8.29 Digital input polarity

0 Negative
Input or output selection
1 Positive   08.31 Output

DIO1 state

Digital input or output 1   DIO1   08.01

Invert   08.11

Input   1
0

Input or output selection
08.32

DIO2 state

Output
Digital input or output 2   DIO2   08.02   1
0

Invert   08.12

Input   1
0

This manual is to be given to the end user

MENU 0
Refer to section

10V
AI1+
AI1-
0V
PX1   ADI2
ADI3
AO1
AO2

MENU 7
Configuration of analog I/O

MENU 1
Speed references and limitations

MENU 14
PID controller

DIO1
24V
DIO2
DIO3
24V
PX2   DI4
24V
DI5
SDI1

MENU 8
Configuration of digital I/O

MENU 6
Sequencer and clock

POWERDRIVE MD
Variable speed drive
Commissioning manual

POWERDRIVE MD
Variable speed drive

NOTE

LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

⚠ CAUTION

For the user's own safety, this variable speed drive must be connected to an approved earth (⏚ terminal).

If accidentally starting the installation is likely to cause a risk to personnel or the machines being driven, it is essential to comply with the power connection diagrams recommended in this manual.

The variable speed drive is fitted with safety devices which, in the event of a problem, control stopping and thus stop the motor. The motor itself can become jammed for mechanical reasons. Voltage fluctuations, and in particular power cuts, may also cause the motor to stop. The removal of the causes of the shutdown can lead to restarting, which may be dangerous for certain machines or installations.
In such cases, it is essential that the user takes appropriate precautions against the motor restarting after an unscheduled stop.

The variable speed drive is designed to be able to supply a motor and the driven machine above its rated speed.
If the motor or the machine are not mechanically designed to withstand such speeds, the user may be exposed to serious danger resulting from their mechanical deterioration.
Before programming a high speed, it is important that the user checks that the installation can withstand it.

The variable speed drive which is the subject of this manual is designed to be integrated in an installation or an electrical machine, and can under no circumstances be considered to be a safety device. It is therefore the responsibility of the machine manufacturer, the designer of the installation or the user to take all necessary precautions to ensure that the system complies with current standards, and to provide any devices required to ensure the safety of equipment and personnel.

LEROY-SOMER declines all responsibility in the event of the above recommendations not being observed.

....

This manual only describes the commissioning and configuration of the POWERDRIVE MD. For additional information about installation, product characteristics and warnings, refer to the installation manual for the relevant product.

Manual corresponding to software versions higher than or equal to 4.20

POWERDRIVE MD
Variable speed drive

SAFETY AND OPERATING INSTRUCTIONS FOR VARIABLE SPEED DRIVES
(In accordance with the low voltage directive 2006/95/EC)

⚠ • **Throughout the manual, this symbol warns of consequences which may arise from inappropriate use of the drive, since electrical risks may lead to material or physical damage as well as constituting a fire hazard.**

1 - General
Depending on their degree of protection, the variable speed drives may contain unprotected live parts, which may be moving or rotating, as well as hot surfaces, during operation. Unjustified removal of protection devices, incorrect use, faulty installation or inappropriate operation could represent a serious risk to personnel and equipment.
For further information, consult the manual.
All work relating to transportation, installation, commissioning and maintenance must be performed by experienced, qualified personnel (see IEC 364 or CENELEC HD 384, or DIN VDE 0100 and national specifications for installation and accident prevention).
In these basic safety instructions, qualified personnel means persons competent to install, mount, commission and operate the product and possessing the relevant qualifications.

2 - Use
Variable speed drives are components designed for integration in installations or electrical machines.
When integrated in a machine, commissioning must not take place until it has been verified that the machine conforms with directive 2006/42/EC (Machinery Directive). It is also necessary to comply with standard EN 60204, which stipulates in particular that electrical actuators (which include variable speed drives) cannot be considered as circuit-breaking devices and certainly not as isolating switches.
Commissioning can take place only if the requirements of the Electromagnetic Compatibility Directive (EMC 2004/108/EC) are met.
The variable speed drives meet the requirements of the Low Voltage Directive 2006/95/EC, modified by 93/68/EEC. The harmonised standards of the DIN VDE 0160 series in connection with standard VDE 0660, part 500 and EN 60146/VDE 0558 are also applicable.
The technical characteristics and instructions concerning the connection conditions specified on the nameplate and in the documentation provided must be observed without fail.

3 - Transportation, storage
All instructions concerning transportation, storage and correct handling must be observed.
The climatic conditions specified in the technical manual must be observed.

4 - Installation
The installation and cooling of equipment must comply with the specifications in the manual supplied with the product.
The variable speed drives must be protected against any excessive stress. In particular, there must be no damage to parts and/or modification of the clearance between components during transportation and handling. Avoid touching the electronic components and contact parts.

The variable speed drives contain parts which are sensitive to electrostatic stresses and may be easily damaged if handled incorrectly. Electrical components must not be exposed to mechanical damage or destruction (risks to health!).

5 - Electrical connection
When work is performed on variable speed drives which are powered up, the national accident prevention regulations must be respected.
The electrical installation must comply with the relevant specifications (for example conductor cross-sections, protection via fused circuit-breaker, connection of protective conductor). More detailed information is given in the manual. Instructions for an installation which meets the requirements for electromagnetic compatibility, such as screening, earthing, presence of filters and correct insertion of cables and conductors, are given in the documentation supplied with the variable speed drives. These instructions must be followed in all cases, even if the variable speed drive carries the CE mark. Adherence to the limits given in the EMC legislation is the responsibility of the manufacturer of the installation or the machine.

6 - Operation
Installations in which variable speed drives are to be integrated must be fitted with additional protection and monitoring devices as laid down in the current relevant safety regulations, such as the law on technical equipment, accident prevention regulations, etc. Modifications to the variable speed drives using control software are permitted.
Active parts of the device and the live power connections must not be touched immediately after the variable speed drive is powered down, as the capacitors may still be charged. In view of this, the warnings fixed to the variable speed drives must be observed.
During operation, all doors and protective covers must be kept closed.

7 - Servicing and maintenance
Refer to the manufacturer's documentation.

This manual is to be given to the end user.

POWERDRIVE MD
Variable speed drive

Notes

POWERDRIVE MD
Variable speed drive

POWERDRIVE MD
Variable speed drive
INTRODUCTION

1 - INTRODUCTION

⚠ • **The drives use an algorithm which is adjusted by parameters. The performance levels obtained depend on the parameter setting. Inappropriate settings may have serious consequences for personnel and machinery.**

• **The drive parameters should only be set by appropriately qualified and experienced personnel.**

• **Before powering up the drive, check that the power connections (mains supply and motor) are correct, and that any moving parts are mechanically protected.**

• **Before setting the drive parameters, all instructions relating to installation and connection contained in the installation document or the manual supplied with the drive must have been strictly observed.**

• **Users of the drive should take particular care to avoid starting it accidentally.**

2 - PARAMETER SETTING INTERFACE

2.1 - Presentation

The parameter setting interface comprises a touch screen giving access to different menus.

After a loading phase following powering-up of the drive, the parameter setting interface displays this screen.
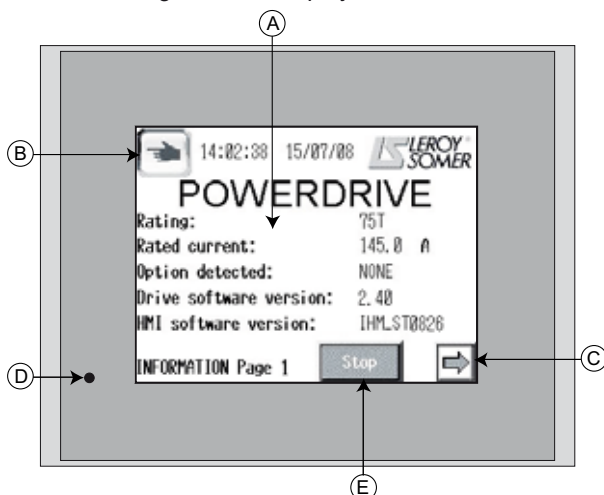
Ref.	Function
A	Touch screen
B	Touch button allowing simple access to the main menu. It can also be used to exit sub-menus of the parameter setting interface at any time.
C	Touch button for scrolling to the following pages.
D	Display status LED.
E	Touch button for stopping the drive at any time.

Certain screens include a (M) button, allowing the display of a number pad. It appears on the side of the screen enabling a numerical value or parameter number to be entered.

Number pad enabling the input of the desired value

Press " **ENT** " to validate

Press " **CLR** " to cancel
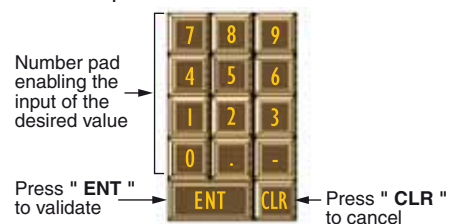
- Temperature operating range : 0°C to 50°C.
- A lithium battery allows back-up of parameters for 10 years, without any power-up.
- After 10 minutes without activity on the interface, it returns to page 1 of "**Read mode**".

2.2 - Interface architecture

This button, available on each screen page, gives direct access to the main menu consisting of 6 touch buttons
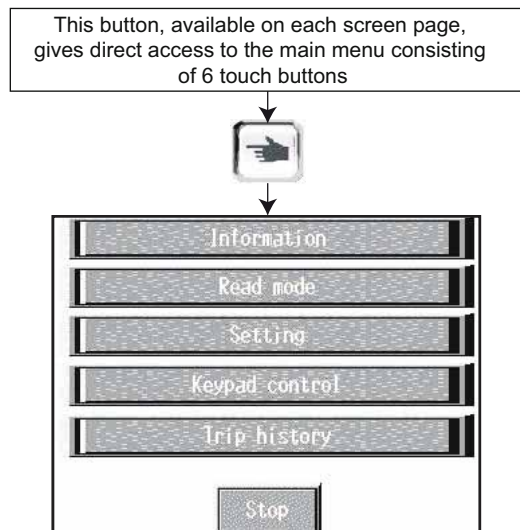
- **Informations:** gives the user information quickly on the drive characteristics (rating, version, options, current, etc.) and also allows a choice of language.
- **Read mode:** used to display the drive status when stopped or running, and its main measurement points.
- **Setting:** used for reading and modifying all parameters, and configuring the drive control mode.
- **Keypad control:** gives direct access to the "Keypad control" page, allowing the drive to be controlled via the HMI (Human-Machine Interface).
- **Trip history:** Gives a quick overview of the last 10 drive trips.
- **Stop:** this button is accessible on all screens and is used to give a stop command (see Section 2.2.6).

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.1 - "Information" function

This mode has two pages, one for giving the user information on the main characteristics of the drive without going into the detailed menus, and the other enables language choice (French, English or German) and display of the run time (for other languages, please ask your usual LEROY-SOMER contact).
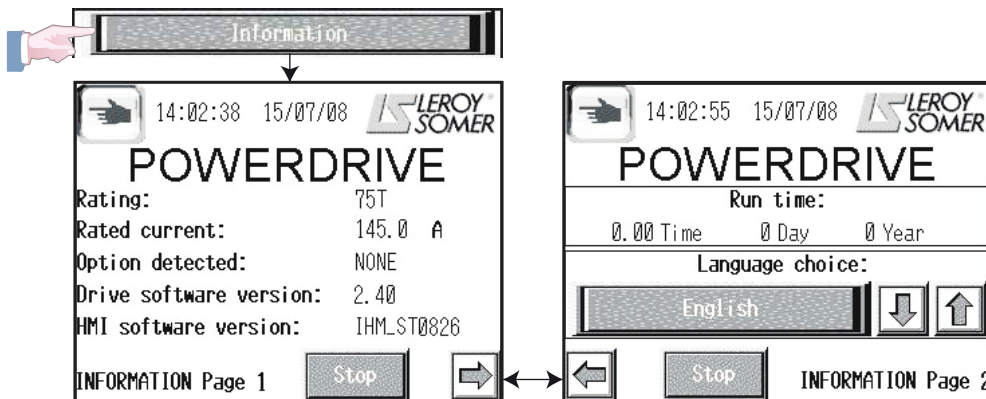
2.2.2 - "Read mode" function

This mode uses 14 screen pages to display a number of parameters representing the status of the drive, when stopped or running. On page 1 of this function, the user can configure two parameters useful for his application (pages 2 to 14 are read-only).

Parameters chosen on the **"Display configuration"** page

Selection of previous or next pages of **"Read mode"**
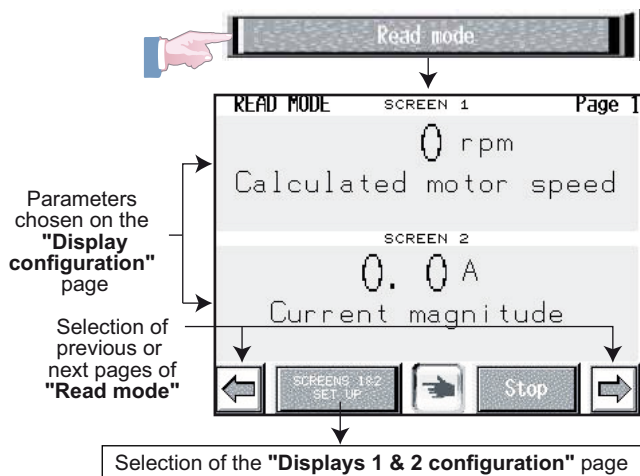
Selection of the **"Displays 1 & 2 configuration"** page
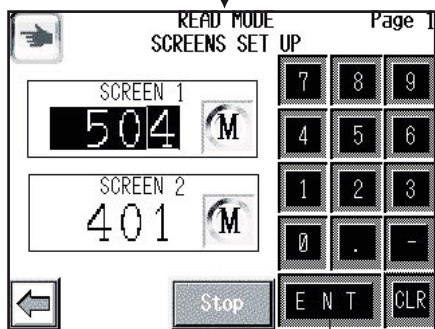
Pressing [M] displays the number pad used for selecting the parameter number.
Press "ENT" to confirm.
CAUTION: Only "read-only" parameters can be configured here. Parameters 5.04 and 4.01 are the two parameters defined in the factory settings.

List of parameters displayed in read mode

Page	Wording	Address	Units
Page 1	Displays 1 and 2 can be configured by the user		-
Page 2	Drive status	**10.98**	-
	Status word **10.01** to **10.15**	**10.01** to **10.15**	
Page 3	Motor speed	**5.04**	rpm
	Current magnitude	**4.01**	A
Page 4	Output frequency	**5.01**	Hz
	Active current	**4.02**	A
Page 5	Output voltage	**5.02**	V
	Output power	**5.03**	kW
Page 6	DC bus voltage	**5.05**	V
	Supply voltage	**7.70**	
Page 7	Analog input AI1	**7.01**	%
	Analogue/digital input ADI2	**7.02**	
Page 8	Analogue/digital input ADI3 or CTP	**7.03**	%
Page 9	Analog output AO1	**7.68**	%
	Analog output AO2	**7.69**	
Page 10	Digital I/O Relay outputs DIO1, DIO2, DIO3, DI4, DI5, RL10, RL20, SDI	**8.01** to **8.05**, **8.07** to **8.09**	-
Page 11	Selected ref indicator	**1.49**	-
	Selected preset reference indicator	**1.50**	
Page 12	Speed reference selected	**1.01**	rpm
Page 13	Pre-ramp reference	**1.03**	rpm
	Post-ramp reference	**2.01**	
Page 14	Control board temperature	**7.55**	°C

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.3 - "Setting" function

This mode is divided into four sub-menus each providing adapted user access levels. These sub-menus are as follows:
- **"BASIC SET UP":** gives access to menu 0 corresponding to the most common parameters.
- **"USER SET UP":** access to 10 parameters customised for the application.
- **"ADVANCED SET UP":** gives read and write access (protected by a code) to all the drive parameters.
- **"KEYPAD CONTROL SET UP":** allows the control mode to be configured via the interface (protected by a code).
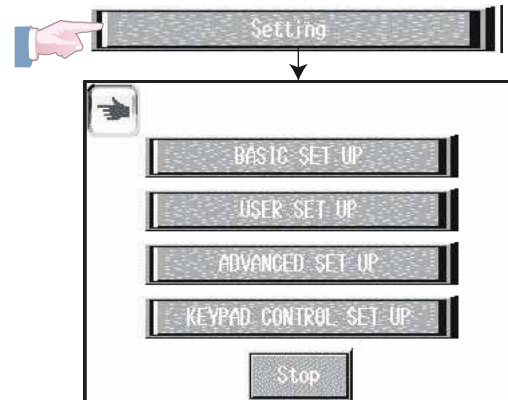
2.2.3.1 - Basic set up
"BASIC SET UP" corresponds to menu 0, and groups together the most common parameters. See Section 2.4.5.1 "parameter list" in the commissioning manual.

Modifying a numerical parameter	Modifying a selection parameter
MENU 0	MENU 0
Parameter 00.01	Parameter 00.01
MINIMUM REFERENCE CLAMP	MINIMUM REFERENCE CLAMP
0 rpm	0 rpm
Using the arrows, select the number of the parameter to be modified. Then press [M] to display the number pad and type in the new value of the parameter.	Use the arrows to modify the selection and press "ENTER" to confirm the choice.

2.2.3.2 - User set up
"USER SET UP" allows access to 10 parameters (**00.56** to **00.65**) customised for the application. These parameters are determined by the user by means of the following sub-menu:
- Setting/Advanced set up/User set up assignments (see Section 2.2.3.3.1).
The factory settings of these 10 parameters are blank.

USER MENU
Parameter 00.56 ← User parameter No.

0.00 = 0 ← Parameter value

← Represents the selected parameter
← Represents the selected menu

Not used ← Parameter wording
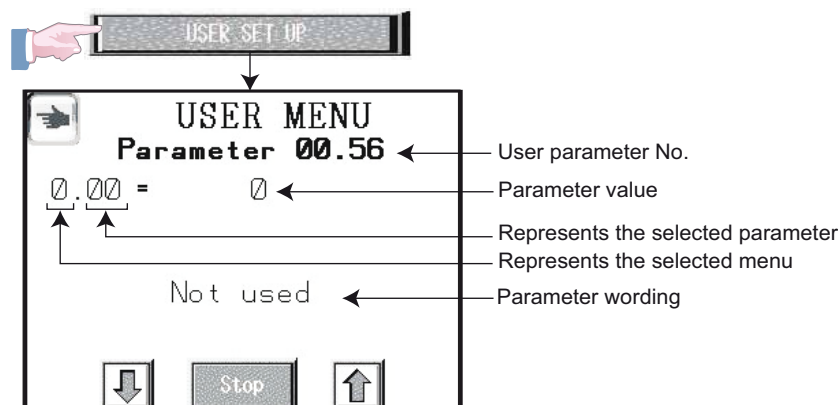
POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.3.3 - Advanced set up

"ADVANCED SET UP" gives read and write access (protected by a code) to the parameters for programming the various functions available on the HMI, in three separate sub-menus:
- **"USER SET UP ASSIGNMENTS":** used to configure the 10 user parameters **00.56** to **00.65**.
- **"ADVANCED SET UP":** provides access to all the drive's parameters (Menus 1 to 21).
- **"SET UP TIME":** for adjusting the date and time.

Press [M], then type in the access code "149" and confirm using the "ENT" button.

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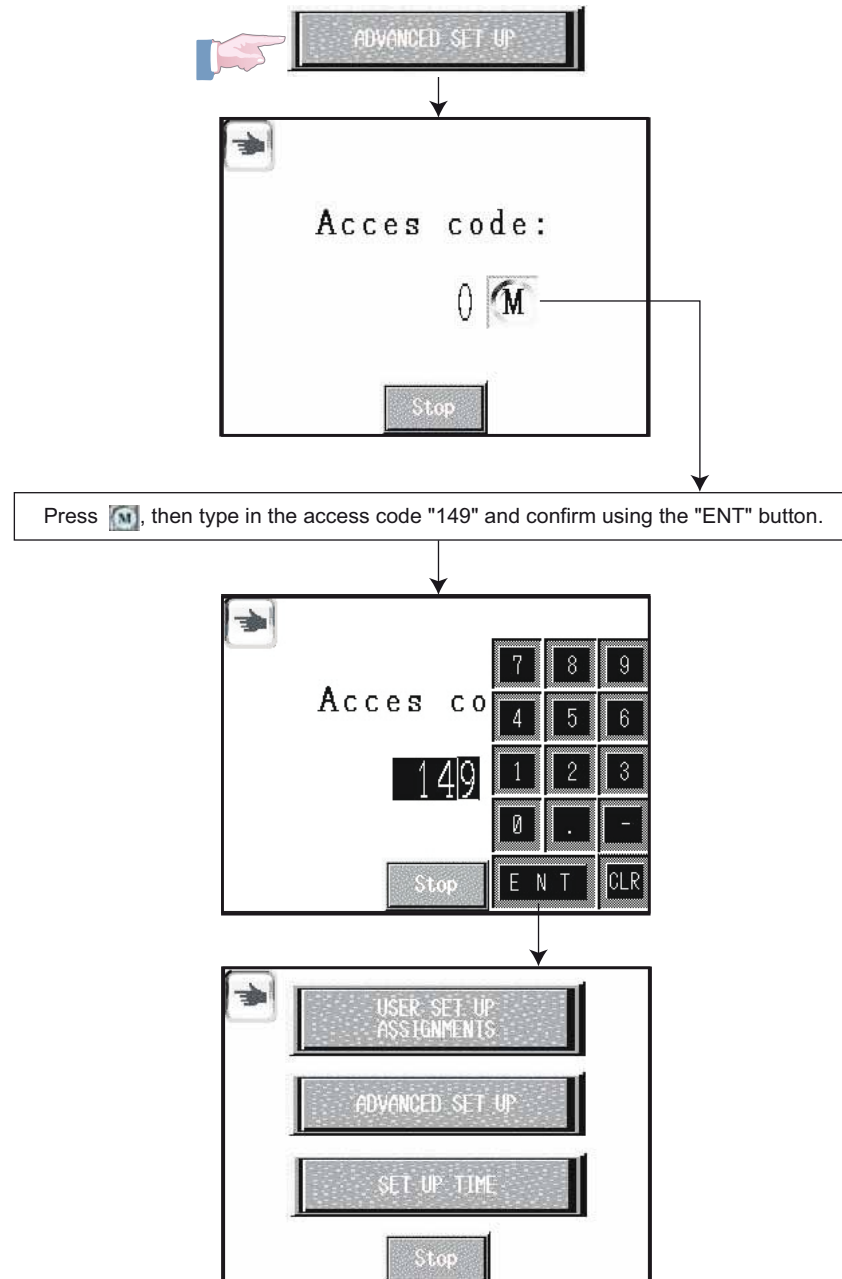
POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.3.3.1 - User set up assignments

"USER SET UP ASSIGNMENTS" is used to configure the 10 parameters **00.56** to **00.65** required by the user and accessible directly in the sub-menu: Setting/User set up (see 2.2.3.2). These 10 parameters are unassigned in the factory settings (except for **00.56** = 559).

USER SET UP ASSIGNMENTS

USER ASSIGNMENTS

00.56 = 559 M

00.57 = 0 M

00.58 = 0 M

00.59 = 0 M

Stop

Access to the following parameters
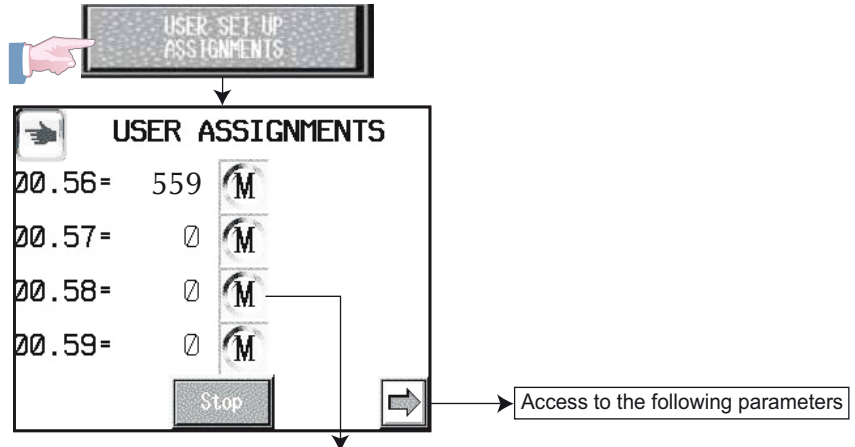
Press the M button corresponding to the number of the user parameter to be modified, then type in the number of the parameter which is to be displayed in the **"User set up"** menu. Any parameter (menu 1 to 21) can be assigned.

2.2.3.3.2 - Advanced set up

"ADVANCED SET UP" gives access to all available drive parameters, from menu 1 to menu 21. These various parameters are accessible for reading and writing.

ADVANCED SET UP

ADVANCED SET UP

Selected menu → MENU 1

Speed references and limitations ← Menu name

Menu selection

Stop
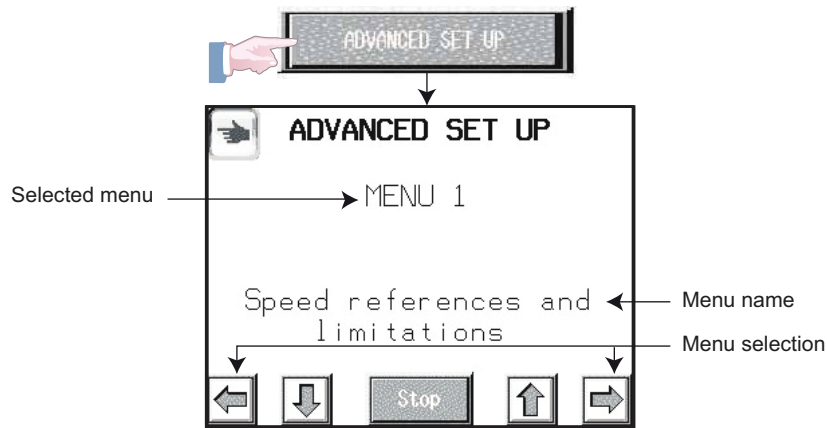
Selecting parameters from a menu

Read-only parameter	Modifying a selection parameter	Modifying a numerical parameter

ADVANCED SET UP

1.01 = 0 rpm

Speed reference selected

Stop

ADVANCED SET UP

1.14 = Keypad

ENTER

Reference selector

Stop

ADVANCED SET UP

1.04 = 0 rpm

M

Reference offset

Stop
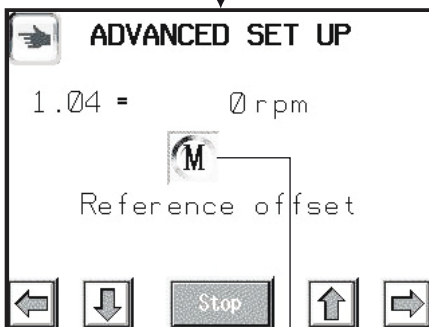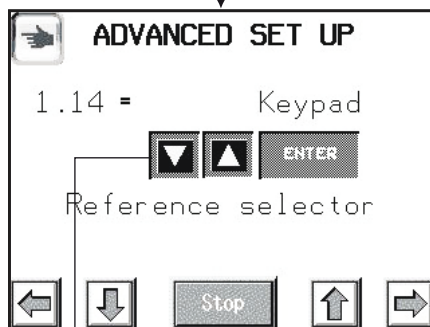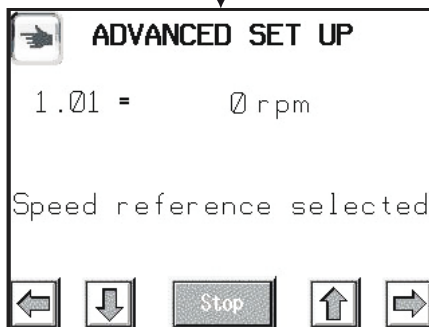
Use the ▼▲ arrows to modify the selection and press "ENTER" to confirm the choice.

Press M to display the number pad and type in the new value of the parameter.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.3.3.3 - Set up time

"SET UP TIME" enables the user to set the drive's date and time.
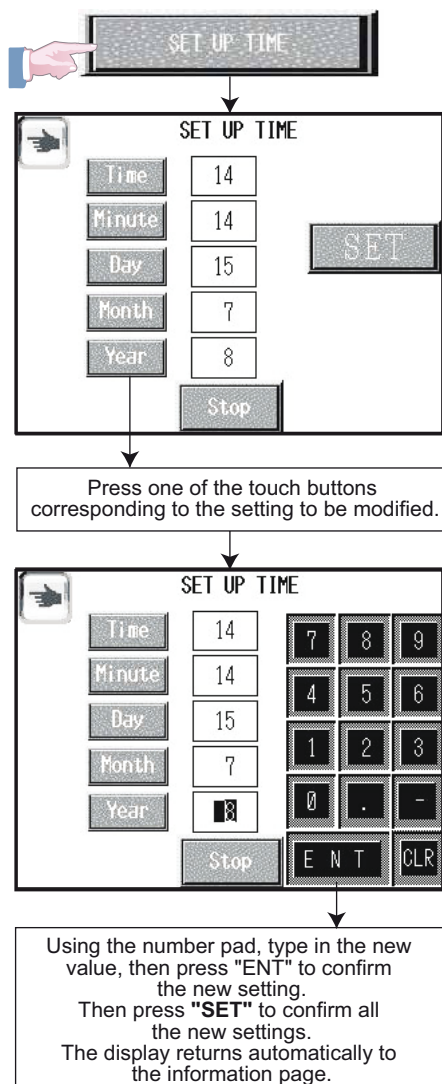
POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.3.4 - Keypad control set up

"KEYPAD CONTROL SET UP" is used to configure the controls possible from the Human-Machine Interface (Run Forward/Run Backward, Stop, Speed reference). Access is protected by a code.
For "Keypad control set up" it is necessary to disconnect terminals SDI1 and SDI2.

KEYPAD CONTROL SET UP

Acces co

149

7	8	9
4	5	6
1	2	3
0	.	-
Stop	E N T	CLR

Press [M], then type in the access code **"149"** and confirm using the **"ENT"** button.

KEYPAD CONTROL SET UP

| Enable the keypad speed reference: | Yes ▼ ▲ |
| Enable the keypad run/stop: | Stop/Run Forwd and Run Backwd ▼ ▲ |

| SET | Stop |
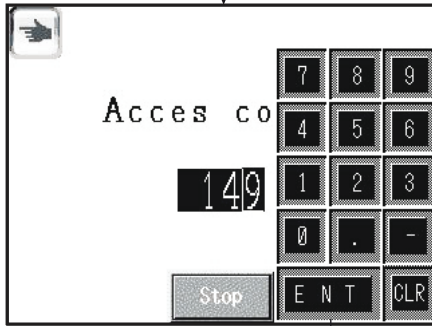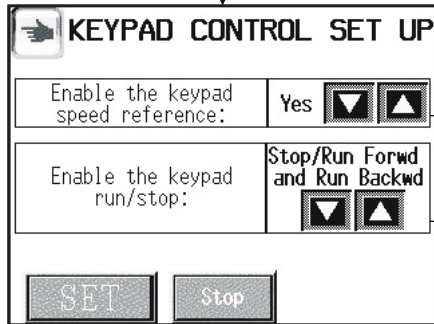
Setup possible	Effects on the "KEYPAD CONTROL" page
NO	No speed adjustment via the HMI.
YES	3 buttons for adjusting the speed reference are displayed.
NO	No Run Fwd/Run Backwd/Stop command via the HMI.
Stop/Run Forward	Two buttons, Forward and Stop, are displayed.
Stop/Run Fwd/ and Run Backwd	Three buttons, Forward, Stop and Backward, are displayed.

Press **"SET"** to confirm the new settings.

CONSOLE COMMANDS

Drive status: DISABLED ◄── Drive status
Motor speed: 0 rpm
Motor current: 0.0 A

Display showing the motor status ──►

| Forward | Stop | Backward |

◄── Touch buttons for giving the following commands:
- Forward,
- Backward,
- Stop.

Speed reference

0 rpm

Touch button for decreasing the speed reference ──► [-]   [+] ◄── Touch button for increasing the speed reference
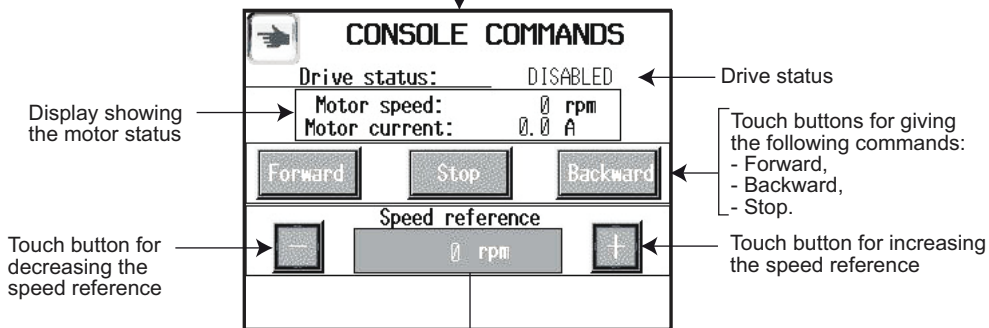
On pressing the **"Speed reference"** button, the number pad is displayed for direct entry of the desired speed reference.
The + and - buttons will then allow the value to be adjusted more easily.

