2]. 20% - <30% Counter [3]: 30% - <40% Counter [4]: 40% - <50% Counter [5]: 50% - <60% Counter [6]. 60% - <70% Counter [7]: 70% - <80% Counter [8]. 80% - <90% Counter [9]: 90% - <100% or Max The above minimum limits for the intervals are the default limits. These can be changed in par. 23-65 Minimum Bin Value. Starts to count when the frequency converter is powered up for the first time. All counters can be reset to 0 in par. 23-66 Reset Continuous Bin Data.

23-62 Timed Bin Data

Range:		Function:
0*	[0 - 4294967295]	Array with 10 elements ([0]-[9] below parameter number in display). Press OK and step between elements by means of ▲ and ▼ buttons on the keypad. 10 counters with the frequency of occurrence for the operating data monitored sorted according to the intervals as for par. 23-61 Continuous Bin Data. Starts to count at the date/time programmed in par. 23-63 Timed Period Start, and stops at the time/date programmed in par. 23-64 Timed Period Stop. All counters can be reset to 0 in par. 23-67 Reset Timed Bin Data.

23-63 Timed Period Start

Range:		Function:
Application dependent*	[Application dependant]	Set the date and time at which the Trending starts the update of the Timed Bin counters. Date format will depend on setting in par. 0-71 Date Format, and time format on setting in par. 0-72 Time Format.

NOTICE

The frequency converter has no back up of the clock function and the set date/time will reset to default (2000-01-01 00:00) after a power down unless a Real Time Clock module with back up is installed. Consequently the logging will be stopped until date/time is readjusted in par. 0-70 Date and Time. In par. 0-79 Clock Fault it is possible to program for a Warning in case clock not has been set properly, e.g. after a power down.

NOTICE

When mounting an Analog I/O MCB 115 option card, a battery back up of the date and time is included.

23-64 Timed Period Stop

Range:		Function:
Application dependent*	[Application dependant]	Set the date and time at which the Trend Analyses must stop update of the Timed Bin counters. Date format will depend on setting in par. 0-71 Date Format, and time format on setting in par. 0-72 Time Format.

NOTICE

When mounting an Analog I/O MCB 115 option card, a battery back up of the date and time is included.

23-65 Minimum Bin Value

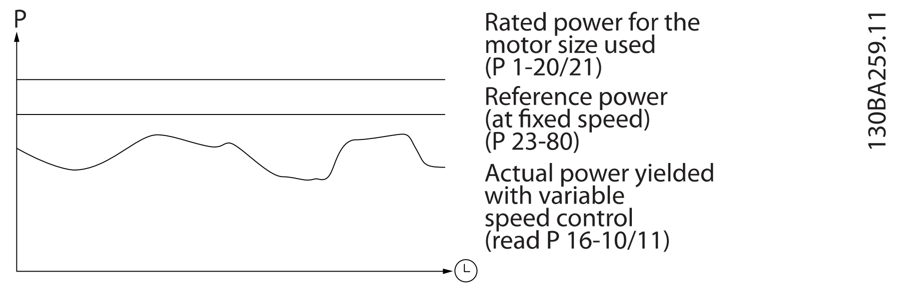
Range:		Function:
Application dependent*	[Application dependant]	Array with 10 elements ([0]-[9] below parameter number in display). Press OK and step between elements by means of ▲ and ▼ buttons on the keypad. Set the minimum limit for each interval in par. 23-61 Continuous Bin Data and par. 23-62 Timed Bin Data. Example: if selecting *counter* [1] and changing setting from 10% to 12%, *counter* [0] will be based on the interval 0 - <12% and *counter* [1] on interval 12% - <20%.

23-66 Reset Continuous Bin Data		
Option:		Function:
		Select *Do reset* [1] to reset all values in par. 23-61 Continuous Bin Data. After pressing OK the setting of the parameter value will automatically change to *Do not reset* [0].
[0] *	Do not reset	
[1]	Do reset	

23-67 Reset Timed Bin Data		
Option:		Function:
		Select *Do reset* [1] to reset all counters in par. 23-62 Timed Bin Data. After pressing OK the setting of the parameter value will automatically change to *Do not reset* [0].
[0] *	Do not reset	
[1]	Do reset	

23-8* Payback Counter

The frequency converter includes a feature which can give a rough calculation on payback in cases where the frequency converter has been installed in an existing plant to ensure energy saving by changing from fixed to variable speed control. Reference for the savings is a set value to represent the average power yielded before the upgrade with variable speed control.



The difference between the Reference Power at fixed speed and the Actual Power yielded with speed control represent the actual saving.

As value for the fixed speed case, the rated motor size (kW) is multiplied with a factor (set in %) representing the power produced at fixed speed. The difference between this reference power and the actual power is accumulated and stored. The difference in energy can be read in par. 23-83 Energy Savings.
The accumulated value for the difference in power consumption is multiplied with the energy cost in local currency and the investment is subtracted. This calculation for Cost Savings can also be read in par. 23-84 Cost Savings.

$$Cost\ Savings =$$

$$\left\{ \sum_{t=0}^{t} \left[(Rated\ Motor\ Power * Power\ Reference\ Factor) - Actual\ Power\ Consumption \right] \times Energy\ Cost \right\}$$

$$-\ Investment\ Cost$$

Break even (payback) occurs when the value read in the parameter turns from negative to positive.

It is not possible to reset the Energy Savings counter, but the counter can be stopped any time by setting par. 23-80 Power Reference Factor to 0.

Parameter overview:

Parameter for settings		Parameters for readout	
Rated Motor Power	Par. 1-20 Motor Power [kW]	Energy Savings	Par. 23-83 Energy Savings
Power Reference Factor in %	Par. 23-80 Power Reference Factor	Actual Power	Par. 16-10 Input Power [kW], par. 16-11 Input Power [hp]
Energy Cost per kWh	Par. 23-81 Energy Cost	Cost Savings	Par. 23-84 Cost Savings
Investment	Par. 23-82 Investment		

23-80 Power Reference Factor

Range:		Function:
100 %*	[0 - 100 %]	Set the percentage of the rated motor size (set in par. 1-20 Motor Power [kW] or par. 1-21 Motor Power [HP]) which is supposed to represent the average power yielded at the time running with fixed speed (before upgrade with variable speed control). Must be set to a value different from zero to start counting.

23-81 Energy Cost

Range:		Function:
1.00*	[0.00 - 999999.99]	Set the actual cost for a kWh in local currency. If the energy cost is changed later on it will impact the calculation for the entire period.

23-82 Investment

Range:		Function:
0*	[0 - 999999999]	Set the value of the investment spent on upgrading the plant with speed control, in same currency as used in par. 23-81 Energy Cost.

23-83 Energy Savings

Range:		Function:
0 kWh*	[0 - 0 kWh]	This parameter allows a readout of the accumulated difference between the reference power and the actual output power. If motor size set in Hp (par. 1-21 Motor Power [HP]), the equivalent kW value will be used for the Energy Savings.

23-84 Cost Savings

Range:		Function:
0*	[0 - 2147483647]	This parameter allows a readout of the calculation based on the above equation (in local currency).

Main Menu - Application Functions 2 - Group 24

24-0* Fire Mode

⚠WARNING

Please note the frequency converter is only one component of the TR200 system. Correct function of Fire Mode depends on the correct design and selection of system components. Ventilation systems working in life safety applications have to be approved by the local fire Authorities. ***Non-interruption of the frequency converter due to Fire Mode operation could cause over pressure and result in damage to TR200 system and components, hereunder dampers and air ducts. The frequency converter itself could be damaged and it may cause damage or fire. Failure to follow recommendations could result in death or serious injury. Trane accepts no responsibility for errors, malfunctions personal injury or any damage to the frequency converter itself or components herein, TR200 systems and components herein or other property when the frequency converter has been programmed for Fire Mode. In no event shall Trane be liable to the end user or any other party for any direct or indirect, special or consequential damage or loss suffered by such party, which has occurred due to the frequency converter being programmed and operated in Fire Mode***

Background

Fire Mode is for use in critical situations, where it is imperative for the motor to keep running, regardless of the frequency converter's normal protective functions. These could be ventilation fans in tunnels or stairwells for instance, where continued operation of the fan facilitates safe evacuation of personnel in the event of a fire. Some selections of Fire Mode Function cause alarms and trip conditions to be disregarded, enabling the motor to run without interruption.

Activation

Fire Mode is activated only via Digital Input terminals. See parameter group 5-1* Digital Inputs.

Messages in display

When Fire Mode is activated, the display will show a status message "Fire Mode" and a warning "Fire Mode". Once the Fire Mode is again deactivated, the status messages will disappear and the warning will be replaced by the warning "Fire M Was Active". This message can only be reset by power-cycling the frequency converter supply. If, whilst the frequency converter is active in Fire Mode, a warranty-affecting alarm (see par. 24-09 Fire Mode Alarm Handling) should occur, display will show the warning "Fire M Limits Exceeded".
Digital and relay outputs can be configured for the status messages "Fire Mode Active" and the warning "Fire M Was Active". See parameter group5-3* and parameter group 5-4*.
"Fire M was Active" messages can also be accessed in the warning word via serial communication. (See relevant documentation).
The status messages "Fire Mode" can be accessed via the extended status word.

Message	Type	keypad	Messages in display	Warning Word 2	Ext. Status Word 2
Fire Mode	Status	+	+		+ (bit 25)
Fire Mode	Warning	+			
Fire M was Active	Warning	+	+	+ (bit 3)	
Fire M Limits Exceeded	Warning	+	+		

Log

An overview of events related to Fire Mode can be viewed in the Fire Mode log, parameter group 18-1*, or via the Alarm Log button on the keypad.
The log will include up to 10 of the latest events. Warranty Affecting Alarms will have a higher priority as the two other types of events.
The log cannot be reset!
Following events are logged:
*Warranty affecting alarms (see par. 24-09 Fire Mode Alarm Handling, Fire Mode Alarm Handling)
*Fire Mode activated
*Fire Mode deactivated
All other alarms occurring while Fire Mode activated will be logged as usual.

NOTICE

During Fire Mode operation all stop commands to the frequency converter will be ignored, including Coast/Coast inverse and External Interlock. However, if your frequency converter incorporates "Safe-Stop", this function is still active. See Section "How to Order / Ordering Form Type Code".

NOTICE

If in Fire Mode it is desired to use the Live Zero function, then it will also be active for analog inputs other than that used for Fire Mode setpoint / feedback. Should the feedback to any of those other analog inputs be lost, for example a cable is burned, Live Zero function will operate. If this is undesirable then Live Zero function must be disabled for those other inputs.
Desired Live Zero function in case of missing signal when Fire Mode active, must be set in par. 6-02 Fire Mode Live Zero Timeout Function.
Warning for Live Zero will have a higher priority than the warning "Fire Mode".

NOTICE

If setting the command Start Reversing [11] on a digital input terminal in par. 5-10 Terminal 18 Digital Input, the drive will understand this as a reversing command.

24-00 Fire Mode Function		
Option:		Function:
[0] *	Disabled	Fire Mode Function is not active.
[1]	Enabled - Run Forward	In this mode the motor will continue to operate in a clockwise direction. Works only in Open Loop. Set par. 24-01 Fire Mode Configuration to Open Loop [0].
[2]	Enabled - Run Reverse	In this mode the motor will continue to operate in a counter-clockwise direction. Works only in Open Loop. Set par. 24-01 Fire Mode Configuration to Open Loop [0].
[3]	Enabled - Coast	Whilst this mode is enabled, the output is disabled and the motor is allowed to coast to stop.
[4]	Enabled - Run Fwd/Rev	

NOTICE

In the above, alarms are produced or ignored in accordance with the selection in par. 24-09 Fire Mode Alarm Handling.

24-04 Fire Mode Max Reference

Range:		Function:
Application dependent*	[Application dependant]	Maximum value for the reference/set point (limiting the sum of value in par. 24-05 Fire Mode Preset Reference and value of signal on input selected in par. 24-06 Fire Mode Reference Source). If running in Open loop when Fire Mode is active, the unit is chosen by the setting of par. 0-02 Motor Speed Unit. For closed loop, the unit is selected in par. 24-02 Fire Mode Unit.

24-05 Fire Mode Preset Reference

Range:		Function:
0.00 %*	[-100.00 - 100.00 %]	Enter the required preset reference/set point as a percentage of the Fire Mode Max Reference set in par. 24-04 Fire Mode Max Reference. The set value will be added to the value represented by the signal on the analog input selected in par. 24-06 Fire Mode Reference Source.

24-06 Fire Mode Reference Source

Option:		Function:
		Select the external reference input to be used for the Fire Mode. This signal will be added to the value set in par. 24-06 Fire Mode Reference Source.
[0] *	No function	
[1]	Analog input 53	
[2]	Analog input 54	
[7]	Pulse input 29	
[8]	Pulse input 33	
[20]	Digital pot.meter	
[21]	Analog input X30/11	
[22]	Analog input X30/12	
[23]	Analog Input X42/1	
[24]	Analog Input X42/3	
[25]	Analog Input X42/5	

24-09 Fire Mode Alarm Handling

Option:		Function:
[0]	Trip+Reset, Critical Alarms	If this mode is selected, the frequency converter will continue to run, ignoring most alarms, even if doing so it may result in damage of the frequency converter. Critical alarms are alarms, which cannot be suppressed but a restart attempt is possible (Infinity Automatic Reset).
[1] *	Trip, Critical Alarms	In case of a critical alarm, the frequency converter will trip and not auto-restart (Manual Reset).
[2]	Trip, All Alarms/Test	It is possible to test the operation of Fire Mode, but all alarm states are activated normally (Manual Reset).

NOTICE

Warranty-affecting alarms. Certain alarms can affect the lifetime of the frequency converter. Should one of these ignored alarms occur whilst in Fire Mode, a log of the event is stored in the Fire Mode Log.
Here the 10 latest events of warranty-affecting alarms, fire mode activation and fire mode deactivation are stored.

NOTICE

The setting in par. 14-20 Reset Mode is disregarded in case of Fire Mode being active (see par. 24-0*, Fire Mode).

No:	Description	Critical Alarms	Warranty Affecting Alarms
4	Mains ph. Loss		x
7	DC over volt	x	
8	DC under volt	x	
9	Inverter overloaded		x
13	Over current	x	
14	Earth fault	x	
16	Short circuit	x	
29	Power card temp		x
33	Inrush fault		x
38	Internal fault		x
65	Ctrl. card temp		x
68	SafeStop	x	

24-1* Drive Bypass

The frequency converter includes a feature, which can be used to automatically activate an external electro-mechanical bypass in case of a trip/trip lock of the frequency converter or the event of a Fire Mode Coast (see par. 24-00 Fire Mode Function).

The bypass will switch the motor to operation direct on line. The external bypass is activated by means of one of the digital outputs or relays in the frequency converter, when programmed in parameter group 5-3* or parameter group 5-4*.

NOTICE

Important! After enabling the Drive Bypass Function, the frequency converter is no longer Safety Certified (for using the Safe Stop in versions, where included).

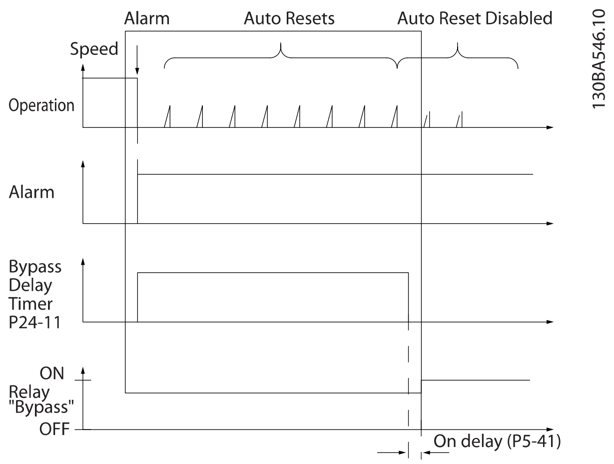
To deactivate the Drive Bypass at normal operation (Fire Mode not activated), one of following actions must be carried out:

- Press the Off button on the keypad, (or program two of the digital inputs for Hand On-Off-Auto).
- Activate External Interlock via digital input
- Carry out a Power Cycling.