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POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.4 - "Keypad control" function
This function gives direct access to the "**KEYPAD CONTROL**" page and enables the drive to be controlled via the HMI interface.

Screen in factory settings

Configured screen, see Section 2.2.3.4

CONSOLE COMMANDS

To configure this function, go into the Setting menu. Then press KEYPAD CONTROL SET UP.

Stop

CONSOLE COMMANDS

Drive status: DISABLED
Motor speed: 0 rpm
Motor current: 0.0 A

Forward Stop Backward

Speed reference
− 0 rpm +

The "Keypad control" page is not configured in the factory settings. To configure it, press ⬛ to access the main menu, then go into the SETTINGS/KEYPAD CONTROL SET UP sub-menu.
Then follow the parameter-setting procedure described in Section 2.2.3.4.

2.2.5 - "Trip history" function
If the date and time settings are correct (see Section 2.2.3.3.3), this page shows a history of the last 10 drive trips with their precise date and time.

TRIP HISTORY
15/07/08 14:23 DC bus overvoltage]
15/07/08 14:22 DC bus undervoltage

INIT   Trip

ACTIVE TRIP
15/07/08 14:23 DC bus overvoltage
Provide a braking resistor (optional).
If a resistor is connected, reduce its value within permitted limits.
Check that the mains power supply is not subject to interference.
Check the motor insulation.
Set a longer deceleration time in 00.04.
Check the deceleration mode.

RESET

This "ACTIVE TRIP" screen is displayed when the drive trips. Press "RESET" to cancel the trip (refer to Section 7.2 of the commissioning manual). It is still possible to move around in the interface, and as long as the problem persists a "TRIP" button flashes at the bottom of each screen, so as to make it possible to return to the "ACTIVE TRIP" page which enables the drive to be reset.

TRIP HISTORY
Pressing "INIT", clears trip history.
INIT is required upon first connection of the HMI.

Init confirmation: Yes   Off

Stop

INIT is required if there have been trips while the HMI was disconnected or when a new interface is connected to the drive.
CAUTION:
In this case, the button downloads the last 10 POWERDRIVE trips stored in parameters 10.20 to 10.29.
The time stamp will then be reinitialised and identical for the whole history.

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POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.2.6 - "Stop" function

This "Stop" button gives a stop command. This function can be configured by a combination of parameters **06.12** and **06.43** in accordance with the table below.

CAUTION:

The stop button is automatically enabled in Keypad control mode. If the stop button is inactive, it is not displayed on the screen.

When the drive is tripped, the flashing "Trip" button takes priority. The "Stop" button then becomes inaccessible (see "TRIP HISTORY" screen, Section 2.2.5).

06.43 (00.23)	06.12	Stop
Terminals	**Enabled**	**Active (factory setting)**
	Disabled	Inactive
Fieldbus	Enabled	Active
	Disabled	Inactive
LCD keypad	Enabled	Active
	Disabled	
Inactive	Enabled	Active
	Disabled	Inactive

2.3 - Communication loss alarm

If communication between the drive and the HMI is broken, the following flashing message appears on the screen, preventing access to all HMI functions.


```
SERIAL LINK LOSS
Check the communication
cable between the HMI
and the POWERDRIVE.
```
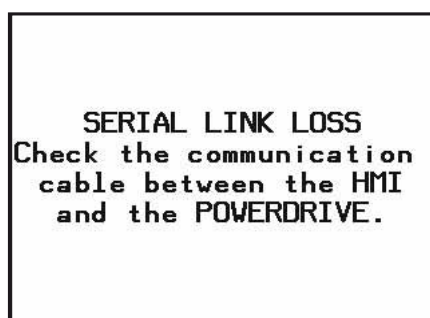
To restore communication, check that the lead between the HMI and the drive is connected properly. If the alarm persists, please get in touch with your usual LEROY-SOMER contact.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4 - Commissioning

2.4.1 - Quick commissioning in open loop flux vector control mode 📖

With the drive powered down, make sure that:

• Terminals SDI1 and SDI2 are connected for performing the power module self-test (see **17.03**).
• The run command is not enabled.
• The motor is connected.

↓

Power up the drive

• In read mode (page 2 of the configuration interface), the operating status displays "DISABLED".
• If the drive trips, refer to Section 7 "TRIPS – DIAGNOSTICS".

↓

Control mode selection

• In parameter setting mode, select "Basic set up" (Section 2.2.3.1).
• Check that **00.13** = OPEN LOOP. If not, return to factory settings:
  00.45 = 50 Hz HIGH or LOW for a 400 V/50 Hz supply or 60 Hz HIGH or LOW for a 460 V/60 Hz supply
  (**00.45** automatically returns to DISABLED after a few seconds).

↓

Enter the main parameters

• **00.02**: Maximum reference clamp (in rpm).
• **00.03** and **00.04**: Acceleration rate 1 and deceleration rate 1 (in sec per 1000 rpm, factory setting).
• **00.28**: Set to CTP if a motor sensor is wired to ADI3, otherwise keep **00.28** = 0-10V.

⚠ • **Before setting the maximum speed, check that the motor and the machine can withstand it.**

↓

Enter the motor parameters to be taken from the nameplate

• **00.06**: MOTOR RATED CURRENT (A).
• **00.07**: MOTOR RATED SPEED (rpm).
• **00.08**: MOTOR RATED VOLTAGE (V).
Observe the connection used (star or delta).

• **00.09**: RATED POWER FACTOR.
• **00.10**: MOTOR RATED FREQUENCY (Hz).
• **00.11**: NUMBER OF MOTOR POLES.

↓

Autotuning, stationary

Measurement of motor characteristics (stator resistance and voltage offset).
The magnetising current is calculated using data on the motor nameplate.

• **Make sure that the motor is stopped, and then start autotuning.**

• **00.42** = STATIONARY
• Enable the drive (connect terminals SDI1 and SDI2).
• Give a run forward or reverse command (with factory settings, close DI4 or DI5).
• Check that **00.42** = Off (autotuning complete).
• Remove the run command and disable the drive.

↓

The drive is ready for operation or waiting for additional parameter settings.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4.2 - Quick commissioning for induction motor in closed loop flux vector control mode ▣

(To manage a PTC sensor, please refer to MD-Encoder installation sheet).

With the drive powered down, make sure that:

• Terminals SDI1 and SDI2 are connected for performing the power module self-test (see **17.03**).
• The run command is not enabled.
• The motor is connected.
• The MD-Encoder option is installed and the encoder feedback is connected correctly.
• Check the position of the switch on the MD-Encoder option according to the encoder supply (5 V or 15 V).

↓

Power up the drive

• In read mode (page 2 of the configuration interface), the operating status displays "DISABLED".
• If the drive trips, refer to Section 7 "TRIPS – DIAGNOSTICS".

↓

Control mode selection

• In parameter setting mode, select "Basic set up" (Section 2.2.3.1).
• Return to factory settings: **00.45** = 50 Hz HIGH or LOW for a 400 V/50 Hz supply or 60 Hz HIGH or LOW for a 460 V/60 Hz supply (**00.45** automatically returns to DISABLED after a few seconds).
• Enter **00.13** = CL LP Vector.

↓

Enter the main parameters

• **00.02**: MAXIMUM SPEED (in rpm).
• **00.03** and **00.04**: ACCELERATION RATE 1 and DECELERATION RATE 1 (in sec per 1000 rpm, factory setting).

⚠ • **Before setting the maximum speed, check that the motor and the machine can withstand it.**

↓

Enter the motor parameters to be taken from the nameplate

• **00.06**: MOTOR RATED CURRENT (A).
• **00.07**: MOTOR RATED SPEED (rpm).
• **00.08**: MOTOR RATED VOLTAGE (V).
Observe the connection used (star or delta).

• **00.09**: RATED POWER FACTOR.
• **00.10**: MOTOR RATED FREQUENCY (Hz).
• **00.11**: NUMBER OF MOTOR POLES.

↓

YES ◁——— Can motor be uncoupled? ———▷ NO

Autotuning, rotating

Measurement of motor characteristics (stator resistance, voltage offset, magnetising current, leakage inductance and power factor).
This mode allows optimum performance to be obtained, but the motor must operate at no load.

⚠ • **Make sure that the motor is stopped and uncoupled from the load, and then start autotuning.**
• **If there is brake, make sure it is released (reactivate the brake after autotuning).**
• **Regardless of the reference and direction of rotation requested, the autotuning procedure drives the motor clockwise at 2/3 of its rated speed. Make sure there is no danger to personnel and equipment.**
• **Once the procedure is complete, the motor will stop automatically in freewheel mode.**
• **The procedure can be interrupted at any time by giving a stop command, pressing the "STOP" button on the configuration interface (see Section 2.2.6 STOP function) or opening the disable circuit.**

• **00.42** = Rotating
• Enable the drive (connect terminals SDI1 and SDI2).
• Give a run forward or reverse command (with factory settings, close DI4 or DI5).
• The motor starts to run.
• Wait until it has completely stopped and check that **00.42** = Off (autotuning complete).
• Remove the run command and disable the drive.

Autotuning, stationary

Measurement of motor characteristics (stator resistance and voltage offset).
The magnetising current is calculated using data on the motor nameplate.

• **Make sure that the motor is stopped, and then start autotuning.**

• **00.42** = Stationary
• Enable the drive (connect terminals SDI1 and SDI2).
• Give a run forward or reverse command (with factory settings, close DI4 or DI5).
• Check that **00.42** = Off (autotuning complete).
• Remove the run command and disable the drive.

↓

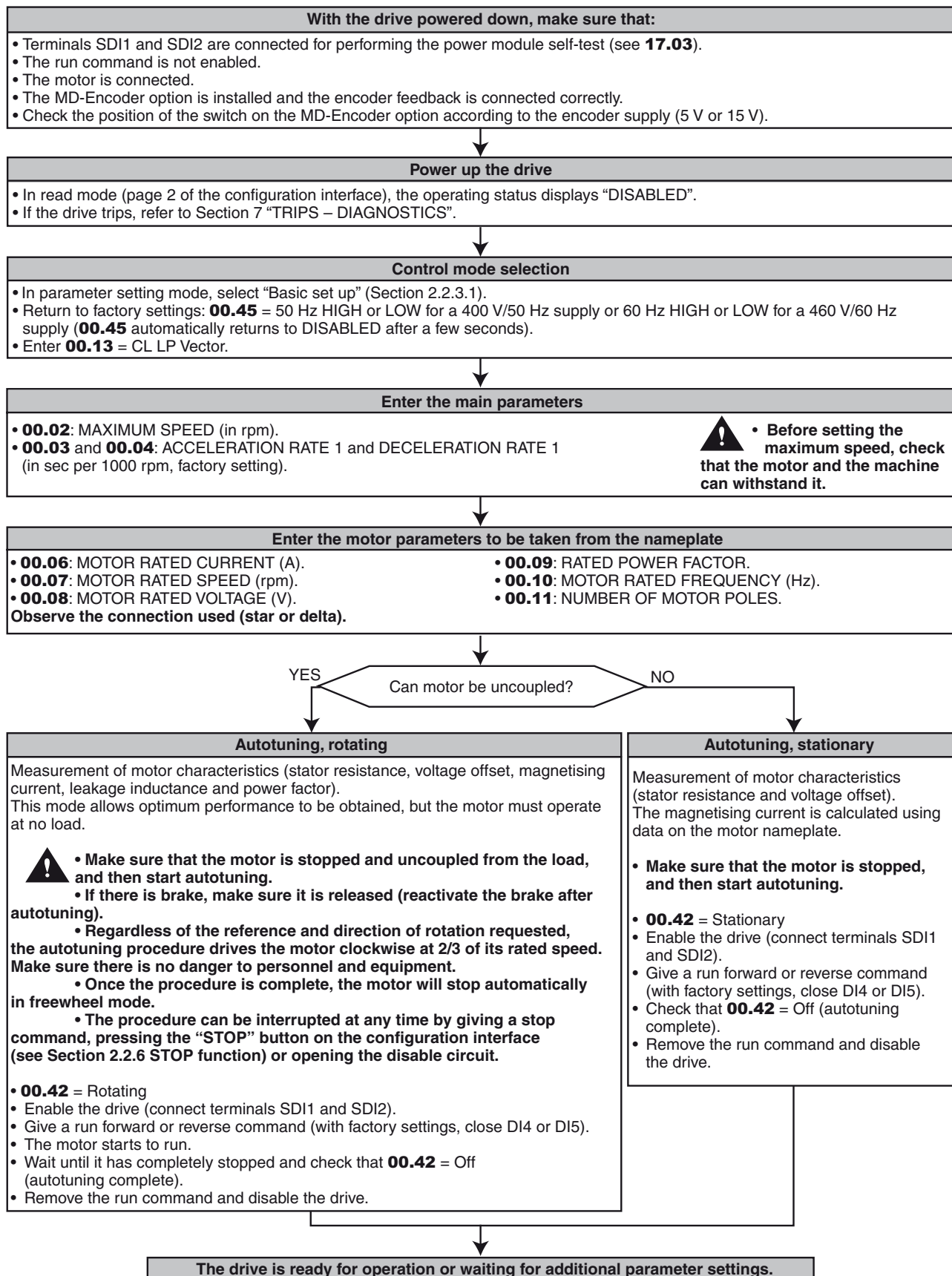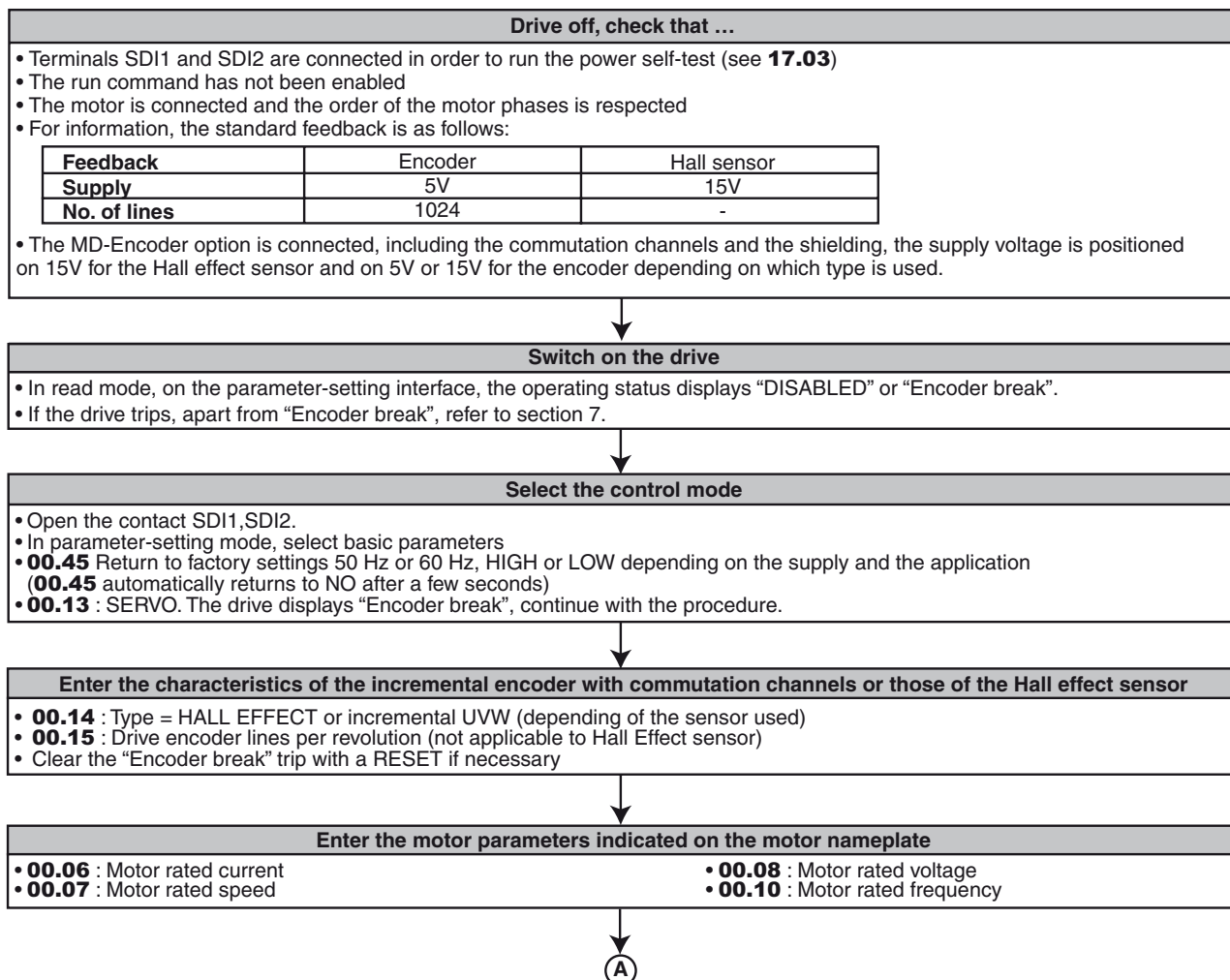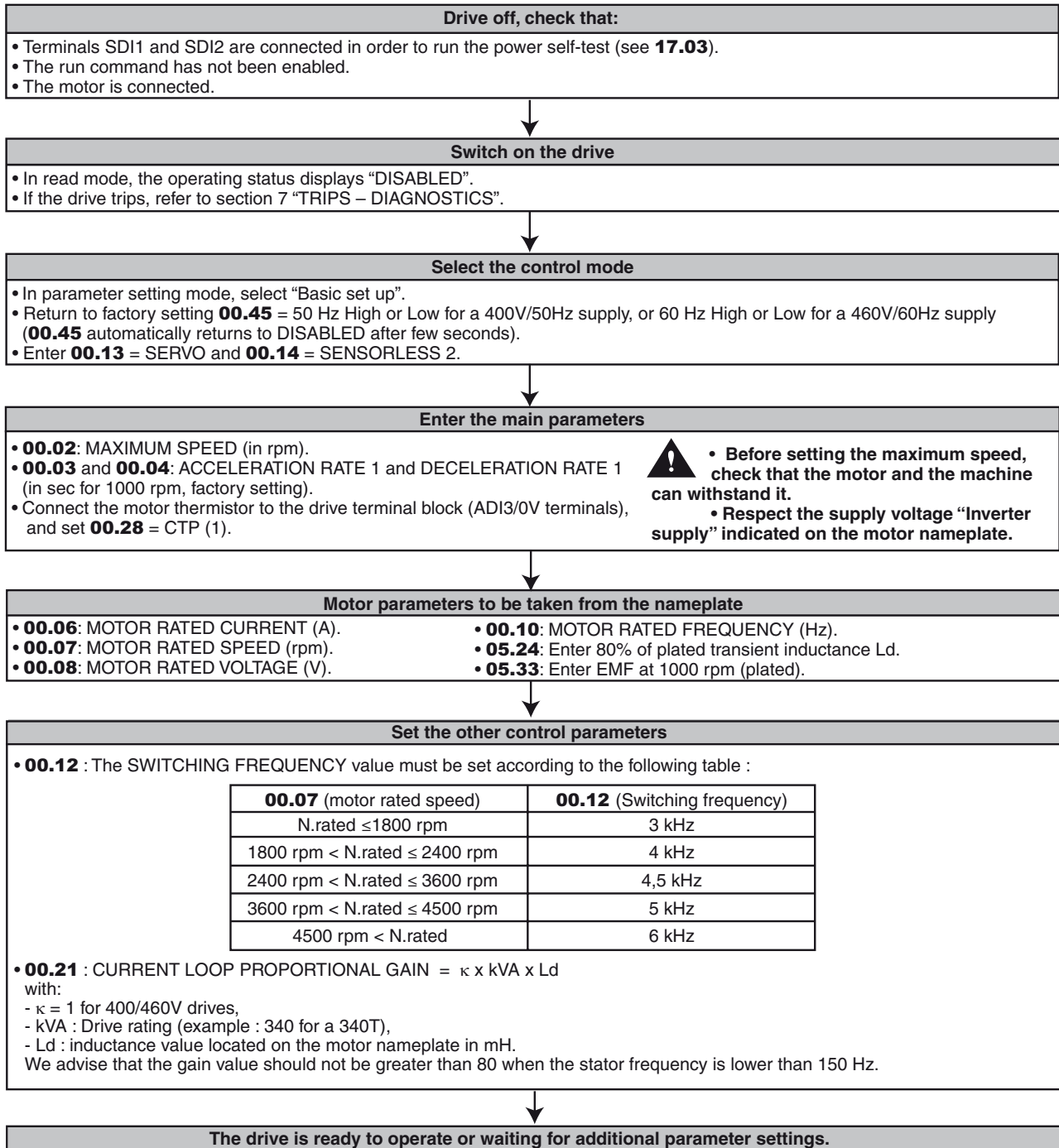### The drive is ready for operation or waiting for additional parameter settings.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4.3 - Quick commissioning for an LSRPM motor with feedback via encoder with commutation channels or Hall effect sensor, controlled by a POWERDRIVE MD ◼▸

(To manage a PTC sensor, please refer to MD-Encoder installation sheet).

Drive off, check that …
• Terminals SDI1 and SDI2 are connected in order to run the power self-test (see **17.03**)
• The run command has not been enabled
• The motor is connected and the order of the motor phases is respected
• For information, the standard feedback is as follows:

Feedback	Encoder	Hall sensor
Supply	5V	15V
No. of lines	1024	-

• The MD-Encoder option is connected, including the commutation channels and the shielding, the supply voltage is positioned on 15V for the Hall effect sensor and on 5V or 15V for the encoder depending on which type is used.

↓

Switch on the drive
• In read mode, on the parameter-setting interface, the operating status displays "DISABLED" or "Encoder break".
• If the drive trips, apart from "Encoder break", refer to section 7.

↓

Select the control mode
• Open the contact SDI1,SDI2.
• In parameter-setting mode, select basic parameters
• **00.45** Return to factory settings 50 Hz or 60 Hz, HIGH or LOW depending on the supply and the application (**00.45** automatically returns to NO after a few seconds)
• **00.13** : SERVO. The drive displays "Encoder break", continue with the procedure.

↓

Enter the characteristics of the incremental encoder with commutation channels or those of the Hall effect sensor
• **00.14** : Type = HALL EFFECT or incremental UVW (depending of the sensor used)
• **00.15** : Drive encoder lines per revolution (not applicable to Hall Effect sensor)
• Clear the "Encoder break" trip with a RESET if necessary

↓

Enter the motor parameters indicated on the motor nameplate	
• **00.06** : Motor rated current	• **00.08** : Motor rated voltage
• **00.07** : Motor rated speed	• **00.10** : Motor rated frequency

↓

(A)

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

(A)

Enter the other motor and control parameters

• **00.02** : Max. speed < 140% of **00.07**
• **00.12** : The switching frequency value must be set according to the following table:

00.07 (Motor rated speed)	**00.12** (Switching frequency)
N.rated ≤1800 rpm	3 kHz
1800 rpm < N.rated ≤ 2400 rpm	4 kHz
2400 rpm < N.rated ≤ 3600 rpm	4,5 kHz
3600 rpm < N.rated ≤ 4500 rpm	5 kHz
4500 rpm < N.rated	6 kHz

⚠ • **Before setting the maximum speed, check that the motor and the machine can withstand it.**
• **Respect the supply voltage "Inverter supply" indicated on the motor nameplate.**

• **00.21** : CURRENT LOOP PROPORTIONAL GAIN = κ x kVA x Ld
  with: - κ = 1 for 400/460V drives,
      - kVA : Drive rating (example : 340 for a 340T),
      - Ld : inductance value located on the motor nameplate in mH.
The recommended gain value should not be greater than 80 when the stator frequency is lower than 150 Hz.

YES ⟵ ◇ Possible to uncouple the motor? ⟶ NO

Autotuning with rotation

Measurement of the phase angle for the encoder or Hall effect sensor (**00.17**).

⚠ • **Check that the motor is stopped and has been uncoupled from the load, then continue with autotuning.**
• **If a brake is present, check that it has been released (reactivate the brake after autotuning).**
• **Regardless of the required reference and direction of rotation, the autotuning procedure causes the motor to run at very low speed.**
Check that there is no danger to people and equipment.
• **Once the procedure is complete, the motor stops automatically.**
• **The procedure can be interrupted at any time by sending a stop command, pressing the "STOP" button on the parameter-setting interface (see STOP section 2.2.6) or opening the disable circuit.**

• **00.42** : With rotation.
• Enable the drive (link terminals SDI1 - SDI2).
• Give a run forward command or run reverse command (in factory settings, close DI4 or DI5).
• The motor starts to turn. Wait until it stops completely and check that **00.42** = NO (autotuning complete).
• Remove the run command, disable the drive and check any changes in the value of **00.17**, **05.17**, **05.24**.

No autotuning

• Enter the encoder phase angle (α) manually in **00.17** , located on the motor nameplate.

Optimising performance

• Couple the load
• Enable the drive (link terminals SDI1 - SDI2).
• Start the machine with no load and then on load, if necessary re-adjust the ramps (**00.03**, **00.04**) then the speed controller gains via **00.18** (increase the factory settings in proportion with the inertia applied to the motor shaft), **00.19** and **00.16**.

The drive is ready to operate, or waiting for additional parameter settings.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4.4 - Quick commissioning for the control of an LSRPM or LSHPM motor in sensorless mode ■

Drive off, check that:
• Terminals SDI1 and SDI2 are connected in order to run the power self-test (see **17.03**). • The run command has not been enabled. • The motor is connected.

↓

Switch on the drive
• In read mode, the operating status displays "DISABLED". • If the drive trips, refer to section 7 "TRIPS – DIAGNOSTICS".

↓

Select the control mode
• In parameter setting mode, select "Basic set up". • Return to factory setting **00.45** = 50 Hz High or Low for a 400V/50Hz supply, or 60 Hz High or Low for a 460V/60Hz supply (**00.45** automatically returns to DISABLED after few seconds). • Enter **00.13** = SERVO and **00.14** = SENSORLESS 2.

↓

Enter the main parameters
• **00.02**: MAXIMUM SPEED (in rpm). • **00.03** and **00.04**: ACCELERATION RATE 1 and DECELERATION RATE 1 (in sec for 1000 rpm, factory setting). • Connect the motor thermistor to the drive terminal block (ADI3/0V terminals), and set **00.28** = CTP (1).   ⚠   **• Before setting the maximum speed, check that the motor and the machine can withstand it.** **• Respect the supply voltage "Inverter supply" indicated on the motor nameplate.**

↓

Motor parameters to be taken from the nameplate
• **00.06**: MOTOR RATED CURRENT (A).   • **00.10**: MOTOR RATED FREQUENCY (Hz). • **00.07**: MOTOR RATED SPEED (rpm).   • **05.24**: Enter 80% of plated transient inductance Ld. • **00.08**: MOTOR RATED VOLTAGE (V).   • **05.33**: Enter EMF at 1000 rpm (plated).

↓

Set the other control parameters
• **00.12** : The SWITCHING FREQUENCY value must be set according to the following table :

00.07 (motor rated speed)	**00.12** (Switching frequency)
N.rated ≤1800 rpm	3 kHz
1800 rpm < N.rated ≤ 2400 rpm	4 kHz
2400 rpm < N.rated ≤ 3600 rpm	4,5 kHz
3600 rpm < N.rated ≤ 4500 rpm	5 kHz
4500 rpm < N.rated	6 kHz

• **00.21** : CURRENT LOOP PROPORTIONAL GAIN $= \kappa \times kVA \times Ld$
  with:
  - κ = 1 for 400/460V drives,
  - kVA : Drive rating (example : 340 for a 340T),
  - Ld : inductance value located on the motor nameplate in mH.
We advise that the gain value should not be greater than 80 when the stator frequency is lower than 150 Hz.

↓

The drive is ready to operate or waiting for additional parameter settings.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4.5 - Commissioning using the user menu (menu 0)

2.4.5.1 - List of parameters

▣ : V/F open loop flux vector control mode (see **00.13**).
▣ : Servo or closed loop flux vector control mode (see **00.13**).
Ico : Continuous output current.

Parameter	Name	Address	Mode	Adjustment range	Factory setting
List of parameters 00.01 to 00.45					
00.01	MINIMUM REFERENCE CLAMP	**01.07**	▣ ▣	0 to **00.02** rpm	0 rpm
00.02	MAXIMUM REFERENCE CLAMP	**01.06**	▣ ▣	0 to 32000 rpm	1500 rpm
00.03	ACCELERATION RATE 1	**02.11**	▣ ▣	0.1 to 3200.0 s/1000 rpm, 100 rpm	20.0 s/1000 rpm
00.04	DECELERATION RATE 1	**02.21**	▣ ▣	0.1 to 3200.0 s/1000 rpm, 100 rpm	20.0 s/1000 rpm
00.05	REFERENCE SELECTOR	**01.14**	▣ ▣	Term. inputs, Analog 1, Analog 2, Preset, Keypad	Term. inputs
00.06	MOTOR RATED CURRENT	**05.07**	▣ ▣	0 to Ico (A)	(depends on the rating, refer to section 5.6.3)
00.07	MOTOR RATED SPEED	**05.08**	▣ ▣	1 to 32000 rpm	(depends on the rating, refer to section 5.6.3)
00.08	MOTOR RATED VOLTAGE	**05.09**	▣ ▣	0 to 999 V	400 V
00.09	RATED POWER FACTOR	**05.10**	▣ ▣	0.00 to 1.00	0.85
00.10	MOTOR RATED FREQUENCY	**05.06**	▣ ▣	0.0 to 999.9 Hz	50.0 Hz
00.11	NUMBER OF MOTOR POLES	**05.11**	▣ ▣	Automatic, 2 Poles, 4 Poles, 6 Poles, 8 Poles, 10 Poles, 12 Poles, 14 Poles, 16 Poles	Automatic
00.12	MAXIMUM SWITCHING FREQUENCY	**05.18**	▣ ▣	1,5 - 2 - 2.5 - 3 - 3.5 - 4 - 4.5 - 5 - 5.5 - 6 6.5 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 kHz	3 kHz
00.13	USER DRIVE MODE	**11.31**	▣ ▣	OPEN LOOP, CL LP Vector, SERVO, REGEN, Syn VS REGEN, Asy VS REGEN, CONV DC/DC	OPEN LOOP
00.14	OPEN LOOP MODE SELECT	**05.14**	▣	RS: EACH RUN, RS: NO Mes., RS: LINEAR V/F, RS: 1st RUN, RS: POWER UP, RS: V/F SQUARE	RS: NO Mes.
	ENCODER TYPE	**03.38**	▣	INCREMENTAL, Increm. FD, U, V, W only, Increm. UVW, HALL EFFECT, SENSORLESS 1 to 5, RESOLVER	INCREMENTAL
00.15	LOW FREQUENCY VOLTAGE BOOST	**05.15**	▣	0.0 to 25.0%	1.0%
	ENCODER LINES PER REVOLUTION	**03.34**	▣	0 to 32000 lines/revolution	1024 lines/revolution

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Variable speed drive
PARAMETER SETTING INTERFACE

Parameter	Name	Address	Mode	Adjustment range	Factory setting
00.16	V TO F SELECT	05.13		Linear, Dynamic	Linear
	DRIVE ENCODER FILTER	03.42		0 to 10	3
00.17	ENCODER PHASE ANGLE	03.25		0.0 to 359.9°	0.0°
00.18	SPEED LOOP PROPORTIONAL GAIN (Kp1)	03.10		0 to 32000	200
00.19	SPEED LOOP INTEGRAL GAIN (Ki1)	03.11		0 to 32000	100
00.20	CURRENT DEMAND FILTER	04.12		0 to 10	2
00.21	CURRENT LOOP PROPORTIONAL GAIN	04.13		0 to 250	40
00.22	START STOP LOGIC SELECT	06.04		Latched Run/Stop, Pulsed Run/Stop, Run-Fwd/Rev, Controlled Run/Stop	Controlled Run/Stop
00.23	RUN/STOP SOURCE	06.43		Terminals, Fieldbus, NOT ACTIV, LCD Keypad	Terminals
00.24	SECURE DISABLE SELECT	08.10		Drive enable; Secur. disab.	Secur. disab.
00.25	ANALOG INPUT 1 MODE	07.06		0-20 mA, 20-0 mA, 4-20 trip, 20-4 trip, 4-20 no trip, 20-4 no trip, 0-10 V, +/-10V	+/-10V
00.26	ANALOG/DIGITAL INPUT 2 MODE	07.11		0-20 mA, 20-0 mA, 4-20 trip, 20-4 trip, 4-20 no trip, 20-4 no trip, 0-10 V, +/-10V, Digital in	4-20 no trip
00.27	Not used				
00.28	ANALOG/DIGITAL INPUT 3 MODE	07.15		0-10 V, CTP, Digital in	0-10 V
00.29	AO1 ANALOG OUTPUT MODE	07.21		+/-10V, 0-20mA, 4-20mA	4-20mA
00.30	AO2 ANALOG OUTPUT MODE	07.24		+/-10V, 0-20mA, 4-20mA	+/-10V
00.31	Not used				
00.32	DIO2 INPUT DESTINATION OR OUTPUT SOURCE	08.22		00.00 to 21.51	01.45
00.33	Not used				
00.34	DIO3 INPUT DESTINATION OR OUTPUT SOURCE	08.23		00.00 to 21.51	01.41
00.35	DIGITAL INPUT 4 DESTINATION	08.24		00.00 to 21.51	06.30
00.36	DIGITAL INPUT 5 DESTINATION	08.25		00.00 to 21.51	06.32
00.37	LOGIC TYPE FOR DIGITAL IN	08.29		NEGATIVE, POSITIVE	POSITIVE
00.38	BIPOLAR REFERENCE ENABLE	01.10		Pos. only, Pos. and Neg.	Pos. only
00.39	JOG REFERENCE	01.05		0 to 00.02 rpm	45 rpm
00.40	DECELERATION RAMP MODE SELECT	02.04		Fast, Standard, Standard +, Fast +	Standard

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

Parameter	Name	Address	Mode	Adjustment range	Factory setting
00.41	STOP MODE	06.01		Coast, Ramp, Ramp + DC, DC to 0, Timed DC	Ramp
00.42	AUTOTUNE	05.12		Off, Stationary, Rotating	Off
00.43	POWER MODULE AUTOTEST	17.03		NO, YES	YES
00.44	PARAMETER CLONING	11.42		Disabled, Key to drive, Drive to key, Auto key mem	Disabled
00.45	FACTORY SETTINGS	11.43		DISABLED, 50Hz HIGH, 60Hz HIGH 50Hz LOW Trq, 60Hz LOW Trq, Mot.EXCLUDED	Disabled
The 10 parameters 00.46 to 00.55 are assignable parameters (see 11.01 to 11.10, section 5.12.2).					
00.46	PRESET REFERENCE 1	01.21		± 00.02 rpm	0 rpm
00.47	PRESET REFERENCE 2	01.22		± 00.02 rpm	0 rpm
00.48	PRESET REFERENCE 3	01.23		± 00.02 rpm	0 rpm
00.49	PRESET REFERENCE 4	01.24		± 00.02 rpm	0 rpm
00.50	CATCH A SPINNING MOTOR	06.09		DISABLED, 2 DIR, CLOCKWISE, C/CLOCKWISE, 2 Dir Reman.	DISABLED
00.51	MAINS LOSS MODE	06.03		NO DETECTION, FULL STOP, DELAYED STOP	NO DETECTION
00.52	AT SPEED THRESHOLD	03.06		0 to 500 rpm	30 rpm
00.53	DELAY BEFORE MAINS LOSS	06.62		0.00 to 200.00 s	0.00 s
00.54	Not used				
00.55	No. OF AUTORESET ATTEMPTS	10.34		None, 1 to 5	None
The 10 parameters 00.56 to 00.65 are assignable user parameters (see 11.11 to 11.20 § 5.12.2)					
00.56	Rotation direction	05.59		Clockwise, Counter clockwise	Clockwise
00.57 to 00.65	Not used in factory settings (to assign these parameters and make them active, see section 2.2.3.3.1)				

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

2.4.5.2 - Explanation of parameters

00.01 : **Minimum reference clamp**
Adjustment range : 0 to **00.02** rpm
Factory setting : 0
In unipolar mode, defines the minimum speed (inactive in bipolar mode).
CAUTION:
• **This parameter is inactive during jog operation.**
• **If the value of 00.02 is lower than that of 00.01, the value of 00.01 is automatically changed to the new value of 00.02.**

00.02 : **Maximum reference clamp**
Adjustment range : 0 to 32000 rpm
Factory setting : **Eur = 1500 rpm**
  USA = 1800 rpm

⚠ • **Before setting the maximum reference clamp, check that the motor and the driven machine can withstand it.**
Defines the maximum speed in both directions of rotation.

00.03 : **Acceleration rate 1**
Adjustment range : 0.1 to 3200.0 s/1000 rpm *
Factory setting : 20.0 s/1000 rpm
Sets the time for acceleration from 0 to 1000 rpm *.

$$00.03 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$
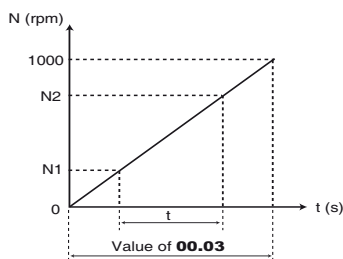
00.04 **Deceleration rate 1**
Adjustment range : 0.1 to 3200.0 s/1000 rpm *
Factory setting : 20.0 s/1000 rpm
Sets the time for deceleration from 1000 rpm * to 0.

$$00.04 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$
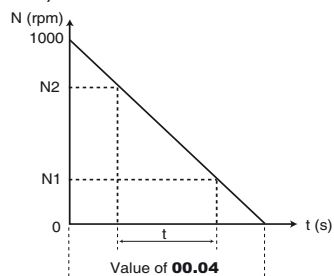
*** Note:** The reference speed can be changed from 1000 to 100 rpm in parameter **02.56**. This makes it possible to multiply the acceleration and deceleration times by 10.

00.05 : **Reference selector**
Adjustment range : Term. inputs (0),
  Analog 1 (1),
  Analog 2 (2),
  Preset (3),
  Keypad (4)
Factory setting : Terminals (0)
Term. inputs (0): In factory setting mode, the speed reference is selected by combining digital inputs DIO2 and DIO3, as follows:

DIO2 state	DIO3 state	Speed reference selection
0	0	Analog reference AI1
0	1	Analog reference ADI2
1	0	Preset reference 2
1	1	Preset reference 2

To fix the value of preset reference 2, set **00.47**.
To connect the corresponding control, refer to the "Factory configuration of control terminal blocks" section in the drive installation manual.

Analog 1 (1): In factory setting mode, the speed reference is selected via digital input DIO2, as follows:

DIO2 state	Speed reference selection
0	Analog reference AI1
1	Preset reference 2

Analog 2 (2): In factory setting mode, the speed reference is selected via digital input DIO2, as follows:

DIO2 state	Speed reference selection
0	Analog reference ADI2
1	Preset reference 2

Preset (3): The speed reference comes from preset references.
In order to be able to select one of 4 preset references via 2 digital inputs DIO2 and DIO3, set the following parameters:
- **00.34** = **01.46**,
- **00.46** to **00.49** at the desired preset speed (rpm).

DIO2 state	DIO3 state	Speed reference selection
0	0	Preset reference 1
0	1	Preset reference 2
1	0	Preset reference 3
1	1	Preset reference 4

Keypad (4): The speed reference comes from the configuration interface.

00.06 : **Motor rated current**
Adjustment range : 0 to I_{co} (A)
Factory setting : Motor rated current corresponding to the drive rating (see section 5.6.3)
This is the value of the motor rated current indicated on the nameplate. The overload is calculated from this value.

00.07 : **Motor rated speed**
Adjustment range : 1 to 32000 rpm
Factory setting : Motor rated speed corresponding to the drive rating (see section 5.6.3)
This is the on-load speed of the motor shown on the nameplate.
Note: This value must take into account the slip of the asynchronous motor with respect to the synchronous speed. Under no circumstances must this slip be negative.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

00.08 : **Motor rated voltage**
Adjustment range : 0 to 999 V
Factory setting : **Eur: 400 V**, USA: 460 V
Enter the rated voltage shown on the nameplate taking account of the normal power supply conditions.

00.09 : **Rated power factor**
Adjustment range : 0 to 1.00
Factory setting : 0.85
The power factor is measured automatically during a level 2 autotune phase (see **00.42**) and set in this parameter.
If it has not been possible to carry out the autotune procedure, enter the Cos φ value indicated on the motor nameplate.

00.10 : **Motor rated frequency**
Adjustment range : 0 to 999.9 Hz
Factory setting : **Eur = 50.0 Hz**
: USA = 60.0 Hz
This is the point at which motor operation changes from constant torque to constant power.
In standard operation, it is the frequency indicated on the motor nameplate.

00.11 : **Number of motor poles**
Adjustment range : Auto (0), 2 Poles (1), 4 Poles (2),
6 Poles (3), 8 Poles (4), 10 Poles (5),
12 Poles (6), 14 Poles (7), 16 Poles (8)
Factory setting : Auto (0)
When this parameter is at 0 (Automatic), the drive automatically calculates the number of poles according to the rated speed (**00.07**) and the rated frequency (**00.10**). However, the value can be entered directly
in accordance with the table below:

Number of poles	00.11
2	1
4	2
6	3
8	4
10	5
12	6
14	7
16	8

00.12 : **Maximum switching frequency**
Adjustment range : 1,5 kHz to 14 kHz (see table below)
Factory setting : 3 kHz (2)
Sets the PWM switching frequency.

Frequency	00.12	Frequency	00.12
2 kHz	0	6.5 kHz	9
2.5 kHz	1	7 kHz	10
3 kHz	**2**	8 kHz	11
3.5 kHz	3	9 kHz	12
4 kHz	4	10 kHz	13
4.5 kHz	5	11 kHz	14
5 kHz	6	12 kHz	15
5.5 kHz	7	13 kHz	16
6 kHz	8	14 kHz	17
		1,5 kHz	18

Note : For frequencies higher than 6kHz, phase contact LEROY-SOMER.

CAUTION:
A high switching frequency reduces the magnetic noise, however it increases the drive temperature rise.
Refer to the installation manual to determine the derating of the drive according to the frequency.

00.13 : **User drive mode**
Adjustment range : OPEN LOOP (0),
OPEN LOOP (1),
CL LP Vector (2),
SERVO (3),
REGEN (4),
Syn VS REGEN (5),
Asy VS REGEN (6),
Conv DC/DC (7)
Factory setting : OPEN LOOP (0)
The choice of operating mode can only be made
when the drive is stopped.

OPEN LOOP (0 and 1): Asynchronous motor controlled in open loop mode (see also parameter 00.14).

CL LP Vector (2): Asynchronous motor controlled in closed loop mode

(see also parameter **00.14**).

SERVO (3): Servo or synchronous motor controlled in closed loop mode (see also parameter **00.14**).

REGEN (4): Reversible mode.

Syn VS REGEN (5): Reversible mode with variable speed synchronous generator.

Asy VS REGEN (6): Reversible mode with variable speed asynchronous generator.

Conv DC/DC (7): Get in touch with your usual LEROY-SOMER contact.

Note: A change from open loop mode (**00.13** = OPEN LOOP (0 or 1) to closed loop mode (**00.13** = CL LP Vector (2) or SERVO (3)), or vice versa, causes a return to factory settings of parameters **12.45** Brake apply frequency or speed threshold, and **12.46** Magnetisation time delay/speed threshold.

CAUTION:
If the mode is changed with a fieldbus option, reset the option (Pr 15.32 = ON).

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00.14 : **Open loop mode select (■)**
Encoder type (■)

■ :
Adjustment range : RS: EACH RUN (0),
RS: NO Mes. (1),
LINEAR V/F (2),
RS: 1st RUN (3),
RS: POWER UP (4),
V/F SQUARE (5)
Factory setting : RS: NO Mes. (1)
Determines the open loop control mode.

Modes 0, 1, 3 or 4 are used in flux vector control. The difference between these modes is the method used to identify the motor parameters, in particular the stator resistance. As these parameters vary with temperature and are essential for obtaining optimum performance, the machine cycle must be taken into account for selecting the most appropriate mode.

Modes 2 and 5 correspond to a V/F ratio control mode. This ratio is linear in mode 2 and square in mode 5.

RS: EACH RUN (0): The stator resistance and voltage offset are measured each time the drive receives a run command. These measurements are only valid if the machine is stopped and totally defluxed. The measurement is not taken when the run command is given less than 2 seconds after the previous stop. This is the most effective flux vector control mode. However, the operating cycle must be compatible with the 2 seconds required between a stop command and a new run command.

RS: NO Mes. (1): The stator resistance and voltage offset are not measured. This mode is of course the least effective. It should only be used when mode 0 is incompatible with the operating cycle.

LINEAR V/F (2): Voltage-frequency ratio with fixed boost adjustable via parameters **00.15** and **00.08**.
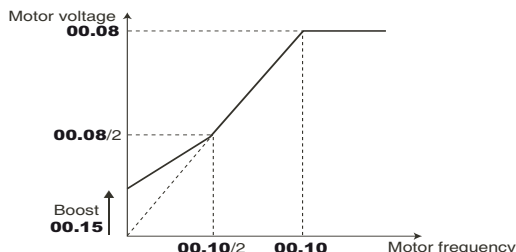
CAUTION:
Use this mode to control several motors.

RS: 1st RUN (3): The stator resistance and voltage offset are measured the first time the drive is enabled (drive output active).

RS: POWER UP (4): The stator resistance and voltage offset are measured the first time the drive is enabled (drive output active) following each power-up.

V/F SQUARE (5): Square law characteristic.
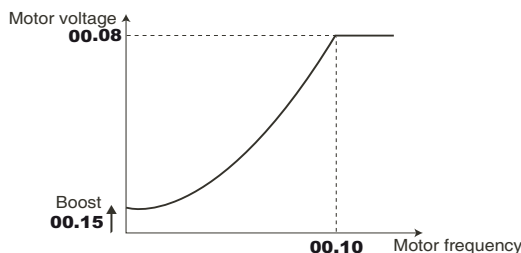
⚠ **• In mode 4, a voltage is briefly applied to the motor. For safety reasons, no electrical circuit must be accessible once the drive has been powered up.**

■:
Adjustment range : INCREMENTAL (0),
Increm. FD (1), UVW only (2),
Increm. UVW (3),
HALL EFFECT (4),
SENSORLESS 1 to 5 (5 to 9),
RESOLVER (10)
Factory setting : INCREMENTAL (0)
INCREMENTAL (0): Quadrature incremental encoder.

Increm. FD (1): Incremental encoder with Frequency/Direction output.
Function not available in the current version.

UVW only (2): Channels U, V, W only without their complement.

Increm. UVW (3): Incremental encoder with commutation channels.

HALL EFFECT (4): Encoder with 6 lines per pair of poles.

SENSORLESS 1 (5) to SENSORLESS 5 (9): See advanced parameter **03.38**.

RESOLVER (10): Resolver.
The option required for managing the resolver (00.14 = 10) is not available.

CAUTION:
The MD-Encoder option is required for managing incremental encoders with or without commutation channels (00.14 = 0 to 3) and managing Hall effect sensors (00.14 = 4).

00.15 : **Low frequency voltage boost (■)**
Encoder lines per revolution (■)

■:
Adjustment range : 0 to 25.0% of motor Un (**00.08**)
Factory setting : 1.0% motor Un
For operation in V/F mode (**00.14** at V/F (2)), parameter **00.15** is used to overflux the motor at low speed so that it delivers more torque on starting. It is a percentage of the rated motor voltage (**00.08**).
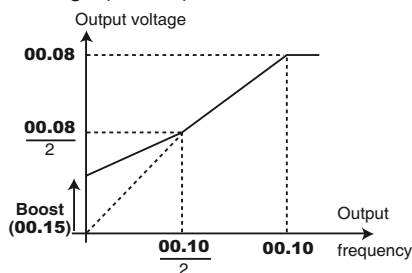
■:
Adjustment range : 0 to 32000 lines per revolution
Factory setting : 1024 lines per revolution
Used to configure the number of lines per encoder revolution. Converts the encoder input into a speed.

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00.16 : **V to F select (■)**
              Drive encoder filter (■)

■:
Adjustment range : Linear (0) or Dynamic (1)
Factory setting : Linear (0)

Linear (0): The V/F ratio is fixed and set by the base frequency (00.10).

Dynamic (1): Dynamic V/F ratio.
Generates a voltage/frequency characteristic which varies with theload. It is for use in quadratic torque applications (pumps/fans/compressors). It can be used in constant torque applications with low dynamics to reduce motor noise.

CAUTION:
00.16 is only active if 00.14 = LINEAR V/F (2).

■:
Adjustment range : 0 to 10
Factory setting : 3
This parameter is used to filter the noise on the speed feedback.
The filter is inactive if **00.16** = 0.

00.17 : **Encoder phase angle (■)**
Adjustment range : 0 to 359.9°
Factory setting : 0.0°
Indicates the result of the phasing test (see **00.42**). It is stored when the drive is powered down and will be modified automatically only after a new phasing test.

⚠ **• The phase angle, where it is known, can be entered manually. Any incorrect value can cause the motor to rotate in the wrong direction or trip the drive.**

00.18 : **Speed loop proportional gain (Kp1) (■)**
Adjustment range : 0 to 32000
Factory setting : 200
Sets the stability of the motor speed in the event of sudden variations in the reference.
Increase the proportional gain until vibration occurs in the motor, then reduce the value by 20 to 30%, checking that the stability of the motor is acceptable in the event of sudden variations in speed, both at no load and on load.

00.19 : **Speed loop integral gain (Ki1) (■)**
Adjustment range : 0 to 32000
Factory setting : 100
Sets the stability of the motor speed on load impact.
Increase the integral gain so that the same speed is obtained on load and at no load in the event of load impact.

00.20 : **Current demand filter (■)**
Adjustment range : 0 to 10
Factory setting : 2
This filter is used to introduce a time constant aimed at reducing any noise generated by the speed loop, such that: time constant = $2^{00.20}$ ms.

00.21 : **Current loop proportional gain**
Adjustment range : 0 to 250
Factory setting : 40
Due to a number of factors internal to the drive, oscillations may occur in the following cases:
- Frequency control with current limiting around the rated frequency and on load impacts.
- Torque control on machines with a low load and around the rated speed.
- On a mains supply break or on a controlled deceleration ramp when control via the DC bus is requested.
To reduce these oscillations, increasing the proportional gain **00.21** is recommended.

00.22 : **Start stop logic select**
Adjustment range : Latched Run/Stop (0), Pulsed Run/Stop (1),
                   Run-Fwd/Rev (2),
                   Controlled Run/Stop (3)
Factory setting : Controlled run/stop (3)
Used to choose one of 4 Run/Stop command and Direction of rotation management modes.

Run no latch (0): Command for FWD/Stop and REV/Stop via stay-put contacts.
Terminal DI4 preset to FWD/Stop.
Terminal DI5 preset to REV/Stop.
On power-up or after a trip reset, if a run command is already selected, the motor starts as soon as the reference appears.

Pulsed Run/Stop (1): Command for Run and Stop via jog contacts.
In this mode, use DIO3 to give the Stop command.
To do this, configure:
- **00.34** = **06.39** (DIO3 assigned as Stop input).
Terminal DI4 preset as Run FWD.
Terminal DI5 preset as Run REV.
If the user wishes to assign DIO1 and DIO2 to other functions, provide stay-put contacts on these inputs.
To change from FWD to REV or vice versa, go via a stop command.

Run-Fwd/Rev (2): Command for Run/Stop via stay-put contact.
In this mode, use DI4 as Run/Stop, and DI5 to give the direction of rotation. To do this, configure:
- **00.35** = **06.34** and **00.36** = **06.33**.

CONTROLLED RUN/STOP (3): Operation is identical to the Latched Run/Stop (0) mode if 00.24 = SECUR. DISAB. (1) (factory setting). To use the specific features of this mode, 00.24 must be set to DRIVE ENABLE (0). In this case, if the drive is powered up with the run command present, the motor does not start. The run command must be cycled for it to have effect. Similarly, upon clearing of a trip, if the run command is present, it is not taken into account. It must be cycled to have effect.

If, in one of these configurations, an input is not used by the application (no Reverse operation for example), the corresponding input can be reassigned using menu 8 (see section 5.9).

Note: Modifications to **00.22** must be made with the drive disabled.

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00.23 : **Run/Stop source**
Adjustment range : TERMINALS (0), FIELDBUS (1),
NOT ACTIV (2), LCD Keypad (3)
Factory setting : TERMINALS (0)

Terminals (0): Commands come from the terminals.

Fieldbus (1): Commands come from the control word (see **06.42** in menu 6, section 5.7).

NOT ACTIV (2): Not used.

LCD Keypad (3): Commands come from the configuration interface.

Note: Modifications to **00.23** must be made with the drive disabled.

CAUTION:
• **The configuration interface Stop key, if enabled, is recognised irrespective of the source of the commands. If a stop is caused by the configuration interface Stop key while the commands are coming from the terminals or the fieldbus (00.23 = TERMINALS (0) or FIELDBUS (1)) and a run command is present, the run command must go back to 0 and then 1 in order to be taken into account.**
• **When the secure disable function is enabled 00.24 = SECUR. DISAB. (1), the value of 00.23 is automatically set to "TERMINALS" (0). Even so, the user can change this value to "LCD KEYPAD" (3) or "FIELDBUS" (1). This will force 00.24 to "DRIVE ENABLE", and only conformity to EN954-1 category 1 will be provided.**

00.24 : **Secure disable select**
Adjustment range : DRIVE ENABLE (0) or
SECUR. DISAB. (1)
Factory setting : SECUR. DISAB. (1)

DRIVE ENABLE (0): The SDI input is used as a simple enabling input.

SECUR. DISAB. (1): The SDI input is used as a secure disable input. In order to conform to safety standard EN954-1 category 3, the drive must be connected in accordance with the recommended diagram in the installation manual supplied with the drive.

Note: Modifications to **00.24** must be made with the SDI1/SDI2 contact open.

⚠ • **The secure disable input function is disabled automatically, 00.24 changes to DRIVE ENABLE (0), when the drive is controlled via the configuration interface or fieldbus, for example, when 00.23 = Fieldbus (1) or LCD KEYPAD (3). Only conformity to EN954-1 category 1 will be provided.**

00.25 : **Analog input 1 mode**
Adjustment range : 0-20 mA (0), 20-0 mA (1),
4-20 trip (2),
20-4 trip (3),
4-20 no trip (4),
20-4 no trip (5), 0-10 V (6),
+/-10 V (7)
Factory setting : +/-10 V (7)
Used to define the type of signal on the AI1 input.

00.25	Description
0	0-20 mA current signal, 0 mA corresponds to the minimum reference
1	20-0 mA current signal, 20 mA corresponds to the minimum reference
2	4-20 mA current signal with detection of signal loss. 4 mA corresponds to the minimum reference
3	20-4 mA current signal with detection of signal loss. 20 mA corresponds to the minimum reference
4	4-20 mA current signal without detection of signal loss. 4 mA corresponds to the minimum reference
5	20-4 mA current signal without detection of signal loss. 20 mA corresponds to the minimum reference
6	0-10 V voltage signal
7	**±10 V voltage signal**

00.26 : **Analog/digital input 2 mode**
Adjustment range : 0-20 mA (0), 20-0 mA (1),
4-20 trip (2),
20-4 trip (3),
4-20 no trip (4),
20-4 no trip (5), 0-10 V (6),
+/-10 V (7), Digital in (8)
Factory setting : 4-20 no trip (4)
Used to define the type of signal on the ADI2 input.

00.26	Description
0	0-20 mA current signal, 0 mA corresponds to the minimum reference
1	20-0 mA current signal, 20 mA corresponds to the minimum reference
2	4-20 mA current signal with detection of signal loss. 4 mA corresponds to the minimum reference
3	20-4 mA current signal with detection of signal loss. 20 mA corresponds to the minimum reference
4	**4-20 mA current signal without detection of signal loss. 4 mA corresponds to the minimum reference**
5	20-4 mA current signal without detection of signal loss. 20 mA corresponds to the minimum reference
6	0-10 V voltage signal
7	±10 V voltage signal
8	The input is configured as a digital input

00.27 : **Not used**

00.28 : **Analog/digital input 3 mode**
Adjustment range : 0-10 V (0), CTP (1), Digital in (2)
Factory setting : 0-10 V (0)
To enable management of the motor PTC sensor, connect the sensor between ADI3 and 0 V, and then configure **00.28** as CTP (1).
Note: The other functions of **00.28** are not used from menu 0.

00.29 : **AO1 analog output mode**
Adjustment range : +/-10V (0), 0-20mA (1), 4-20mA (2)
Factory setting : 4-20mA (2)

+/-10V (0): ±10 V voltage output.

0-20mA (1): 0 to 20 mA current output.

4-20mA (2): 4 to 20 mA current output.
Selection of the type of signal on the analog output (current image).

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00.30 : **AO2 analog output mode**
Adjustment range : +/-10V (0), 0-20mA (1), 4-20mA (2)
Factory setting : +/-10V (0)
+/-10V (0): ±10 V voltage output.

0-20mA (1): 0 to 20 mA current output.

4-20mA (2): 4 to 20 mA current output.
Selection of the type of signal on the analog output (speed image).

00.31 : **Not used**

00.32 : **Digital in/out 2 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.45**: Reference selector
This parameter is used to select the destination of input DIO2.
Any unprotected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed, no assignment is taken into account.
Note: Terminal DIO2 is not used as an output from menu 0.

00.33 : **Not used**

00.34 : **Digital in/out 3 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.41**: Reference selector
This parameter is used to select the destination of input DIO3.
Any unprotected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed, no assignment is taken into account.
Note: Terminal DIO3 is not used as an output from menu 0.

00.35 : **Digital input 4 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **06.30**: Run FWD/Stop
This parameter is used to select the destination of input DI4 and allow it to be assigned a function other than Run FWD/Stop.
Examples of possible assignments:
- **00.35** = **06.33**: FWD/Reverse sequencing bit
- **00.35** = **06.34**: Run/Stop sequencing bit
- **00.35** = **10.33**: Trip reset
Note: Any unprotected "bit" type parameter can be assigned to the input.
If an unsuitable parameter is addressed, no assignment is taken into account.

00.36 : **Digital input 5 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **06.32**: REV/Stop
This parameter is used to select the destination of input DI5 and allow it to be assigned a function other than REV/Stop.
Examples of possible assignments:
- **00.36** = **06.33**: FWD/Reverse sequencing bit
- **00.36** = **06.34**: Run/Stop sequencing bit
- **00.36** = **10.33**: Trip reset
Note: Any unprotected "bit" type parameter can be assigned to the input.
If an unsuitable parameter is addressed, no assignment is taken into account.

00.37 : **Logic type for digital in**
Adjustment range : NEGATIVE (0) or POSITIVE (1)
Factory setting : POSITIVE (1)
This parameter is used to change the polarity of the digital inputs.
NEGATIVE (0): Negative logic.

POSITIVE (1): Positive logic.

00.38 : **Bipolar reference enable**
Adjustment range : Pos.only (0) or
Pos.and Neg. (1)
Factory setting : Pos.only (0)
Pos.only (0): All negative references are treated as zero.

Pos.and Neg. (1): Used for changing the direction of rotation by the reference polarity (which may come from the preset references).

00.39 : **Jog reference**
Adjustment range : 0 to **00.02** rpm
Factory setting : 45 rpm
Operating speed when a jog input is configured and **06.31** = 1.

00.40 : **Deceleration ramp mode select**
Adjustment range : Fast (0), Standard (1),
Standard + (2), Fast + (3)
Factory setting : Standard (1)

Fast (0): Deceleration ramp imposed. If the deceleration ramp which has been set is too fast in relation to the inertia of the load, the DC bus voltage exceeds its maximum value and the drive trips on "DC bus overvoltage".
CAUTION:
Select mode 00.40 = Fast (0) when a braking resistor is being used.

Standard (1): Standard deceleration ramp with automatic extension of the ramp time in order to avoid causing a DC bus overvoltage trip on the drive.

Standard + (2): The drive allows the motor voltage to be increased to up to 1.2 times the rated voltage configured in **00.08** (motor rated voltage), to avoid reaching the maximum DC bus voltage threshold. However, if this is not sufficient, the standard deceleration ramp time is extended, to avoid causing a DC bus overvoltage trip on the drive.
For the same amount of energy, mode (2) enables faster deceleration than mode (1).

Fast + (3): Same as mode (2), but the ramp is imposed.
If the configured ramp is too fast, the drive trips on "DC bus overvoltage".
CAUTION:
In modes (2) and (3), the motor must be capable of tolerating additional losses relating to the increase in voltage at its terminals.

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| 00.41 | **: Stop mode**

Adjustment range : Coast (0), Ramp (1),
Ramp + DC (2), DC to 0 (3),
Timed DC (4)

Factory setting   : Ramp (1)

Coast (0): Freewheel stop.

The power bridge is deactivated as soon as the stop command is given.

The drive cannot receive another run command during the time programmed in **06.63**, the motor demagnetisation time.

After this stopping time, the drive is "ready".

The machine stopping time depends on its inertia.

Ramp (1): Stop on deceleration ramp.
The drive decelerates the motor according to the deceleration mode chosen in parameter 00.40.
One second after the stop, the drive is "ready".
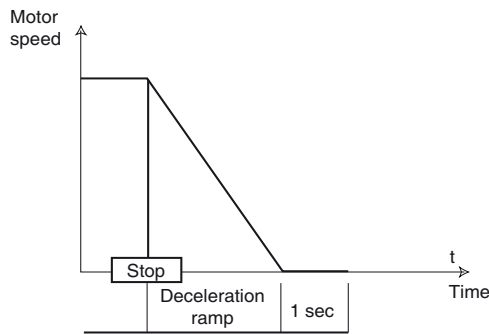
Ramp + DC (2) (■)): Stop on deceleration ramp with DC injection for 1 second.

The drive decelerates the motor according to the deceleration mode chosen in parameter **00.40**.

When zero frequency is reached, the drive injects DC current for 1 second.

The drive is then "ready".
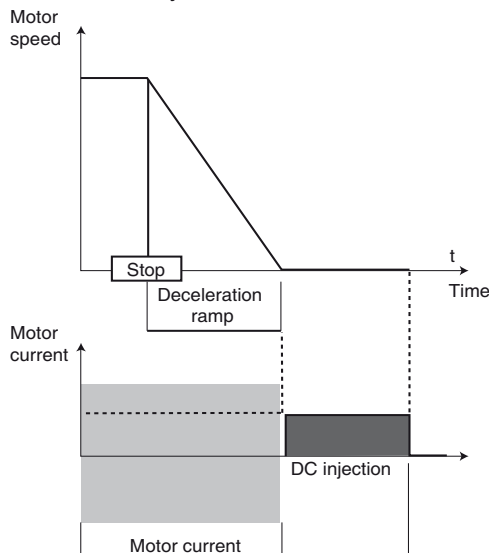
DC to 0 (3) (■)): Stop by DC injection braking, and elimination at zero speed.

The drive decelerates the motor by imposing a low frequency current until it reaches almost zero speed, which the drive detects automatically.

The drive then injects DC current for 1 second. No run command can be taken into account until the drive is "ready".
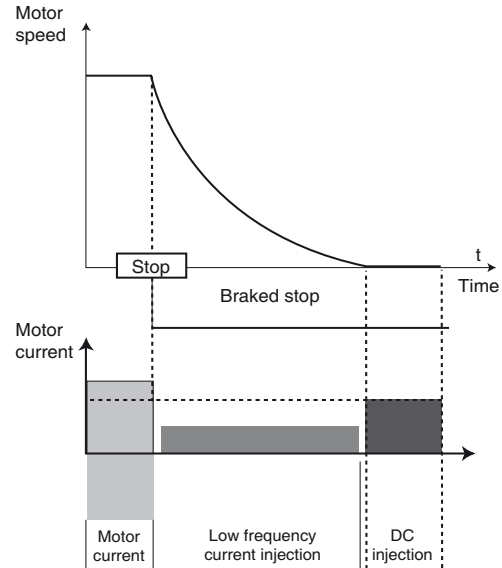
Timed DC (4) (■)): Stop on DC injection with an imposed period of time.

The drive decelerates the motor by imposing a current for 1 second. No run command can be taken into account until the drive is "ready".
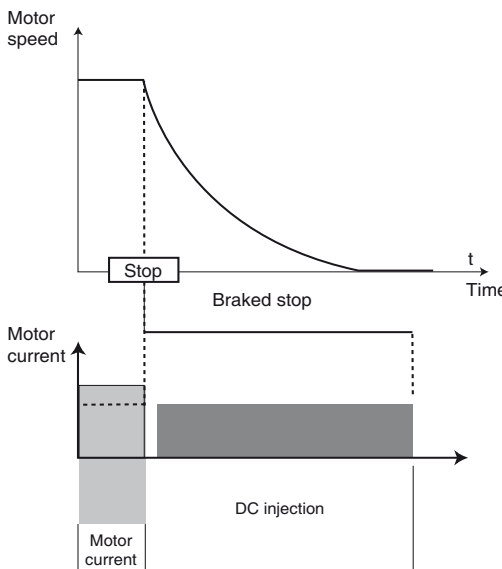
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PARAMETER SETTING INTERFACE

00.42 : Autotune

Adjustment range : Off (0), Stationary (1),
Rotating (2)
Factory setting : Off (0)

⚠️ **• Measurements taken when 00.42 = Rotating (2) must be performed with the motor uncoupled since the drive drives the motor at 2/3 of its rated speed. Check that this operation does not present any safety risks, and that the motor is stopped before the autotune procedure.**

• After modifying the motor parameters, repeat autotuning.