NOTICE

The Drive Bypass cannot be deactivated if in Fire Mode. It can be deactivated only by either removing the Fire Mode command signal or the power supply to the frequency converter!

When the Drive Bypass function is activated, the display on the keypad will show the status message Drive Bypass. This message has a higher priority than the Fire Mode status messages. When the automatic Drive Bypass function is enabled, it will cut in the external bypass according to the below sequence:



24-10 Drive Bypass Function

Option:		Function:
		This parameter determines, what circumstances will activate the Drive Bypass Function:
[0] *	Disabled	
[1]	Enabled	If in normal operation the automatic Drive Bypass Function will be activated at following conditions: At a Trip Lock or a Trip. After the programmed number of reset attempts, programmed in par. 14-20 Reset Mode or if the Bypass Delay Timer (par. 24-11 Drive Bypass Delay Time) expires before reset attempts have been completed When in Fire Mode, the Bypass Function will operate under following conditions: When experiencing a trip at critical alarms, a Coast or if the Bypass Delay Timer expires before reset attempts have completed when [2] Enabled in Fire Mode. The Bypass Function will operate at trip at critical alarms, Coast or if the Bypass Delay Timer expires before reset attempts have been completed.
[2]	Enabled (Fire M Only)	The Bypass Function will operate at Trip at Critical Alarms, Coast or Bypass Delay Timer if the timer expires before reset attempts have completed.

⚠CAUTION

Important! After enabling the Drive Bypass Function, the Safe Stop function (in versions, where included) is not complying with standard EN 954-1, Cat. 3 installations anymore.

24-11 Drive Bypass Delay Time

Range:		Function:
0 s*	[0 - 600 s]	Programmable in 1 s increments. Once the Bypass Function is activated in accordance with the setting in par. 24-10 Drive Bypass Function, the Bypass Delay Timer begins to operate. If the frequency converter has been set for a number of restart attempts, the timer will continue to run while the frequency converter tries to restart. Should the motor have re-started within the time period of the Bypass Delay Timer, then the timer is reset. Should the motor fail to restart at the end of the Bypass Delay Time, the Drive Bypass relay will be activated, which will have been programmed for Bypass in par. 5-40 Function Relay. If a [Relay Delay] has also been programmed in par. 5-41 On Delay, Relay, [Relay] or par. 5-42 Off Delay, Relay, [Relay], then this time must also elapse before the relay action is performed. Where no restart attempts are programmed, the timer will run for the delay period set in this parameter and will then activate the Drive Bypass relay, which will have been programmed for Bypass in par. 5-40 Function Relay, Function Relay. If a Relay Delay has also been programmed in par. 5-41 On Delay, Relay, On Delay, Relay or par. 5-42 Off Delay, Relay, [Relay], then this time must also elapse before the relay action is per-formed.

Main Menu - Programmable I/O Option - Group 36

36-0* I/O Mode

36-00 Terminal X49/1 Mode

Option:		Function:
		Terminal X49/1 can be programmed as either a voltage, current, Pt1000 or a Ni1000 input. Pt1000 (1000 Ω at 0°C) or Ni 1000 (1000 Ω at 0°C) temperature sensors. Select the desired mode. Pt 1000, [2] and Ni 1000 [4] if operating in Celsius - Pt 1000 [3] and Ni 1000 [5] if operating in Fahrenheit.
[0]	Current	
[1] *	Voltage	
[2]	Pt 1000 [°C]	
[3]	Pt 1000 [°F]	
[4]	Ni 1000 [°C]	
[5]	Ni 1000 [°F]	

36-01 Terminal X49/3 Mode

Option:		Function:
		Terminal X49/1 can be programmed as either a voltage, current, Pt1000 or a Ni1000 input. Pt1000 (1000 Ω at 0°C) or Ni 1000 (1000 Ω at 0°C) temperature sensors. Select the desired mode. Pt 1000, [2] and Ni 1000 [4] if operating in Celsius - Pt 1000 [3] and Ni 1000 [5] if operating in Fahrenheit.
[0]	Current	
[1] *	Voltage	
[2]	Pt 1000 [°C]	
[3]	Pt 1000 [°F]	
[4]	Ni 1000 [°C]	
[5]	Ni 1000 [°F]	

36-02 Terminal X49/5 Mode

Option:		Function:
		Terminal X49/1 can be programmed as either a voltage, current, Pt1000 or a Ni1000 input. Pt1000 (1000 Ω at 0°C) or Ni 1000 (1000 Ω at 0°C) temperature sensors. Select the desired mode. Pt 1000, [2] and Ni 1000 [4] if operating in Celsius - Pt 1000 [3] and Ni 1000 [5] if operating in Fahrenheit.
[0]	Current	
[1] *	Voltage	
[2]	Pt 1000 [°C]	
[3]	Pt 1000 [°F]	
[4]	Ni 1000 [°C]	
[5]	Ni 1000 [°F]	

36-03 Terminal X49/7 Mode		
Option:		Function:
		Terminal X49/1 can be programmed as either a voltage, current, Pt1000 or a Ni1000 input. Pt1000 (1000 Ω at 0°C) or Ni 1000 (1000 Ω at 0°C) temperature sensors. Select the desired mode. Pt 1000, [3] and Ni 1000 [5] if operating in Celsius - Pt 1000 [4] and Ni 1000 [6] if operating in Fahrenheit.
[0] *	Voltage 0-10V	
[1] *	Voltage 2-10V	
[2]	Current 0-20mA	
[3]	Current 4-20mA	
[4]	Digital	

36-04 Terminal X49/9 Mode		
Option:		Function:
[0] *	Voltage 0-10V	
[1] *	Voltage 2-10V	
[2]	Current 0-20mA	
[3]	Current 4-20mA	
[4]	Digital	

36-05 Terminal X49/11 Mode		
Option:		Function:
[0] *	Voltage 0-10V	
[1] *	Voltage 2-10V	
[2]	Current 0-20mA	
[3]	Current 4-20mA	
[4]	Digital	

36-1* Analog Input X49/1

36-10 Terminal X49/1 Low Voltage		
Range:		Function:
0.07 V*	[Application dependant]	Enter the voltage (V) that corresponds to the low reference value (set in par. 36-14 Term. X49/1 Low Ref./Feedb. Value).

36-11 Terminal X49/1 Low Current		
Range:		Function:
4.00 mA*	[Application dependant]	Enter the voltage (mA) that corresponds to the low reference value (set in par. 36-14 Term. X49/1 Low Ref./Feedb. Value).

36-12 Terminal X49/1 High Voltage		
Range:		Function:
10.00 V*	[Application dependant]	Enter the voltage (V) that corresponds to the low reference value (set in par. 36-15 Term. X49/1 High Ref./Feedb. Value).

36-13 Terminal X49/1 High Current

Range:		Function:
20.00 mA*	[Application dependant]	Enter the voltage (V) that corresponds to the low reference value (set in par. 36-15 Term. X49/1 High Ref./Feedb. Value).

36-14 Term. X49/1 Low Ref./Feedb. Value

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-10 Terminal X49/1 Low Voltage/par. 36-11 Terminal X49/1 Low Current.

36-15 Term. X49/1 High Ref./Feedb. Value

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-12 Terminal X49/1 High Voltage/par. 36-13 Terminal X49/1 High Current.

36-16 Term. X49/1 Filter Time Constant

Range:		Function:
0.001 s*	[0.001 - 10.000 s]	Enter the filter time constant. This is a first-order digital low pass filter time constant for suppressing electrical noise in terminal X49/1. A high time constant value improves dampening but also increases the delay through the filter.

36-17 Term. X49/1 Live Zero

This parameter gives the possibility of disabling live zero monitoring. E.g. for use as decentral I/O.

Range:		Function:
[0]	Disabled	
[1] *	Enabled	

36-2* Analog Input X49/3

36-20 Terminal X49/3 Low Voltage

Range:		Function:
0.07 V*	[Application dependant]	Enter the voltage (V) that corresponds to the low reference value (set in par. 36-24 Term. X49/3 Low Ref./Feedb. Value).

36-21 Terminal X49/3 Low Current

Range:		Function:
4.00 mA*	[Application dependant]	Enter the current (mA) that corresponds to the low reference value (set in par. 36-24 Term. X49/3 Low Ref./Feedb. Value).

36-22 Terminal X49/3 High Voltage

Range:		Function:
10.00 V*	[Application dependant]	Enter the voltage (V) that corresponds to the high reference value (set in par. 36-25 Term. X49/3 High Ref./Feedb. Value).

36-23 Terminal X49/3 High Current

Range:		Function:
20.00 mA*	[Application dependant]	Enter the current (mA) that corresponds to the high reference value (set in par. 36-25 Term. X49/3 High Ref./Feedb. Value).

36-24 Term. X49/3 Low Ref./Feedb. Value

Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-20 Terminal X49/3 Low Voltage/par. 36-21 Terminal X49/3 Low Current.

36-25 Term. X49/3 High Ref./Feedb. Value

Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-22 Terminal X49/3 High Voltage/par. 36-23 Terminal X49/3 High Current.

36-26 Term. X49/3 Filter Time Constant

Range:		Function:
0.001 s*	[0.001 - 10.000 s]	Enter the filter time constant. This is a first-order digital low pass filter time constant for suppressing electrical noise in terminal X49/3. A high time constant value improves dampening but also increases the delay through the filter.

36-27 Term. X49/3 Live Zero

This parameter gives the possibility of disabling live zero monitoring. E.g. for use as decentral I/O.

Option:		Function:
[0]	Disabled	
[1] *	Enabled	

36-3* Analog Input X49/5

36-30 Terminal X49/5 Low Voltage

Range:		Function:
0.07 V*	[Application dependant]	Enter the voltage (V) that corresponds to the low reference value (set in par. 36-34 Term. X49/5 Low Ref./Feedb. Value).

36-31 Terminal X49/5 Low Current

Range:		Function:
4.00 mA*	[Application dependant]	Enter the current (mA) that corresponds to the low reference value (set in par. 36-34 Term. X49/5 Low Ref./Feedb. Value).

36-32 Terminal X49/5 High Voltage

Range:		Function:
10.00 V*	[Application dependant]	Enter the voltage (V) that corresponds to the high reference value (set in par. 36-35 Term. X49/5 High Ref./Feedb. Value).

36-33 Terminal X49/5 High Current

Range:		Function:
20.00 mA*	[Application dependant]	Enter the current (mA) that corresponds to the high reference value (set in par. 36-35 Term. X49/5 High Ref./Feedb. Value).

36-34 Term. X49/5 Low Ref./Feedb. Value		
Range:		Function:
0.000*	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-20 Terminal X49/3 Low Voltage/par. 36-21 Terminal X49/3 Low Current.

36-35 Term. X49/5 High Ref./Feedb. Value		
Range:		Function:
100.000 *	[-999999.999 - 999999.999]	Enter the reference or feedback value (in RPM, Hz, bar, etc.) that corresponds to the voltage or current set in par. 36-32 Terminal X49/5 High Voltage/par. 36-33 Terminal X49/5 High Current.

36-36 Term. X49/5 Filter Time Constant		
Range:		Function:
0.001 s*	[0.001 - 10.000 s]	Enter the filter time constant. This is a first-order digital low pass filter time constant for suppressing electrical noise in terminal X49/5. A high time constant value improves dampening but also increases the delay through the filter.

36-37 Term. X49/5 Live Zero		
Option:		Function:
[0]	Disabled	This parameter gives the possibility of disabling live zero monitoring. E.g. for use as decentral I/O.
[1] *	Enabled	

36-4* Output X49/7

36-40 Terminal X49/7 Analogue Output		
Select the function of Terminal X49/7 as an analogue voltage or current output.		
Option:		Function:
[0] *	No operation	
[100]	Output freq. 0-100	
[101]	Reference Min-Max	
[102]	Feedback +-200%	
[103]	Motor cur. 0-Imax	
[104]	Torque 0-Tlim	
[105]	Torque 0-Tnom	
[106]	Power 0-Pnom	
[107]	Speed 0-HighLim	
[113]	Ext. Closed Loop 1	
[114]	Ext. Closed Loop 2	
[115]	Ext. Closed Loop 3	
[139]	Bus ctrl.	
[141]	Bus ctrl t.o.	

36-41 Terminal X49/7 Digital Output

Select the function of Terminal X49/7 as a digital output.

Option:	Function:
[0] *	No operation
[1]	Control ready
[2]	Drive ready
[3]	Drive rdy/rem ctrl
[4]	Standby / no warning
[5]	Running
[6]	Running / no warning
[8]	Run on ref/no warn
[9]	Alarm
[10]	Alarm or warning
[11]	At torque limit
[12]	Out of current range
[13]	Below current, low
[14]	Above current, high
[15]	Out of speed range
[16]	Below speed, low
[17]	Above speed, high
[18]	Out of feedb. range
[19]	Below feedback, low
[20]	Above feedback, high
[21]	Thermal warning
[25]	Reverse
[26]	Bus OK
[27]	Torque limit & stop
[28]	Brake, no brake war
[29]	Brake ready, no fault
[30]	Brake fault (IGBT)
[35]	External Interlock
[40]	Out of ref range
[41]	Below reference, low
[42]	Above ref, high
[45]	Bus ctrl.
[46]	Bus ctrl, 1 if timeout
[47]	Bus ctrl, 0 if timeout
[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.
[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[220]	Run Confirmation

36-42 Terminal X49/7 Min. Scale

Range:		Function:
0.00 %*	[0.00 - 200.00 %]	Scale the minimum output of the selected analogue signal at terminal X49/7, as a percentage of the maximum signal value. E.g. if 0 V is desired at 25% of the maximum output value, then programme 25%.

36-43 Terminal X49/7 Max. Scale

Range:		Function:
100.00 %*	[0.00 - 200.00 %]	Scale the maximum output of the selected analogue signal at terminal X49/7.

36-44 Terminal X49/7 Bus Control

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus controlled".

36-45 Terminal X49/7 Timeout Preset

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus ctrl. Timeout" and timeout is detected.

36-5* Output X49/9

36-50 Terminal X49/9 Analogue Output

Select the function of Terminal X49/9 as an analogue voltage or current output.

Option:		Function:
[0] *	No operation	
[100]	Output freq. 0-100	
[101]	Reference Min-Max	
[102]	Feedback +-200%	
[103]	Motor cur. 0-Imax	
[104]	Torque 0-Tlim	
[105]	Torque 0-Tnom	
[106]	Power 0-Pnom	
[107]	Speed 0-HighLim	
[113]	Ext. Closed Loop 1	
[114]	Ext. Closed Loop 2	
[115]	Ext. Closed Loop 3	
[139]	Bus ctrl.	
[141]	Bus ctrl t.o.	

36-51 Terminal X49/9 Digital Output

Select the function of Terminal X49/9 as an analogue voltage output.

Option:		Function:
[0] *	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive rdy/rem ctrl	
[4]	Standby / no warning	
[5]	Running	
[6]	Running / no warning	
[8]	Run on ref/no warn	
[9]	Alarm	
[10]	Alarm or warning	
[11]	At torque limit	
[12]	Out of current range	
[13]	Below current, low	
[14]	Above current, high	
[15]	Out of speed range	
[16]	Below speed, low	
[17]	Above speed, high	
[18]	Out of feedb. range	
[19]	Below feedback, low	
[20]	Above feedback, high	
[21]	Thermal warning	
[25]	Reverse	
[26]	Bus OK	
[27]	Torque limit & stop	
[28]	Brake, no brake war	

[29]	Brake ready, no fault
[30]	Brake fault (IGBT)
[35]	External Interlock
[40]	Out of ref range
[41]	Below reference, low
[42]	Above ref, high
[45]	Bus ctrl.
[46]	Bus ctrl, 1 if timeout
[47]	Bus ctrl, 0 if timeout
[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.
[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[220]	Run Confirmation

36-52 Terminal X49/9 Min. Scale		
Range:		Function:
0.00 %*	[0.00 - 200.00 %]	Scale the minimum output of the selected analogue signal at terminal X49/9, as a percentage of the maximum signal value. E.g. if 0 V is desired at 25% of the maximum output value, then programme 25%.

36-53 Terminal X49/9 Max. Scale

Range:		Function:
100.00 %*	[0.00 - 200.00 %]	Scale the maximum output of the selected analogue signal at terminal X49/9.

36-54 Terminal X49/9 Bus Control

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus controlled".