Disabled (0): No autotune

Stationary (1): Measurement of motor characteristics when stopped. This mode is recommended for open loop operation. The stator resistance and voltage offset are stored.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped.
- Enable the drive.
- Give a run command.
Wait until the procedure ends, then disable the drive and remove the run command.
The motor is then ready to operate normally.
Parameter **00.42** returns to 0 as soon as autotuning is complete.

Rotating (2): Measurement of motor characteristics with rotation. This mode is not suitable for open loop operation. The stator resistance, voltage offset and encoder phase angle (■ see **00.17**) are stored. The magnetising current and leakage inductance are used to calculate the power factor **00.09**. This mode is used to obtain optimum performance.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped.
- Enable the drive.
- Give a run command. The motor is driven at low speed, and then performs a freewheel stop when autotuning is complete. Disable the drive and remove the run command.
The motor is then ready to operate normally.
Parameter **00.42** returns to Off (0) as soon as autotuning is complete.

00.43 : Power module autotest

Adjustment range : NO (0) or YES (1)
Factory setting : YES (1)
This self-test is recommended for checking the power components on each power-up. It lasts for less than 5 seconds since, in this instance, the bus is not loaded.

Note: This self-test is possible only for **POWERDRIVE MDS or MD0S** versions (the drive must control the preloading of capacitors on the DC bus).

NO (0): The power self-test has not been enabled.

Enabled (1): Enabling of the power test, which will be performed each time the drive is powered up.

To operate, the secure disable input must be closed.

At the end of the test, if a "Diagnostics" fault appears, read the result in 17.11, and then get in touch with your usual LEROY-SOMER contact.

⚠️ **• Caution, during this test, current is flowing in the motor.**

00.44 : Parameter cloning

Adjustment range : Disabled (0), Key → drive (1),
Drive → key (2),
Auto key mem (3)
Factory setting : Disabled (0)
Disable the drive before cloning or transferring parameters using the XpressKey (SDI terminal open).
Disabled (0): No action.

Key → drive (1): The "Key to drive" function is activated using the pushbutton located on the copy key. After disconnecting the configuration interface cable from the RJ45 connector, connect the XPressKey instead. A first press on the button corresponds to parameter **00.44** changing to "Key to drive" (the XPressKey LED flashes quickly) and a second press confirms the transfer of data from the XPressKey to the drive (the XPressKey LED is then on continuously). The LED going out indicates the end of the transfer. Disconnect the XPressKey and reconnect the interface cable.

Note: If the transfer cannot be performed, the XPressKey LED flashes quickly.

CAUTION:
• Press the button on the key within a maximum of 10 seconds after selecting "Key to drive" in 00.44, otherwise the action is cancelled.
• If the ratings of the source and destination drives are different:
- Destination drive software < V3.00: the transfer is not permitted
- Destination drive software ≥ V3.00: the transfer is performed, except for menus 5 and 21.

Drive → key (2): After configuring **00.44** = "Drive to key", disconnect the configuration interface cable from the RJ45 connector and connect the XPressKey instead (the XPressKey LED flashes slowly). Pressing the key button causes the parameters contained in the drive to be stored in the copy key (the XPressKey LED is then on continuously). The LED going out indicates the end of the transfer. Disconnect the XPressKey and reconnect the configuration interface cable.
Parameter **00.44** automatically changes back to Disabled (0) once the transfer has been performed.

Note: If the transfer cannot be performed, the XPressKey LED flashes quickly.

CAUTION:
Press the button on the key within a maximum of 10 seconds after selecting "Drive to key" in 00.44, otherwise the action is cancelled.

Auto key mem (3): Not used.

CAUTION:
• If the ratings of the source and destination drives are different:
- Destination drive software < V3.00: the transfer is not permitted
- Destination drive software ≥ V3.00: the transfer is performed, except for menus 5 and 21.

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00.45 : **Factory settings**
Adjustment range : DISABLED (0), 50Hz HIGH (1), 60Hz HIGH (2),
50Hz LOW Trq (3), 60Hz LOW Trq (4),
Mot.EXCLUDED (5)
Factory setting : DISABLED (0)

DISABLED (0): No return to factory settings.

50 Hz HIGH (1): Used to set the drive to factory settings with a 400 V/50 Hz motor and a high overload (heavy duty).

60Hz HIGH (2): Used to set the drive to factory settings with a 460 V/60 Hz motor and a high overload (heavy duty).

50Hz LOW Trq (3): Used to set the drive to factory settings with a 400 V/50 Hz motor and a low overload (normal duty).

60Hz LOW Trq (4): Used to set the drive to factory settings with a 460 V/60 Hz motor and a low overload (normal duty).

Mot.EXCLUDED (5): Used to set the drive to factory settings with the exception of parameters linked to the motor.
Function 5 is not available in the current version.

Note: The factory settings for **00.06** and **00.07** according to **00.45** are listed in section 5.6.3.

00.46 : **Preset reference 1**
Adjustment range : ± **00.02** rpm
Factory setting : 0
Used to define preset reference Pr1.

00.47 : **Preset reference 2**
Adjustment range : ± **00.02** rpm
Factory setting : 0
Used to define preset reference Pr2.

00.48 : **Preset reference 3**
Adjustment range : ± **00.02** rpm
Factory setting : 0
Used to define preset reference Pr3.

00.49 : **Preset reference 4**
Adjustment range : ± **00.02** rpm
Factory setting : 0
Used to define preset reference Pr4.

00.50 : **Catch a spinning motor**
Adjustment range : DISABLED (0), 2 DIRECTIONS (1),
CLOCKWISE (2), C/CLOCKWISE (3),
2 Dir Reman. (4)
Factory setting : DISABLED (0)
If this parameter is enabled (**00.50** ≠ DISABLED (0)), when there is a run command or after a mains supply break, the drive executes a procedure to calculate the motor frequency and direction of rotation. It will automatically recalibrate the output frequency to the measured value and reaccelerate the motor up to the reference frequency.

DISABLED (0): Disable flying restart on a motor which is rotating.

2 DIRECTIONS (1): Enable flying restart on a motor which is rotating clockwise or counter-clockwise

CLOCKWISE (2): Enable flying restart on a motor which is rotating clockwise.

C/CLOCKWISE (3): Enable flying restart on a motor which is rotating counter-clockwise.

2 Dir Reman. (4): Enable flying restart on a motor which is rotating clockwise or counter-clockwise by measuring the remanent voltage (only if the measure remanent voltage option is available).
Not available in the current version.

⚠ **• If the load is stationary at the time of the run command or when the mains supply returns, this operation may cause the machine to rotate in both directions before the motor accelerates.**

• Before enabling this function, check that there is no danger to equipment and personnel.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING INTERFACE

00.51 : Mains loss mode
Adjustment range : NO DETECTION (0), FULL STOP (1),
DELAYED STOP (2)
Factory setting : NO DETECTION (0)
NO DETECTION (0): The drive does not take account of mains supply breaks and continues to operate while there is sufficient voltage on the DC bus.
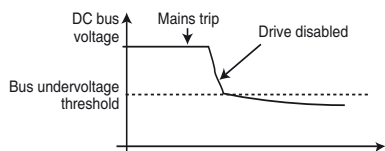
FULL STOP (1): If there is a mains supply break, the drive will decelerate on a ramp, which is automatically calculated by the drive, so that the motor feeds back energy to the DC bus. On return to normal conditions, deceleration continues until the motor stops, according to the stop mode programmed in **00.41**.
"Mains loss" trip is displayed.

DELAYED STOP (2) : If there is a mains supply break, the drive will decelerate on a ramp, which is automatically calculated by the drive, so that the motor feeds back energy to the DC bus.
On return to normal conditions:
- If the duration of the mains loss is less than parameter **00.53** "Delay before mains loss", the motor reaccelerates up to reference speed.
- If the duration of the mains loss is greater than parameter **00.53** "Delay before mains loss", deceleration continues in freewheel mode. "Mains loss" trip is displayed.
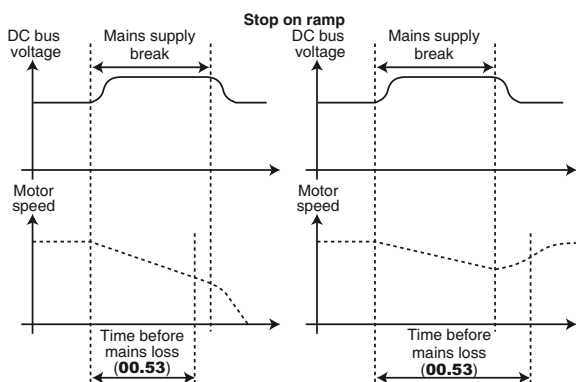
00.52 : At speed threshold
Adjustment range : 0 to 500 rpm
Factory setting : 30 rpm
Defines the window within which the "At speed" alarm is activated.
This alarm is activated when the post-ramp reference equals the reference ± (**00.52**/2).

00.53 : Delay before mains loss
Adjustment range : 0 to 200.00 s
Factory setting : 0.00 s
This parameter is used to set a mains loss time during which the drive will re-accelerate or decelerate until the motor stops when **00.51** = DELAYED STOP (2) (see explanation for **00.51**).

00.54 : Not used

00.55 : No. of autoreset attempts
Adjustment range : None (0), 1 to 5 (1 to 5)
Factory setting : None (0)
None (0): There will be no automatic reset. A command must be given.

1 to 5 (1 to 5): There will be as many automatic reset attempts as have been programmed.
When the counter reaches the permitted number of reset attempts, the drive is disabled and will not auto-reset. This last trip can only be reset via a command.
If no trips occur, the counter is decremented by one value every 5 minutes.

00.56 : Rotation direction
Adjustment range : Clockwise (0) or counter clockwise (1)
Factory setting : Clockwise (0)
This parameter allows changing the motor direction without changing the sign of the speed reference.
A change to this parameter will be taken into consideration at stop.

POWERDRIVE MD
Variable speed drive
PARAMETER SETTING USING THE PC

3 - PARAMETER SETTING USING THE PC
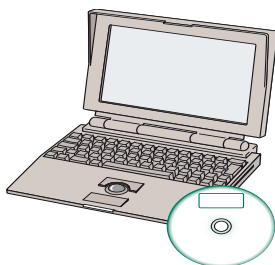
POWERSOFT
Configuring software
+ CT Comms Cable or
USB/485 CONVERTER

This software can be downloaded from the Internet at the following address:
http://www.leroy-somer.com/en/downloads/software/

With POWERSOFT, setting parameters and supervising the **POWERDRIVE MD** from a PC is very user-friendly.
Numerous functions are available:
- Fast commissioning
- LEROY-SOMER motor database
- File saving
- Online help
- Comparison of 2 files or one file with the factory settings
- Printing of a complete file or differences compared to the factory setting
- Supervision
- Diagnostics
- Representation of parameters in table or graphic form
To connect the PC to the POWERDRIVE MD, use a CT Comms Cable or USB/485 CONVERTER.

POWERDRIVE MD control board

RJ45 socket:
Connection of
CT Comms Cable
or USB/485
CONVERTER
for POWERSOFT
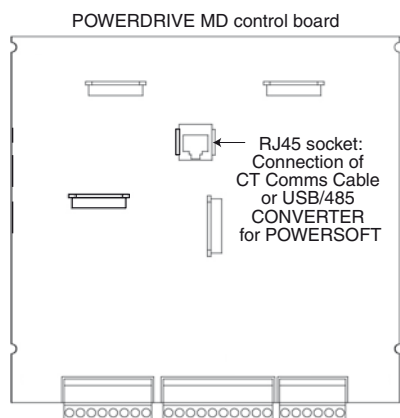
4 - DUPLICATION OF PARAMETERS

4.1 - XpressKey

The XPress Key option is used to save a copy of all the **POWERDRIVE MD** parameters so that they can be duplicated very simply in another drive.
Insert the RJ45 connector for the key

POWERDRIVE MD control board
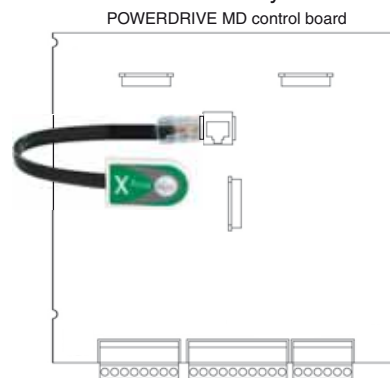
4.2 - Saving parameters in the XPressKey

• Connect the configuration interface.
Using the configuration interface, check that the drive is disabled (terminal SDI open). After configuring **00.44** = "Drive $\rightarrow$ key", disconnect the configuration interface cable from the RJ45 connector and connect the XPressKey instead (the XPressKey LED flashes slowly). Pressing the key button causes the parameters contained in the drive to be stored in the copy key (the XPressKey LED is then on continuously). The LED going out indicates the end of the transfer.
Disconnect the XPressKey and reconnect the configuration interface cable. Parameter **00.44** automatically changes back to Disabled (0) once the transfer has been performed.
CAUTION:
• Press the button on the key within a maximum of 10 seconds after selecting "Drive to key (2)" in 00.44, otherwise the action is cancelled.
• If the ratings of the source and destination drives are different:
- Destination drive software < V3.00: the transfer is not permitted
- Destination drive software ≥ V3.00: the transfer is performed, except for menus 5 and 21.

POWERDRIVE MD
Variable speed drive
DUPLICATION OF PARAMETERS

4.3 - Duplication in another drive for a similar application

• Connect the XPressKey to the RJ45 socket on the **POWERDRIVE MD**.
• The drive is disabled (terminal SDI2 open).
• The "Key → drive" function is activated using the pushbutton
located on the copy key.

A first press on the button corresponds to parameter **00.44** changing to "Key → drive" (the XPressKey LED flashes slowly). A second press on the button confirms the transfer, and the green LED is then on continuously. The LED going out indicates the end of the transfer. Disconnect the XPressKey and reconnect the configuration interface cable.

CAUTION:
Press the key button within 10 seconds maximum after selecting "Key → drive" in 00.44, otherwise the action is cancelled.

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5 - MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.1 - Introduction

⚠ • **Before setting the drive parameters using the diagrams, all instructions relating to installation, connection and commissioning of the drive must have been followed to the letter (manuals supplied with the drive).**

5.1.1 - Menu organisation
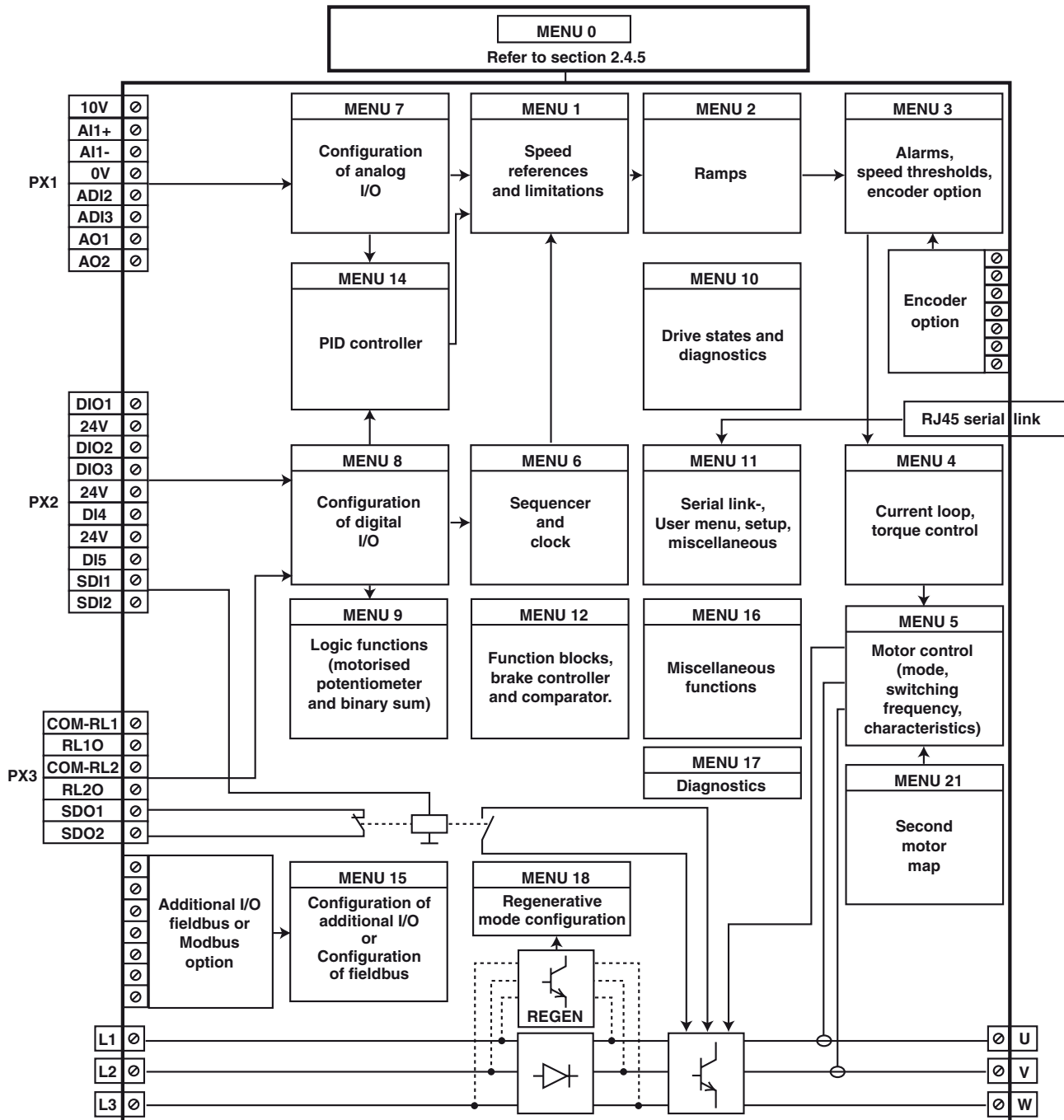
POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.1.2 - Explanations of symbols used

01.06 : A number in bold refers to a parameter.

ADI1 ⊘ : Refers to a drive input or output terminal.

01.21 : Parameters which appear in a rectangle are parameters with Read and Write access.
They can be designated as an assignment destination for connection to:
- Digital inputs for bit parameters
- Analog inputs for non-bit parameters
- Outputs of internal functions (threshold detectors, logical or arithmetic operations, etc.)
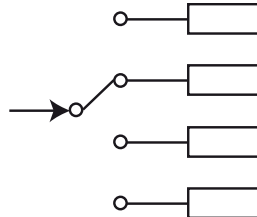
01.01 : Parameters which appear in a diamond are parameters with Read Only access and are write-protected. They are used to provide information concerning operation of the drive and can be designated as an assignment source for connection to:
- Digital outputs for bit parameters
- Analog outputs for non-bit parameters
- Inputs of internal functions (threshold detectors, logical or arithmetic operations, etc.)
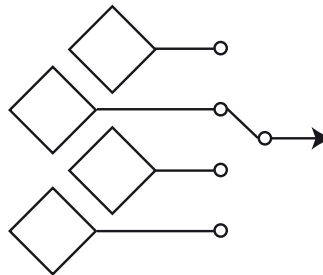
01.36 : Parameters which appear in a hexagon are parameters which can only be assigned to:
- Digital inputs for bit parameters
- Analog inputs for non-bit parameters
- Destination of internal functions (threshold detectors, logical or arithmetic operations, etc...)
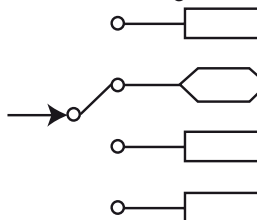
■▷ : Indicates a parameter used when the drive is configured in open loop Flux Vector Control mode or V/F.

■▷ : Indicates a parameter used when the drive is configured in closed loop Flux Vector Control mode, servo mode.

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.2 - Menu 1: Speed references and limitations

5.2.1 - Menu 1 diagrams

• **Selection of reference (speed)**
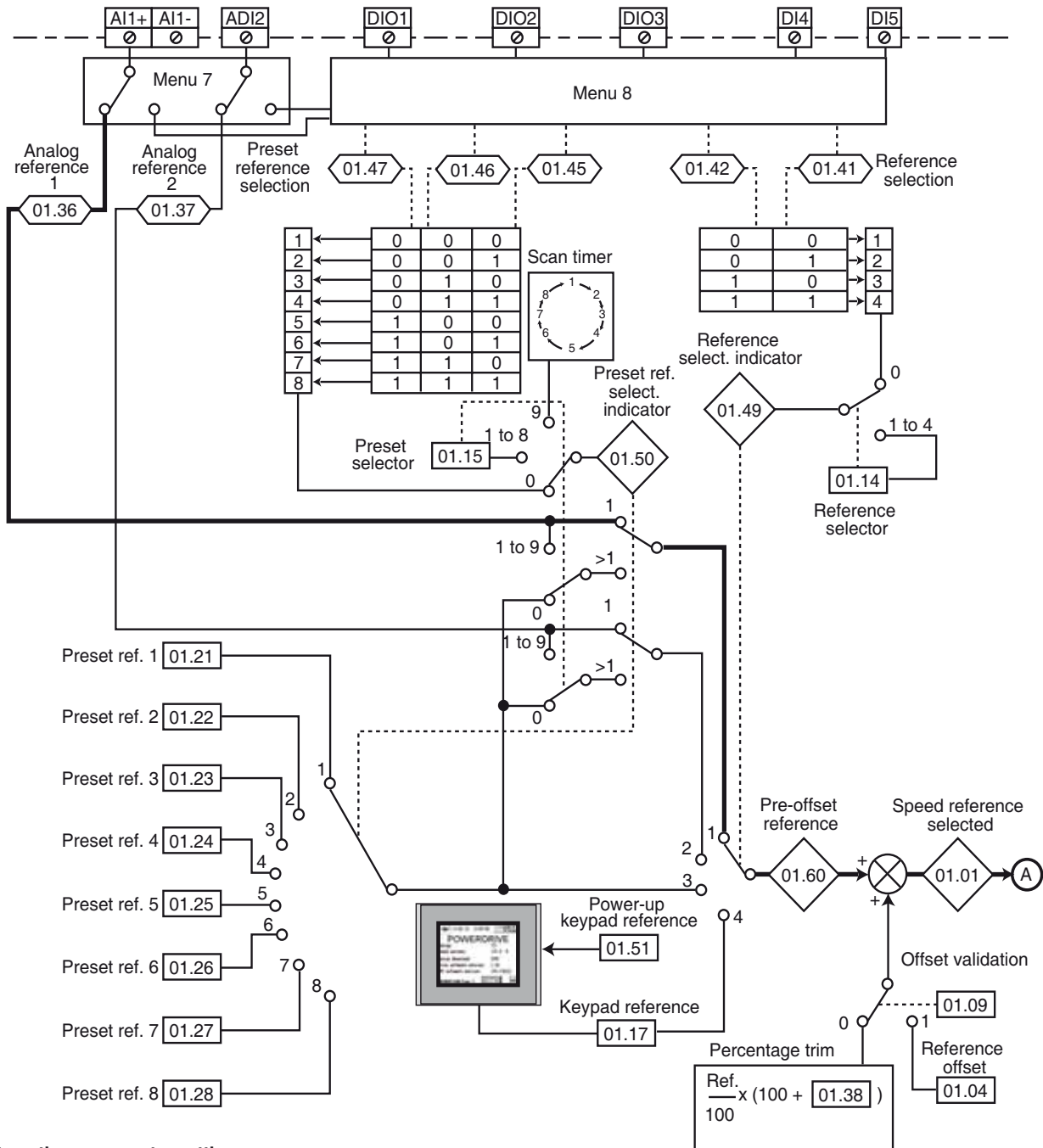
Scan timer parameter settings

01.16 Preset reference timer		01.73 Scan timer Pr3 time	
01.48 Reference timer reset flag		01.74 Scan timer Pr4 time	
01.69 Number of preset references timed		01.75 Scan timer Pr5 time	
01.70 Time between each ref		01.76 Scan timer Pr6 time	
01.71 Scan timer Pr1 time		01.77 Scan timer Pr7 time	
01.72 Scan timer Pr2 time		01.78 Scan timer Pr8 time	

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

• Limiting and filters
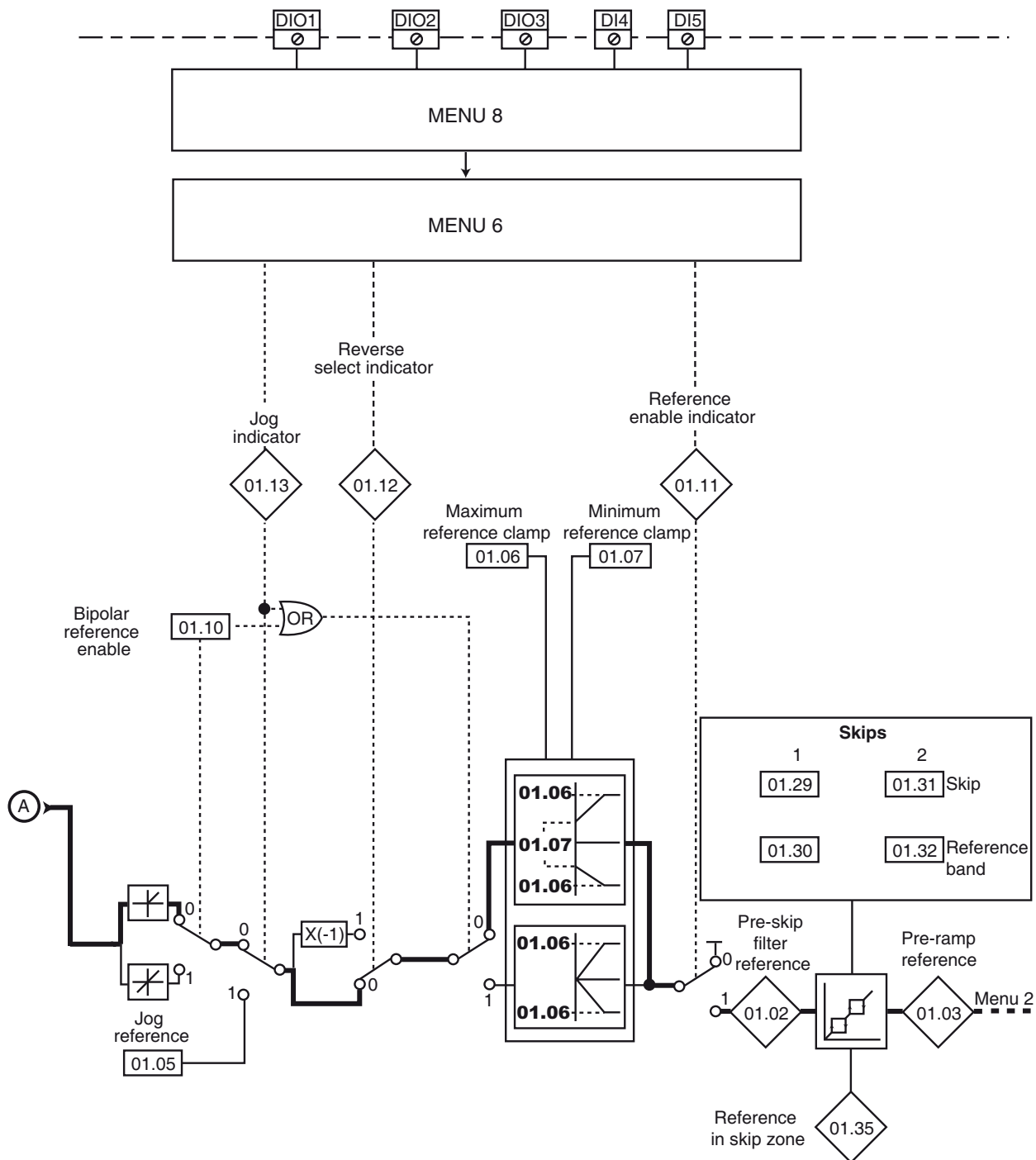
POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.2.2 - Explanation of parameters in menu 1

01.01 : Speed reference selected

Adjustment range : ± **01.06**
Indicates the reference value.

01.02 : Pre-skip filter reference

Adjustment range : ± **01.06** or **01.07** to **01.06**
Reference after limiting but before the skips.

01.03 : Pre-ramp reference

Adjustment range : ± **01.06** or **01.07** to **01.06**
Indicates the reference after the skips but before the acceleration or deceleration ramps.

01.04 : Reference offset
Adjustment range : ± **01.06**
Factory setting : 0
This reference is added to (positive value) or subtracted from (negative value) the selected reference if **01.09** is set to "Ref + **01.04**". It can be used to correct the selected main reference to obtain an accurate setting.

01.05 : Jog reference
Adjustment range : 0 to **01.06** rpm
Factory setting : 45 rpm
Operating speed when a jog input is configured and **06.31** = 1.

01.06 : Maximum reference clamp
Adjustment range : 0 to 32000 rpm
Factory setting : **Eur = 1500 rpm**
USA = 1800 rpm

⚠️ **• Before setting the maximum limit, check that the motor and the driven machine can withstand it.**
Maximum speed in both directions of rotation.

01.07 : Minimum reference clamp
Adjustment range : 0 to **01.06** rpm
Factory setting : 0 rpm
In unipolar mode, defines the minimum speed (inactive in bipolar mode).
CAUTION:
• This parameter is inactive during jog operation.
• If the value of 01.06 is lower than that of 01.07, the value of 01.07 is automatically changed to the new value of 01.06.

01.08 : Not used

01.09 : Offset validation
Adjustment range : Ref. x **01.38** (0) or Ref. + **01.04** (1)
Factory setting : Ref. x **01.38** (0)
Ref. x 01.38 (0): A value proportional to this reference is added to the main reference. The percentage is adjusted using parameter 01.38 (see explanation for 01.38).

Ref. + 01.04 (1): A fixed value set in **01.04** is added to the main reference.

01.10 : Bipolar reference enable
Adjustment range : Pos. only (0) or Pos. and Neg. (1)
Factory setting : Pos. only (0)
Pos. only (0): All negative references are treated as zero.

Pos. and Neg. (1): Used for changing the direction of rotation by the polarity of the reference (which may come from the preset references).

01.11 : Reference enable indicator

Adjustment range : Disabled (0) or Enabled (1)
Used to control enabling of the run command.

01.12 : Reverse select indicator

Adjustment range : Forward (0) or Reverse (1)
Used to control enabling of the direction of rotation.
Forward (0): Run forward.

Reverse (1): Run reverse.

01.13 : Jog select indicator

Adjustment range : Disabled (0) or Enabled (1)
Used to control enabling of the jog command.
Disabled (0): Jog operation not enabled.

Enabled (1): Jog operation enabled.

01.14 : Reference selector
Adjustment range : Term. inputs (0), Analog 1 (1),
Analog 2 (2), Preset (3),
Keypad (4)
Factory setting : Term. inputs (0)
Term. inputs (0): The speed reference is selected by combining the digital inputs assigned to parameters 01.41 and 01.42.

Analog 1 (1): The speed reference comes from analog input 1.

Analog 2 (2): The speed reference comes from analog input 2.

Preset (3): The speed reference comes from preset references.

Keypad (4): The speed reference comes from the configuration interface.

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

01.15 : **Preset selector**
Adjustment range : Term. inputs (0), Preset 1 (1) to Preset 8
(8),
Timer (9)
Factory setting : Term. inputs (0)
This parameter is used to select the preset references. It works as follows:
Term. inputs (0): Used to select the reference by combining the digital inputs assigned to parameters 01.45 to 01.47.

Preset 1 (1): Preset reference 1

Preset 2 (2): Preset reference 2

Preset 3 (3): Preset reference 3

Preset 4 (4): Preset reference 4

Preset 5 (5): Preset reference 5

Preset 6 (6): Preset reference 6

Preset 7 (7): Preset reference 7

Preset 8 (8): Preset reference 8

Timer (9): The reference is selected automatically by a scan timer.

01.16 : **Preset reference timer**
Adjustment range : 0 to 9999 s
Factory setting : 0
When **01.15** = Timer (9) and **01.70** = "Same" (0), is used to set the time between each reference where the scan time is identical between each preset reference.

01.17 : **Keypad reference**
Adjustment range : ± **01.06**
Indicates the reference value coming from the configuration interface (see section 2.2.3.4).

01.18 to **01.20** : **Not used**

01.21 to **01.28** : **Preset references 1 to 8**
Adjustment range : ± **01.06**
Factory setting : 0
In order, **01.21** to **01.28** are used to define preset references Preset 1 to Preset 8.