36-55 Terminal X49/9 Timeout Preset

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus ctrl. Timeout" and timeout is detected.

36-6* Output X49/11

36-60 Terminal X49/11 Analogue Output

Select the function of Terminal X49/11 as an analogue voltage or current output.

Option:		Function:
[0] *	No operation	
[100]	Output freq. 0-100	
[101]	Reference Min-Max	
[102]	Feedback +-200%	
[103]	Motor cur. 0-Imax	
[104]	Torque 0-Tlim	
[105]	Torque 0-Tnom	
[106]	Power 0-Pnom	
[107]	Speed 0-HighLim	
[113]	Ext. Closed Loop 1	
[114]	Ext. Closed Loop 2	
[115]	Ext. Closed Loop 3	
[139]	Bus ctrl.	
[141]	Bus ctrl t.o.	

36-61 Terminal X49/11 Digital Output

Select the function of Terminal X49/11 as an analogue voltage output.

Option:		Function:
[0] *	No operation	
[1]	Control ready	
[2]	Drive ready	
[3]	Drive rdy/rem ctrl	
[4]	Standby / no warning	
[5]	Running	
[6]	Running / no warning	
[8]	Run on ref/no warn	
[9]	Alarm	
[10]	Alarm or warning	

[11]	At torque limit
[12]	Out of current range
[13]	Below current, low
[14]	Above current, high
[15]	Out of speed range
[16]	Below speed, low
[17]	Above speed, high
[18]	Out of feedb. range
[19]	Below feedback, low
[20]	Above feedback, high
[21]	Thermal warning
[25]	Reverse
[26]	Bus OK
[27]	Torque limit & stop
[28]	Brake, no brake war
[29]	Brake ready, no fault
[30]	Brake fault (IGBT)
[35]	External Interlock
[40]	Out of ref range
[41]	Below reference, low
[42]	Above ref, high
[45]	Bus ctrl.
[46]	Bus ctrl, 1 if timeout
[47]	Bus ctrl, 0 if timeout
[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
[84]	SL digital output E
[85]	SL digital output F
[160]	No alarm
[161]	Running reverse
[165]	Local ref active
[166]	Remote ref active
[167]	Start command act.

[168]	Hand mode
[169]	Auto mode
[180]	Clock Fault
[181]	Prev. Maintenance
[190]	No-Flow
[193]	Sleep Mode
[194]	Broken Belt
[195]	Bypass Valve Control
[220]	Run Confirmation

36-62 Terminal X49/11 Min. Scale

Range:		Function:
0.00 %*	[0.00 - 200.00 %]	Scale the minimum output of the selected analogue signal at terminal X49/11, as a percentage of the maximum signal value. E.g. if 0 V is desired at 25% of the maximum output value, then programme 25%.

36-63 Terminal X49/11 Max. Scale

Range:		Function:
100.00 %*	[0.00 - 200.00 %]	Scale the maximum output of the selected analogue signal at terminal X49/11.

36-64 Terminal X49/11 Bus Control

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus controlled".

36-65 Terminal X49/11 Timeout Preset

Range:		Function:
0.00 %*	[0.00 - 100.00 %]	Contains the value to put on the output terminal when it is configured as "Bus ctrl. Timeout" and timeout is detected.

Troubleshooting

A warning or an alarm is signalled by the relevant LED on the front of the frequency converter 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 motor may still be continued. Warning messages may be critical, but are not necessarily so.

In the event of an alarm, the frequency converter will have tripped. Alarms must be reset to restart operation once their cause has been rectified.

This may be done in four ways:

1. By using the [RESET] control button on the keypad.
2. Via a digital input with the “Reset” function.
3. Via serial communication/optional fieldbus.
4. By resetting automatically using the [Auto Reset] function, which is a default setting for TR200 Drive, see par. 14-20 Reset Mode in the *TR200 Programming Guide*

NOTICE

After a manual reset using the [RESET] button on the keypad, the [AUTO ON] or [HAND ON] button must be pressed 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 also table on following page).

Alarms that are trip-locked offer additional protection, means that the mains supply must be switched off before the alarm can be reset. After being switched back on, the frequency converter 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 par. 14-20 Reset Mode

⚠CAUTION

Automatic wake-up is possible!
Could result in equipment or property damage.

If a warning and alarm is marked against a code in the table on the following page, this means that either a warning occurs before an alarm, or it can be specified whether it is a warning or an alarm that is to be displayed for a given fault.
This is possible, for instance, in par. 1-90 Motor Thermal Protection. After an alarm or trip, the motor carries on coasting, and the alarm and warning flash on the frequency converter. Once the problem has been rectified, only the alarm continues flashing.

No.	Description	Warning	Alarm/ Trip	Alarm/Trip Lock	Parameter Reference
1	10 Volts low	X			
2	Live zero error	(X)	(X)		6-01
3	No motor	(X)			1-80
4	Mains phase loss	(X)	(X)	(X)	14-12
5	DC link voltage high	X			
6	DC link voltage low	X			
7	DC over voltage	X	X		
8	DC under voltage	X	X		
9	Inverter overloaded	X	X		
10	Motor ETR over temperature	(X)	(X)		1-90
11	Motor thermistor over temperature	(X)	(X)		1-90
12	Torque limit	X	X		
13	Over Current	X	X	X	
14	Earth fault	X	X	X	
15	Hardware mismatch		X	X	
16	Short Circuit		X	X	
17	Control word timeout	(X)	(X)		8-04
23	Internal Fan Fault	X			
24	External Fan Fault	X			14-53
25	Brake resistor short-circuited	X			
26	Brake resistor power limit	(X)	(X)		2-13
27	Brake chopper short-circuited	X	X		
28	Brake check	(X)	(X)		2-15
29	Drive over temperature	X	X	X	
30	Motor phase U missing	(X)	(X)	(X)	4-58
31	Motor phase V missing	(X)	(X)	(X)	4-58
32	Motor phase W missing	(X)	(X)	(X)	4-58
33	Inrush fault		X	X	
34	Fieldbus communication fault	X	X		
35	Out of frequency range	X	X		
36	Mains failure	X	X		
37	Phase Imbalance	X	X		
38	Internal fault		X	X	
39	Heatsink sensor		X	X	
40	Overload of Digital Output Terminal 27	(X)			5-01
41	Overload of Digital Output Terminal 29	(X)			5-02
42	Overload of Digital Output On X30/6	(X)			5-32
42	Overload of Digital Output On X30/7	(X)			5-33
46	Pwr. card supply		X	X	
47	24 V supply low	X	X	X	
48	1.8 V supply low		X	X	
49	Speed limit	X	(X)		1-86
50	AMA calibration failed		X		
51	AMA check U_{nom} and I_{nom}		X		
52	AMA low I_{nom}		X		
53	AMA motor too big		X		
54	AMA motor too small		X		
55	AMA Parameter out of range		X		
56	AMA interrupted by user		X		
57	AMA timeout		X		
58	AMA internal fault	X	X		
59	Current limit	X			
60	External Interlock	X			
62	Output Frequency at Maximum Limit	X			
64	Voltage Limit	X			

Table 5. 1: Alarm/Warning code list

No.	Description	Warn-ing	Alarm/Trip	Alarm/Trip Lock	Parameter Refer-ence
65	Control Board Over-temperature	X	X	X	
66	Heat sink Temperature Low	X			
67	Option Configuration has Changed		X		
69	Pwr. Card Temp		X	X	
70	Illegal Drive configuration			X	
72	Dangerous Failure			X[1)]	
76	Power Unit Setup	X			
79	Illegal PS config		X	X	
80	Drive Initialized to Default Value		X		
91	Analog input 54 wrong settings			X	
92	NoFlow	X	X		22-2*
93	Dry Pump	X	X		22-2*
94	End of Curve	X	X		22-5*
95	Broken Belt	X	X		22-6*
96	Start Delayed	X			22-7*
97	Stop Delayed	X			22-7*
98	Clock Fault	X			0-7*
201	Fire M was Active				
202	Fire M Limits Exceeded				
203	Missing Motor				
204	Locked Rotor				
243	Brake IGBT	X	X		
244	Heatsink temp	X	X	X	
245	Heatsink sensor		X	X	
246	Pwr.card supply		X	X	
247	Pwr.card temp		X	X	
248	Illegal PS config		X	X	
250	New spare parts			X	
251	Type Code		X	X	

Table 5. 2: Alarm/Warning code list

(X) Dependent on parameter
1) Can not be Auto reset via par. 14-20 Reset Mode
A trip is the action when an alarm has appeared. The trip will coast the motor and can be reset by pressing the reset button or make a reset by a digital input (parameter group 5-1* [1]). The original event that caused an alarm cannot damage the frequency converter or cause dangerous conditions. A trip lock is an action when an alarm occurs, which may cause damage to frequency converter or connected parts. A Trip Lock situation can only be reset by a power cycling.

LED indication	
Warning	yellow
Alarm	flashing red
Trip locked	yellow and red

Alarm Word and Extended Status Word					
Bit	Hex	Dec	Alarm Word	Warning Word	Extended Status Word
0	00000001	1	Brake Check	Brake Check	Ramping
1	00000002	2	Pwr. Card Temp	Pwr. Card Temp	AMA Running
2	00000004	4	Earth Fault	Earth Fault	Start CW/CCW
3	00000008	8	Ctrl.Card Temp	Ctrl.Card Temp	Slow Down
4	00000010	16	Ctrl. Word TO	Ctrl. Word TO	Catch Up
5	00000020	32	Over Current	Over Current	Feedback High
6	00000040	64	Torque Limit	Torque Limit	Feedback Low
7	00000080	128	Motor Th Over	Motor Th Over	Output Current High
8	00000100	256	Motor ETR Over	Motor ETR Over	Output Current Low
9	00000200	512	Inverter Overld.	Inverter Overld.	Output Freq High
10	00000400	1024	DC under Volt	DC under Volt	Output Freq Low
11	00000800	2048	DC over Volt	DC over Volt	Brake Check OK
12	00001000	4096	Short Circuit	DC Voltage Low	Braking Max
13	00002000	8192	Inrush Fault	DC Voltage High	Braking
14	00004000	16384	Mains ph. Loss	Mains ph. Loss	Out of Speed Range
15	00008000	32768	AMA Not OK	No Motor	OVC Active
16	00010000	65536	Live Zero Error	Live Zero Error	
17	00020000	131072	Internal Fault	10V Low	
18	00040000	262144	Brake Overload	Brake Overload	
19	00080000	524288	U phase Loss	Brake Resistor	
20	00100000	1048576	V phase Loss	Brake IGBT	
21	00200000	2097152	W phase Loss	Speed Limit	
22	00400000	4194304	Fieldbus Fault	Fieldbus Fault	
23	00800000	8388608	24 V Supply Low	24V Supply Low	
24	01000000	16777216	Mains Failure	Mains Failure	
25	02000000	33554432	1.8V Supply Low	Current Limit	
26	04000000	67108864	Brake Resistor	Low Temp	
27	08000000	134217728	Brake IGBT	Voltage Limit	
28	10000000	268435456	Option Change	Unused	
29	20000000	536870912	Drive Initialized	Unused	

Table 5. 3: Description of Alarm Word, Warning Word and Extended Status Word

The alarm words, warning words and extended status words can be read out via serial bus or optional fieldbus for diagnosis. See also par. 16-90 Alarm Word, par. 16-92 Warning Word and par. 16-94 Ext. Status Word.

Alarm Words

Alarm word, par. 16-90 Alarm Word

Bit (Hex)	Alarm Word (par. 16-90 Alarm Word)
00000001	Brake check
00000002	Power card over temperature
00000004	Earth fault
00000008	Ctrl. card over temperature
00000010	Control word timeout
00000020	Over current
00000040	Torque limit
00000080	Motor thermistor over temp.
00000100	Motor ETR over temperature
00000200	Inverter overloaded
00000400	DC link under voltage
00000800	DC link over voltage
00001000	Short circuit
00002000	Inrush fault
00004000	Mains phase loss
00008000	AMA not OK
00010000	Live zero error
00020000	Internal fault
00040000	Brake overload
00080000	Motor phase U is missing
00100000	Motor phase V is missing
00200000	Motor phase W is missing
00400000	Fieldbus fault
00800000	24V supply fault
01000000	Mains failure
02000000	1.8V supply fault
04000000	Brake resistor short circuit
08000000	Brake chopper fault
10000000	Option change
20000000	Drive initialised
40000000	Safe Stop
80000000	Not used

Alarm word 2, par. 16-91 Alarm Word 2

Bit (Hex)	Alarm Word 2 (par. 16-91 Alarm Word 2)
00000001	Service Trip, read / Write
00000002	Reserved
00000004	Service Trip, Typecode / Sparepart
00000008	Reserved
00000010	Reserved
00000020	No Flow
00000040	Dry Pump
00000080	End of Curve
00000100	Broken Belt
00000200	Not used
00000400	Not used
00000800	Reserved
00001000	Reserved
00002000	Reserved
00004000	Reserved
00008000	Reserved
00010000	Reserved
00020000	Not used
00040000	Fans error
00080000	ECB error
00100000	Reserved
00200000	Reserved
00400000	Reserved
00800000	Reserved
01000000	Reserved
02000000	Reserved
04000000	Reserved
08000000	Reserved
10000000	Reserved
20000000	Reserved
40000000	Reserved
80000000	Reserved

Warning Words

Warning word, par. 16-92 Warning Word

Bit (Hex)	Warning Word (par. 16-92 Warning Word)
00000001	Brake check
00000002	Power card over temperature
00000004	Earth fault
00000008	Ctrl. card over temperature
00000010	Control word timeout
00000020	Over current
00000040	Torque limit
00000080	Motor thermistor over temp.
00000100	Motor ETR over temperature
00000200	Inverter overloaded
00000400	DC link under voltage
00000800	DC link over voltage
00001000	DC link voltage low
00002000	DC link voltage high
00004000	Mains phase loss
00008000	No motor
00010000	Live zero error
00020000	10V low
00040000	Brake resistor power limit
00080000	Brake resistor short circuit
00100000	Brake chopper fault
00200000	Speed limit
00400000	Fieldbus comm. fault
00800000	24V supply fault
01000000	Mains failure
02000000	Current limit
04000000	Low temperature
08000000	Voltage limit
10000000	Encoder loss
20000000	Output frequency limit
40000000	Not used
80000000	Not used

Warning word 2, par. 16-93 Warning Word 2

Bit (Hex)	Warning Word 2 (par. 16-93 Warning Word 2)
00000001	Start Delayed
00000002	Stop Delayed
00000004	Clock Failure
00000008	Reserved
00000010	Reserved
00000020	No Flow
00000040	Dry Pump
00000080	End of Curve
00000100	Broken Belt
00000200	Not used
00000400	Reserved
00000800	Reserved
00001000	Reserved
00002000	Reserved
00004000	Reserved
00008000	Reserved
00010000	Reserved
00020000	Not used
00040000	Fans warning
00080000	ECB warning
00100000	Reserved
00200000	Reserved
00400000	Reserved
00800000	Reserved
01000000	Reserved
02000000	Reserved
04000000	Reserved
08000000	Reserved
10000000	Reserved
20000000	Reserved
40000000	Reserved
80000000	Reserved

Extended Status Words

Extended status word, par. 16-94 Ext. Status Word

Bit (Hex)	Extended Status Word (par. 16-94 Ext. Status Word)
00000001	Ramping
00000002	AMA tuning
00000004	Start CW/CCW
00000008	Not used
00000010	Not used
00000020	Feedback high
00000040	Feedback low
00000080	Output current high
00000100	Output current low
00000200	Output frequency high
00000400	Output frequency low
00000800	Brake check OK
00001000	Braking max
00002000	Braking
00004000	Out of speed range
00008000	OVC active
00010000	AC brake
00020000	Password Timelock
00040000	Password Protection
00080000	Reference high
00100000	Reference low
00200000	Local Ref./Remote Ref.
00400000	Reserved
00800000	Reserved
01000000	Reserved
02000000	Reserved
04000000	Reserved
08000000	Reserved
10000000	Reserved
20000000	Reserved
40000000	Reserved
80000000	Reserved

Extended status word 2, par. 16-95 Ext. Status Word 2

Bit (Hex)	Extended Status Word 2 (par. 16-95 Ext. Status Word 2)
00000001	Off
00000002	Hand / Auto
00000004	Not used
00000008	Not used
00000010	Not used
00000020	Relay 123 active
00000040	Start Prevented
00000080	Control ready
00000100	Drive ready
00000200	Quick Stop
00000400	DC Brake
00000800	Stop
00001000	Standby
00002000	Freeze Output Request
00004000	Freeze Output
00008000	Jog Request
00010000	Jog
00020000	Start Request
00040000	Start
00080000	Start Applied
00100000	Start Delay
00200000	Sleep
00400000	Sleep Boost
00800000	Running
01000000	Bypass
02000000	Fire Mode
04000000	Reserved
08000000	Reserved
10000000	Reserved
20000000	Reserved
40000000	Reserved
80000000	Reserved

Fault Messages

⚠WARNING

Hazardous Service Procedures!
The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

WARNING 1, 10 volts low
The control card voltage is below 10 V from terminal 50.
Remove some of the load from terminal 50, as the 10 V supply is overloaded. Max. 15 mA or minimum 590 Ω.