01.29 and **01.31** : **Skip references 1 and 2**
Adjustment range : 0 to 32000 rpm
Factory setting : 0
Two skips are available to avoid a machine running at critical speeds. When one of these parameters is at 0, the corresponding skip reference is deactivated.

01.30 and **01.32** : **Skip reference bands 1 and 2**
Adjustment range : 0 to 300 rpm
Factory setting : 15 rpm
Define the skip band around the avoided speed. The total skip will therefore equal the threshold set ± skip reference band. When the reference is within the window determined in this way, the drive will not allow operation in this zone.

01.33 and **01.34** : **Not used**

01.35 : **Reference in skip zone**

Adjustment range : Out (0) or In (1)
This parameter is In (1) when the selected reference is within one of the skip zones.
In this case, the motor speed does not correspond to the requested reference.

01.36 and **01.37** : **Analog references 1 and 2**
Adjustment range : **01.07** to **01.06** (**01.10** = 0)
± **01.06** (**01.10** = 1)
The analog inputs assigned to these parameters are automatically scaled so that 100.0% of the input corresponds to the maximum reference (**01.06**). Similarly the 0% input level will correspond to the minimum reference **01.07** or 0 according to **01.10**.
Unipolar mode (**01.10** = 0)
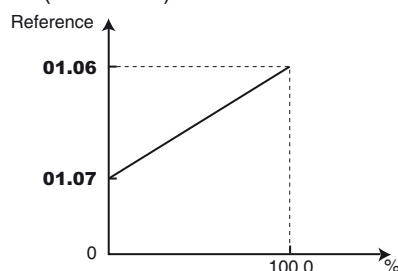
Bipolar mode (**01.10** = 1)
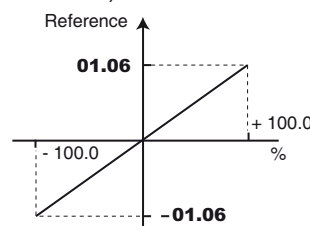
01.38 : **Percentage trim**
Adjustment range : ± 100.0%
An offset proportional to the selected reference can be added to this reference.
The multiplication coefficient is determined by the analog input assigned to **01.38**.

$$\text{Final ref} = \frac{\text{ref sélectionnée} \times (\mathbf{01.38} + 100)}{100}$$

01.39 and **01.40** : **Not used**

01.41 and **01.42** : **Reference selection using digital inputs**
Adjustment range: Off (0) or On (1)
Used to assign the digital inputs to selection of the speed reference.
01.41: bit 0
01.42: bit 1

01.42	01.41	Selected reference	01.49
0	0	Analog input 1	1
0	1	Analog input 2	2
1	0	Preset references	3
1	1	Reference via the keypad	4

01.43 and **01.44** : **Not used**

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

01.45 to **01.47** : **Preset reference selection using digital inputs**

Adjustment range: Off (0) or On (1)
Used to assign the digital inputs to selection of the preset references.
01.45: bit 0
01.46: bit 1
01.47: bit 2

01.47	01.46	01.45	Selected reference	01.50
0	0	0	Preset reference 1 (Pr1)	1
0	0	1	Preset reference 2 (Pr2)	2
0	1	0	Preset reference 3 (Pr3)	3
0	1	1	Preset reference 4 (Pr4)	4
1	0	0	Preset reference 5 (Pr5)	5
1	0	1	Preset reference 6 (Pr6)	6
1	1	0	Preset reference 7 (Pr7)	7
1	1	1	Preset reference 8 (Pr8)	8

01.48 : **Reference timer reset flag**

Adjustment range : Off (0) or On (1)
Factory setting : Off (0)
When this parameter changes to On (1), the preset reference timer is reset to 0. In this case, the reference is once again Preset 1.
Can be used to control cycle starting via a digital input.

01.49 : **Reference select. indicator**

Adjustment range : Term. inputs (0), Analog 1 (1),
　　　　　　　　　　　Analog 2 (2), Presets (3),
　　　　　　　　　　　Keypad (4)
Indicates which reference has been selected.

01.50 : **Preset ref. select. indicator**

Adjustment range : Term. inputs (0), Preset 1 (1) to Preset 8 (8)
Indicates the selected preset reference.

01.51 : **Power-up keypad reference**

Adjustment range : Reset to 0 (0), Last value (1), Preset 1 (2)
Factory setting : Reset to 0 (0)
Reset to 0 (0): On power-up, the speed reference coming from the configuration interface is reset to zero.

Last value (1): On power-up, the speed reference coming from the configuration interface retains the value it had before power-down.

Preset 1 (2): On power-up, the speed reference coming from the configuration interface takes the value of preset reference 1 (**01.21**).

01.52 to **01.59** : **Not used**

01.60 : **Pre-offset reference**

Adjustment range : ± **01.06**
Indicates the value of the selected reference before offset.

01.61 to **01.68** : **Not used**

01.69 : **Number of preset references timed**
Adjustment range : 0 to 8
Factory setting : 8
Used to configure the number of preset references integrated in the scan timer.
For example, if **01.69** = 3, the scan timer will perform a cycle Preset 1 --> Preset 2 --> Preset 3 --> Preset 1, etc.

01.70 : **Time between each reference**
Adjustment range : Same (0) or Different (1)
Factory setting : Same (0)
Same (0): The time for which the drive remains on each preset reference is the same for all references.

Different (1): The time between each preset reference is different.

01.71 : **Scan timer Pr1 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 1.

01.72 : **Scan timer Pr2 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 2.

01.73 : **Scan timer Pr3 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 3.

01.74 : **Scan timer Pr4 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 4.

01.75 : **Scan timer Pr5 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 5.

01.76 : **Scan timer Pr6 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 6.

01.77 : **Scan timer Pr7 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 7.

01.78 : **Scan timer Pr8 time**
Adjustment range : 0 to 9999 s
Factory setting : 0
If **01.70** is set to 1, determines the time for which the drive remains at reference Pr. 8.

POWERDRIVE MD
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MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

Notes

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.3 - Menu 2: Ramps

5.3.1 - Menu 2 diagrams

• **Acceleration ramps**
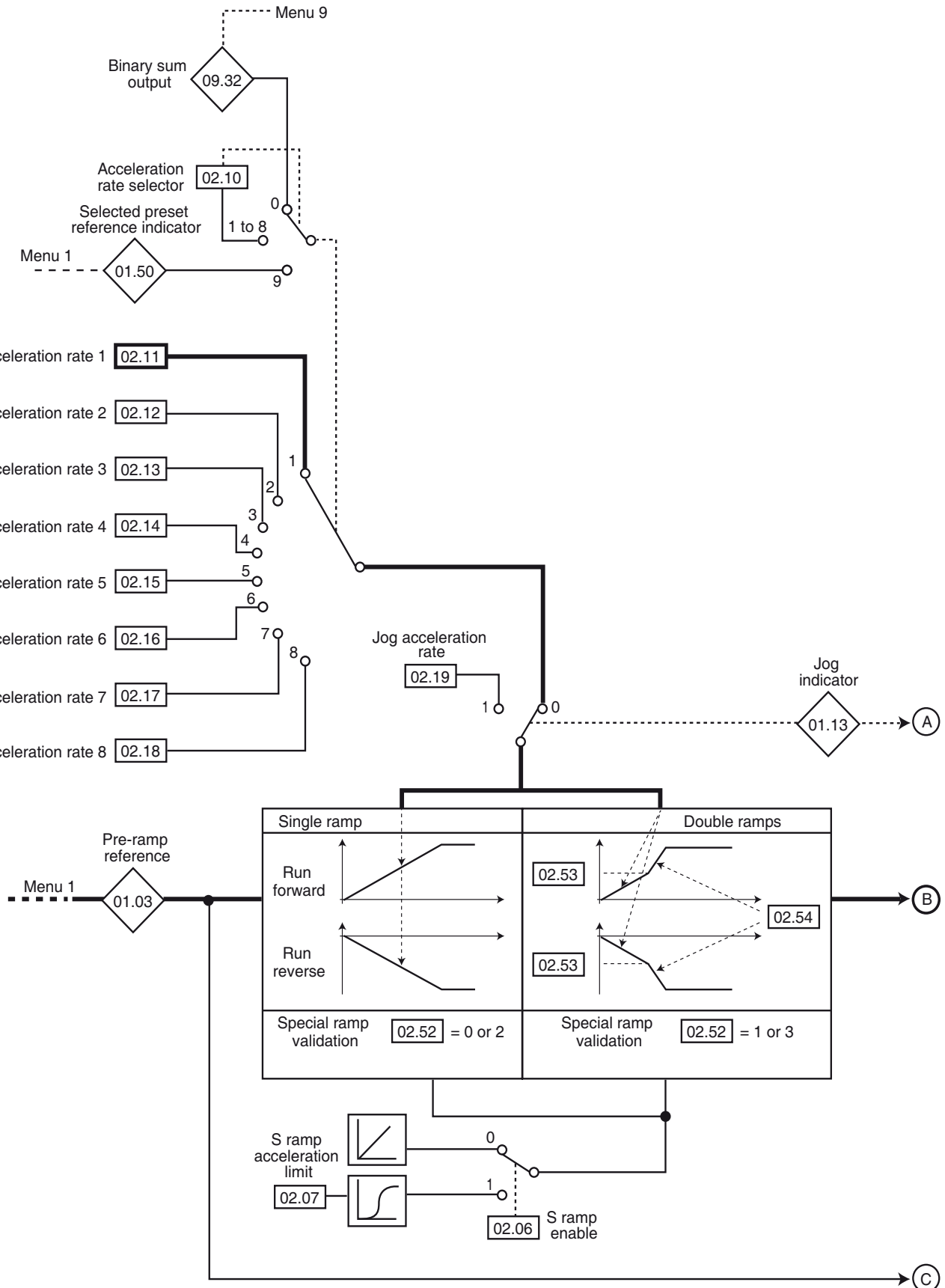
POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

• **Deceleration ramps**

Binary sum output 09.32 — Menu 9

Acceleration rate selector 02.20 — 0 / 1 to 8

Selected preset reference indicator

Menu 1 — 01.50 — 9

Deceleration rate 1 02.21
Deceleration rate 2 02.22
Deceleration rate 3 02.23
Deceleration rate 4 02.24
Deceleration rate 5 02.25
Deceleration rate 6 02.26
Deceleration rate 7 02.27
Deceleration rate 8 02.28

Jog acceleration rate 02.29

A

Single ramp	Double ramps
Run forward / Run reverse	02.53 / 02.55 / 02.53
Special ramp validation 02.52 = 0 or 1	Special ramp validation 02.52 = 2 or 3

B

Menu 4 Current loop

Post-ramp reference 02.01 — Menu 3

Ramp bypass (■) 02.02

Ramp hold 02.03 — 0 / 1

Ramp hold condition 02.51 — 0 / 1

V min

02.04	Deceleration ramp mode select
02.08	Standard ramp voltage
02.50	Speed reference locked to motor speed

C

LEROY-SOMER

POWERDRIVE MD
Variable speed drive
MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.3.2 - Explanation of parameters in menu 2

◁02.01▷ : **Post ramp reference**

Adjustment range : • If **01.10** = 0 and **02.02** = 0: 0 to **01.06**
　　　　　　　　　• If **01.10** = 0 and **02.02** = 1: **01.07** to
　　　　　　　　　　01.06,
　　　　　　　　　• If **01.10** = 1: ± **01.06**

Measurement of the post-ramp reference. Used for diagnostics.

02.02 : **Ramp by-pass (▣)**
Adjustment range : Off (0) or On (1)
Factory setting　　: Off (0)
Off (0): Ramps active.

On (1): Ramps short-circuited.

02.03 : **Ramp hold**
Adjustment range : Off (0) or On (1)
Factory setting　　: Off (0)
Off (0): Ramp freed.

On (1): The ramp is held and acceleration (or deceleration) is therefore interrupted.

CAUTION:
The ramp hold function is disabled if a stop command is given.

02.04 : **Deceleration ramp mode select**
Adjustment range : Fast (0), Standard (1),
　　　　　　　　　　Standard + (2), Fast + (3)
Factory setting　　: Standard (1)

Fast (0): Deceleration ramp imposed. If the deceleration ramp that has been configured is too fast in relation to the inertia of the load, the DC bus voltage exceeds its maximum value (set in **02.08**) and the drive trips on DC bus overvoltage.

CAUTION:
Select mode 02.04 = Fast (0) when a braking resistor is being used.

Standard (1): Standard deceleration ramp with automatic extension of the ramp time in order to avoid causing a DC bus overvoltage trip on the drive (threshold set in 02.08).

Standard + (2): The drive allows the motor voltage to be increased up to 1.2 times the rated voltage set in **05.09** (motor rated voltage), to avoid reaching the maximum DC bus voltage threshold (threshold set in **02.08**). However, if this is not sufficient, the standard deceleration ramp time is extended, to avoid causing a DC bus overvoltage trip on the drive.
For the same amount of energy, mode 2 enables faster deceleration than mode 1.

Fast + (3): Same as mode 2, but the ramp is imposed. If the configured ramp is too fast, the drive trips on DC bus overvoltage.

CAUTION:
In modes 2 and 3, the motor must be capable of tolerating additional losses relating to the increase in voltage at its terminals.

02.05 : **Not used**

02.06 : **S ramp enable**
Adjustment range : Off (0) or On (1)
Factory setting　　: Off (0)
Off (0): The ramp is linear.

On (1): A curved part (defined in **02.07**) at the start and end of the ramp avoids load swinging.

CAUTION:
The S ramp is deactivated during controlled decelerations (02.04 = Standard (1) or Standard + (2)).

02.07 : **S ramp acceleration limit**
Adjustment range : 2 to 10
Factory setting　　: 10
Used to modify the ramp curve by the same value at the start and end of the ramp.
The value 4 represents a time for the curved part of 25% of the total ramp and 10 represents a time for the curved part of 10%.
Note: In S ramp mode, the total ramp time will be greater than that of the selected ramp.

02.08 : **Standard ramp voltage**
Adjustment range : 0 to 1300 V
Factory setting　　: T ratings = **Eur: 690 V**, USA: 750 V
　　　　　　　　　　TH ratings = 1100 V
This threshold is used when the drive is configured in standard deceleration mode (**02.04** = Standard (1) or Standard + (2)).
If this threshold is too high and there are no resistors connected, the drive will trip on DC bus overvoltage.
The minimum value of this parameter must be 50 V higher than the DC bus voltage obtained with the maximum supply voltage (Bus V = Supply V x √2).

02.09 : **Not used**

02.10 : **Acceleration rate selector**
Adjustment range : Term. inputs (0), Acceler. 1 (1) to
　　　　　　　　　　Acceler. 8 (8), To preset (9)
Factory setting　　: Acceler. 1 (1)
This parameter is used to select the acceleration ramp as follows:

Term. inputs (0): Selection of the acceleration ramp via digital inputs. The choice of ramp comes from the binary sum in menu 9 (**09.32**).

Acceler. 1 (1): Acceleration rate 1

Acceler. 2 (2): Acceleration rate 2

Acceler. 3 (3): Acceleration rate 3

Acceler. 4 (4): Acceleration rate 4

Acceler. 5 (5): Acceleration rate 5

Acceler. 6 (6): Acceleration rate 6

Acceler. 7 (7): Acceleration rate 7

Acceler. 8 (8): Acceleration rate 8

To preset (9): The ramp is automatically associated with the corresponding preset speed.

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02.11 to **02.18** : **Acceleration rates 1 to 8**
Adjustment range : 0.1 to 3200.0 s/1000 rpm*
Factory setting : 20.0 s/1000 rpm
Sets the time for acceleration from 0 to 1000 rpm*.

$$02.11 \text{ to } 02.18 = \frac{t(s) \times 1000 \text{ rpm}^*}{(N2 - N1) \text{ rpm}} *$$

Value **02.11** to **02.18**
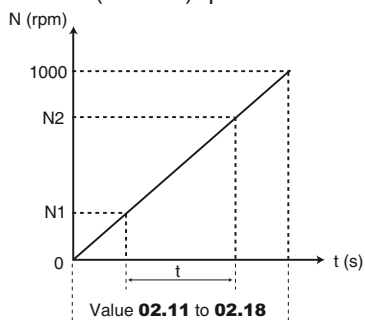
02.11: Acceleration rate 1 (main ramp in factory settings)
02.12: Acceleration rate 2
02.13: Acceleration rate 3
02.14: Acceleration rate 4
02.15: Acceleration rate 5
02.16: Acceleration rate 6
02.17: Acceleration rate 7
02.18: Acceleration rate 8

02.19 : **Jog acceleration rate**
Adjustment range : 0.1 to 3200.0 s/1000 rpm*
Factory setting : 0.2 s/1000 rpm
Sets the time for acceleration from 0 to 1000 rpm*.

$$02.19 = \frac{t(s) \times 1000 \text{ rpm}^*}{(N2 - N1) \text{ rpm}} *$$

Value **02.19**
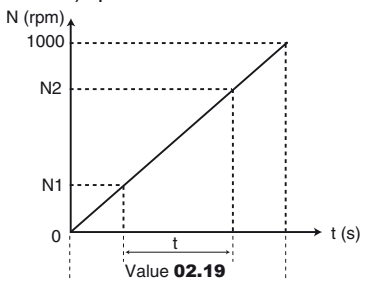
02.20 : **Deceleration rate selector**
Adjustment range : Term. inputs (0), Deceler. 1 (1) to
Deceler. 8 (8), To preset (9)
Factory setting : Deceler. 1 (1)
This parameter is used to select the deceleration ramp as follows:

Term. inputs (0): Selection of the deceleration ramp via digital inputs. The choice of ramp comes from the binary sum in menu 9 (**09.32**).

Deceler. 1 (1): Deceleration rate 1

Deceler. 2 (2): Deceleration rate 2

Deceler. 3 (3): Deceleration rate 3

Deceler. 4 (4): Deceleration rate 4

Deceler. 5 (5): Deceleration rate 5

Deceler. 6 (6): Deceleration rate 6

Deceler. 7 (7): Deceleration rate 7

Deceler. 8 (8): Deceleration rate 8

To preset (9): The ramp is automatically associated with the corresponding preset speed.

02.21 to **02.28** : **Deceleration rates 1 to 8**
Adjustment range : 0.1 to 3200.0 s/1000 rpm*
Factory setting : 20.0 s/1000 rpm
Sets the time for deceleration from 1000 rpm * to 0.

$$02.21 \text{ to } 02.28 = \frac{t(s) \times 1000 \text{ rpm}^*}{(N2 - N1) \text{ rpm}} *$$

Value **02.21** to **02.28**
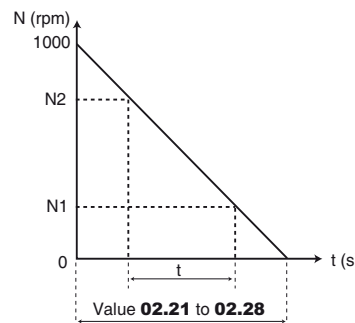
02.21: Deceleration rate 1 (main ramp in factory settings)
02.22: Deceleration rate 2
02.23: Deceleration rate 3
02.24: Deceleration rate 4
02.25: Deceleration rate 5
02.26: Deceleration rate 6
02.27: Deceleration rate 7
02.28: Deceleration rate 8

02.29 : **Jog deceleration rate**
Adjustment range : 0.1 to 3200.0 s/1000 rpm*
Factory setting : 0.2 s/1000 rpm
Sets the time for deceleration from 1000 rpm * to 0.

$$02.29 = \frac{t(s) \times 1000 \text{ rpm}^*}{(N2 - N1) \text{ rpm}} *$$

Value **02.29**
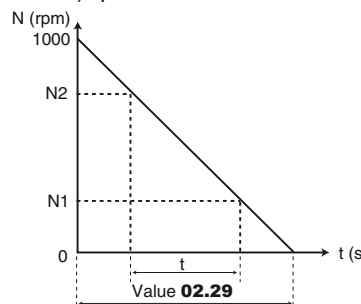
02.30 to **02.49** : **Not used**

* Note: The reference speed can be changed from 1000 to 100 rpm in parameter **02.56**. This makes it possible to multiply the acceleration and deceleration times by 10.

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02.50 : Speed reference locked at motor speed
Adjustment range :No (0) or Yes (1)
Factory setting   : No (0)
For high inertia applications, it may happen that the motor speed cannot follow the speed reference. In such situation, if a stop command or a speed reference change occurs, a dead time may be noticed. By enabling **02.50**, the speed reference will be locked to the motor speed, thus preventing from any dead time.
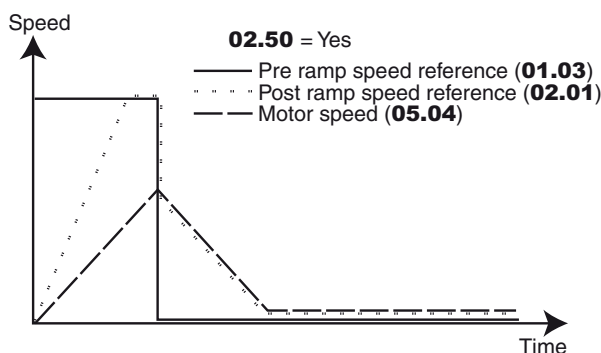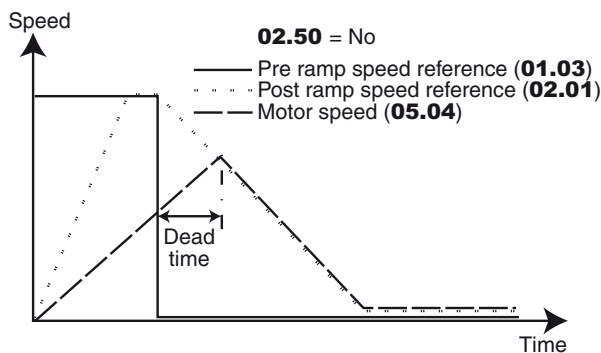
02.51 : Ramp hold condition
Adjustment range : ALL (0) or > V$_{MIN}$ (1)
Factory setting   : ALL (0)

ALL (0): When 02.03 = On (1), the ramp is always held.

>V$_{min}$ (1): When **02.03** = On (1), the ramp is freed between 0 and V min (**01.07**).

02.52 : Special ramp validation
Adjustment range : DISABLED (0), 2 Accel. (1),
                    2 Decel. (2), 2 Acc.Decel (3)
Factory setting   : DISABLED (0)

DISABLED (0): Double ramps not enabled.

2 Accel. (1): Double acceleration ramps. From 0 to the speed defined in **02.53**, the acceleration ramp used is that defined by **02.11** to **02.19.** From **02.53**, the acceleration ramp used is defined in **02.54**.

2 Decel. (2): Double deceleration ramps. The drive decelerates to the speed defined in **02.53** with the deceleration ramp defined by **02.55**, then decelerates to 0 with the ramp defined by **02.21** to **02.28**.

2 Acc.Decel. (3): Double acceleration and deceleration ramps. The drive accelerates or decelerates to the speed defined in **02.53**, and the acceleration and deceleration ramps used are those defined by **02.11** to **02.19** and **02.21** to **02.29** respectively. From **02.53**, the acceleration and deceleration ramps used are defined by **02.54** and **02.55** respectively.

02.53 : Threshold for acceleration and/or deceleration
Adjustment range : ± **01.06**
Factory setting   : 0
See explanation in **02.52**.

02.54 : High speed acceleration ramp
Adjustment range : 0.1 to 3200.0 s/1000 rpm *
Factory setting   : 20 s/1000 rpm
See explanation in **02.52**.

02.55 : High speed deceleration ramp
Adjustment range : 0.1 to 3200.0 s/1000 rpm *
Factory setting   : 20 s/1000 rpm
See explanation in **02.52**.

02.56 : Acceleration/Deceleration speed reference
Adjustment range : 1000 rpm (0), 100 rpm (1)
Factory setting   : 1000 rpm (0)

* Note: The reference speed can be changed from 1000 to 100 rpm in parameter **02.56**. This makes it possible to multiply the acceleration and deceleration times by 10.

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5.4 - Menu 3: Alarms, speed thresholds, encoder option
5.4.1 - Menu 3 diagrams
• **Basic version**
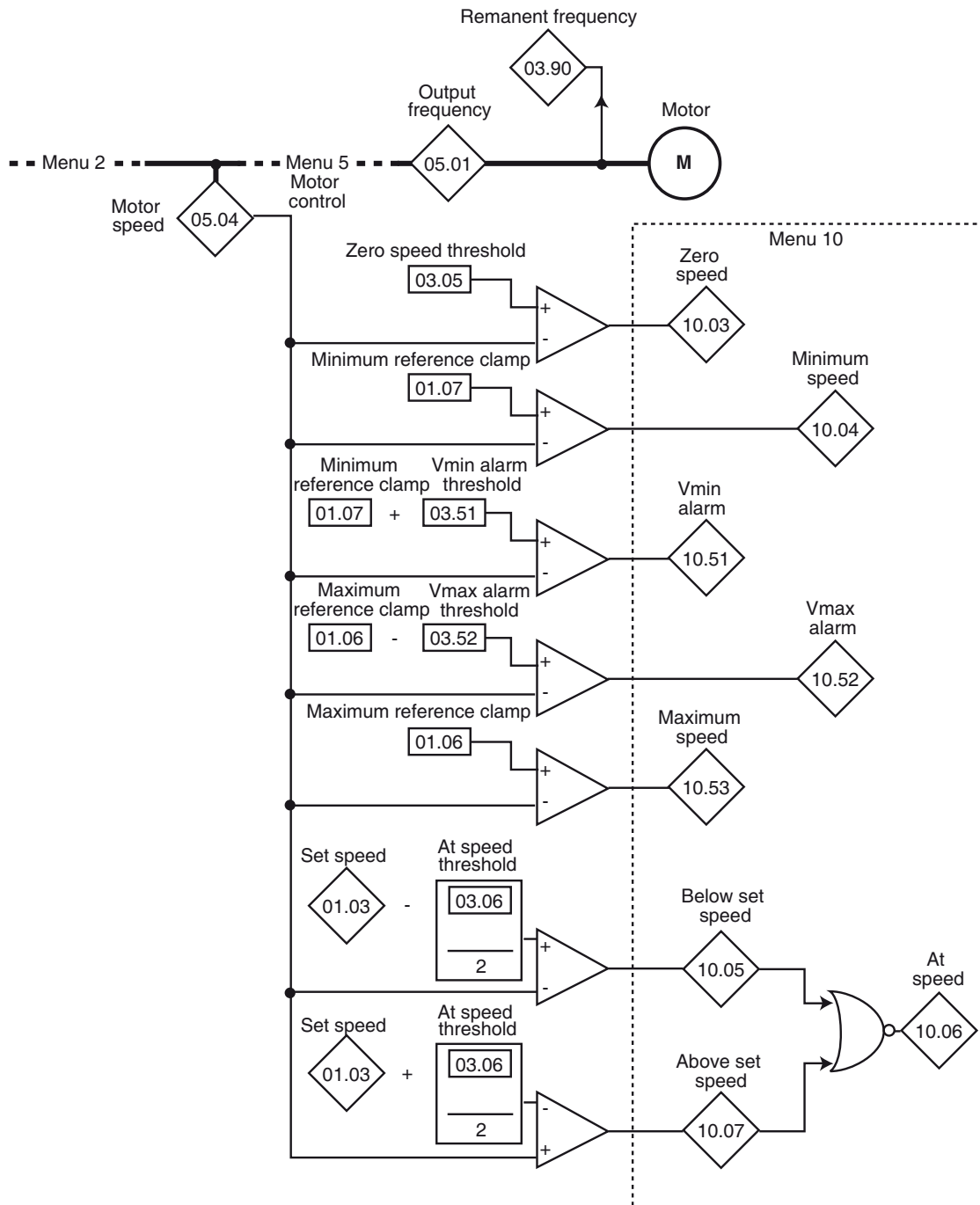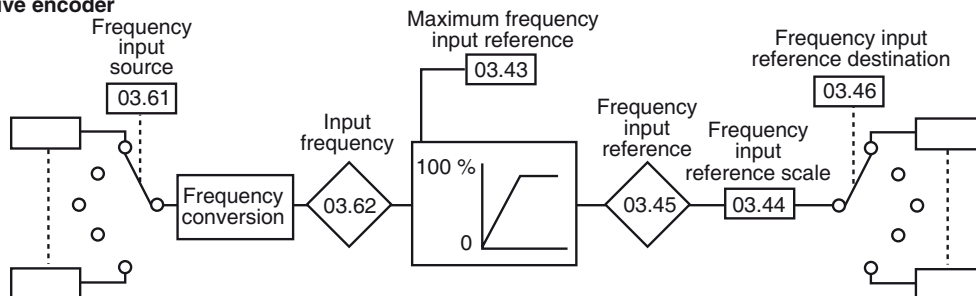
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• With encoder option
   • Encoder feedback option

Speed gain select

Post-ramp reference — 02.01 — Final speed reference — 03.01 — Speed error — 03.03 — 03.16

03.10 Kp1
03.11 Ki1
03.13 Kp2
03.14 Ki2

Speed control output — 03.04

Menu 2

03.12 Kd1
03.15 Kd2

Speed loop gains

Motor speed — 03.02

Hard speed reference selector — 03.23

Hard speed reference — 03.22

Zero speed threshold — 03.05

Menu 10

Zero speed — 10.03

Minimum speed — 01.07 — Minimum speed — 10.04

Minimum reference clamp — 01.07 + Vmin alarm threshold — 03.51 — Vmin alarm — 10.51

Maximum reference clamp — 01.06 - Vmax alarm threshold — 03.52 — Vmax alarm — 10.52

Maximum reference clamp — 01.06 — Maximum speed — 10.53

Encoder type — 03.38
Lines per revolution — 03.34
Phase angle — 03.25
Filter — 03.42

Encoder

Position — 03.29

Set speed — 01.03 - At speed threshold — 03.06 / 2 — Below set speed — 10.05

Set speed — 01.03 + At speed threshold — 03.06 / 2 — Above set speed — 10.07

At speed — 10.06

Frequency input

Motor speed — 03.02

Input from encoder

+100% / -100%

Maximum frequency input reference — 03.43

Frequency input source — 03.61

Frequency conversion

Input frequency — 03.62

100% / 0

Frequency input select — 03.67

Frequency input reference — 03.45

Frequency input reference scale — 03.44

Frequency input reference destination — 03.46

• **Encoder feedback option (continued)**

03.16	Speed gain select
03.17	Speed gain setup
03.18	Total inertia
03.20	Bandwidth
03.21	Damping factor
03.90	Remanent frequency

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5.4.2 - Explanation of parameters in menu 3

Parameters marked with the symbol ▣ can only be accessed in closed loop or servo mode.

03.01 : Final speed reference (▣)

Adjustment range : ± 2 x **01.06** rpm
Represents the sum of the post ramp reference and the hard speed reference if this has been enabled.

03.02 : Motor speed

Adjustment range : ± 2 x **01.06** rpm
Actual speed from the encoder.

03.03 : Speed error (▣)

Adjustment range : ± 2 x **01.06** rpm
Difference between the final speed reference and the speed feedback.

03.04 : Speed control output (▣)

Adjustment range : ± 300.0%
The speed control output produces a torque reference to be used in determining the value of the active current.

03.05 : Zero speed threshold
Adjustment range : 0 to 500 rpm
Factory setting   : 30 rpm
If the motor speed **05.04** (▣) or **03.02** (▣) is at or below the level defined by this parameter, the zero speed alarm **10.03** will be at 1, otherwise it will be at 0.
In open loop mode, upon a stop command, the drive decelerates on the selected ramp to the threshold set by **03.05**, and then the motor stops into freewheel mode.

03.06 : At speed threshold
Adjustment range : 0 to 500 rpm
Factory setting   : 30 rpm
Defines the window within which the **10.06** "At speed" alarm is activated.
10.06 is at 1 when the post-ramp reference equals the reference ± (**03.06**/2).
CAUTION:
For values of 03.06 < 20, see parameters 10.05 and 10.07.

03.07 to 03.09 : Not used

03.10 : Speed loop proportional gain Kp1 (▣)
Adjustment range : 0 to 32000
Factory setting   : 200
Sets the stability of the motor speed in the event of sudden variations in the reference.
Increase the proportional gain until vibration occurs in the motor, then reduce the value by 20 to 30%, checking that the stability of the motor is acceptable in the event of sudden variations in speed, both at no load and on load.

03.11 : Speed loop integral gain Ki1 (▣)
Adjustment range : 0 to 32000
Factory setting   : 100
Sets the stability of the motor speed on load impact.
Increase the integral gain to limit the speed recovery time in the event of load impact.

03.12 : Speed loop differential gain Kd1 (▣)
Adjustment range : 0 to 32000
Factory setting   : 0
Adjusts the stability of the motor speed in the event of load shedding or sudden variations in the reference.
Reduces overshoots.
In general, leave the setting at 0.
Function not available in the current version.

03.13 : Speed loop proportional gain Kp2 (▣)
Adjustment range : 0 to 32000
Factory setting   : 200
Sets the stability of the motor speed in the event of sudden variations in the reference.
The drive uses Kp1 (**03.10**) or Kp2 (**03.13**) depending on the value of **03.16.**

03.14 : Speed loop integral gain Ki2 (▣)
Adjustment range : 0 to 32000
Factory setting   : 100
Sets the stability of the motor speed on load impact.
The drive uses Ki1 (**03.11**) or Ki2 (**03.14**) depending on the value of **03.16**.

03.15 : Speed loop differential gain Kd2 (▣)
Adjustment range : 0 to 32000
Factory setting   : 0
Sets the stability of the motor speed in the event of load shedding or sudden variations in the reference.
The drive uses Kd1 (**03.12**) or Kd2 (**03.15**) depending on the value of **03.16**.
Function not available in the current version.

03.16 : Speed gain select (▣)
Adjustment range : Gain No1 (0) or Gain No2 (1)
Factory setting   : Gain No1 (0)
This parameter can be modified when the drive is disabled or enabled.

Gain No1 (0): Selection of Kp1 (03.10), Ki1 (03.11) and Kd1 (03.12) gains.

Gain No2 (1): Selection of Kp2 (**03.13**), Ki2 (**03.14**) and Kd2 (**03.15**) gains.

03.17 : Speed gain setup (▣)
Adjustment range : MANUAL1 (0), AUTO (1), MANUAL2 (2)
Factory setting   : MANUAL1 (0)

MANUAL1 (0): The speed controller operates with the gains entered by the user. The regulation is optimised for normal to high inertias.

AUTO (1): Not available.

MANUAL2 (2): The speed controller operates with the gains entered by the user.

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03.18 : **Total inertia (■)**
Adjustment range : 0.001 to 32,000 kg.m^2
Factory setting : 0.001 kg.m^2
Corresponds to the total inertia applied to the motor (motor inertia + load inertia).

03.19 : **Not used**

03.20 : **Bandwidth (■)**
Adjustment range : 0.1 to 255.0 Hz
Factory setting : 10.0 Hz
Used to set the bandwidth taken into account for automatic calculation of the gains (see **03.17**).
Function not available in the current version.

03.21 : **Damping factor (■)**
Adjustment range : 0 to 10.0
Factory setting : 1.0
Used to set the damping factor for automatic calculation of the gains (see **03.17**).
Function not available in the current version.

03.22 : **Hard speed reference (■)**
Adjustment range : 0 to **01.06** rpm
Factory setting : 0
This hard speed reference is an additional reference which is not affected by the ramps.
Function not available in the current version.

03.23 : **Hard speed reference selector (■)**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
Used to add an unramped speed reference to the main reference.
Function not available in the current version.

03.24 : **Not used**

03.25 : **Encoder phase angle (■)**
Adjustment range : 0 to 359.9°
Factory setting : 0
Indicates the result of the phasing test (see **05.12**). It is stored when the drive is powered down and will be modified automatically only after a new phasing test.

⚠ • **The phase angle, where it is known, can be entered manually. Any incorrect value can cause the motor to rotate in the wrong direction or trip the drive.**

03.26 to **03.28** : **Not used**

03.29 : **Drive encoder position (■)**

Adjustment range : 0 to 16383 lines
Indicates the position of the encoder in relation to the line it was on at power-up.

03.30 to **03.33** : **Not used**

03.34 : **Encoder lines per revolution**
Adjustment range : 0 to 32000 lines per revolution
Factory setting : 1024 lines per revolution
Used to configure the number of lines per encoder revolution. Converts the encoder input into a speed.

03.35 to **03.37** : **Not used**

03.38 : **Encoder type**
Adjustment range : INCREMENTAL (0), Increm. FD (1), UVW only (2), Increm. UVW (3), HALL EFFECT (4), SENSORLESS 1 to 5 (5 to 9), RESOLVER (10)
Factory setting : INCREMENTAL (0)

INCREMENTAL (0): Quadrature incremental encoder

Increm. FD (1): Incremental encoder with Frequency/Direction output.
Function not available in the current version.

UVW only (2): Channels U, V, W only without their complement.

Increm. UVW (3): Incremental encoder with commutation channels

HALL EFFECT (4): Encoder with 6 lines per pair of poles.

SENSORLESS 1 (5): Estimated position (type 1): closed loop feedback with no encoder intended for asynchronous motors operating in applications with a low overtorque requirement at start-up (applications such as: pumps, fans, etc.) and synchronous permanent magnet motors operating in applications with high inertia (greater than 20 times the inertia of the motor).

SENSORLESS 2 (6): Estimated position (type 2): closed loop feedback with no encoder intended for asynchronous motors operating in applications with a high overtorque requirement at start-up (applications such as: grinders, presses, extruders, etc.) and synchronous permanent magnet motors operating in applications with low inertia (less than 20 times the inertia of the motor).

SENSORLESS 3 (7): Reserved. **Function not available in the current version.**

SENSORLESS 4 (8): Reserved. **Function not available in the current version.**

SENSORLESS 5 (9): Reserved. **Function not available in the current version.**

RESOLVER (10): Resolver.
The option required for managing the resolver (03.38 = 10) is not available.

Note: The operating modes SENSORLESS 1 and SENSORLESS 2 (**03.38** = 5 and **03.38** = 6) are active only for a drive mode at CL LP Vector (**11.31** = 2), SERVO (**11.31** = 3) or Syn VS REGEN (**11.31** = 5). For optimum operation of these types, first enable Autotune in Rotating mode (**05.12** = 2) and/or manually set parameters **05.17**, **05.23**, **05.24** and **05.25** for an asynchronous motor and **05.17**, **05.23**, **05.24**, **05.33** and **05.51** for a synchronous motor, according to the motor used.

CAUTION:
The MD-Encoder option is required for managing incremental encoders with or without commutation channels (03.38 = 0 to 3) and for managing Hall effect sensors (03.38 = 4).

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03.39 to **03.41** : Not used

03.42 : Drive encoder filter (■)
Adjustment range : 0 to 10
Factory setting : 3
This parameter is used to insert a filter in the encoder speed feedback, such that:
time constant = $2^{03.42}$ ms.
This is particularly useful for attenuating the current demand when the load has high inertia and high gain is necessary on the speed controller. If the filter is not enabled under these conditions, it is possible for the speed controller output to change continuously from one current limit to another, disabling the integral function of the speed controller.
The filter is inactive if **03.42** = 0.

03.43 : Max frequency input reference
Adjustment range : 0 to 32000
Factory setting : 5000
Adjusts the input frequency which should correspond to 100% of the destination numerical value.

03.44 : Frequency input reference scale
Adjustment range : 0 to 2.000
Factory setting : 1.000
Used for scaling the numerical reference to be converted into pulses.

03.45 : Frequency input reference

Adjustment range : 0 to 100% (■); ± 100% (■)
Indicates the value of the numerical reference resulting from conversion of the pulse signal.

03.46 : Frequency input reference destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to select the destination of the numerical reference resulting from conversion of the pulse signal. Only "non-bit" type parameters can be programmed. If an unsuitable parameter is selected, **03.46** will be frozen at 0.

03.47 to **03.50** : Not used

03.51 : Vmin alarm threshold
Adjustment range : 0 to 500 rpm
Factory setting : 90 rpm
Triggers an alarm **10.51** when the motor speed is such that:
- (**05.04**) < V min (**01.07** or **21.02**) + **03.51** in open loop mode
- (**03.02**) < V min (**01.07** or **21.02**) + **03.51** in closed loop mode

03.52 : Vmax alarm threshold
Adjustment range : 0 to 500 rpm
Factory setting : 90 rpm
Triggers an alarm **10.52** when the motor speed is such that:
- (**05.04**) > V max (**01.06** or **21.01**) - **03.52** in open loop mode,
- (**03.02**) > V max (**01.06** or **21.01**) - **03.52** in closed loop mode.

03.53 to **03.60** : Not used

03.61 : Frequency input source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to select the source of pulses.
Note: Only use inputs DIO1, DIO2 and DIO3 as the frequency input source corresponding respectively to parameters **08.01**, **08.02** and **08.03**. The maximum input frequency should be 500 Hz. If the input frequency is higher than 500 Hz, use an MD-Encoder option, and set **03.67** to Encoder (1).

03.62 : Input frequency

Adjustment range : 0 to 5000 Hz
Pulse input frequency which will be converted to a numerical reference.
Application example:
Pulses from an inductive sensor connected to a digital input are converted to a reference which is assigned to the speed reference.

03.63 to **03.66** : Not used

03.67 : Frequency input select (■)
Adjustment range : Digital in (0) or Encoder (1)
Factory setting : Digital in (0)

Digital in (0): An analog reference is generated from a frequency signal.

Encoder (1): The encoder signal is used to generate an analog reference (e.g. speed reference).

03.68 to **03.89** : Not used

03.90 : Remanent frequency

Adjustment range : ± 590.0 Hz
Indicates the frequency of the remanent voltage present at the motor terminals when the drive is disabled. This parameter is reset to zero when the drive is enabled.

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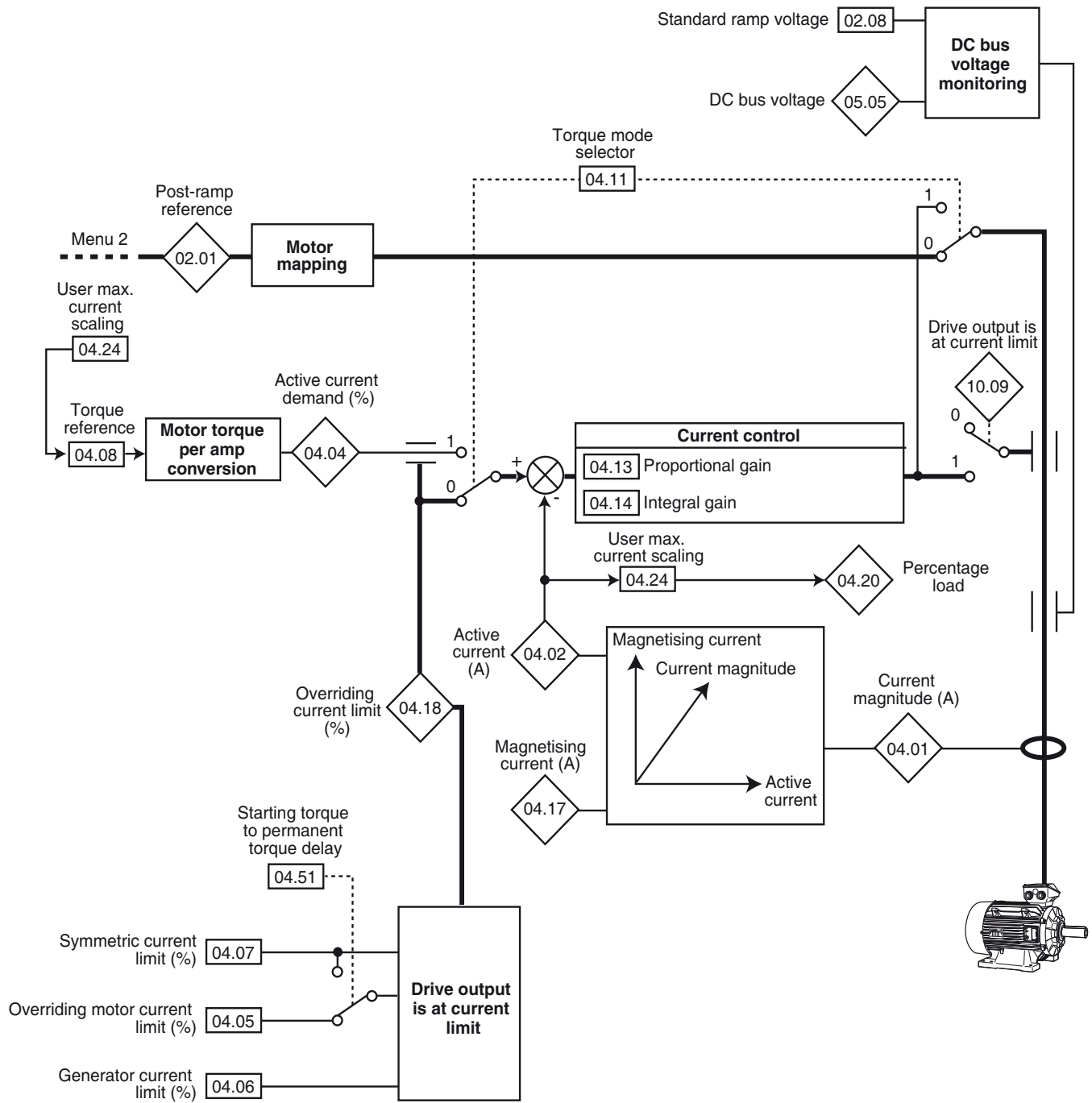MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

Notes

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5.5 - Menu 4: Current loop - Torque control

5.5.1 - Menu 4 diagrams

• Open loop control

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• **Closed loop control**
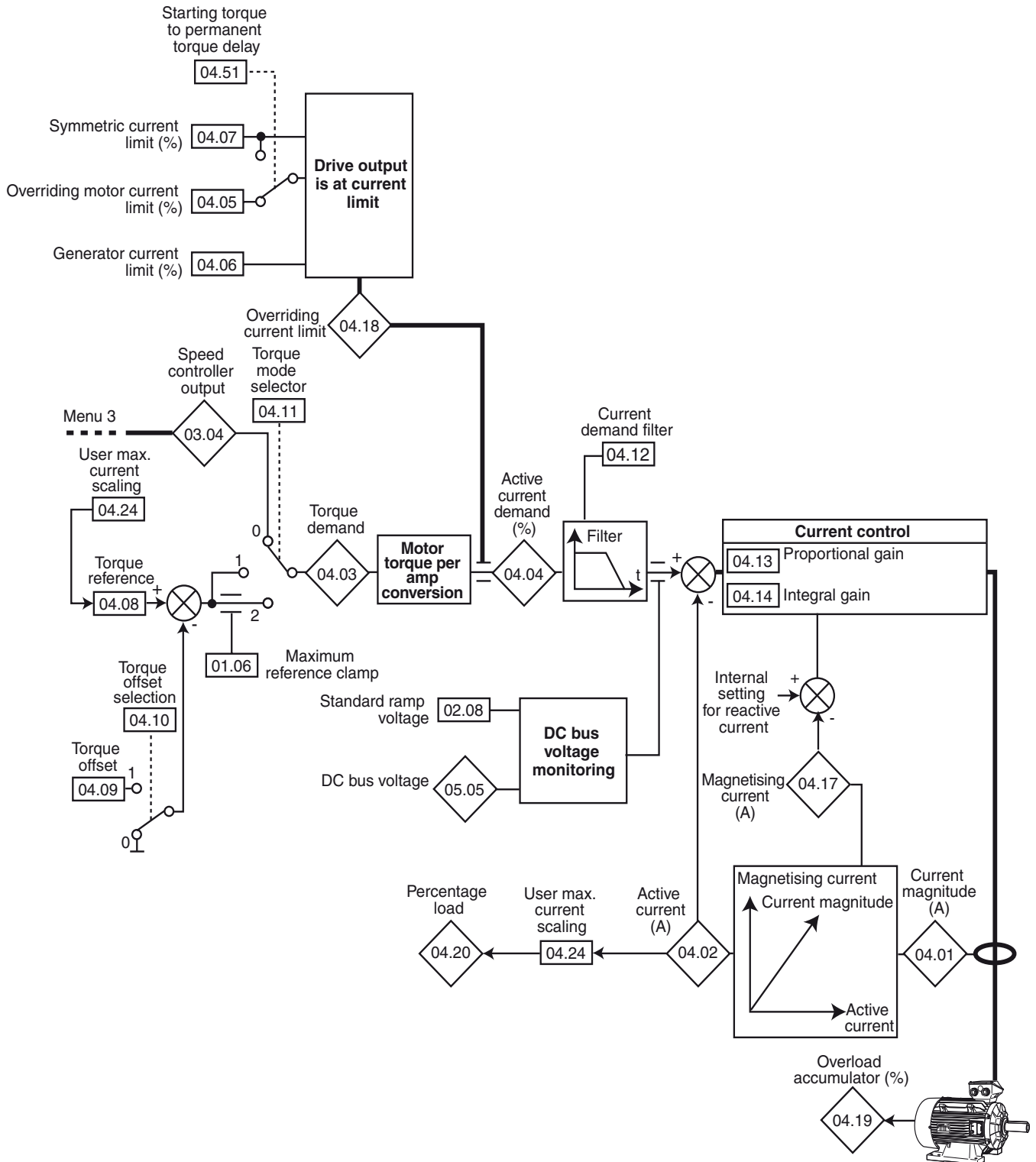
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5.5.2 - Explanation of parameters in menu 4

04.01 : Current magnitude

Adjustment range : 0.0 to max. drive current (A)
Reading of the rms current in each drive output phase.
This is the result of the vectorial sum of the reactive current and the active current.
Note: Max. drive current = 2.22 x **11.32**.

04.02 : Active current

Adjustment range : ± max. drive current
Reading of the active current delivered by the drive.
The active current gives a fairly precise image of the motor torque between 10 Hz and 50 Hz.
A negative value indicates operation in generator mode with driving load whereas a positive value indicates operation in motor mode.

04.03 : Torque demand

Adjustment range : ± 999.9% Tn (percentage of rated motor torque)
Value of the torque demand required by the motor as a % of the rated motor torque.

04.04 : Active current demand

Adjustment range : ± motor active current limit (% motor active In)
The current demand is the result of conversion of the torque reference **04.08** into active current.
04.04 = **04.03** when the drive current limit is not reached and the motor is not in the defluxing zone.

04.05 : Overriding motor current limit
Adjustment range : 0 to 300.0% (% motor active In*)
Factory setting : 150% In
Used to set the maximum starting current limit permitted in motor mode during a maximum time specified by **04.51**.
When the value of **04.05** is less than **04.07**, then **04.05** overrides **04.07**.

04.06 : Generator current limit
Adjustment range : 0 to 300.0% (% motor active In*)
Factory setting : 110% In
Used to set the maximum permanent current limit permitted in generator mode.
When the value of **04.07** is less than **04.06**, then **04.07** overrides **04.06**.

04.07 : Symmetric current limit
Adjustment range : 0 to 300.0% (% motor active In*)
Factory setting : 110% In
Used to set the maximum permanent current limit permitted in motor mode.
Note: In open loop and linear V/F mode, the only current limit is **04.07**.

* Motor actif current is in relation with the power factor and motor rated current.

04.08 : Torque reference
Adjustment range : ± **04.24** (% motor active In)
Factory setting : 0.0% In
Main torque reference when the drive is configured for torque control.
Give a positive reference for the torque to be applied clockwise and conversely, a negative reference for the torque to be applied counter-clockwise.
The maximum value of **04.08** is fixed by **04.24**.

04.09 : Torque offset
Adjustment range : ±150.0%
Factory setting : 0.0%

04.10 : Torque offset selection
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)

NO (0): The torque reference is equal to parameter 04.08.

YES (1): The torque reference is equal to parameter **04.08** plus the torque offset value **04.09**.

04.11 : Torque mode selector
Adjustment range : SPEED (0), DIRECT Trq (1), TORQUE (2)
Factory setting : SPEED (0)

■ :
SPEED (0): Speed control with current limiting by parameter 04.07.

DIRECT Trq (1): Torque control. The speed reference is no longer active and the torque reference may be given by analog reference 2 (if it is programmed on the torque reference, parameter **04.08**). The output frequency is adjusted so that the active current measured by the drive equals the reference.

■ :
SPEED (0): Speed control with current limiting by parameter 04.07.

DIRECT Trq (1): Direct torque control. The motor torque is set to the value of **04.08** (**04.08** + **04.09** if **04.10** is set to YES).
The motor speed value therefore depends on the resistive torque of the application.

TORQUE (2): Torque control with overspeed protection provided by parameter **01.06**.

⚠ **• In torque control mode (04.11 = 1), if the resistive torque becomes zero, the drive accelerates the machine to the maximum speed of 01.06 + 30%. It is therefore imperative to ensure that parameter 01.06, which limits the maximum speed, is set so as to ensure the safety of equipment and personnel.**

04.12 : Current demand filter (■)
Adjustment range : 0 to 10
Factory setting : 2
This filter is used to introduce a time constant aimed at reducing any noise generated by the speed loop, such that:
time constant = $2^{04.12}$ ms.

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04.13 : **Current loop proportional gain**

04.14 : **Current loop integral gain**
Adjustment range : 0 to 250
Factory setting   : **04.13** = 40
                     04.14 = 40
Due to a number of factors internal to the drive, oscillations may occur in the following cases:
- Frequency control with current limiting around the rated frequency and on load impacts
- Torque control on machines with a low load and around the rated speed
- On a mains supply break or on a controlled deceleration ramp when control via the DC bus is requested.
To reduce these oscillations, we recommend that you first:
- Increase the proportional gain **04.13**
- Then reduce the integral gain **04.14**

04.15 and **04.16** : **Not used**

04.17 : **Reactive current**

Adjustment range : 0 to + max. drive current (A)
Reactive current reading.

04.18 : **Overriding current limit**

Adjustment range : 0 to + 300% (% max. active In)
Indication of the transient limit of the drive current. This value depends on **04.05**, **04.06**, **04.51** and internal limits.

04.19 : **Overload accumulator**

Adjustment range : 0 to 100%
This parameter indicates the estimated thermal state of the motor (I^2t) (see **10.17**); however, it does not generate a trip in the event of motor overheating. This parameter is reset to 0 on each power-up.
The use of a PTC sensor is therefore strongly recommended to protect the motor.

04.20 : **Percentage load**

Adjustment range : ± active current limit (% active In)
This parameter indicates the drive load level. A positive value indicates operation in motor mode whereas a negative value indicates operation in generator mode (driving load).
The maximum value of **04.20** is fixed by **04.24**.

04.21 to **04.23** : **Not used**

04.24 : **User max. current scaling**
Adjustment range : ± 999.9%
Factory setting   : 150%
Defines the maximum value of parameter **04.20** and parameter **04.08**.

04.25 to **04.50** : **Not used**

04.51 : **Time start torque to permanent torque**
Adjustment range : 0 to 250 s
Factory setting   : 60 s
On starting, time permitted for torque limit **04.05** before changing to torque limit **04.07**.

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5.6 - Menu 5: Motor control (mode, switching frequency, characteristics)

5.6.1 - Menu 5 diagram
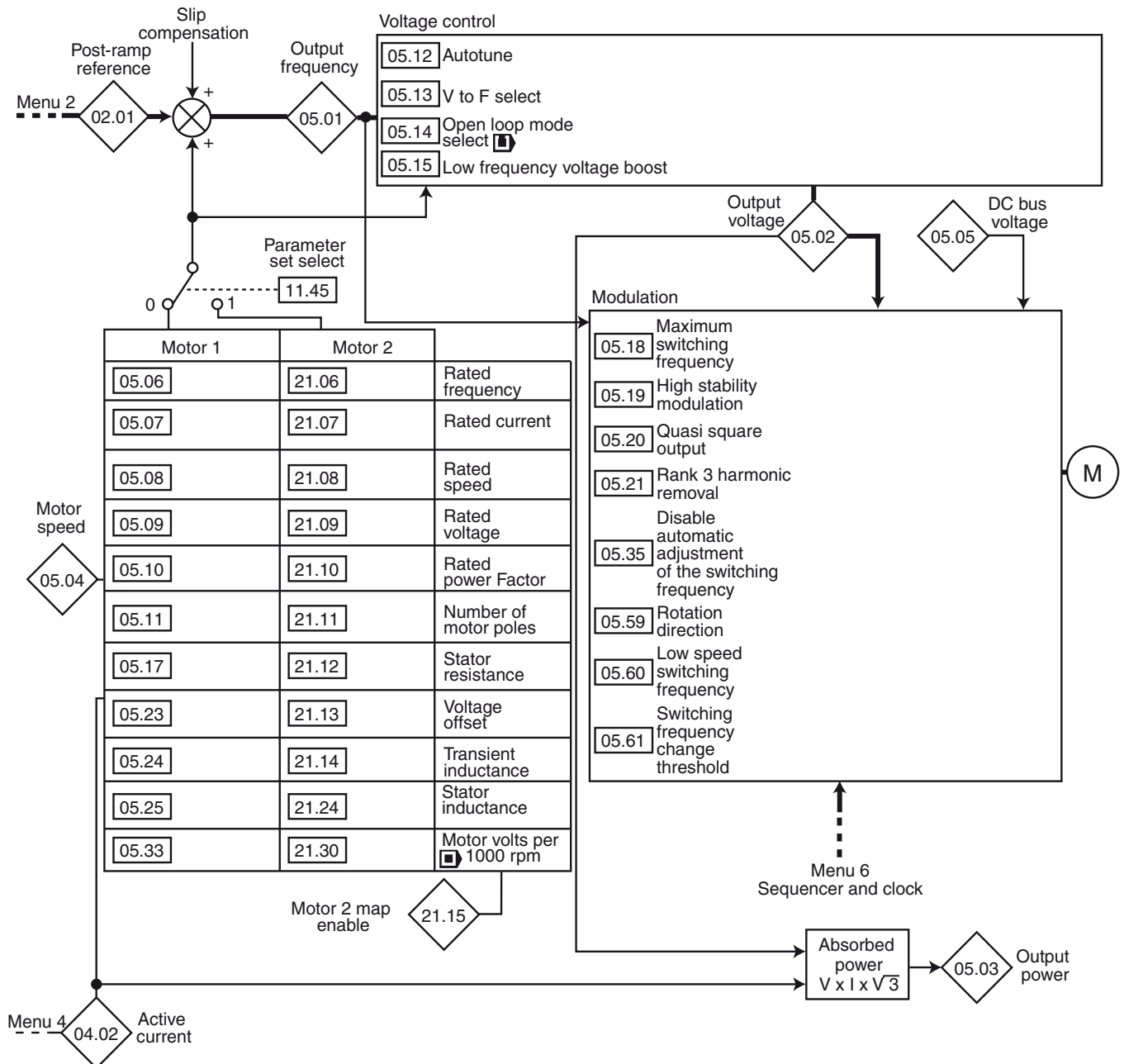
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5.6.2 - Explanation of parameters in menu 5

05.01 : **Output frequency**

Adjustment range : ± 590.0 Hz
Indicates the drive output frequency.

05.02 : **Output voltage**

Adjustment range : 0 to 999 V
Fondamental voltage value at the drive output.

05.03 : **Output power**

Adjustment range : $\pm 11.33 \times 11.32 \times 2.22 \times \dfrac{\sqrt{3}}{1000}$ kW

05.03 is the calculated motor active power.

05.03 = 04.01 x 05.02 x $\left(\cos \varphi \times \dfrac{\sqrt{3}}{1000} \quad \text{kW}\right)$.

If this parameter has been assigned to an analog output via menu 7, 10 V corresponds to the maximum power measurable by the drive (max. drive current = 2.22 x **11.32**).

05.04 : **Motor speed**

Adjustment range : ± 2 x **01.06** rpm
The motor speed is calculated from the output frequency **05.01** according to the formula:

05.04 (rpm) = $\dfrac{60 \times \textbf{05.01}}{\text{number of pairs of motor poles}}$

05.05 : **DC bus voltage**

Adjustment range : 0 to 1300 V
Indicates the DC bus voltage measurement.

05.06 : **Motor rated frequency**
Adjustment range : 0.0 to 590.0 Hz
Factory setting   : **Eur = 50.0 Hz**
                   USA = 60.0 Hz
This is the point at which motor operation changes from constant torque to constant power.
In standard operation, it is the frequency indicated on the motor nameplate.

05.07 : **Motor rated current**
Adjustment range : 0 to I_{co} (A)
Factory setting   : Motor rated current corresponding
                   to the drive rating (see section 5.6.3)
This is the value of the motor rated current indicated on the nameplate. The overload is calculated from this value.

05.08 : **Motor rated speed**
Adjustment range : 1 to 32000 rpm
Factory setting   : Motor rated speed corresponding
                   to the drive rating (see section 5.6.3)
This is the on-load speed of the motor shown on the nameplate.
Note: This value must take into account the slip of the asynchronous motor with respect to the synchronous speed. Under no circumstances must this slip be negative.

05.09 : **Motor rated voltage**
Adjustment range : 0 to 999 V
Factory setting   : **Eur: 400 V**, USA: 460 V
Enter the rated voltage shown on the nameplate taking account of the normal power supply conditions.
Defines the voltage/frequency ratio as follows:
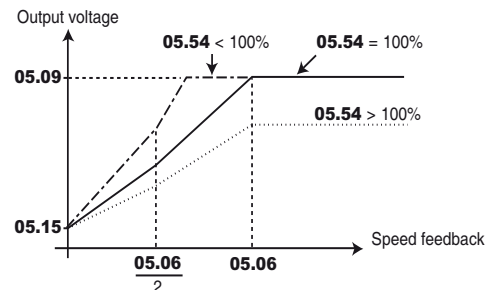
* If fixed boost has been selected **05.14** = LINEAR V/F (2), the boost value is set via **05.15**.

05.10 : **Rated power factor**
Adjustment range : 0 to 1.00
Factory setting   : 0.85
The power factor is measured automatically during a level 2 autotune phase (see **05.12**) and set in this parameter. If it has not been possible to carry out the autotune procedure, enter the Cos φ value indicated on the motor nameplate.

05.11 : **Number of motor poles**
Adjustment range : Automatic (0), 2 Poles (1), 4 Poles (2),
                   6 Poles (3), 8 Poles (4), 10 Poles (5),
                   12 Poles (6), 14 Poles (7), 16 Poles (8)
Factory setting   : Automatic (0)
When this parameter is at 0 (Automatic), the drive automatically calculates the number of poles according to the rated speed (**05.08**) and the rated frequency (**05.06**). However, the value can be entered directly in accordance with the table below:

Number of poles	05.11
2	2 Poles (1)
4	4 Poles (2)
6	6 Poles (3)
8	8 Poles (4)
10	10 Poles (5)
12	12 Poles (6)
14	14 Poles (7)
16	16 Poles (8)

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05.12 : **Autotune**

Adjustment range : Off (0), Stationary (1), Rotating (2)
Factory setting : Off (0)
During autotune sequence, brake is disabled.

⚠ **• The measurement taken when 05.12 = Rotating (2) should be taken with the motor uncoupled since the variable speed drive drives the motor at 2/3 of its rated speed.**

• "Rotating" autotune is necessary only in closed loop operating mode (■).
Make sure that this operation does not present any safety risks, and that the motor is stopped before the autotune procedure.

• After modifying motor parameters, repeat autotuning.

Off (0): No autotune

Stationary (1): Measurement of motor characteristics when stopped. This mode is recommended for open loop operation. The stator resistance and the voltage offset are stored in **05.17** and **05.23** respectively.

Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped.
- Enable the drive.
- Give a run command.
Wait until the procedure ends, then disable the drive and remove the run command.
The motor is then ready to operate normally.
Parameter **05.12** returns to 0 as soon as autotuning is complete.

Rotating (2): Measurement of motor characteristics with rotation. This mode is not suitable for open loop operation.

The stator resistance, the voltage offset and the encoder phase angle (■) are stored in **05.17**, **05.23** and **03.25** respectively, and the magnetising current and leakage inductance are used to calculate the power factor **05.10**. This mode is used to obtain optimum performance. Inductances **05.24** and **05.25** or **21.14** and **21.24** are also calculated and memorized during the autotune.

Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped.
- Enable the drive.
- Set **04.07** to 30% to avoid overcurrents.
- Give a run command. The motor is driven at low speed, and then performs a freewheel stop when autotuning is complete. Disable the drive and remove the run command.
The motor is then ready to operate normally.
Parameter **05.12** returns to Off (0) as soon as autotuning is complete.

05.13 : **V to F select**

Adjustment range : Linear (0) or Dynamic (1)
Factory setting : Linear (0)

Linear (0): The V/F ratio is fixed and set by the base frequency (05.06).

Dynamic (1): Dynamic V/F ratio.
Generates a voltage/frequency characteristic which varies with the load. It is for use in quadratic torque applications (pumps/fans/compressors). It can be used in constant torque applications with low dynamics to reduce motor noise.

05.14 : **Open loop mode select (■)**

Adjustment range : RS: EACH RUN (0),
RS: NO Mes. (1), LINEAR V/F (2),
RS: 1st RUN (3),
RS: POWER UP (4), V/F SQUARE (5)
Factory setting : RS: NO Mes. (1)
Determines the open loop control mode. Modes 0, 1, 3 or 4 are used in flux vector control. The difference between these modes is the method used to identify the motor parameters, in particular the stator resistance. As these parameters vary with temperature and are essential for obtaining optimum performance, the machine cycle must be taken into account for selecting the most appropriate mode. Modes 2 and 5 correspond to a V/F ratio control mode. This ratio is linear in mode 2 and square in mode 5.