This condition can be caused by a short in a connected potentiometer or improper wiring of the potentiometer.

⚠WARNING

Live Electrical Components!

Troubleshooting: Remove the wiring from terminal 50. If the warning clears, the problem is with the customer wiring. If the warning does not clear, replace the control card.

WARNING/ALARM 2, Live zero error

This warning or alarm will only appear if programmed by the user in par. 6-01 Live Zero Timeout Function. The signal on one of the analog inputs is less than 50% of the minimum value programmed for that input. This condition can be caused by broken wiring or faulty device sending the signal.

WARNING/ALARM 3, No motor

No motor has been connected to the output of the frequency converter. This warning or alarm will only appear if programmed by the user in par. 1-80 Function at Stop.

Troubleshooting:
- Extend the ramp time
- Change the ramp type
- Activate functions in par. 2-10 Brake Function
- Increase par. 14-26 Trip Delay at Inverter Fault

Troubleshooting: Check the connection between the drive and the motor.

WARNING/ALARM 4, Mains phase loss 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 on the frequency converter. Options are programmed at par. 14-12 Function at Mains Imbalance.

⚠WARNING

Live Electrical Components!

Troubleshooting: Check the supply voltage and supply currents to the frequency converter.

WARNING 5, DC link voltage high

The intermediate circuit voltage (DC) is higher than the high voltage warning limit. The limit is dependent on the drive voltage rating. The frequency converter is still active.

WARNING 6, DC link voltage low

The intermediate circuit voltage (DC) is lower than the low voltage warning limit. The limit is dependent on the drive voltage rating. The frequency converter is still active.

WARNING/ALARM 7, DC overvoltage

If the intermediate circuit voltage exceeds the limit, the frequency converter trips after a time.

WARNING/ALARM 8, DC under voltage

If the intermediate circuit voltage (DC) drops below the under voltage limit, the frequency converter checks if a 24 V backup supply is connected. If no 24 V backup supply is connected, the frequency converter trips after a fixed time delay. The time delay varies with unit size.

WARNING/ALARM 9, Inverter overloaded

The frequency converter is about to cut out because of an overload (too high current for too long). The counter for electronic, thermal inverter protection gives a warning at 98% and trips at 100%, while giving an alarm. The frequency converter *cannot* be reset until the counter is below 90%.
The fault is that the frequency converter is overloaded by more than 100% for too long. NOTE: See the derating section in the Design Guide for more details if a high switching frequency is required.

WARNING/ALARM 10, Motor overload temperature
According to the electronic thermal protection (ETR), the motor is too hot. Select whether the frequency converter gives a warning or an alarm when the counter reaches 100% in par. 1-90 Motor Thermal Protection. The fault is that the motor is overloaded by more than 100% for too long.

⚠WARNING

Live Electrical Components!

Troubleshooting:

Check if motor is over heating.

If the motor is mechanically overloaded

That the motor par. 1-24 Motor Current is set correctly.

Motor data in parameters 1-20 through 1-25 are set correctly.

The setting in par. 1-91 Motor External Fan.

Run AMA in par. 1-29 Automatic Motor Adaptation (AMA).

⚠WARNING

Disconnect power before proceeding.

WARNING/ALARM 12, Torque limit
The torque is higher than the value in par. 4-16 Torque Limit Motor Mode or the torque is higher than the value in par. 4-17 Torque Limit Generator Mode. Par. 14-25 Trip Delay at Torque Limit can be used to change this from a warning only condition to a warning followed by an alarm.

WARNING/ALARM 13, Over current
The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning lasts about 1.5 sec., then the frequency converter trips and issues an alarm. If extended mechanical brake control is selected, trip can be reset externally.

Troubleshooting:

This fault may be caused by shock loading or fast acceleration with high inertia loads.

Turn off the frequency converter. Check if the motor shaft can be turned.

Check that the motor size matches the frequency converter.

Incorrect motor data in parameters 1-20 through 1-25.

ALARM 14, Earth (ground) fault
There is a discharge from the output phases to earth, either in the cable between the frequency converter and the motor or in the motor itself.

⚠WARNING

Disconnect power before proceeding.

Troubleshooting:

Turn off the frequency converter and remove the earth fault.

Measure the resistance to ground of the motor leads and the motor with a megohmmeter to check for earth faults in the motor.

Perform current sensor test.

ALARM 15, Hardware mismatch

A fitted option is not operational with the present control board hardware or software.

Record the value of the following parameters and contact your Trane supplier:

Par. 15-40 FC Type

Par. 15-41 Power Section

Par. 15-42 Voltage

Par. 15-43 Software Version

Par. 15-45 Actual Typecode String

Par. 15-49 SW ID Control Card

Par. 15-50 SW ID Power Card

Par. 15-60 Option Mounted

Par. 15-61 Option SW Version

ALARM 16, Short circuit
There is short-circuiting in the motor or on the motor terminals.

⚠WARNING

Disconnect power before proceeding.

Turn off the frequency converter and remove the short-circuit.

WARNING/ALARM 17, Control word timeout
There is no communication to the frequency converter.
The warning will only be active when par. 8-04 Control Timeout Function is NOT set to OFF.
If par. 8-04 Control Timeout Function is set to *Stop* and *Trip*, a warning appears and the frequency converter ramps down until it trips, while giving an alarm.

⚠WARNING

Live Electrical Components!

Troubleshooting:

Check connections on the serial communication cable.

Increase par. 8-03 Control Timeout Time

Check operation of the communication equipment.

Verify proper installation based on EMC requirements.

WARNING 23, Internal fan fault
The fan warning function is an extra protection function that checks if the fan is running / mounted. The fan warning can be disabled in par. 14-53 Fan Monitor ([0] Disabled).

For the D, E, and F Frame drives, the regulated voltage to the fans is monitored.

⚠WARNING

Disconnect power before proceeding.

Troubleshooting:

Check fan resistance.

Check soft charge fuses.

WARNING 24, External fan fault

The fan warning function is an extra protection function that checks if the fan is running / mounted. The fan warning can be disabled in par. 14-53 Fan Monitor ([0] Disabled).

For the D, E, and F Frame drives, the regulated voltage to the fans is monitored.

Troubleshooting:

Check fan resistance.

Check soft charge fuses.

WARNING/ALARM 28, Brake check failed

Brake resistor fault: the brake resistor is not connected or not working.
Check par. 2-15 Brake Check.

ALARM 29, Heatsink temp
The maximum temperature of the heatsink has been exceeded. The temperature fault will not be reset until the temperature falls below a defined heatsink temperature. The trip and reset point are different based on the drive power size.

Troubleshooting:

Ambient temperature too high.

Too long motor cable.

Incorrect clearance above and below the drive.

Dirty heatsink.

Blocked air flow around the drive.

Damaged heatsink fan.

For the D, E, and F Frame Drives, this alarm is based on the temperature measured by the heatsink sensor mounted inside the IGBT modules. For the F Frame drives, this alarm can also be caused by the thermal sensor in the Rectifier module.

⚠WARNING

Disconnect power before proceeding.

Troubleshooting:

Check fan resistance.

Check soft charge fuses.

IGBT thermal sensor.

ALARM 30, Motor phase U missing
Motor phase U between the frequency converter and the motor is missing.

⚠WARNING

Disconnect power before proceeding.

Turn off the frequency converter and check motor phase U.

ALARM 31, Motor phase V missing
Motor phase V between the frequency converter and the motor is missing.

⚠WARNING

Disconnect power before proceeding.

Turn off the frequency converter and check motor phase V.

ALARM 32, Motor phase W missing
Motor phase W between the frequency converter and the motor is missing.

⚠WARNING

Disconnect power before proceeding.

Turn off the frequency converter and check motor phase W.

ALARM 33, Inrush fault

Too many power-ups have occurred within a short time period. Let unit cool to operating temperature.

WARNING/ALARM 34, Fieldbus communication fault

The fieldbus on the communication option card is not working.

WARNING/ALARM 35, Out of frequency range:

This warning is active if the output frequency has reached the high limit (set in par. 4-53) or low limit (set in par. 4-52). In *Process Control, Closed Loop* (par. 1-00) this warning is displayed.

WARNING/ALARM 36, Mains failure

This warning/alarm is only active if the supply voltage to the frequency converter is lost and par. 14-10 Mains Failure is NOT set to OFF. Check the fuses to the frequency converter

ALARM 38, Internal fault

It may be necessary to contact your Trane supplier. Some typical alarm messages:

0	Serial port cannot be initialized. Serious hardware failure
256-258	Power EEPROM data is defect or too old
512	Control board EEPROM data is defect or too old
513	Communication time out reading EEPROM data
514	Communication time out reading EEPROM data
515	Application Orientated Control cannot recognize the EEPROM data
516	Cannot write to the EEPROM because a write command is on progress
517	Write command is under time out
518	Failure in the EEPROM
519	Missing or invalid Barcode data in EEPROM
783	Parameter value outside of min/max limits
1024-1279	A can-telegram that has to be sent, couldn't be sent
1281	Digital Signal Processor flash timeout
1282	Power micro software version mismatch
1283	Power EEPROM data version mismatch
1284	Cannot read Digital Signal Processor software version
1299	Option SW in slot A is too old
1300	Option SW in slot B is too old
1302	Option SW in slot C1 is too old
1315	Option SW in slot A is not supported (not allowed)
1316	Option SW in slot B is not supported (not allowed)
1318	Option SW in slot C1 is not supported (not allowed)
1379	Option A did not respond when calculating Platform Version.
1380	Option B did not respond when calculating Platform Version.
1536	An exception in the Application Orientated Control is registered. Debug information written in keypad
1792	DSP watchdog is active. Debugging of power part data Motor Orientated Control data not transferred correctly
2049	Power data restarted

2064-2072	H081x: option in slot x has restarted
2080-2088	H082x: option in slot x has issued a powerup-wait
2096-2104	H083x: option in slot x has issued a legal powerup-wait
2304	Could not read any data from power EEPROM
2305	Missing SW version from power unit
2314	Missing power unit data from power unit
2315	Missing SW version from power unit
2316	Missing io_statepage from power unit
2324	Power card configuration is determined to be incorrect at power up
2330	Power size information between the power cards does not match
2561	No communication from DSP to ATACD
2562	No communication from ATACD to DSP (state running)
2816	Stack overflow Control board module
2817	Scheduler slow tasks
2818	Fast tasks
2819	Parameter thread
2820	keypad Stack overflow
2821	Serial port overflow
2822	USB port overflow
2836	cfListMempool to small
3072-5122	Parameter value is outside its limits
5123	Option in slot A: Hardware incompatible with Control board hardware
5124	Option in slot B: Hardware incompatible with Control board hardware
5125	Option in slot C0: Hardware incompatible with Control board hardware
5126	Option in slot C1: Hardware incompatible with Control board hardware
5376-6231	Out of memory

ALARM 39, Heatsink sensor

No feedback from the heatsink temperature sensor.

The signal from the IGBT thermal sensor is not available on the power card. The problem could be on the power card, on the gate drive card, or the ribbon cable between the power card and gate drive card.

WARNING 40, Overload of Digital Output Terminal 27

Check the load connected to terminal 27 or remove short-circuit connection. Check par. 5-01 Terminal 27 Mode.

WARNING 41, Overload of Digital Output Terminal 29

Check the load connected to terminal 29 or remove short-circuit connection. Check par. 5-02 Terminal 29 Mode.

WARNING 42, Overload of Digital Output on X30/6 or Overload of Digital Output on X30/7

For X30/6, check the load connected to X30/6 or remove short-circuit connection. Check par. 5-32 Term X30/6 Digi Out (MCB 101).

For X30/7, check the load connected to X30/7 or remove short-circuit connection. Check par. 5-33 Term X30/7 Digi Out (MCB 101).

ALARM 46, Power card supply

The supply on the power card is out of range.

There are three power supplies generated by the switch mode power supply (SMPS) on the power card: 24 V, 5V, +/- 18V. When powered with three phase mains voltage, all three supplied are monitored.

WARNING 47, 24 V supply low

The 24 Vdc is measured on the control card.

WARNING 48, 1.8 V supply low

The 1.8 Vdc supply used on the control card is outside of allowable limits. The power supply is measured on the control card.

WARNING 49, Speed limit

When the speed is not within the specified range in par. 4-11 and par. 4-13. the drive will show a warning. When the speed is below the specified limit in par. 1-86 Trip Speed Low [RPM] (except when starting or stopping) the drive will trip.

ALARM 50, AMA calibration failed

Contact your Trane supplier.

ALARM 51, AMA check Unom and Inom

The setting of motor voltage, motor current, and motor power is presumably wrong. Check the settings.

ALARM 52, AMA low Inom

The motor current is too low. Check the settings.

ALARM 53, AMA motor too big

The motor is too big for the AMA to be carried out.

ALARM 54, AMA motor too small

The motor is too small for the AMA to be carried out.

ALARM 55, AMA Parameter out of range

The parameter values found from the motor are outside acceptable range.

ALARM 56, AMA interrupted by user

The AMA has been interrupted by the user.

ALARM 57, AMA timeout

Try to start the AMA again a number of times, until the AMA is carried out. Please note that repeated runs may heat the motor to a level where the resistance Rs and Rr are increased. In most cases, however, this is not critical.

ALARM 58, AMA internal fault

Contact your Trane supplier.

WARNING 59, Current limit

The current is higher than the value in par. 4-18 Current Limit.

WARNING 60, External interlock

External interlock has been activated. To resume normal operation, apply 24 Vdc to the terminal programmed for external interlock and reset the frequency converter (via serial communication, digital I/O, or by pressing reset button on keypad).

WARNING 62, Output frequency at maximum limit

The output frequency is higher than the value set in par. 4-19 Max Output Frequency

WARNING 64, Voltage limit

The load and speed combination demands a motor voltage higher than the actual DC link voltage.

WARNING/ALARM/TRIP 65, Control card over temperature

Control card over temperature: The cutout temperature of the control card is 80° C.

WARNING 66, Heatsink temperature low

This warning is based on the temperature sensor in the IGBT module.

Troubleshooting:

ALARM 67, Option module configuration has changed

One or more options have either been added or removed since the last power-down.

ALARM 69, Power card temperature

The temperature sensor on the power card is either too hot or too cold.

Troubleshooting:

Check the operation of the door fans.

Check that the filters for the door fans are not blocked.

Check that the gland plate is properly installed on IP 21 and IP 54 (NEMA 1 and NEMA 12) drives.

ALARM 70, Illegal Drive Configuration

Actual combination of control board and power board is illegal.

WARNING 76, Power Unit Setup

The required number of power units does not match the detected number of active power units.

WARNING 77, Reduced power mode:

This warning indicates that the drive is operating in reduced power mode (i.e. less than the allowed number of inverter sections). This warning will be generated on power cycle when the drive is set to run with fewer inverters and will remain on.

ALARM 79, Illegal power section configuration

The scaling card is the incorrect part number or not installed. Also MK102 connector on the power card could not be installed.

ALARM 80, Drive initialized to default value

Parameter settings are initialized to default settings after a manual reset.

ALARM 91, Analog input 54 wrong settings

Switch S202 has to be set in position OFF (voltage input) when a KTY sensor is connected to analog input terminal 54.

ALARM 92, No flow

A no-load situation has been detected in the system. See parameter group 22-2.

ALARM 93, Dry pump

A no-flow situation and high speed indicates that the pump has run dry. See parameter group 22-2.

ALARM 94, End of curve

Feedback stays lower than the set point which may indicate leakage in the pipe system.

ALARM 95, Broken belt

Torque is below the torque level set for no load, indicating a broken belt. See parameter group 22-6.

ALARM 96, Start delayed

Motor start has been delayed due to short-cycle protection active. See parameter group 22-7.

WARNING 97, Stop delayed

Stopping the motor has been delayed due to short cycle protection is active. See parameter group 22-7.

WARNING 98, Clock fault

Clock Fault. Time is not set or RTC clock (if mounted) has failed. See parameter group 0-7.

WARNING 201, Fire Mode was Active

Fire Mode has been active.

WARNING 202, Fire Mode Limits Exceeded

Fire Mode has suppressed one or more warranty voiding alarms.

WARNING 203, Missing Motor

A multi-motor under-load situation was detected, this could be due to e.g. a missing motor.

WARNING 204, Locked Rotor

A multi-motor overload situation was detected, this could be due to e.g. a locked rotor.

ALARM 244, Heatsink temperature

This alarm is only for F Frame drives. It is equivalent to Alarm 29. The report value in the alarm log indicates which power module generated the alarm:

1 = left most inverter module.

2 = middle inverter module in F2 or F4 drive.

2 = right inverter module in F1 or F3 drive.

3 = right inverter module in F2 or F4 drive.

5 = rectifier module.

ALARM 245, Heatsink sensor

This alarm is only for F Frame drives. It is equivalent to Alarm 39. The report value in the alarm log indicates which power module generated the alarm:

1 = left most inverter module.

2 = middle inverter module in F2 or F4 drive.

2 = right inverter module in F1 or F3 drive.

3 = right inverter module in F2 or F4 drive.

5 = rectifier module.

ALARM 246, Power card supply

This alarm is only for F Frame drives. It is equivalent to Alarm 46. The report value in the alarm log indicates which power module generated the alarm:

1 = left most inverter module.

2 = middle inverter module in F2 or F4 drive.

2 = right inverter module in F1 or F3 drive.

3 = right inverter module in F2 or F4 drive.

5 = rectifier module.

ALARM 247, Power card temperature

This alarm is only for F Frame drives. It is equivalent to Alarm 69. The report value in the alarm log indicates which power module generated the alarm:

1 = left most inverter module.

2 = middle inverter module in F2 or F4 drive.

2 = right inverter module in F1 or F3 drive.

3 = right inverter module in F2 or F4 drive.

5 = rectifier module.

ALARM 248, Illegal power section configuration

This alarm is only for F Frame drives. It is equivalent to Alarm 79. The report value in the alarm log indicates which power module generated the alarm:

1 = left most inverter module.

2 = middle inverter module in F2 or F4 drive.

2 = right inverter module in F1 or F3 drive.

3 = right inverter module in F2 or F4 drive.

5 = rectifier module.

ALARM 250, New spare part

The power or switch mode power supply has been exchanged. The frequency converter type code must be restored in the EEPROM. Select the correct type code in par. 14-23 Typecode Setting according to the label on the unit. Remember to select 'Save to EEPROM' to complete.

ALARM 251, New type code

The frequency converter has a new type code.

Parameter Lists

Parameter Lists TR200

Default settings

<u>Changes during operation:</u>
"TRUE" means that the parameter can be changed while the frequency converter is in operation and "FALSE" means that the frequency converter must be stopped before a change can be made.

<u>4-Set-up:</u>
'All set-up': the parameter can be set individually in each of the four set-ups, i. e. one single parameter can have four different data values.
'1 set-up': data value will be the same in all set-ups.

<u>SR:</u>
Size related

<u>N/A:</u>
No default value available.

<u>Conversion index:</u>
This number refers to a conversion figure used when writing or reading by means of a frequency converter.

Conv. index	100	67	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6
Conv. factor	1	1/60	1000000	100000	10000	1000	100	10	1	0.1	0.01	0.001	0.0001	0.00001	0.000001

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
54	Time difference w/o date	TimD

0-** Operation and Display

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conver-sion index	Type
0-0* Basic Settings						
0-01	Language	[0] English	1 set-up	TRUE	-	Uint8
0-02	Motor Speed Unit	[1] Hz	2 set-ups	FALSE	-	Uint8
0-03	Regional Settings	[0] International	2 set-ups	FALSE	-	Uint8
0-04	Operating State at Power-up	[0] Resume	All set-ups	TRUE	-	Uint8
0-05	Local Mode Unit	[0] As Motor Speed Unit	2 set-ups	FALSE	-	Uint8
0-1* Set-up Operations						
0-10	Active Set-up	[1] Set-up 1	1 set-up	TRUE	-	Uint8
0-11	Programming Set-up	[9] Active Set-up	All set-ups	TRUE	-	Uint8
0-12	This Set-up Linked to	[0] Not linked	All set-ups	FALSE	-	Uint8
0-13	Readout: Linked Set-ups	0 N/A	All set-ups	FALSE	0	Uint16
0-14	Readout: Prog. Set-ups / Channel	0 N/A	All set-ups	TRUE	0	Int32
0-2* LCP Display						
0-20	Display Line 1.1 Small	1602	All set-ups	TRUE	-	Uint16
0-21	Display Line 1.2 Small	1614	All set-ups	TRUE	-	Uint16
0-22	Display Line 1.3 Small	1610	All set-ups	TRUE	-	Uint16
0-23	Display Line 2 Large	1613	All set-ups	TRUE	-	Uint16
0-24	Display Line 3 Large	1502	All set-ups	TRUE	-	Uint16
0-25	My Personal Menu	Expression Limit	1 set-up	TRUE	0	Uint16
0-3* LCP Custom Readout						
0-30	Custom Readout Unit	[1] %	All set-ups	TRUE	-	Uint8
0-31	Custom Readout Min Value	Expression Limit	All set-ups	TRUE	-2	Int32
0-32	Custom Readout Max Value	100.00 Custom-ReadoutUnit	All set-ups	TRUE	-2	Int32
0-37	Display Text 1	Expression Limit	1 set-up	TRUE	0	VisStr[25]
0-38	Display Text 2	Expression Limit	1 set-up	TRUE	0	VisStr[25]
0-39	Display Text 3	Expression Limit	1 set-up	TRUE	0	VisStr[25]
0-4* LCP Keypad						
0-40	[Hand on] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-41	[Off] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-42	[Auto on] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-43	[Reset] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-44	[Off/Reset] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-45	[Drive Bypass] Key on LCP	[1] Enabled	All set-ups	TRUE	-	Uint8
0-5* Copy/Save						
0-50	LCP Copy	[0] No copy	All set-ups	FALSE	-	Uint8
0-51	Set-up Copy	[0] No copy	All set-ups	FALSE	-	Uint8

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
0-6* Password						
0-60	Main Menu Password	100 N/A	1 set-up	TRUE	0	Int16
0-61	Access to Main Menu w/o Password	[0] Full access	1 set-up	TRUE	-	Uint8
0-65	Personal Menu Password	200 N/A	1 set-up	TRUE	0	Int16
0-66	Access to Personal Menu w/o Password	[0] Full access	1 set-up	TRUE	-	Uint8
0-7* Clock Settings						
0-70	Date and Time	Expression Limit	All set-ups	TRUE	0	TimeOfDay
0-71	Date Format	null	1 set-up	TRUE	-	Uint8
0-72	Time Format	null	1 set-up	TRUE	-	Uint8
0-74	DST/Summertime	[0] Off	1 set-up	TRUE	-	Uint8
0-76	DST/Summertime Start	Expression Limit	1 set-up	TRUE	0	TimeOfDay
0-77	DST/Summertime End	Expression Limit	1 set-up	TRUE	0	TimeOfDay
0-79	Clock Fault	null	1 set-up	TRUE	-	Uint8
0-81	Working Days	null	1 set-up	TRUE	-	Uint8
0-82	Additional Working Days	Expression Limit	1 set-up	TRUE	0	TimeOfDay
0-83	Additional Non-Working Days	Expression Limit	1 set-up	TRUE	0	TimeOfDay
0-89	Date and Time Readout	0 N/A	All set-ups	TRUE	0	VisStr[25]

1-** Load / Motor

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
1-0* General Settings						
1-00	Configuration Mode	null	All set-ups	TRUE	-	Uint8
1-03	Torque Characteristics	[3] Auto Energy Optim. VT	All set-ups	TRUE	-	Uint8
1-2* Motor Data						
1-20	Motor Power [kW]	Expression Limit	All set-ups	FALSE	1	Uint32
1-21	Motor Power [HP]	Expression Limit	All set-ups	FALSE	-2	Uint32
1-22	Motor Voltage	Expression Limit	All set-ups	FALSE	0	Uint16
1-23	Motor Frequency	Expression Limit	All set-ups	FALSE	0	Uint16
1-24	Motor Current	Expression Limit	All set-ups	FALSE	-2	Uint32
1-25	Motor Nominal Speed	Expression Limit	All set-ups	FALSE	67	Uint16
1-28	Motor Rotation Check	[0] Off	All set-ups	FALSE	-	Uint8
1-29	Automatic Motor Adaptation (AMA)	[0] Off	All set-ups	FALSE	-	Uint8
1-3* Adv. Motor Data						
1-30	Stator Resistance (Rs)	Expression Limit	All set-ups	FALSE	-4	Uint32
1-31	Rotor Resistance (Rr)	Expression Limit	All set-ups	FALSE	-4	Uint32
1-35	Main Reactance (Xh)	Expression Limit	All set-ups	FALSE	-4	Uint32
1-36	Iron Loss Resistance (Rfe)	Expression Limit	All set-ups	FALSE	-3	Uint32
1-39	Motor Poles	Expression Limit	All set-ups	FALSE	0	Uint8
1-5* Load Indep. Setting						
1-50	Motor Magnetisation at Zero Speed	100 %	All set-ups	TRUE	0	Uint16
1-51	Min Speed Normal Magnetising [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
1-52	Min Speed Normal Magnetising [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
1-58	Flystart Test Pulses Current	30 %	All set-ups	FALSE	0	Uint16
1-59	Flystart Test Pulses Frequency	200 %	All set-ups	FALSE	0	Uint16
1-6* Load Depen. Setting						
1-60	Low Speed Load Compensation	100 %	All set-ups	TRUE	0	Int16
1-61	High Speed Load Compensation	100 %	All set-ups	TRUE	0	Int16
1-62	Slip Compensation	0 %	All set-ups	TRUE	0	Int16
1-63	Slip Compensation Time Constant	Expression Limit	All set-ups	TRUE	-2	Uint16
1-64	Resonance Dampening	100 %	All set-ups	TRUE	0	Uint16
1-65	Resonance Dampening Time Constant	5 ms	All set-ups	TRUE	-3	Uint8

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
1-7* Start Adjustments						
1-71	Start Delay	0.0 s	All set-ups	TRUE	-1	Uint16
1-73	Flying Start	[0] Disabled	All set-ups	FALSE	-	Uint8
1-8* Stop Adjustments						
1-80	Function at Stop	[0] Coast	All set-ups	TRUE	-	Uint8
1-81	Min Speed for Function at Stop [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
1-82	Min Speed for Function at Stop [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
1-86	Trip Speed Low [RPM]	0 RPM	All set-ups	TRUE	67	Uint16
1-87	Trip Speed Low [Hz]	0.0 Hz	All set-ups	TRUE	-1	Uint16
1-9* Motor Temperature						
1-90	Motor Thermal Protection	[4] ETR trip 1	All set-ups	TRUE	-	Uint8
1-91	Motor External Fan	[0] No	All set-ups	TRUE	-	Uint16
1-93	Thermistor Source	[0] None	All set-ups	TRUE	-	Uint8

2-** Brakes

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
2-0* DC-Brake						
2-00	DC Hold/Preheat Current	50 %	All set-ups	TRUE	0	Uint8
2-01	DC Brake Current	50 %	All set-ups	TRUE	0	Uint16
2-02	DC Braking Time	10.0 s	All set-ups	TRUE	-1	Uint16
2-03	DC Brake Cut In Speed [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
2-04	DC Brake Cut In Speed [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
2-1* Brake Energy Funct.						
2-10	Brake Function	[0] Off	All set-ups	TRUE	-	Uint8
2-11	Brake Resistor (ohm)	Expression Limit	All set-ups	TRUE	0	Uint16
2-12	Brake Power Limit (kW)	Expression Limit	All set-ups	TRUE	0	Uint32
2-13	Brake Power Monitoring	[0] Off	All set-ups	TRUE	-	Uint8
2-15	Brake Check	[0] Off	All set-ups	TRUE	-	Uint8
2-16	AC brake Max. Current	Expression Limit	All set-ups	TRUE	-1	Uint32
2-17	Over-voltage Control	[2] Enabled	All set-ups	TRUE	-	Uint8

3-** Reference / Ramps

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
3-0* Reference Limits						
3-02	Minimum Reference	Expression Limit	All set-ups	TRUE	-3	Int32
3-03	Maximum Reference	Expression Limit	All set-ups	TRUE	-3	Int32
3-04	Reference Function	null	All set-ups	TRUE	-	Uint8
3-1* References						
3-10	Preset Reference	0.00 %	All set-ups	TRUE	-2	Int16
3-11	Jog Speed [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
3-13	Reference Site	[0] Linked to Hand / Auto	All set-ups	TRUE	-	Uint8
3-14	Preset Relative Reference	0.00 %	All set-ups	TRUE	-2	Int32
3-15	Reference 1 Source	[1] Analog input 53	All set-ups	TRUE	-	Uint8
3-16	Reference 2 Source	[20] Digital pot.meter	All set-ups	TRUE	-	Uint8
3-17	Reference 3 Source	[0] No function	All set-ups	TRUE	-	Uint8
3-19	Jog Speed [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
3-4* Ramp 1						
3-40	Ramp 1 Type	[0] Linear	All set-ups	TRUE	-	Uint8
3-41	Ramp 1 Ramp up Time	Expression Limit	All set-ups	TRUE	-2	Uint32
3-42	Ramp 1 Ramp Down Time	Expression Limit	All set-ups	TRUE	-2	Uint32
3-45	Ramp 1 S-ramp Ratio at Accel. Start	50 %	All set-ups	TRUE	0	Uint8
3-46	Ramp 1 S-ramp Ratio at Accel. End	50 %	All set-ups	TRUE	0	Uint8
3-47	Ramp 1 S-ramp Ratio at Decel. Start	50 %	All set-ups	TRUE	0	Uint8
3-48	Ramp 1 S-ramp Ratio at Decel. End	50 %	All set-ups	TRUE	0	Uint8
3-5* Ramp 2						
3-50	Ramp 2 Type	[0] Linear	All set-ups	TRUE	-	Uint8
3-51	Ramp 2 Ramp up Time	Expression Limit	All set-ups	TRUE	-2	Uint32
3-52	Ramp 2 Ramp down Time	Expression Limit	All set-ups	TRUE	-2	Uint32
3-55	Ramp 2 S-ramp Ratio at Accel. Start	50 %	All set-ups	TRUE	0	Uint8
3-56	Ramp 2 S-ramp Ratio at Accel. End	50 %	All set-ups	TRUE	0	Uint8
3-57	Ramp 2 S-ramp Ratio at Decel. Start	50 %	All set-ups	TRUE	0	Uint8
3-58	Ramp 2 S-ramp Ratio at Decel. End	50 %	All set-ups	TRUE	0	Uint8

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
3-8* Other Ramps						
3-80	Jog Ramp Time	Expression Limit	All set-ups	TRUE	-2	Uint32
3-81	Quick Stop Ramp Time	Expression Limit	2 set-ups	TRUE	-2	Uint32
3-84	Initial Ramp Time	Expression Limit	All set-ups	TRUE	-2	Uint16
3-88	Final Ramp Time	Expression Limit	All set-ups	TRUE	-2	Uint16
3-9* Digital Pot.Meter						
3-90	Step Size	0.10 %	All set-ups	TRUE	-2	Uint16
3-91	Ramp Time	1.00 s	All set-ups	TRUE	-2	Uint32
3-92	Power Restore	[0] Off	All set-ups	TRUE	-	Uint8
3-93	Maximum Limit	100 %	All set-ups	TRUE	0	Int16
3-94	Minimum Limit	0 %	All set-ups	TRUE	0	Int16
3-95	Ramp Delay	Expression Limit	All set-ups	TRUE	-3	TimD