RS: EACH RUN (0): The stator resistance **05.17** and voltage offset **05.23** are measured each time the drive receives a run command.
These measurements are valid only if the machine is stopped, and totally defluxed. The measurement is not taken when the run command is given less than 2 seconds after the previous stop. This is the most effective flux vector control mode. However, the operating cycle must be compatible with the 2 seconds required between a stop command and a new run command.

RS: NO Mes. (1): The stator resistance 05.17 and voltage offset 05.23 are not measured.
This mode is of course the least effective. It should only be used when mode 0 is incompatible with the operating cycle. If this were to be the case, during commissioning, an autotune (05.12) should be performed to read the values measured in 05.17 and 05.23 and use them with mode 1 during normal operation.

LINEAR V/F (2): Voltage-frequency ratio with fixed boost adjustable via parameters **05.15** and **05.09**.
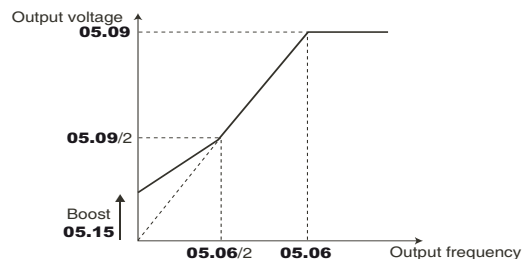
CAUTION:
Use this mode to control several motors.

RS: 1st RUN (3): The stator resistance **05.17** and voltage offset **05.23** are measured the first time the drive is enabled (drive output active).

RS: POWER UP (4): The stator resistance **05.17** and voltage offset **05.23** are measured the first time the drive is enabled (drive output active) following each power-up.

V/F SQUARE (5): Square law characteristic.
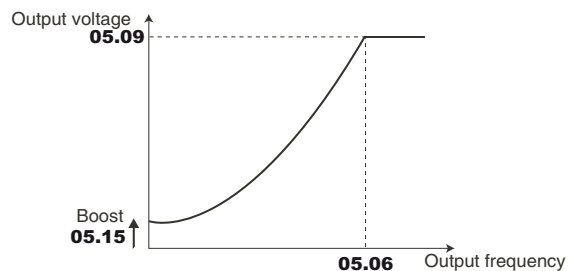
⚠ **• In mode 4, a voltage is briefly applied to the motor. For safety reasons, no electrical circuit must be accessible once the drive is powered up.**

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05.15 : **Low frequency voltage boost**
Adjustment range : 0 to 25.0% of motor Un (**05.09**)
Factory setting : 1.0% motor Un
For operation in V/F mode (**05.14** at V/F (2)), parameter **05.15** is used to overflux the motor at low speed so that it delivers more torque on starting. It is a percentage of the motor rated voltage (**05.09**).
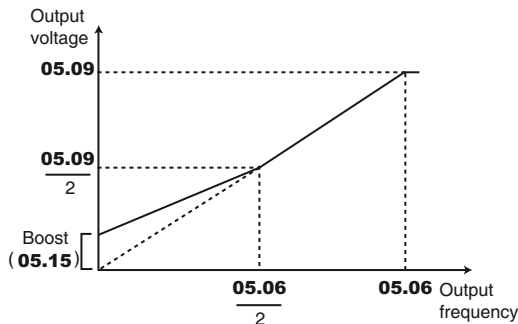
05.16 : **Not used**

05.17 : **Stator resistance**
Adjustment range : 0 to 32.000 xΩ
Factory setting : 0.000 xΩ
This parameter stores the motor stator resistance for flux vector control mode (see parameter **05.14**).
If the stator resistance cannot be measured (motor not connected, value higher than the max. rating), a "Stator res." trip occurs.
During autotuning (**05.12** = Stationary (1) or Rotating (2)), the value of the stator resistance is automatically stored in **05.17**.

05.18 : **Maximum switching frequency**
Adjustment range : 1,5 kHz to 14 kHz (see table below)
Factory setting : 3 kHz (2)
Sets the PWM switching frequency.

Frequency	05.18	Frequency	05.18
2 kHz	0	6.5 kHz	9
2.5 kHz	1	7 kHz	10
3 kHz	**2**	8 kHz	11
3.5 kHz	3	9 kHz	12
4 kHz	4	10 kHz	13
4.5 kHz	5	11 kHz	14
5 kHz	6	12 kHz	15
5.5 kHz	7	13 kHz	16
6 kHz	8	14 kHz	17
		1,5 kHz	18

Note : For frequencies higher than 6 kHz, please contact LEROY-SOMER.

CAUTION:
A high switching frequency reduces the magnetic noise, but it increases the drive temperature rise.
Refer to the installation manual to determine the derating of the drive according to the frequency.

05.19 : **High stability modulation**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): Function disabled.

Enabled (1): Function enabled.
Instabilities can occur:
- At 50% of the motor rated frequency for an underloaded motor
- Around and above the motor rated speed, when the motor is underloaded or very heavily loaded.
This function is used to eliminate these instabilities.
It also enables a slight reduction in the drive temperature rise. However, using this mode may result in a slight increase in motor noise.

05.20 : **Quasi square output**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Enabled (1)
Disabled (0): Function disabled.
Enabled (1): The maximum drive output voltage is higher, resulting in an increase in motor torque. This is beneficial for applications where it is desirable to reduce speed pick-up times in the event of long cycles.
However, the motor torque may have slight ripples when it is lightly loaded.

05.21 : **H3V removal**
Adjustment range : No (0) or Yes (1)
Factory setting : No (0)
This signal allow to remove rank 3 voltage harmonic (H3V) on drive sitgnal output. The maximum level reduction will be 15%.

05.22 : **Not used**

05.23 : **Voltage offset**
Adjustment range : 0 to 25.5 V
Factory setting : 0.0 V
This voltage offset is measured by the drive (see parameter **05.14**). It is used to correct imperfections in the drive, especially voltage drops in the IGBTs and idle times. This parameter plays an important role in low-speed operation, i.e. when the drive output voltage is low.
During autotuning (**05.12** = Stationary (1) or Rotating (2)), the value of the voltage offset is automatically stored in **05.23**.

05.24 : **Transient inductance**
Adjustment range : 0 to 32.000 mH
Factory setting : 0.000 mH
During autotuning with rotation (**05.12** = Rotating (2)), the motor leakage inductance is stored in this parameter.

05.25 : **Stator inductance L$_S$**
Adjustment range : 0 to 320.00 mH
Factory setting : 0.00 mH
This is the motor stator inductance at rated flux.
During autotuning with rotation (**05.12**: Rotating (2)), the total motor inductance is stored in this parameter.

05.26 : **Dynamic control enable**
Adjustment range : No (0) or Yes (1)
Factory setting : No (0)
Reserved.

05.27 to **05.31** : **Not used**

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05.32 : **Motor torque per amp Kt (■)**
Adjustment range : 0.01 to 320.00 NmA^{-1}
Factory setting : 1.00 NmA^{-1}
Indicates the motor torque per Amp of active current used by the drive in calculating the speed loop gains (**03.17** = 1).
Function not available in the current version.

05.33 : **Motor volt per 1000 rpm (Ke) (■)**
Adjustment range : 0 to 10000 V
Factory setting : 98 V
Used to set the motor voltage per 1000 rpm. Is used to adjust the current loop integral gain to prevent current peaks when the drive is enabled with a spinning motor.

05.34 : **Not used**

05.35 : **Automatic switching frequency**
Adjustment range : Enabled (0) or Disabled (1)
Factory setting : Enabled (0)

Enabled (0): In the event of increased temperature of the IGBTs, the switching frequency is automatically reduced.

Disabled (1): Automatic adjustment of the switching frequency is disabled. In this case, the drive trips if the temperature of the IGBTs is too high.
Function not available in the current version.

05.36 to **05.49** : **Not used**

05.50 : **Motor ventilation**
Adjustment range : Not cooled (0). Self cooled (1),
Forced cool. (2)
Factory setting : Self cooled (1)

Not cooled (0): Not cooled.

Self cooled (1): Self-cooled.

Forced cool. (2): Forced cooling.

05.51 : **Q axis inductance (synchronous motor)**
Adjustment range : 40% to 250% of **05.24**
Factory setting : 100%
Used to set an inductance value in quadrature with the pole axis for salient-pole synchronous machines.

05.52 : **Starting I brushless motor (synchronous motor)**
Adjustment range : 0% to 120% of **05.07**
Factory setting : 20%
In Sensorless Servo application (**11.31** = SERVO - **03.38** = Sensorless), allows to increase the starting torque.
In Closed loop application (**11.31** = CL.LP Vector) allows to boost the magnetizing current at run order in order to achieve the flux level quicker.

05.53 : **Flux installation time (synchronous motor)**
Adjustment range : 80 ms to 32000 ms
Factory setting : 250 ms
In Sensorless Servo application (**11.31** = SERVO) define the parking time before the motor start to run. If total inertia **03.18** is higher than 10 kg.m^2, the packing time is multiplied by **03.18** value.
In closed loop application (**11.31** = CL.LP Vector), after a run order, the flux is considered installed if **05.53** runs out, or if the 7/8 x rated flux are achieved.

05.54 : **Base frequency/Nominal frequency ratio**
Adjustment range : 75% to 150%
Factory setting : 100%
This parameter is used to adjust the level of flux in the induction motor.
The diagram below shows the influence of **05.54** on the change in the motor no-load voltage characteristic as a function of the speed of rotation.
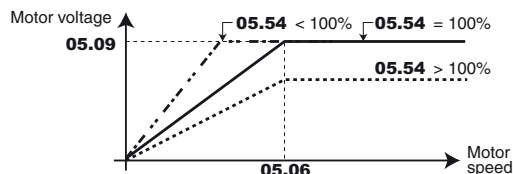
05.55 to **05.58** : **Not used**

05.59 : **Rotation direction**
Adjustment range : Clockwise (0) or counter clockwise (1)
Factory setting : Clockwise (0)
This parameter allows changing the motor direction without changing the sign of the speed reference.
A change to this parameter will be taken into consideration at stop.

05.60 : **Low-speed switching frequency**
Adjustment range : See table below
Factory setting : 2.5 kHz (1)

Frequency	05.60		Frequency	05.60
2 kHz	0		6.5 kHz	9
2.5 kHz	**1**		7 kHz	10
3 kHz	2		8 kHz	11
3.5 kHz	3		9 kHz	12
4 kHz	4		10 kHz	13
4.5 kHz	5		11 kHz	14
5 kHz	6		12 kHz	15
5.5 kHz	7		13 kHz	16
6 kHz	8		14 kHz	17
			1,5 kHz	18

Note : For frequencies higher than 6 kHz, please contact LEROY-SOMER.

Used to set the switching frequency when the motor frequency/speed has reached the threshold defined in **05.61**.

05.61 : **Switching frequency change threshold**
Adjustment range : 0.0 to 590.0 Hz
Factory setting : 0.0 Hz
If the motor frequency (speed) is below the threshold set by **05.61**, the switching frequency selected via **05.60** is used. Otherwise, the switching frequency **05.18** is used.
Reminder: F = (pp x S)/60
Where F is the frequency in Hz, pp the number of pairs of poles and S the speed in rpm.

05.62 : **Brushless flux mode**
Adjustment range : STANDARD (0), FIXED (1),
Opt. Mode 1 (2), Opt. Mode 2 (3)
Factory setting : STANDARD (0)

Note: Leave **05.62** = STANDARD (0) and only change after consulting LEROY-SOMER.

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05.63 : **Brushless magnet current**

Adjustment range : 0 to I_{co}
Factory setting : 0.0 A
When **05.62** is not equal to STANDARD (0) and **11.31** is set
to SERVO (3), **05.63** is used to set the magnetising current.
On the other hand, if **05.62** is set to STANDARD (0) and
11.31 is set to SERVO (3), the value programmed in **05.63**
can be used to increase the losses in the motor during braking
phases by setting **02.04** to Fast + (3) or Standard + (2) and
in this way brake more quickly.

5.6.3 - Factory settings according to the rating (see parameter 11.43 or 00.45)

The factory settings for **05.07** and **05.08** vary depending on the drive rating.

Note: • In Regen mode, the factory settings of **18.26** are equivalent to those of **05.07**.
• The factory setting values for **21.07** and **21.08** are identical to those for **05.07** and **05.08**.

• **Factory setting 400V/50 Hz (Eur) and 460V/60Hz (USA) - heavy or normal duty application**

| | Heavy duty | | | | Normal duty | | | |
| | Europe | | USA | | Europe | | USA | |
Rating	05.07/00.06	05.08/00.07	05.07/00.06	05.08/00.07	05.07/00.06	05.08/00.07	05.07/00.06	05.08/00.07
270TH	224	1486	209	1785	224	1487	209	1786
340TH	259	1487	253	1786	259	1487	253	1785
400TH	315	1487	315	1785	315	1487	315	1787
500TH	375	1489	367	1787	375	1489	367	1787
600TH	465	1489	463	1787	465	1489	463	1789
750TH	524	1490	523	1789	524	1490	523	1791
900TH	778	1491	776	1791	778	1491	776	1791
1200TH	1006	1490	1001	1791	1006	1490	1001	1791
1500TH	1147	1490	1141	1791	1147	1490	1141	1791
60T	80	1480	80	1770	99	1480	98	1770
75T	99	1480	98	1770	137	1480	133	1765
100T	137	1480	133	1765	163	1480	161	1765
120T	163	1480	161	1765	197	1482	193	1773
150T	197	1482	193	1773	238	1485	230	1780
180T	238	1485	230	1780	280	1485	283	1775
220T	280	1485	283	1775	350	1480	350	1775
270T	350	1480	350	1775	425	1480	417	1775
340T	425	1480	420	1775	505	1480	500	1780
400T	505	1480	500	1780	610	1490	595	1782
470T	610	1490	605	1787	689	1490	688	1788
600T	689	1490	688	1788	767	1491	763	1789
750T	767	1491	763	1789	864	1491	862	1791
900T	864	1491	862	1791	1164	1490	1160	1791
1100T	1164	1490	1160	1791	1284	1490	1280	1791

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5.7 - Menu 6: Sequencer and clock

5.7.1 - Menu 6 diagrams

• **Sequencer**
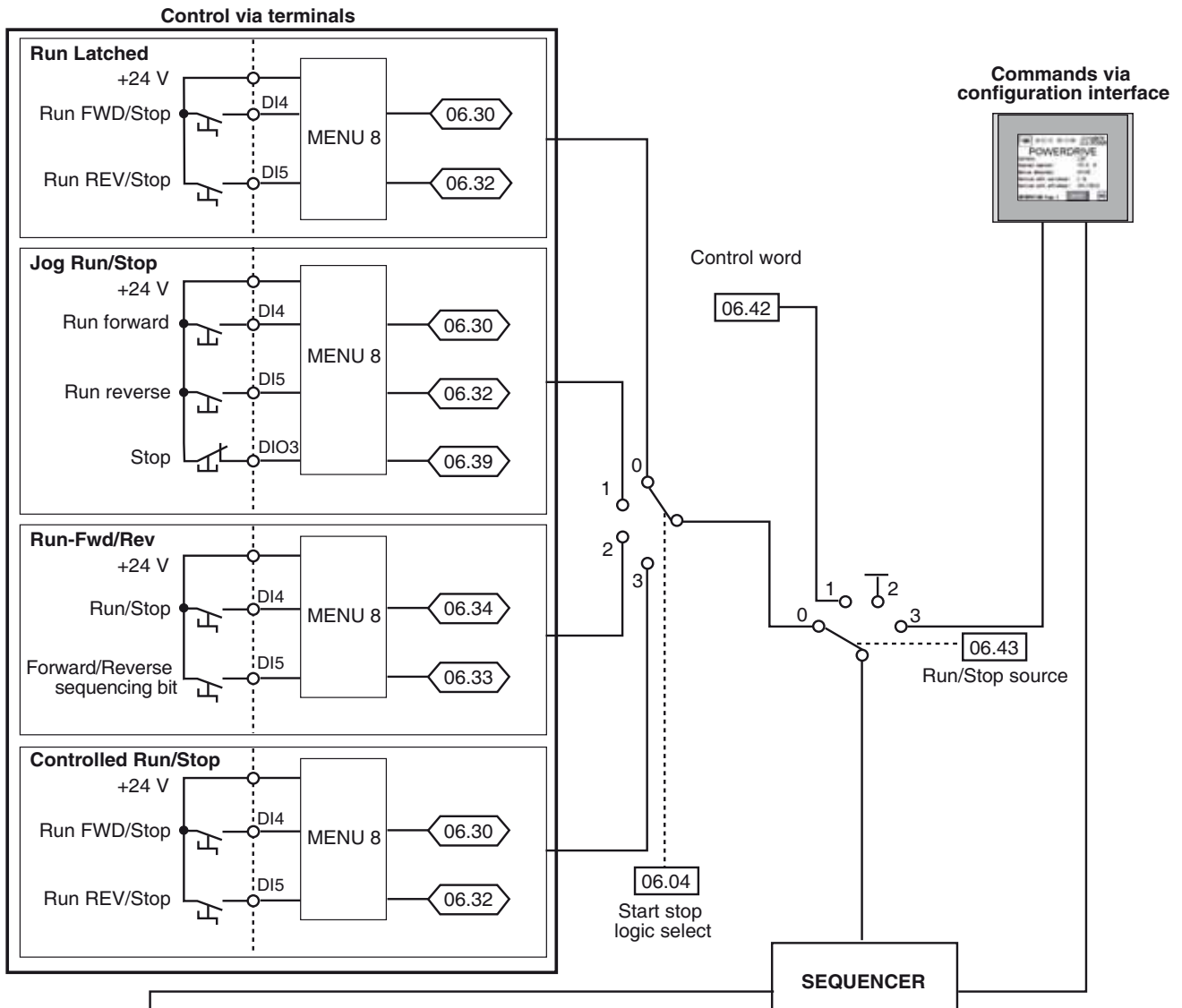
06.01	Stop mode
06.03	Mains loss mode
06.06	Injection braking level
06.07	Injection braking time
06.08	Hold zero speed
06.09	Catch a spinning motor
06.10	Reduced voltage
06.12	Keypad stop key
06.15	Drive output
06.60	Mains undervoltage threshold
06.61	Delay before start
06.62	Delay before mains loss
06.63	Delay before flying restart

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• **Clock**
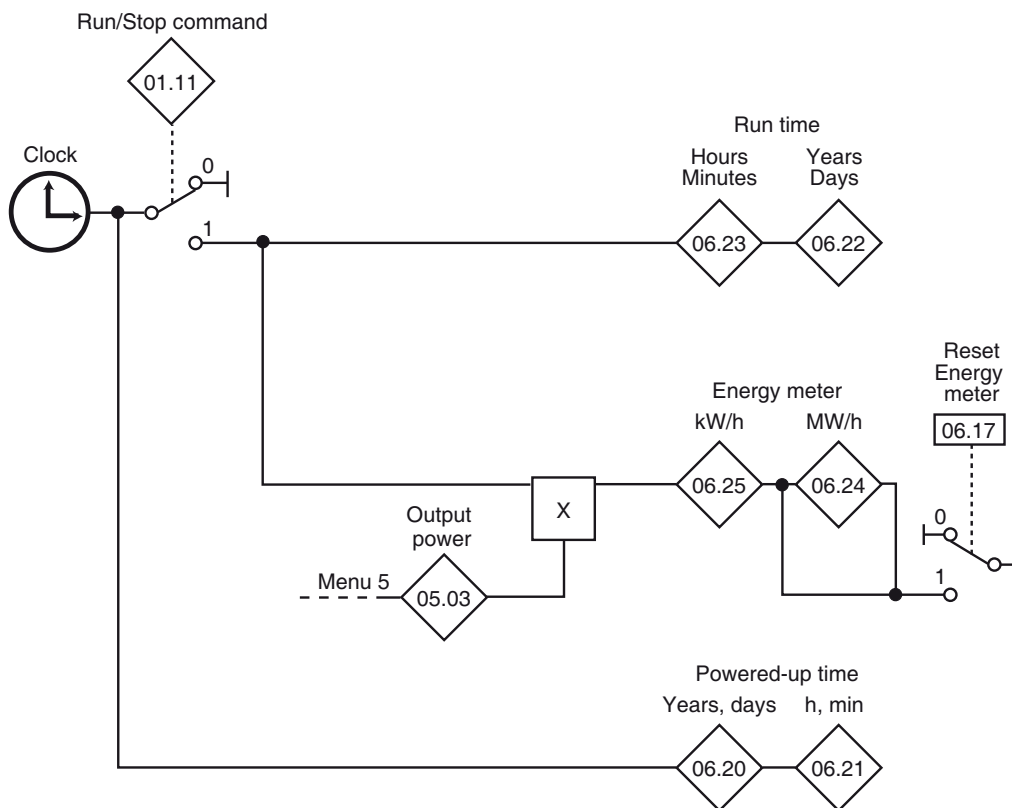
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5.7.2 - Explanation of parameters in menu 6

06.01 : **Stop mode**

Adjustment range : Coast (0), Ramp (1),
Ramp + DC (2), DC to 0 (3),
Timed DC (4)
Factory setting : Ramp (1)

Coast (0): Freewheel stop.
The power bridge is deactivated as soon as the stop command is given.
The drive cannot receive another run command during the time programmed in **06.63**, the motor demagnetisation time. After this stopping time, the drive is "ready". The machine stopping time depends on its inertia.

Ramp (1): Stop on deceleration ramp.
The drive decelerates the motor according to the deceleration mode chosen in parameter 02.04.
One second after the stop, the drive is "ready".
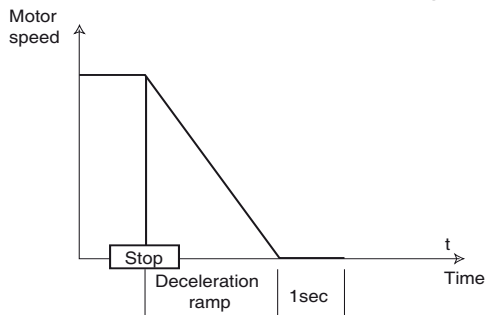
Ramp + DC (2) (■): Stop on deceleration ramp with DC injection for an imposed period of time.
The drive decelerates the motor according to the deceleration mode chosen in parameter **02.04**.
When zero frequency is reached, the drive injects DC with a magnitude which can be set in parameter **06.06** for a time defined by parameter **06.07**.
The drive is "ready".
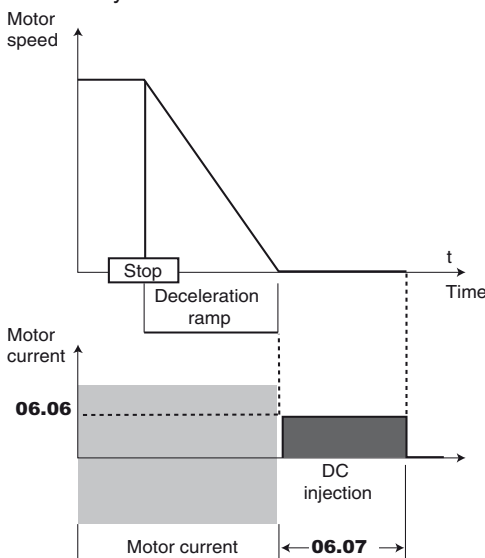
DC to 0 (3) (■): Stop by braking by low frequency current injection, then DC injection at zero speed.
The drive decelerates the motor by imposing a low frequency current until it reaches almost zero speed, which the drive detects automatically.
The drive then injects DC with a magnitude which can be set in parameter **06.06** for a time defined by parameter **06.07**. No run command can be taken into account until the drive is "ready".
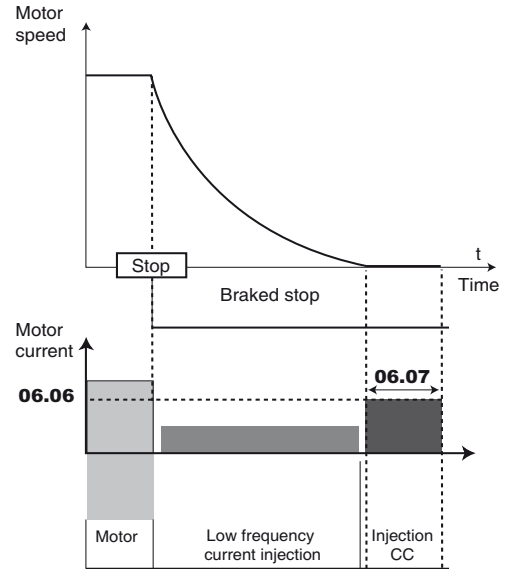
Timed DC (4) (■): Stop on DC injection with an imposed period of time.
The drive decelerates the motor by imposing a current defined by parameter **06.06** for a time defined by parameter **06.07**. No run command can be taken into account until the drive is "ready".
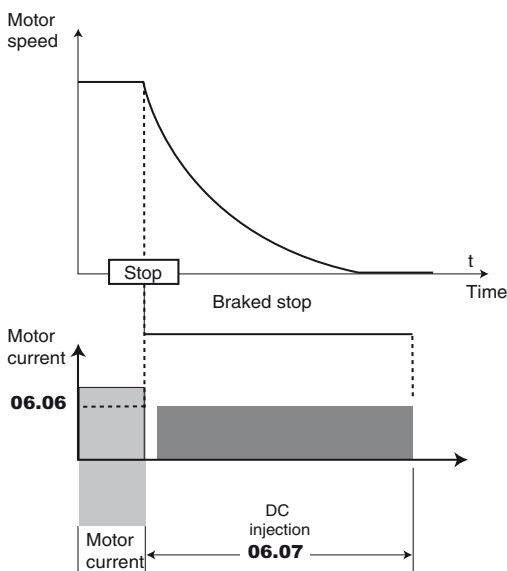
Note: In closed loop mode (■), the stop modes Ramp + DC (2), DC to 0 (3) and Timed DC (4) are equivalent to the stop mode Ramp (1).

06.02 : **Not used**

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06.03 : Mains loss mode

Adjustment range : NO DETECTION (0), FULL STOP (1),
DELAYED STOP (2)
Factory setting : NO DETECTION (0)

NO DETECTION (0): The drive does not take account of mains supply breaks and continues to operate while there is sufficient voltage on the DC bus.
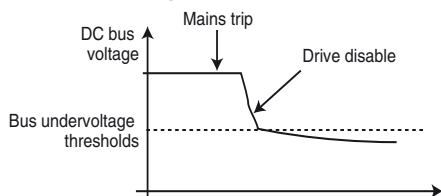
FULL STOP (1): If there is a mains supply break, the drive will decelerate on a ramp, automatically calculated by the drive, so that the motor feeds back energy to the DC bus. On return to normal conditions, deceleration continues until the motor stops, according to the stop mode programmed in **06.01**.
The message "Mains loss" is displayed.

DELAYED STOP (2): If there is a mains supply break, the drive will decelerate on a ramp, automatically calculated by the drive, so that the motor feeds back energy to the DC bus. On return to normal conditions:
- If the duration of the mains loss is less than parameter **06.62** "Delay before mains loss", the motor reaccelerates up to reference speed.
- If the duration of the mains loss is greater than parameter **06.62** "Delay before mains loss", deceleration continues in freewheel mode. The "Mains loss" message is displayed.
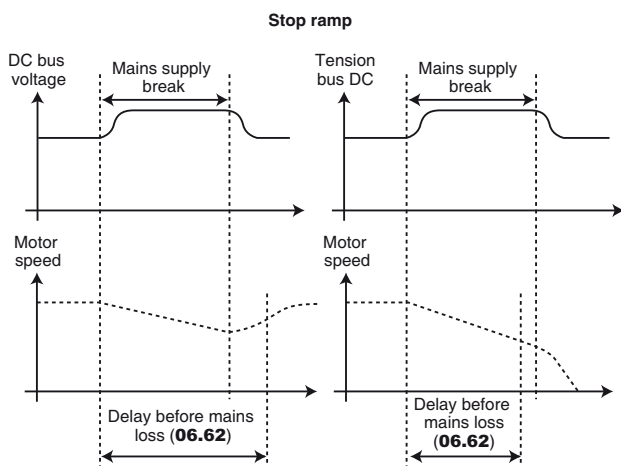
06.04 : Start stop logic select

Adjustment range : Run Latched (0), Jog Run/Stop (1),
Run-Fwd/Rev (2), Controlled Run/Stop (3)
Factory setting : Controlled Run/Stop (3)
Used to choose one of 4 Run/Stop command and Direction of rotation management modes.

Run Latched (0): Command for FWD/Stop and REV/Stop via stay-put contacts.
Terminal DI4 preset to FWD/Stop.
Terminal DI5 preset to REV/Stop.
On power-up or after a trip reset, if a run command is already selected, the motor starts as soon as the reference appears.

Jog Run/Stop (1): Command for Run and Stop via jog contacts.
In this mode, use DIO3 to give the Stop command.
To do this, configure:
- **08.23** = **06.39** (DIO3 assigned as Stop input).
Terminal DI4 preset to Run FWD.
Terminal DI5 preset to Run REV.
If the user wishes to assign DIO1 and DIO2 to other functions, provide stay-put contacts on these inputs.
To switch from FWD to REV or vice versa, go via a stop command.

Run-Fwd/Rev (2): Command for Run/Stop via stay-put contact.
In this mode, use DI4 as Run/Stop, and DI5 to give the direction of rotation.
To do this, configure:
- **08.24** = **06.34** and **08.25** = **06.33**.

Controlled Run/Stop (3): Controlled Run/Stop.
Controlled Run/Stop operation is identical to Run Latched (0) if 08.10 is set to Secur. disab. (1) (factory setting). To use the specific features of this mode, 08.10 must be set to Drive enable (0). In this case, if the drive is powered up with the run command present, the motor does not start. The run command must be cycled for it to have effect. Similarly, upon clearing of a trip, if the run command is present, it is not taken into account. It must be cycled to have effect.

Note: Modifications to **06.04** must be made with the drive disabled.

06.05 : Not used

06.06 : Injection braking level
Adjustment range : 0 to 300.0%
Factory setting : 100.0%
This parameter defines the level of current used for DC injection braking (see **06.01** and **06.08**).
CAUTION:
For efficient braking, the value of parameter 06.06 should be 60% minimum.
The values 04.05, 04.06 and 04.07 can limit the braking level defined in 06.06.

06.07 : Injection braking time
Adjustment range : 0 to 25.0 s
Factory setting : 1 s
This parameter defines the DC injection braking time when **06.01** is at Ramp + DC (2),
DC to 0 (3) or Timed DC (4).

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06.08 : **Hold zero speed**
Adjustment range : Disabled (0), Enabled (1),
DC IN RUN (2), DC IN STOP (3)
Factory setting   : Disabled (0)

Disabled (0): The drive output is deactivated when the speed is zero.

Enabled (1): The drive output remains active while the speed is zero in order to hold the torque at standstill. The drive output is deactivated when **06.08** changes to 0.

Note: When the drive is in the "Enabled" state and the Run command has not been activated after one minute, the drive returns to the "Disabled" state (drive output deactivated).

DC IN RUN (2): The motor speed is zero. When there is a Run command, the drive output is activated to maintain a permanent DC current for heating the motor. This current is defined by parameter **06.06**.

DC IN STOP (3): On a stop command, the drive output remains activated after the motor has stopped, in order to maintain a permanent DC current for heating the motor. This current is defined by parameter **06.06**.

06.09 : **Catch a spinning motor**
Adjustment range : DISABLED (0), 2 DIRECTIONS (1),
CLOCKWISE (2), C/CLOCKWISE (3),
2 Dir Reman. (4)
Factory setting   : DISABLED (0)
If this parameter is enabled (**06.09** ≠ DISABLED (0)), and the drive output is inactive (**10.02** = Disabled (0)), the drive executes a procedure to calculate the motor frequency and direction of rotation. It will automatically recalibrate the output frequency to the measured value and re-accelerate the motor up to the reference frequency.

DISABLED (0): Disable flying restart on a motor which is rotating.

2 DIRECTIONS (1): Enable flying restart on a motor which is rotating clockwise or anti-clockwise

CLOCKWISE (2): Enable flying restart on a motor which is rotating clockwise.

C/CLOCKWISE (3): Enable flying restart on a motor which is rotating counter-clockwise.

2 Dir Reman. (4): Enable flying restart on a motor which is rotating clockwise and anti-clockwise by measuring the remanent voltage (only if the measure remanent voltage option is available).

⚠ • **If the load is stationary at the time of the run command or when the mains supply returns, this operation may cause the machine to rotate in both directions before the motor accelerates.**
• **Before enabling this function, check that there is no danger to equipment and personnel.**
In some cases it may be necessary to increase the time delay before the flying restart procedure (required for motor demagnetisation). For details, see parameter **06.63**.

06.10 : **Reduced voltage**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting   : Disabled (0)

Disabled (0): The DC bus undervoltage detection thresholds are unchanged.

Enabled (1): Used to modify the DC bus undervoltage detection thresholds of drives, so as to be at the same levels as lower-voltage drives. This enables a 400 V (T) rating to be supplied with 230 V or a 690 V (TH) with 400 V, if necessary, without tripping the drive.
CAUTION:
The value 06.10 is taken into account only after repowering-up of the drive.