4-** Limits / Warnings

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
4-1* Motor Limits						
4-10	Motor Speed Direction	[2] Both directions	All set-ups	FALSE	-	Uint8
4-11	Motor Speed Low Limit [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
4-12	Motor Speed Low Limit [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
4-13	Motor Speed High Limit [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
4-14	Motor Speed High Limit [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
4-16	Torque Limit Motor Mode	110.0 %	All set-ups	TRUE	-1	Uint16
4-17	Torque Limit Generator Mode	100.0 %	All set-ups	TRUE	-1	Uint16
4-18	Current Limit	Expression Limit	All set-ups	TRUE	-1	Uint32
4-19	Max Output Frequency	Expression Limit	All set-ups	FALSE	-1	Uint16
4-5* Adj. Warnings						
4-50	Warning Current Low	0.00 A	All set-ups	TRUE	-2	Uint32
4-51	Warning Current High	ImaxVLT (P1637)	All set-ups	TRUE	-2	Uint32
4-52	Warning Speed Low	0 RPM	All set-ups	TRUE	67	Uint16
4-53	Warning Speed High	outputSpeed-HighLimit (P413)	All set-ups	TRUE	67	Uint16
4-54	Warning Reference Low	-999999.999 N/A	All set-ups	TRUE	-3	Int32
4-55	Warning Reference High	999999.999 N/A	All set-ups	TRUE	-3	Int32
4-56	Warning Feedback Low	-999999.999 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
4-57	Warning Feedback High	999999.999 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
4-58	Missing Motor Phase Function	[2] Trip 1000 ms	All set-ups	TRUE	-	Uint8
4-6* Speed Bypass						
4-60	Bypass Speed From [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
4-61	Bypass Speed From [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
4-62	Bypass Speed To [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
4-63	Bypass Speed To [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
4-64	Semi-Auto Bypass Set-up	[0] Off	All set-ups	FALSE	-	Uint8

5-** Digital In / Out

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
5-0* Digital I/O mode						
5-01	Terminal 27 Mode	[0] Input	All set-ups	TRUE	-	Uint8
5-02	Terminal 29 Mode	[0] Input	All set-ups	TRUE	-	Uint8
5-1* Digital Inputs						
5-10	Terminal 18 Digital Input	[8] Start	All set-ups	TRUE	-	Uint8
5-11	Terminal 19 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-12	Terminal 27 Digital Input	null	All set-ups	TRUE	-	Uint8
5-13	Terminal 29 Digital Input	[14] Jog	All set-ups	TRUE	-	Uint8
5-14	Terminal 32 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-15	Terminal 33 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-16	Terminal X30/2 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-17	Terminal X30/3 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-18	Terminal X30/4 Digital Input	[0] No operation	All set-ups	TRUE	-	Uint8
5-3* Digital Outputs						
5-30	Terminal 27 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
5-31	Terminal 29 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
5-32	Term X30/6 Digi Out (MCB 101)	[0] No operation	All set-ups	TRUE	-	Uint8
5-33	Term X30/7 Digi Out (MCB 101)	[0] No operation	All set-ups	TRUE	-	Uint8
5-4* Relays						
5-40	Function Relay	null	All set-ups	TRUE	-	Uint8
5-41	On Delay, Relay	0.01 s	All set-ups	TRUE	-2	Uint16
5-42	Off Delay, Relay	0.01 s	All set-ups	TRUE	-2	Uint16
5-5* Pulse Input						
5-50	Term. 29 Low Frequency	100 Hz	All set-ups	TRUE	0	Uint32
5-51	Term. 29 High Frequency	100 Hz	All set-ups	TRUE	0	Uint32
5-52	Term. 29 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
5-53	Term. 29 High Ref./Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
5-54	Pulse Filter Time Constant #29	100 ms	All set-ups	FALSE	-3	Uint16
5-55	Term. 33 Low Frequency	100 Hz	All set-ups	TRUE	0	Uint32
5-56	Term. 33 High Frequency	100 Hz	All set-ups	TRUE	0	Uint32
5-57	Term. 33 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
5-58	Term. 33 High Ref./Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
5-59	Pulse Filter Time Constant #33	100 ms	All set-ups	FALSE	-3	Uint16

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
5-6* Pulse Output						
5-60	Terminal 27 Pulse Output Variable	[0] No operation	All set-ups	TRUE	-	Uint8
5-62	Pulse Output Max Freq #27	5000 Hz	All set-ups	TRUE	0	Uint32
5-63	Terminal 29 Pulse Output Variable	[0] No operation	All set-ups	TRUE	-	Uint8
5-65	Pulse Output Max Freq #29	5000 Hz	All set-ups	TRUE	0	Uint32
5-66	Terminal X30/6 Pulse Output Variable	[0] No operation	All set-ups	TRUE	-	Uint8
5-68	Pulse Output Max Freq #X30/6	5000 Hz	All set-ups	TRUE	0	Uint32
5-9* Bus Controlled						
5-90	Digital & Relay Bus Control	0 N/A	All set-ups	TRUE	0	Uint32
5-93	Pulse Out #27 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
5-94	Pulse Out #27 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16
5-95	Pulse Out #29 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
5-96	Pulse Out #29 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16
5-97	Pulse Out #X30/6 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
5-98	Pulse Out #X30/6 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16

6-** Analog In / Out

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
6-0* Analog I/O Mode						
6-00	Live Zero Timeout Time	10 s	All set-ups	TRUE	0	Uint8
6-01	Live Zero Timeout Function	[0] Off	All set-ups	TRUE	-	Uint8
6-02	Fire Mode Live Zero Timeout Function	[0] Off	All set-ups	TRUE	-	Uint8
6-1* Analog Input 53						
6-10	Terminal 53 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
6-11	Terminal 53 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
6-12	Terminal 53 Low Current	4.00 mA	All set-ups	TRUE	-5	Int16
6-13	Terminal 53 High Current	20.00 mA	All set-ups	TRUE	-5	Int16
6-14	Terminal 53 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
6-15	Terminal 53 High Ref./ Feedb. Value	Expression Limit	All set-ups	TRUE	-3	Int32
6-16	Terminal 53 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
6-17	Terminal 53 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
6-2* Analog Input 54						
6-20	Terminal 54 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
6-21	Terminal 54 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
6-22	Terminal 54 Low Current	4.00 mA	All set-ups	TRUE	-5	Int16
6-23	Terminal 54 High Current	20.00 mA	All set-ups	TRUE	-5	Int16
6-24	Terminal 54 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
6-25	Terminal 54 High Ref./ Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
6-26	Terminal 54 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
6-27	Terminal 54 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
6-3* Analog Input X30/11						
6-30	Terminal X30/11 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
6-31	Terminal X30/11 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
6-34	Term. X30/11 Low Ref./ Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
6-35	Term. X30/11 High Ref./ Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
6-36	Term. X30/11 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
6-37	Term. X30/11 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
6-4* Analog Input X30/12						
6-40	Terminal X30/12 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
6-41	Terminal X30/12 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
6-44	Term. X30/12 Low Ref./ Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
6-45	Term. X30/12 High Ref./ Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
6-46	Term. X30/12 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
6-47	Term. X30/12 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
6-5* Analog Output 42						
6-50	Terminal 42 Output	null	All set-ups	TRUE	-	Uint8
6-51	Terminal 42 Output Min Scale	0.00 %	All set-ups	TRUE	-2	Int16
6-52	Terminal 42 Output Max Scale	100.00 %	All set-ups	TRUE	-2	Int16
6-53	Terminal 42 Output Bus Control	0.00 %	All set-ups	TRUE	-2	N2
6-54	Terminal 42 Output Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16
6-6* Analog Output X30/8						
6-60	Terminal X30/8 Output	[0] No operation	All set-ups	TRUE	-	Uint8
6-61	Terminal X30/8 Min. Scale	0.00 %	All set-ups	TRUE	-2	Int16
6-62	Terminal X30/8 Max. Scale	100.00 %	All set-ups	TRUE	-2	Int16
6-63	Terminal X30/8 Output Bus Control	0.00 %	All set-ups	TRUE	-2	N2
6-64	Terminal X30/8 Output Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16

8-** Communication and Options

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
8-0* General Settings						
8-01	Control Site	null	All set-ups	TRUE	-	Uint8
8-02	Control Source	null	All set-ups	TRUE	-	Uint8
8-03	Control Timeout Time	Expression Limit	1 set-up	TRUE	-1	Uint32
8-04	Control Timeout Function	[0] Off	1 set-up	TRUE	-	Uint8
8-05	End-of-Timeout Function	[1] Resume set-up	1 set-up	TRUE	-	Uint8
8-06	Reset Control Timeout	[0] Do not reset	All set-ups	TRUE	-	Uint8
8-07	Diagnosis Trigger	[0] Disable	2 set-ups	TRUE	-	Uint8
8-09	Communication Charset	[0] ISO 8859-1	2 set-ups	TRUE	-	Uint8
8-1* Control Settings						
8-10	Control Profile	[0] Drive profile	2 set-ups	FALSE	-	Uint8
8-13	Configurable Status Word STW	[1] Profile Default	All set-ups	TRUE	-	Uint8
8-3* Drive Port Settings						
8-30	Protocol	null	1 set-up	TRUE	-	Uint8
8-31	Address	Expression Limit	1 set-up	TRUE	0	Uint8
8-32	Baud Rate	null	1 set-up	TRUE	-	Uint8
8-33	Parity / Stop Bits	null	1 set-up	TRUE	-	Uint8
8-35	Minimum Response Delay	Expression Limit	1 set-up	TRUE	-3	Uint16
8-36	Maximum Response Delay	Expression Limit	1 set-up	TRUE	-3	Uint16
8-37	Maximum Inter-Char Delay	Expression Limit	1 set-up	TRUE	-5	Uint16
8-4* Drive MC protocol set						
8-40	Telegram Selection	[1] Standard telegram 1	2 set-ups	TRUE	-	Uint8
8-5* Digital/Bus						
8-50	Coasting Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-52	DC Brake Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-53	Start Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-54	Reversing Select	null	All set-ups	TRUE	-	Uint8
8-55	Set-up Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-56	Preset Reference Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-7* BACnet						
8-70	BACnet Device Instance	1025 N/A	1 set-up	TRUE	0	Uint32
8-72	MS/TP Max Masters	127 N/A	1 set-up	TRUE	0	Uint8
8-73	MS/TP Max Info Frames	1 N/A	1 set-up	TRUE	0	Uint16
8-74	"I-Am" Service	[0] Send at power-up	1 set-up	TRUE	-	Uint8
8-75	Initialisation Password	Expression Limit	1 set-up	TRUE	0	VisStr[25]
8-8* Drive Port Diagnostics						
8-80	Bus Message Count	0 N/A	All set-ups	TRUE	0	Uint32
8-81	Bus Error Count	0 N/A	All set-ups	TRUE	0	Uint32
8-82	Slave Messages Rcvd	0 N/A	All set-ups	TRUE	0	Uint32
8-83	Slave Error Count	0 N/A	All set-ups	TRUE	0	Uint32
8-84	Slave Messages Sent	0 N/A	All set-ups	TRUE	0	Uint32
8-85	Slave Timeout Errors	0 N/A	All set-ups	TRUE	0	Uint32
8-88	Reset Drive port Diagnostics	[0] Do not reset	All set-ups	TRUE	-	Uint8
8-89	Diagnostics Count	0 N/A	1 set-up	TRUE	0	Int32

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
8-9* Bus Jog / Feedback						
8-90	Bus Jog 1 Speed	100 RPM	All set-ups	TRUE	67	Uint16
8-91	Bus Jog 2 Speed	200 RPM	All set-ups	TRUE	67	Uint16
8-94	Bus Feedback 1	0 N/A	1 set-up	TRUE	0	N2
8-95	Bus Feedback 2	0 N/A	1 set-up	TRUE	0	N2
8-96	Bus Feedback 3	0 N/A	1 set-up	TRUE	0	N2

11-** LonWorks

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
11-0* LonWorks ID						
11-00	Neuron ID	0 N/A	All set-ups	TRUE	0	OctStr[6]
11-01	Domain	1 N/A	All set-ups	TRUE	0	OctStr[6]
11-02	Subnet ID	0 N/A	All set-ups	TRUE	0	Uint8
11-03	Node ID	0 N/A	All set-ups	TRUE	0	Uint8
11-1* LON Functions						
11-10	Drive Profile	[0] VSD profile	All set-ups	TRUE	-	Uint8
11-15	LON Warning Word	0 N/A	All set-ups	TRUE	0	Uint16
11-17	XIF Revision	0 N/A	All set-ups	TRUE	0	VisStr[5]
11-18	LonWorks Revision	0 N/A	All set-ups	TRUE	0	VisStr[5]
11-2* LON Param. Access						
11-21	Store Data Values	[0] Off	All set-ups	TRUE	-	Uint8

13-** Smart Logic Controller

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
13-0* SLC Settings						
13-00	SL Controller Mode	null	2 set-ups	TRUE	-	Uint8
13-01	Start Event	null	2 set-ups	TRUE	-	Uint8
13-02	Stop Event	null	2 set-ups	TRUE	-	Uint8
13-03	Reset SLC	[0] Do not reset SLC	All set-ups	TRUE	-	Uint8
13-1* Comparators						
13-10	Comparator Operand	null	2 set-ups	TRUE	-	Uint8
13-11	Comparator Operator	null	2 set-ups	TRUE	-	Uint8
13-12	Comparator Value	Expression Limit	2 set-ups	TRUE	-3	Int32
13-2* Timers						
13-20	SL Controller Timer	Expression Limit	1 set-up	TRUE	-3	TimD
13-4* Logic Rules						
13-40	Logic Rule Boolean 1	null	2 set-ups	TRUE	-	Uint8
13-41	Logic Rule Operator 1	null	2 set-ups	TRUE	-	Uint8
13-42	Logic Rule Boolean 2	null	2 set-ups	TRUE	-	Uint8
13-43	Logic Rule Operator 2	null	2 set-ups	TRUE	-	Uint8
13-44	Logic Rule Boolean 3	null	2 set-ups	TRUE	-	Uint8
13-5* States						
13-51	SL Controller Event	null	2 set-ups	TRUE	-	Uint8
13-52	SL Controller Action	null	2 set-ups	TRUE	-	Uint8

14-** Special Functions

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
14-0* Inverter Switching						
14-00	Switching Pattern	[0] 60 AVM	All set-ups	TRUE	-	Uint8
14-01	Switching Frequency	null	All set-ups	TRUE	-	Uint8
14-03	Overmodulation	[1] On	All set-ups	FALSE	-	Uint8
14-04	PWM Random	[0] Off	All set-ups	TRUE	-	Uint8
14-1* Mains On/Off						
14-10	Mains Failure	[0] No function	All set-ups	FALSE	-	Uint8
14-11	Mains Voltage at Mains Fault	Expression Limit	All set-ups	TRUE	0	Uint16
14-12	Function at Mains Imbalance	[0] Trip	All set-ups	TRUE	-	Uint8
14-2* Reset Functions						
14-20	Reset Mode	null	All set-ups	TRUE	-	Uint8
14-21	Automatic Restart Time	10 s	All set-ups	TRUE	0	Uint16
14-22	Operation Mode	[0] Normal operation	All set-ups	TRUE	-	Uint8
14-23	Typecode Setting	null	2 set-ups	FALSE	-	Uint8
14-25	Trip Delay at Torque Limit	60 s	All set-ups	TRUE	0	Uint8
14-26	Trip Delay at Inverter Fault	Expression Limit	All set-ups	TRUE	0	Uint8
14-28	Production Settings	[0] No action	All set-ups	TRUE	-	Uint8
14-29	Service Code	0 N/A	All set-ups	TRUE	0	Int32
14-3* Current Limit Ctrl.						
14-30	Current Lim Ctrl, Proportional Gain	100 %	All set-ups	FALSE	0	Uint16
14-31	Current Lim Ctrl, Integration Time	0.020 s	All set-ups	FALSE	-3	Uint16
14-32	Current Lim Ctrl, Filter Time	26.0 ms	All set-ups	TRUE	-4	Uint16
14-4* Energy Optimising						
14-40	VT Level	66 %	All set-ups	FALSE	0	Uint8
14-41	AEO Minimum Magnetisation	Expression Limit	All set-ups	TRUE	0	Uint8
14-42	Minimum AEO Frequency	10 Hz	All set-ups	TRUE	0	Uint8
14-43	Motor Cosphi	Expression Limit	All set-ups	TRUE	-2	Uint16
14-5* Environment						
14-50	RFI Filter	[1] On	1 set-up	FALSE	-	Uint8
14-52	Fan Control	[0] Auto	All set-ups	TRUE	-	Uint8
14-53	Fan Monitor	[1] Warning	All set-ups	TRUE	-	Uint8
14-59	Actual Number of Inverter Units	Expression Limit	1 set-up	FALSE	0	Uint8
14-6* Auto Derate						
14-60	Function at Over Temperature	[0] Trip	All set-ups	TRUE	-	Uint8
14-61	Function at Inverter Overload	[0] Trip	All set-ups	TRUE	-	Uint8
14-62	Inv. Overload Derate Current	95 %	All set-ups	TRUE	0	Uint16

15-** Drive Information

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
15-0* Operating Data						
15-00	Operating Hours	0 h	All set-ups	FALSE	74	Uint32
15-01	Running Hours	0 h	All set-ups	FALSE	74	Uint32
15-02	Input kWh Counter	0 kWh	All set-ups	FALSE	75	Uint32
15-03	Power Up's	0 N/A	All set-ups	FALSE	0	Uint32
15-04	Over Temp's	0 N/A	All set-ups	FALSE	0	Uint16
15-05	Over Volt's	0 N/A	All set-ups	FALSE	0	Uint16
15-06	Reset kWh Counter	[0] Do not reset	All set-ups	TRUE	-	Uint8
15-07	Reset Running Hours Counter	[0] Do not reset	All set-ups	TRUE	-	Uint8
15-08	Number of Starts	0 N/A	All set-ups	FALSE	0	Uint32
15-1* Data Log Settings						
15-10	Logging Source	0	2 set-ups	TRUE	-	Uint16
15-11	Logging Interval	Expression Limit	2 set-ups	TRUE	-3	TimD
15-12	Trigger Event	[0] False	1 set-up	TRUE	-	Uint8
15-13	Logging Mode	[0] Log always	2 set-ups	TRUE	-	Uint8
15-14	Samples Before Trigger	50 N/A	2 set-ups	TRUE	0	Uint8
15-2* Historic Log						
15-20	Historic Log: Event	0 N/A	All set-ups	FALSE	0	Uint8
15-21	Historic Log: Value	0 N/A	All set-ups	FALSE	0	Uint32
15-22	Historic Log: Time	0 ms	All set-ups	FALSE	-3	Uint32
15-23	Historic Log: Date and Time	Expression Limit	All set-ups	FALSE	0	TimeOfDay
15-3* Alarm Log						
15-30	Alarm Log: Error Code	0 N/A	All set-ups	FALSE	0	Uint8
15-31	Alarm Log: Value	0 N/A	All set-ups	FALSE	0	Int16
15-32	Alarm Log: Time	0 s	All set-ups	FALSE	0	Uint32
15-33	Alarm Log: Date and Time	Expression Limit	All set-ups	FALSE	0	TimeOfDay
15-4* Drive Identification						
15-40	Drive Type	0 N/A	All set-ups	FALSE	0	VisStr[6]
15-41	Power Section	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-42	Voltage	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-43	Software Version	0 N/A	All set-ups	FALSE	0	VisStr[5]
15-44	Ordered Typecode String	0 N/A	All set-ups	FALSE	0	VisStr[40]
15-45	Actual Typecode String	0 N/A	All set-ups	FALSE	0	VisStr[40]
15-46	Frequency Converter Ordering No	0 N/A	All set-ups	FALSE	0	VisStr[8]
15-47	Power Card Ordering No	0 N/A	All set-ups	FALSE	0	VisStr[8]
15-48	LCP Id No	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-49	SW ID Control Card	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-50	SW ID Power Card	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-51	Frequency Converter Serial Number	0 N/A	All set-ups	FALSE	0	VisStr[10]
15-53	Power Card Serial Number	0 N/A	All set-ups	FALSE	0	VisStr[19]
15-59	CSIV Filename	Expression Limit	1 set-up	FALSE	0	VisStr[16]

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
15-6* Option Ident						
15-60	Option Mounted	0 N/A	All set-ups	FALSE	0	VisStr[30]
15-61	Option SW Version	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-62	Option Ordering No	0 N/A	All set-ups	FALSE	0	VisStr[8]
15-63	Option Serial No	0 N/A	All set-ups	FALSE	0	VisStr[18]
15-70	Option in Slot A	0 N/A	All set-ups	FALSE	0	VisStr[30]
15-71	Slot A Option SW Version	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-72	Option in Slot B	0 N/A	All set-ups	FALSE	0	VisStr[30]
15-73	Slot B Option SW Version	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-74	Option in Slot C0	0 N/A	All set-ups	FALSE	0	VisStr[30]
15-75	Slot C0 Option SW Version	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-76	Option in Slot C1	0 N/A	All set-ups	FALSE	0	VisStr[30]
15-77	Slot C1 Option SW Version	0 N/A	All set-ups	FALSE	0	VisStr[20]
15-9* Parameter Info						
15-92	Defined Parameters	0 N/A	All set-ups	FALSE	0	Uint16
15-93	Modified Parameters	0 N/A	All set-ups	FALSE	0	Uint16
15-98	Drive Identification	0 N/A	All set-ups	FALSE	0	VisStr[40]
15-99	Parameter Metadata	0 N/A	All set-ups	FALSE	0	Uint16

16-** Data Readouts

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
16-0* General Status						
16-00	Control Word	0 N/A	All set-ups	FALSE	0	V2
16-01	Reference [Unit]	0.000 ReferenceFeedbackUnit	All set-ups	FALSE	-3	Int32
16-02	Reference [%]	0.0 %	All set-ups	FALSE	-1	Int16
16-03	Status Word	0 N/A	All set-ups	FALSE	0	V2
16-05	Main Actual Value [%]	0.00 %	All set-ups	FALSE	-2	N2
16-09	Custom Readout	0.00 CustomReadoutUnit	All set-ups	FALSE	-2	Int32
16-1* Motor Status						
16-10	Input Power [kW]	0.00 kW	All set-ups	FALSE	1	Int32
16-11	Input Power [hp]	0.00 hp	All set-ups	FALSE	-2	Int32
16-12	Motor Voltage	0.0 V	All set-ups	FALSE	-1	Uint16
16-13	Frequency	0.0 Hz	All set-ups	FALSE	-1	Uint16
16-14	Motor Current	0.00 A	All set-ups	FALSE	-2	Int32
16-15	Frequency [%]	0.00 %	All set-ups	FALSE	-2	N2
16-16	Torque [Nm]	0.0 Nm	All set-ups	FALSE	-1	Int32
16-17	Speed [RPM]	0 RPM	All set-ups	FALSE	67	Int32
16-18	Motor Thermal	0 %	All set-ups	FALSE	0	Uint8
16-22	Torque [%]	0 %	All set-ups	FALSE	0	Int16
16-3* Drive Status						
16-30	DC Link Voltage	0 V	All set-ups	FALSE	0	Uint16
16-32	Brake Energy /s	0.000 kW	All set-ups	FALSE	0	Uint32
16-33	Brake Energy /2 min	0.000 kW	All set-ups	FALSE	0	Uint32
16-34	Heatsink Temp.	0 °C	All set-ups	FALSE	100	Uint8
16-35	Inverter Thermal	0 %	All set-ups	FALSE	0	Uint8
16-36	Inv. Nom. Current	Expression Limit	All set-ups	FALSE	-2	Uint32
16-37	Inv. Max. Current	Expression Limit	All set-ups	FALSE	-2	Uint32
16-38	SL Controller State	0 N/A	All set-ups	FALSE	0	Uint8
16-39	Control Card Temp.	0 °C	All set-ups	FALSE	100	Uint8
16-40	Logging Buffer Full	[0] No	All set-ups	TRUE	-	Uint8
16-43	Timed Actions Status	[0] Timed Actions Auto	All set-ups	TRUE	-	Uint8
16-49	Current Fault Source	0 N/A	All set-ups	TRUE	0	Uint8
16-5* Ref. & Feedb.						
16-50	External Reference	0.0 N/A	All set-ups	FALSE	-1	Int16
16-52	Feedback [Unit]	0.000 ProcessCtrlUnit	All set-ups	FALSE	-3	Int32
16-53	Digi Pot Reference	0.00 N/A	All set-ups	FALSE	-2	Int16
16-54	Feedback 1 [Unit]	0.000 ProcessCtrlUnit	All set-ups	FALSE	-3	Int32
16-55	Feedback 2 [Unit]	0.000 ProcessCtrlUnit	All set-ups	FALSE	-3	Int32
16-56	Feedback 3 [Unit]	0.000 ProcessCtrlUnit	All set-ups	FALSE	-3	Int32
16-58	PID Output [%]	0.0 %	All set-ups	TRUE	-1	Int16

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
16-6* Inputs & Outputs						
16-60	Digital Input	0 N/A	All set-ups	FALSE	0	Uint16
16-61	Terminal 53 Switch Setting	[0] Current	All set-ups	FALSE	-	Uint8
16-62	Analog Input 53	0.000 N/A	All set-ups	FALSE	-3	Int32
16-63	Terminal 54 Switch Setting	[0] Current	All set-ups	FALSE	-	Uint8
16-64	Analog Input 54	0.000 N/A	All set-ups	FALSE	-3	Int32
16-65	Analog Output 42 [mA]	0.000 N/A	All set-ups	FALSE	-3	Int16
16-66	Digital Output [bin]	0 N/A	All set-ups	FALSE	0	Int16
16-67	Pulse Input #29 [Hz]	0 N/A	All set-ups	FALSE	0	Int32
16-68	Pulse Input #33 [Hz]	0 N/A	All set-ups	FALSE	0	Int32
16-69	Pulse Output #27 [Hz]	0 N/A	All set-ups	FALSE	0	Int32
16-70	Pulse Output #29 [Hz]	0 N/A	All set-ups	FALSE	0	Int32
16-71	Relay Output [bin]	0 N/A	All set-ups	FALSE	0	Int16
16-72	Counter A	0 N/A	All set-ups	TRUE	0	Int32
16-73	Counter B	0 N/A	All set-ups	TRUE	0	Int32
16-75	Analog In X30/11	0.000 N/A	All set-ups	FALSE	-3	Int32
16-76	Analog In X30/12	0.000 N/A	All set-ups	FALSE	-3	Int32
16-77	Analog Out X30/8 [mA]	0.000 N/A	All set-ups	FALSE	-3	Int16
16-8* Fieldbus & Drive Port						
16-80	Fieldbus CTW 1	0 N/A	All set-ups	FALSE	0	V2
16-82	Fieldbus REF 1	0 N/A	All set-ups	FALSE	0	N2
16-84	Comm. Option STW	0 N/A	All set-ups	FALSE	0	V2
16-85	Drive Port CTW 1	0 N/A	All set-ups	FALSE	0	V2
16-86	Drive Port REF 1	0 N/A	All set-ups	FALSE	0	N2
16-9* Diagnosis Readouts						
16-90	Alarm Word	0 N/A	All set-ups	FALSE	0	Uint32
16-91	Alarm Word 2	0 N/A	All set-ups	FALSE	0	Uint32
16-92	Warning Word	0 N/A	All set-ups	FALSE	0	Uint32
16-93	Warning Word 2	0 N/A	All set-ups	FALSE	0	Uint32
16-94	Ext. Status Word	0 N/A	All set-ups	FALSE	0	Uint32
16-95	Ext. Status Word 2	0 N/A	All set-ups	FALSE	0	Uint32
16-96	Maintenance Word	0 N/A	All set-ups	FALSE	0	Uint32

18-** Info & Readouts

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
18-0* Maintenance Log						
18-00	Maintenance Log: Item	0 N/A	All set-ups	FALSE	0	Uint8
18-01	Maintenance Log: Action	0 N/A	All set-ups	FALSE	0	Uint8
18-02	Maintenance Log: Time	0 s	All set-ups	FALSE	0	Uint32
18-03	Maintenance Log: Date and Time	Expression Limit	All set-ups	FALSE	0	TimeOfDay
18-1* Fire Mode Log						
18-10	Fire Mode Log: Event	0 N/A	All set-ups	FALSE	0	Uint8
18-11	Fire Mode Log: Time	0 s	All set-ups	FALSE	0	Uint32
18-12	Fire Mode Log: Date and Time	Expression Limit	All set-ups	FALSE	0	TimeOfDay
18-4* PGIO Data Readouts						
18-40	Analog Input X49/1	0.000 N/A	All set-ups	FALSE	-3	Int32
18-41	Analog Input X49/3	0.000 N/A	All set-ups	FALSE	-3	Int32
18-42	Analog Input X49/5	0.000 N/A	All set-ups	FALSE	-3	Int32
18-43	Analog Out X49/7	0.000 N/A	All set-ups	FALSE	-3	Int16
18-44	Analog Out X49/9	0.000 N/A	All set-ups	FALSE	-3	Int16
18-45	Analog Out X49/11	0.000 N/A	All set-ups	FALSE	-3	Int16
18-46	X49 Digital Output [bin]	0 N/A	All set-ups	FALSE	0	Int16

20-** Drive Closed Loop

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
20-0* Feedback						
20-00	Feedback 1 Source	[2] Analog input 54	All set-ups	TRUE	-	Uint8
20-01	Feedback 1 Conversion	[0] Linear	All set-ups	FALSE	-	Uint8
20-02	Feedback 1 Source Unit	null	All set-ups	TRUE	-	Uint8
20-03	Feedback 2 Source	[0] No function	All set-ups	TRUE	-	Uint8
20-04	Feedback 2 Conversion	[0] Linear	All set-ups	FALSE	-	Uint8
20-05	Feedback 2 Source Unit	null	All set-ups	TRUE	-	Uint8
20-06	Feedback 3 Source	[0] No function	All set-ups	TRUE	-	Uint8
20-07	Feedback 3 Conversion	[0] Linear	All set-ups	FALSE	-	Uint8
20-08	Feedback 3 Source Unit	null	All set-ups	TRUE	-	Uint8
20-12	Reference/Feedback Unit	null	All set-ups	TRUE	-	Uint8
20-13	Minimum Reference/ Feedb.	0.000 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
20-14	Maximum Reference/ Feedb.	100.000 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
20-2* Feedback/Setpoint						
20-20	Feedback Function	[3] Minimum	All set-ups	TRUE	-	Uint8
20-21	Setpoint 1	0.000 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
20-22	Setpoint 2	0.000 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
20-23	Setpoint 3	0.000 ProcessCtrlUnit	All set-ups	TRUE	-3	Int32
20-3* Feedback Adv. Conv.						
20-30	Refrigerant	[0] R22	All set-ups	TRUE	-	Uint8
20-31	User Defined Refrigerant A1	10.0000 N/A	All set-ups	TRUE	-4	Uint32
20-32	User Defined Refrigerant A2	-2250.00 N/A	All set-ups	TRUE	-2	Int32
20-33	User Defined Refrigerant A3	250.000 N/A	All set-ups	TRUE	-3	Uint32
20-7* PID Autotuning						
20-70	Closed Loop Type	[0] Auto	2 set-ups	TRUE	-	Uint8
20-71	PID Performance	[0] Normal	2 set-ups	TRUE	-	Uint8
20-72	PID Output Change	0.10 N/A	2 set-ups	TRUE	-2	Uint16
20-73	Minimum Feedback Level	-999999.000 ProcessCtrlUnit	2 set-ups	TRUE	-3	Int32
20-74	Maximum Feedback Level	999999.000 ProcessCtrlUnit	2 set-ups	TRUE	-3	Int32
20-79	PID Autotuning	[0] Disabled	All set-ups	TRUE	-	Uint8
20-8* PID Basic Settings						
20-81	PID Normal/ Inverse Control	[0] Normal	All set-ups	TRUE	-	Uint8
20-82	PID Start Speed [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
20-83	PID Start Speed [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
20-84	On Reference Bandwidth	5 %	All set-ups	TRUE	0	Uint8

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
20-9* PID Controller						
20-91	PID Anti Windup	[1] On	All set-ups	TRUE	-	Uint8
20-93	PID Proportional Gain	0.50 N/A	All set-ups	TRUE	-2	Uint16
20-94	PID Integral Time	20.00 s	All set-ups	TRUE	-2	Uint32
20-95	PID Differentiation Time	0.00 s	All set-ups	TRUE	-2	Uint16
20-96	PID Diff. Gain Limit	5.0 N/A	All set-ups	TRUE	-1	Uint16

21-** Ext. Closed Loop

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
21-0* Ext. CL Autotuning						
21-00	Closed Loop Type	[0] Auto	2 set-ups	TRUE	-	Uint8
21-01	PID Performance	[0] Normal	2 set-ups	TRUE	-	Uint8
21-02	PID Output Change	0.10 N/A	2 set-ups	TRUE	-2	Uint16
21-03	Minimum Feedback Level	-999999.000 N/A	2 set-ups	TRUE	-3	Int32
21-04	Maximum Feedback Level	999999.000 N/A	2 set-ups	TRUE	-3	Int32
21-09	PID Autotuning	[0] Disabled	All set-ups	TRUE	-	Uint8
21-1* Ext. CL 1 Ref./Fb.						
21-10	Ext. 1 Ref./Feedback Unit	[1] %	All set-ups	TRUE	-	Uint8
21-11	Ext. 1 Minimum Reference	0.000 ExtPID1Unit	All set-ups	TRUE	-3	Int32
21-12	Ext. 1 Maximum Reference	100.000 ExtPID1Unit	All set-ups	TRUE	-3	Int32
21-13	Ext. 1 Reference Source	[0] No function	All set-ups	TRUE	-	Uint8
21-14	Ext. 1 Feedback Source	[0] No function	All set-ups	TRUE	-	Uint8
21-15	Ext. 1 Setpoint	0.000 ExtPID1Unit	All set-ups	TRUE	-3	Int32
21-17	Ext. 1 Reference [Unit]	0.000 ExtPID1Unit	All set-ups	TRUE	-3	Int32
21-18	Ext. 1 Feedback [Unit]	0.000 ExtPID1Unit	All set-ups	TRUE	-3	Int32
21-19	Ext. 1 Output [%]	0 %	All set-ups	TRUE	0	Int32
21-2* Ext. CL 1 PID						
21-20	Ext. 1 Normal/Inverse Control	[0] Normal	All set-ups	TRUE	-	Uint8
21-21	Ext. 1 Proportional Gain	0.01 N/A	All set-ups	TRUE	-2	Uint16
21-22	Ext. 1 Integral Time	10000.00 s	All set-ups	TRUE	-2	Uint32
21-23	Ext. 1 Differentation Time	0.00 s	All set-ups	TRUE	-2	Uint16
21-24	Ext. 1 Dif. Gain Limit	5.0 N/A	All set-ups	TRUE	-1	Uint16
21-3* Ext. CL 2 Ref./Fb.						
21-30	Ext. 2 Ref./Feedback Unit	[1] %	All set-ups	TRUE	-	Uint8
21-31	Ext. 2 Minimum Reference	0.000 ExtPID2Unit	All set-ups	TRUE	-3	Int32
21-32	Ext. 2 Maximum Reference	100.000 ExtPID2Unit	All set-ups	TRUE	-3	Int32
21-33	Ext. 2 Reference Source	[0] No function	All set-ups	TRUE	-	Uint8
21-34	Ext. 2 Feedback Source	[0] No function	All set-ups	TRUE	-	Uint8
21-35	Ext. 2 Setpoint	0.000 ExtPID2Unit	All set-ups	TRUE	-3	Int32
21-37	Ext. 2 Reference [Unit]	0.000 ExtPID2Unit	All set-ups	TRUE	-3	Int32
21-38	Ext. 2 Feedback [Unit]	0.000 ExtPID2Unit	All set-ups	TRUE	-3	Int32
21-39	Ext. 2 Output [%]	0 %	All set-ups	TRUE	0	Int32
21-4* Ext. CL 2 PID						
21-40	Ext. 2 Normal/Inverse Control	[0] Normal	All set-ups	TRUE	-	Uint8
21-41	Ext. 2 Proportional Gain	0.01 N/A	All set-ups	TRUE	-2	Uint16
21-42	Ext. 2 Integral Time	10000.00 s	All set-ups	TRUE	-2	Uint32
21-43	Ext. 2 Differentation Time	0.00 s	All set-ups	TRUE	-2	Uint16
21-44	Ext. 2 Dif. Gain Limit	5.0 N/A	All set-ups	TRUE	-1	Uint16

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
21-5* Ext. CL 3 Ref./Fb.						
21-50	Ext. 3 Ref./Feedback Unit	[1] %	All set-ups	TRUE	-	Uint8
21-51	Ext. 3 Minimum Reference	0.000 ExtPID3Unit	All set-ups	TRUE	-3	Int32
21-52	Ext. 3 Maximum Reference	100.000 ExtPID3Unit	All set-ups	TRUE	-3	Int32
21-53	Ext. 3 Reference Source	[0] No function	All set-ups	TRUE	-	Uint8
21-54	Ext. 3 Feedback Source	[0] No function	All set-ups	TRUE	-	Uint8
21-55	Ext. 3 Setpoint	0.000 ExtPID3Unit	All set-ups	TRUE	-3	Int32
21-57	Ext. 3 Reference [Unit]	0.000 ExtPID3Unit	All set-ups	TRUE	-3	Int32
21-58	Ext. 3 Feedback [Unit]	0.000 ExtPID3Unit	All set-ups	TRUE	-3	Int32
21-59	Ext. 3 Output [%]	0 %	All set-ups	TRUE	0	Int32
21-6* Ext. CL 3 PID						
21-60	Ext. 3 Normal/Inverse Control	[0] Normal	All set-ups	TRUE	-	Uint8
21-61	Ext. 3 Proportional Gain	0.01 N/A	All set-ups	TRUE	-2	Uint16
21-62	Ext. 3 Integral Time	10000.00 s	All set-ups	TRUE	-2	Uint32
21-63	Ext. 3 Differentation Time	0.00 s	All set-ups	TRUE	-2	Uint16
21-64	Ext. 3 Dif. Gain Limit	5.0 N/A	All set-ups	TRUE	-1	Uint16

22-** Application Functions

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
22-0* Miscellaneous						
22-00	External Interlock Delay	0 s	All set-ups	TRUE	0	Uint16
22-2* No-Flow Detection						
22-22	Low Speed Detection	[0] Disabled	All set-ups	TRUE	-	Uint8
22-23	No-Flow Function	[0] Off	All set-ups	TRUE	-	Uint8
22-24	No-Flow Delay	10 s	All set-ups	TRUE	0	Uint16
22-4* Sleep Mode						
22-40	Minimum Run Time	10 s	All set-ups	TRUE	0	Uint16
22-41	Minimum Sleep Time	10 s	All set-ups	TRUE	0	Uint16
22-42	Wake-up Speed [RPM]	Expression Limit	All set-ups	TRUE	67	Uint16
22-43	Wake-up Speed [Hz]	Expression Limit	All set-ups	TRUE	-1	Uint16
22-44	Wake-up Ref./FB Difference	10 %	All set-ups	TRUE	0	Int8
22-45	Setpoint Boost	0 %	All set-ups	TRUE	0	Int8
22-46	Maximum Boost Time	60 s	All set-ups	TRUE	0	Uint16
22-6* Broken Belt Detection						
22-60	Broken Belt Function	[0] Off	All set-ups	TRUE	-	Uint8
22-61	Broken Belt Torque	10 %	All set-ups	TRUE	0	Uint8
22-62	Broken Belt Delay	10 s	All set-ups	TRUE	0	Uint16
22-7* Short Cycle Protection						
22-75	Short Cycle Protection	[0] Disabled	All set-ups	TRUE	-	Uint8
22-76	Interval between Starts	start_to_start_min_on_time (P2277)	All set-ups	TRUE	0	Uint16
22-77	Minimum Run Time	0 s	All set-ups	TRUE	0	Uint16

23-** Time Based Funtions

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
23-0* Timed Actions						
23-00	ON Time	Expression Limit	2 set-ups	TRUE	0	TimeOfDayWoDate
23-01	ON Action	[0] Disabled	2 set-ups	TRUE	-	Uint8
23-02	OFF Time	Expression Limit	2 set-ups	TRUE	0	TimeOfDayWoDate
23-03	OFF Action	[1] No action	2 set-ups	TRUE	-	Uint8
23-04	Occurrence	[0] All days	2 set-ups	TRUE	-	Uint8
23-0* Timed Actions Settings						
23-08	Timed Actions Mode	[0] Timed Actions Auto	2 set-ups	TRUE	-	Uint8
23-09	Timed Actions Reactivation	[1] Enabled	2 set-ups	TRUE	-	Uint8
23-1* Maintenance						
23-10	Maintenance Item	[1] Motor bearings	1 set-up	TRUE	-	Uint8
23-11	Maintenance Action	[1] Lubricate	1 set-up	TRUE	-	Uint8
23-12	Maintenance Time Base	[0] Disabled	1 set-up	TRUE	-	Uint8
23-13	Maintenance Time Interval	1 h	1 set-up	TRUE	74	Uint32
23-14	Maintenance Date and Time	Expression Limit	1 set-up	TRUE	0	TimeOfDay
23-1* Maintenance Reset						
23-15	Reset Maintenance Word	[0] Do not reset	All set-ups	TRUE	-	Uint8
23-16	Maintenance Text	0 N/A	1 set-up	TRUE	0	VisStr[20]
23-5* Energy Log						
23-50	Energy Log Resolution	[5] Last 24 Hours	2 set-ups	TRUE	-	Uint8
23-51	Period Start	Expression Limit	2 set-ups	TRUE	0	TimeOfDay
23-53	Energy Log	0 N/A	All set-ups	TRUE	0	Uint32
23-54	Reset Energy Log	[0] Do not reset	All set-ups	TRUE	-	Uint8
23-6* Trending						
23-60	Trend Variable	[0] Power [kW]	2 set-ups	TRUE	-	Uint8
23-61	Continuous Bin Data	0 N/A	All set-ups	TRUE	0	Uint32
23-62	Timed Bin Data	0 N/A	All set-ups	TRUE	0	Uint32
23-63	Timed Period Start	Expression Limit	2 set-ups	TRUE	0	TimeOfDay
23-64	Timed Period Stop	Expression Limit	2 set-ups	TRUE	0	TimeOfDay
23-65	Minimum Bin Value	Expression Limit	2 set-ups	TRUE	0	Uint8
23-66	Reset Continuous Bin Data	[0] Do not reset	All set-ups	TRUE	-	Uint8
23-67	Reset Timed Bin Data	[0] Do not reset	All set-ups	TRUE	-	Uint8
23-8* Payback Counter						
23-80	Power Reference Factor	100 %	2 set-ups	TRUE	0	Uint8
23-81	Energy Cost	1.00 N/A	2 set-ups	TRUE	-2	Uint32
23-82	Investment	0 N/A	2 set-ups	TRUE	0	Uint32
23-83	Energy Savings	0 kWh	All set-ups	TRUE	75	Int32
23-84	Cost Savings	0 N/A	All set-ups	TRUE	0	Int32

24-** Application Functions 2

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
24-0* Fire Mode						
24-00	Fire Mode Function	[0] Disabled	2 set-ups	TRUE	-	Uint8
24-03	Fire Mode Min Reference	Expression Limit	All set-ups	TRUE	-3	Int32
24-04	Fire Mode Max Reference	Expression Limit	All set-ups	TRUE	-3	Int32
24-05	Fire Mode Preset Reference	0.00 %	All set-ups	TRUE	-2	Int16
24-06	Fire Mode Reference Source	[0] No function	All set-ups	TRUE	-	Uint8
24-09	Fire Mode Alarm Handling	[1] Trip, Critical Alarms	2 set-ups	FALSE	-	Uint8
24-1* Drive Bypass						
24-10	Drive Bypass Function	[0] Disabled	2 set-ups	TRUE	-	Uint8
24-11	Drive Bypass Delay Time	0 s	2 set-ups	TRUE	0	Uint16

36-** Programmable I/O Option

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
36-0* I/O Mode						
36-00	Terminal X49/1 Mode	[1] Voltage	All set-ups	TRUE	-	Uint8
36-01	Terminal X49/3 Mode	[1] Voltage	All set-ups	TRUE	-	Uint8
36-02	Terminal X49/5 Mode	[1] Voltage	All set-ups	TRUE	-	Uint8
36-03	Terminal X49/7 Mode	[0] Voltage 0-10V	All set-ups	TRUE	-	Uint8
36-04	Terminal X49/9 Mode	[0] Voltage 0-10V	All set-ups	TRUE	-	Uint8
36-05	Terminal X49/11 Mode	[0] Voltage 0-10V	All set-ups	TRUE	-	Uint8
36-1* Analog Input X49/1						
36-10	Terminal X49/1 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
36-11	Terminal X49/1 Low Current	4.00 mA	All set-ups	TRUE	-5	Int16
36-12	Terminal X49/1 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
36-13	Terminal X49/1 High Current	20.00 mA	All set-ups	TRUE	-5	Int16
36-14	Term. X49/1 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
36-15	Term. X49/1 High Ref./Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
36-16	Term. X49/1 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
36-17	Term. X49/1 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
36-2* Analog Input X49/3						
36-20	Terminal X49/3 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
36-21	Terminal X49/3 Low Current	4.00 mA	All set-ups	TRUE	-5	Int16
36-22	Terminal X49/3 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
36-23	Terminal X49/3 High Current	20.00 mA	All set-ups	TRUE	-5	Int16
36-24	Term. X49/3 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
36-25	Term. X49/3 High Ref./Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
36-26	Term. X49/3 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
36-27	Term. X49/3 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
36-3* Analog Input X49/5						
36-30	Terminal X49/5 Low Voltage	0.07 V	All set-ups	TRUE	-2	Int16
36-31	Terminal X49/5 Low Current	4.00 mA	All set-ups	TRUE	-5	Int16
36-32	Terminal X49/5 High Voltage	10.00 V	All set-ups	TRUE	-2	Int16
36-33	Terminal X49/5 High Current	20.00 mA	All set-ups	TRUE	-5	Int16
36-34	Term. X49/5 Low Ref./Feedb. Value	0.000 N/A	All set-ups	TRUE	-3	Int32
36-35	Term. X49/5 High Ref./Feedb. Value	100.000 N/A	All set-ups	TRUE	-3	Int32
36-36	Term. X49/5 Filter Time Constant	0.001 s	All set-ups	TRUE	-3	Uint16
36-37	Term. X49/5 Live Zero	[1] Enabled	All set-ups	TRUE	-	Uint8
36-4* Output X49/7						
36-40	Terminal X49/7 Analogue Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-41	Terminal X49/7 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-42	Terminal X49/7 Min. Scale	0.00 %	All set-ups	TRUE	-2	Int16
36-43	Terminal X49/7 Max. Scale	100.00 %	All set-ups	TRUE	-2	Int16
36-44	Terminal X49/7 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
36-45	Terminal X49/7 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16

Par. No. #	Parameter description	Default value	4-set-up	Change during operation	Conversion index	Type
36-5* Output X49/9						
36-50	Terminal X49/9 Analogue Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-51	Terminal X49/9 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-52	Terminal X49/9 Min. Scale	0.00 %	All set-ups	TRUE	-2	Int16
36-53	Terminal X49/9 Max. Scale	100.00 %	All set-ups	TRUE	-2	Int16
36-54	Terminal X49/9 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
36-55	Terminal X49/9 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16
36-6* Output X49/11						
36-60	Terminal X49/11 Analogue Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-61	Terminal X49/11 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
36-62	Terminal X49/11 Min. Scale	0.00 %	All set-ups	TRUE	-2	Int16
36-63	Terminal X49/11 Max. Scale	100.00 %	All set-ups	TRUE	-2	Int16
36-64	Terminal X49/11 Bus Control	0.00 %	All set-ups	TRUE	-2	N2
36-65	Terminal X49/11 Timeout Preset	0.00 %	1 set-up	TRUE	-2	Uint16

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Literature Order Number	BAS-SVX23A-E4
Date	December 2008
Supersedes	