06.11 : **Not used**

06.12 : **Keypad stop key**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting   : Enabled (1)
When the source of commands is not via the keypad (**06.43** ≠ 3), **06.12** is used to disable the "Stop" function of the configuration interface (see section 2.2.5).
The RESET function is not affected by this parameter when the LCD-Keypad is used.

06.13 and **06.14** : **Not used**

06.15 : **Drive output**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting   : Enabled (1)
CAUTION:
Disabling via the drive terminals overrides 06.15 (see 08.10). If the drive is enabled via the terminals, the user can then disable or enable the drive via 06.15.

06.16 : **Not used**

06.17 : **Reset energy meter**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting   : Disabled (0)
When this parameter is set to Enabled (1), the meters **06.24** and **06.25** are reset to 0, then **06.17** goes back to Disabled (0).

06.18 and **06.19** : **Not used**

06.20 : **Powered-up time: years, days**

Adjustment range : 0 to 9, 364 years, days
This parameter records for how many years and days the drive has been powered up.

06.21 : **Powered-up time: hours, minutes**

Adjustment range : 0 to 23, 59 hrs, min
This parameter records for how many hours and minutes the drive has been powered up.
After 23, 59, **06.21** returns to 0 and **06.20** is incremented by one day.

06.22 : **Run time: years, days**

Adjustment range : 0 to 9, 364 (years, days)
This parameter records the number of years and days of operation since the drive was first commissioned.

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◁ **06.23** ▷ **: Run time: hours, minutes**

Adjustment range : 0 to 23, 59 (hrs, min)
This parameter records the number of hours and minutes of operation since the drive was first commissioned.
After 23, 59, **06.23** returns to 0 and **06.22** is incremented by one day.

◁ **06.24** ▷ **: Energy meter: MWh**

Adjustment range : 0 to 999.9 MWh
This parameter records the drive energy consumption in MWh.
This meter can be reset to 0 by changing parameter **06.17** to Enabled (1).

◁ **06.25** ▷ **: Energy meter: kWh**

Adjustment range : 0 to 99.99 kWh
This parameter records the drive energy consumption in kWh.
This meter can be reset to 0 by changing parameter **06.17** to Enabled (1).

06.26 to **06.29** **: Not used**

◁ **06.30** ▷ to ◁ **06.34** ▷ and ◁ **06.39** ▷ **: Sequencing bits for logic commands**

Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
The drive's logic command manager (**06.04**) uses these bits as inputs rather than referring directly to the terminals. This enables the user to define the use for each drive terminal according to the needs of each application. Although these are read/write type parameters, they are volatile and are not stored when the drive is powered down. Each time the drive is powered up they will be reset to Disabled (0).
06.30: Run FWD sequencing bit
06.31: Jog sequencing bit
06.32: Run Reverse sequencing bit
06.33: FWD/Reverse sequencing bit
06.34: Run/Stop sequencing bit
06.39: Stop sequencing bit

06.35 to **06.41** **: Not used**

06.42 **: Control word**

Adjustment range : 0 to 32767
Factory setting : 0
The control word is used to control the drive via a serial link. Each function has a corresponding binary code:

Control word bits 06.42	Decimal conversion	Functions	Equivalent parameter
0	1	Drive enable	**06.15**
1	2	Run forward	**06.30**
2	4	Jog indicator	**06.31**
3	8	Run reverse	**06.32**
4	16	Forward/Reverse	**06.33**
5	32	Run	**06.34**
6	64	Reserved	
7	128	Reserved	
8	256	Analog ref./ Preset ref.	**01.42**
9	512	Reserved	
10	1024	Reserved	
11	2048	Reserved	
12	4096	Reserved	
13	8192	Drive reset	**10.33**
14	16384	Reserved	

06.42 should correspond to the binary sum of the commands to be given to the drive.
So that the control word is taken into account, parameter **06.43** should be at 1.

Note: For enabling the drive by enabling **06.15** (Bit 0), the enabling terminal of the terminal block must previously have been activated (see explanation of **06.15**).

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06.43 : Run/Stop source
Adjustment range : Terminals (0), Fieldbus (1), NOT ACTIV (2),
LCD Keypad (3)
Factory setting : Terminals (0)

Terminals (0): Commands come from the terminals.

Fieldbus (1): Commands come from the control word **06.42**.

NOT ACTIV (2): Not used.

LCD Keypad (3): Commands come from the connected configuration interface.

Note: Modifications to **06.43** must be made with the drive disabled.

This parameter isn't assignable when **08.10** = Secur. disab.

CAUTION:
• **The Stop key on the HMI, if enabled (see 06.12), is always taken into account irrespective of the source of the commands.**
If a stop is caused by the configuration interface Stop key while the commands come from the terminals or the fieldbus (06.43 = Terminals (0) or Fieldbus (1)) and a run command is present, the run command must go back to 0 and then 1 in order to be recognised.
• **When the secure disable function is enabled 08.10 = Secur. disab. (1), the value of 06.43 is automatically set to "Terminals" (0). Even so, the user can change this value to "LCD Keypad" (3) or "Fieldbus" (1).**
This will force 08.10 to "Drive enable", and only conformity to EN954-1 category 1 will be provided. On return of the value 06.43 to "Terminals", parameter 08.10 remains at "Drive enable".

Nota : This parameter can only be assigned if 08.10 = Drive enable.

06.44 to **06.59** : Not used

06.60 : Mains undervoltage threshold
Adjustment range : 100 to 600 V
Factory setting : 300V
Used to define the detection level for mains undervoltage.

06.61 : Delay before start
Adjustment range : 0 to 200.00 s
Factory setting : 0 s
This function is used to delay the motor start-up following the run command.

06.62 : Delay before mains loss
Adjustment range : 0 to 200.00 s
Factory setting : 0.00 s
This parameter is used to set a mains loss time during which the drive will re-accelerate or decelerate until the motor stops when **06.03** = DELAYED STOP (2) (see explanation of **06.03**).

06.63 : Delay before catch a spinning motor
Adjustment range : 0 to 200.00 s
Factory setting : 0.00 s
Defines the time required for motor demagnetisation before performing a flying restart procedure (see **06.09**). A setting of 2 seconds is generally sufficient.
If the flying restart does not take place correctly, increase the value of **06.63**.
This parameter also defines the minimum time between a stop command and the recognition of a new run command.

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Notes

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5.8 - Menu 7: Configuration of analog I/O

5.8.1 - Menu 7 diagrams

• **Analog I/O**
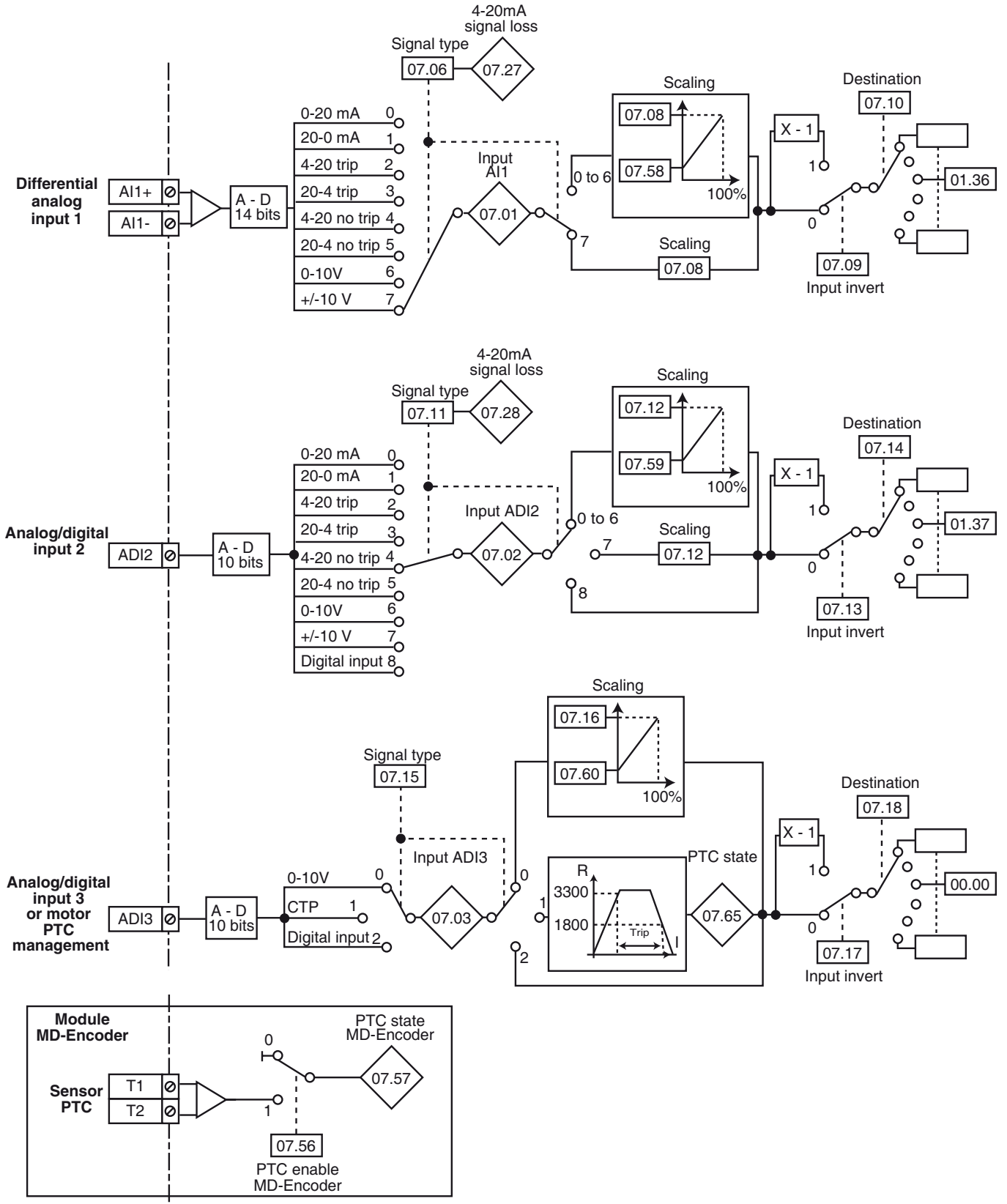
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• Analog I/O (continued)
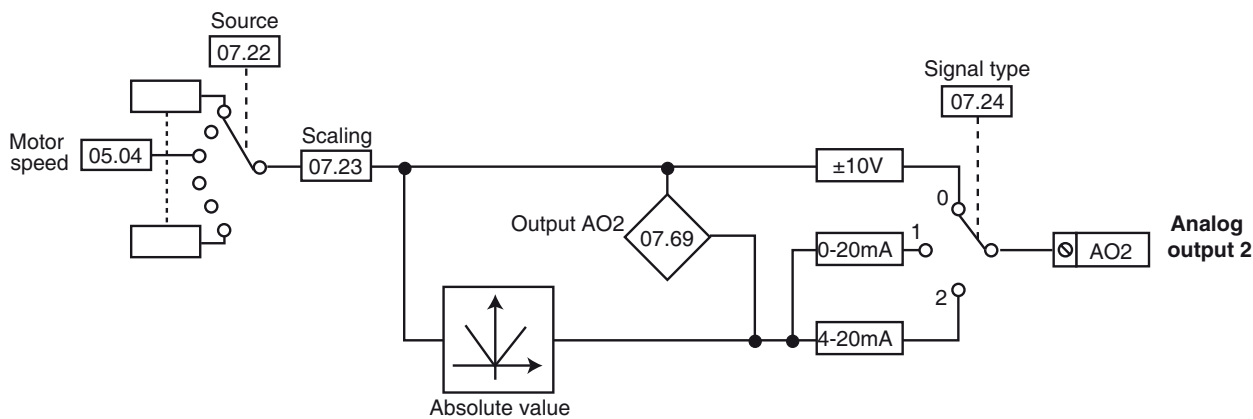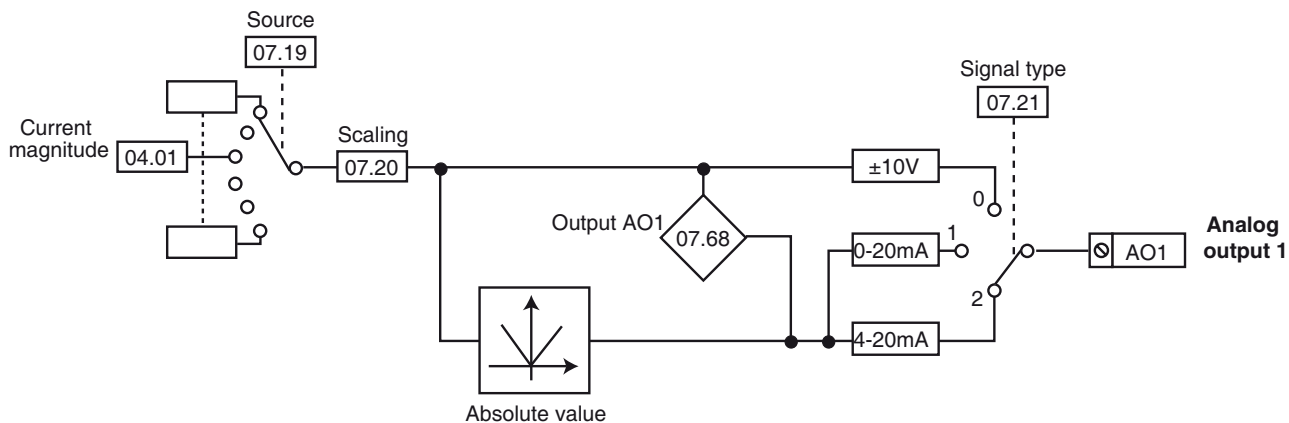
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5.8.2 - Explanation of parameters in menu 7

Note: The sampling period is 2 ms for menu 7 inputs and outputs.

07.01 : **Analog input 1**

Adjustment range : ± 100.00%
Used to read the value of the analog input.
This input uses an analog/digital converter with 14-bit resolution.

07.02 : **Analog/digital input 2**

Adjustment range
As analog input : ±100.0%
As digital input : 0.0% (corresponds to logical 0)
or 100.0% (corresponds to logical 1)
Used to read the value of the analog input or the state of the corresponding digital input.
This input uses an analog/digital converter with a resolution of 9 bits + sign.

07.03 : **Analog/digital/PTC input 3**

Adjustment range : 0 to 100.0%
Used to read the corresponding analog input. This input uses an analog/digital converter with 10-bit resolution.

07.04 and **07.05** : **Not used**

07.06 : **Analog input 1 mode**
Adjustment range : 0-20 mA (0), 20-0 mA (1), 4-20 trip (2),
20-4 trip (3), 4-20 no trip (4),
20-4 no trip (5), 0-10 V (6), +/-10 V (7)
Factory setting : +/-10 V (7)
Used to define the type of signal on the AI1 input.

07.06	Description
0	0-20 mA current signal, 0 mA corresponds to the minimum reference
1	20-0 mA current signal, 20 mA corresponds to the minimum reference
2	4-20 mA current signal with detection of signal loss. 4 mA corresponds to the minimum
3	20-4 mA current signal with detection of signal loss. 20 mA corresponds to the minimum
4	4-20 mA current signal without detection of signal loss. 4 mA corresponds to the minimum
5	20-4 mA current signal without detection of signal loss. 20 mA corresponds to the minimum
6	0-10 V voltage signal
7	**±10 V voltage signal**

Note: For signal loss detection, refer to **07.27** and **07.28**.

07.07 : **Not used**

07.08 and **07.12** : **Analog/digital input 1 and analog/digital input 2 scaling**
Adjustment range : 0 to 2.50
Factory setting : 1.00
These parameters are used, if necessary, to scale the analog inputs. However, this rarely proves necessary since the maximum input level (100%) automatically corresponds to the max. value of the destination parameter.
07.12 is not used when input ADI2 is used as a digital input.

07.09 and **07.13** : **Analog input 1 and analog/digital input 2 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the input signal.

Disabled (0): Input signal not inverted.

Enabled (1): Input signal inverted.

07.10 : **Analog input 1 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.36**: Analog input 1 assigned to analog reference 1
This address should contain the number of the parameter which you wish to assign to input AI1.
Only numerical parameters can be assigned.
If an unsuitable parameter is programmed, no assignment will be taken into account.

07.11 : **Analog/digital input 2 mode**
Adjustment range : 0-20 mA (0), 20-0 mA (1), 4-20 trip (2),
20-4 trip (3), 4-20 no trip (4),
20-4 no trip (5), 0-10 V (6), +/-10 V (7)
Digital in (8)
Factory setting : 4-20 mA no trip (4)
Used to define the type of signal on the ADI2 input.

07.11	Description
0	0-20 mA current signal, 0 mA corresponds to the minimum reference
1	20-0 mA current signal, 20 mA corresponds to the minimum reference
2	4-20 mA current signal with detection of signal loss. 4 mA corresponds to the minimum
3	20-4 mA current signal with detection of signal loss. 20 mA corresponds to the minimum
4	**4-20 mA current signal without detection of signal loss. 4 mA corresponds to the minimum**
5	20-4 mA current signal without detection of signal loss. 20 mA corresponds to the minimum
6	0-10 V voltage signal
7	±10 V voltage signal
8	The input is configured as a digital input

Note: For signal loss detection, refer to **07.27** and **07.28**.

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07.14 : **Analog/digital input 2 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.37**: Analog input 2 assigned to analog reference 2
This address should contain the number of the parameter which you wish to assign to input ADI2.
Only numerical parameters can be assigned if the input is configured as an analog input and bit parameters if the input is configured as a digital input.
If an unsuitable parameter is programmed, no assignment will be taken into account.

07.15 : **Analog/digital input 3 mode**
Adjustment range : 0-10 V (0), CTP (1), Digital in (2)
Factory setting : 0-10 V (0)
Used to define the type of signal on input ADI3.

07.15	Description
0	**0-10 V voltage signal**
1	The input is configured to manage the motor PTC
2	The input is configured as a digital input

Note: In PTC sensor mode (**07.15** = CTP (1)), connect the sensor between the ADI3 terminal and the 0 V terminal.

07.16 : **Analog/digital input 3 scaling**
Adjustment range : Input: 0 to 2.50
Factory setting : 1.00
This parameter is used, if necessary, to scale the analog input. However, this rarely proves necessary since the maximum analog value automatically corresponds to the maximum value of the parameter which has been assigned.

07.17 : **Analog/digital input 3 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
Used to invert the input signal.

Disabled (0): Signal not inverted.

Enabled (1): Signal inverted.

07.18 : **Analog/digital input 3 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This address should contain the number of the parameter which you wish to assign to ADI3. If ADI3 is a digital input, only bit parameters can be assigned. If ADI3 is an analog input, only numerical parameters can be assigned.
If an unsuitable parameter is programmed, the corresponding input will take the value 0.

07.19 and **07.22** : **Analog output source AO1 and AO2**
Adjustment range : **00.00** to **21.51**
Factory setting : **04.01** (AO1) - **05.04** (AO2)
This address should contain the number of the parameter which you wish to assign to the analog outputs.

07.20 and **07.23** : **Analog output scaling AO1 and AO2**
Adjustment range : 0.000 to 4.000
Factory setting : 1.000
These parameters are used to scale respective outputs AO1 and AO2.
Note: When **07.20** (or **07.23**) = 1.000, the maximum value of the analog output corresponds to the maximum value of the parameter assigned to it.

07.21 and **07.24** : **AO1 and AO2 analog output mode**
Adjustment range : +/-10V (0), 0-20mA (1), 4-20mA (2)
Factory setting : 4-20mA (2) for **07.21**
+/-10V (0) for **07.24**
Selection of the type of signal on the corresponding analog output.

+/-10V (0): ±10 V voltage output.

0-20mA (1): 0 to 20 mA current output.

4-20mA (2): 4 to 20 mA current output.

07.25 and **07.26** : **Not used**

07.27 and **07.28** : **AI1 and ADI2 current loss**

Adjustment range : Active (0) or Lost (1)
This parameter changes to Lost (1) when, in 4-20 mA current mode with or without detection of signal loss (see **07.06** and **07.11**), the analog signal goes below 3 mA.
In this case, the "ADI1 loss" or "ADI2 loss" trip is generated only in current mode with detection.
07.27: corresponds to AI1.
07.28: corresponds to ADI2.

07.29 to **07.50** : **Not used**

07.51 , **07.52** and **07.53** : **Temperature for phases U, V, W**
Adjustment range : 0 to 200°C

07.54 :**Rectifier temperature**

Adjustment range : 0 to 200°C

07.55 :**Control board temperature**

Adjustment range : 0 to 100°C

07.56 : **MD-Encoder PTC enable**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
When the MD-Encoder is used, **07.56** is used to enable the PTC sensor.
Note: For connection, refer to the MD-Encoder manual.
Disabled (0): Used to disable management of the PTC sensor from the MD-Encoder.
Enabled (1): Used to enable management of the PTC sensor connected to the MD-Encoder.

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◇ **07.57** ◇ **:MD-Encoder PTC state**

Adjustment range : Not TRIGGERED (0) or TRIGGERED (1)
When **07.56** is enabled, parameter **07.57** indicates the state of the MD-Encoder PTC sensor. When **07.57** goes to (1), the "Motor PTC" trip is triggered.
NotTRIGGERED (0): PTC not triggered.
TRIGGERED (1): PTC triggered.

07.58 : **Minimum value of AI1**
Adjustment range : 0 to 1.00
Factory setting   : 0
For an analog input value of 0, this parameter is used to set the minimum value of the destination parameter.
Value 0 = (**07.58** x destination parameter max. value) + destination parameter min. value.
Example: AI1 is assigned to a parameter with an adjustment range of 0 to 30000. If **07.58** = 0.01, 0 to 100% on AI1 corresponds to 300 to 30000.

07.59 : **Minimum value of ADI2**
Adjustment range : 0 to 1.00
Factory setting   : 0
This parameter is a multiplication coefficient applied to the maximum value of the ADI2 destination parameter. For a 0 value of the analog input, it is used to obtain a different value of the minimum value of the destination parameter.
Value 0 = (**07.59** x destination parameter max. value) + destination parameter min. value.
Example: ADI2 is assigned to a parameter with an adjustment range of 0 - 30000. If **07.59** = 0.01, 0 - 100% on ADI2 corresponds to 300 - 30000.
07.59 is not used when input ADI2 is used as a
+/- 10 V input or a digital input.

07.60 : **Minimum value of ADI3**
Adjustment range : 0 to 1.00
Factory setting   : 0
This parameter is a multiplication coefficient applied to the max value of the ADI3 destination parameter. For a 0 value of the analog input, it is used to obtain a different value of the minimum value of the destination parameter.
Value 0 = (**07.60** x destination parameter max. value) + destination parameter min. value.
Example: ADI3 is assigned to a parameter with an adjustment range of 0 to 30000. If **07.60** = 0.01, 0 to 100% on ADI3 corresponds to 300 to 30000.

07.61 to **07.64** : **Not used**

◇ **07.65** ◇ : **PTC state**

Adjustment range : NotTRIGGERED (0) or TRIGGERED (1)
Indicates the status of the PTC sensor when **07.15** = CTP (1).
When **07.65** goes to (1), the "Motor PTC" trip is triggered.

NotTRIGGERED (0): PTC not triggered.

TRIGGERED (1): PTC triggered.

07.66 and **07.67** : **Not used**

◇ **07.68** ◇ : **AO1 Analog output 1**

Adjustment range : ± 100.00%

◇ **07.69** ◇ : **AO2 Analog output 2**

Adjustment range : ± 100.0%

◇ **07.70** ◇ : **Mains voltage**

Adjustment range : 0 to 999 V
Value of the supply voltage measured by the drive.

07.71 to **07.79** : **Not used**

◇ **07.80** ◇ : **DC bus voltage**

Adjustment range : 0 to 1300 V
Value of the DC bus voltage measured by the drive.

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Notes

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5.9 - Menu 8: Configuration of digital I/O
5.9.1 - Menu 8 diagrams

• **Assignment of digital inputs and relay outputs**
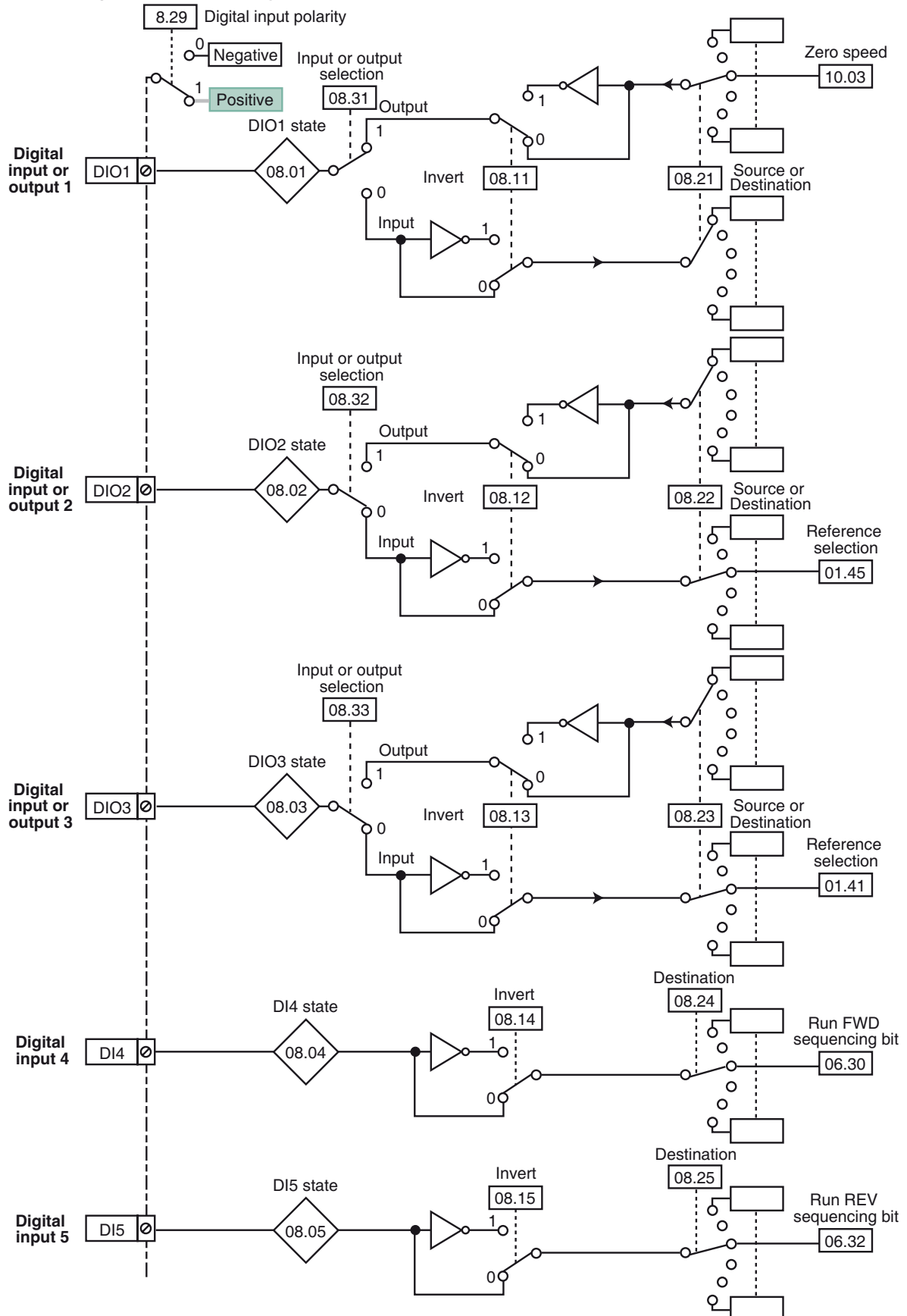
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• Assignment of digital inputs and relay outputs (continued)

Drive healthy — 10.01 — Invert 08.17 — Relay output status 08.07 — 08.27 Source — RL1O / COM-RL1 — **Relay 1 output**

Vmax alarm — 10.52 — Invert 08.18 — Relay output status 08.08 — 08.28 Source — RL2O / COM-RL2 — **Relay 2 output**

SDI1 / SDI2 — SDI state 08.09 — Secure disable select 08.10 — Secure disable input / Enabling input — OPTO — SDO1 / SDO2 — **Secure disable input redundancy output**
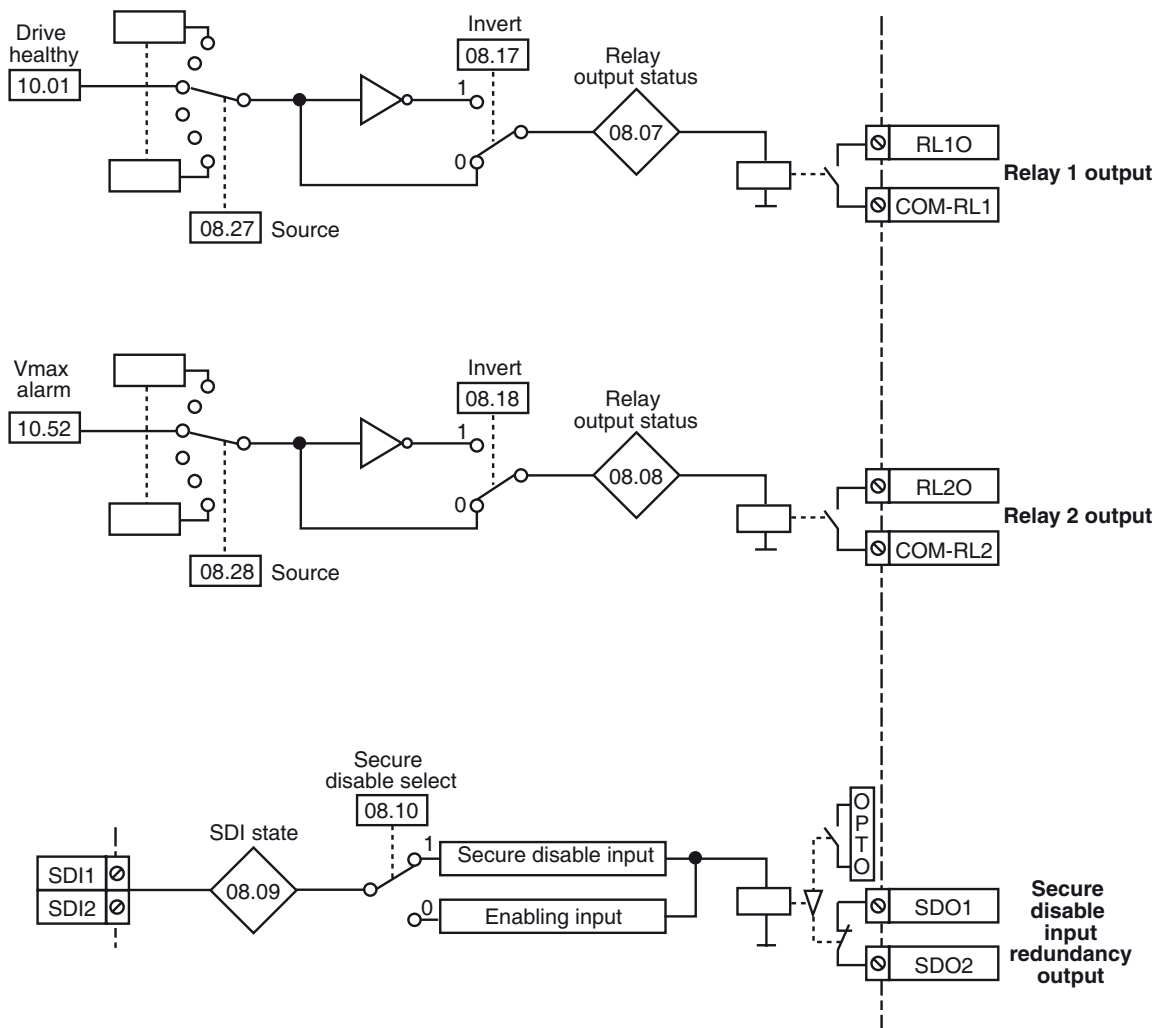
08.20 Digital I/O read word

08.50 Buffer variable 1
08.51 Buffer variable 2
08.52 Buffer variable 3
08.53 Buffer variable 4

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5.9.2 - Explanation of parameters in menu 8

Note: The sampling period is 2 ms for the digital inputs and outputs.

08.01 : **Digital in/out 1 state**

08.02 : **Digital in/out 2 state**

08.03 : **Digital in/out 3 state**

Adjustment range : Disabled (0) or Enabled (1)
These parameters indicate the state of the input or output according to the respective configurations **08.31**, **08.32** and **08.33**.

08.04 : **Digital input 4 state**

08.05 : **Digital input 5 state**

Adjustment range : Disabled (0) or Enabled (1)
These parameters indicate the state of the input.

08.06 : **Not used**

08.07 : **Relay 1 output status**

Adjustment range : Open (0) or Closed (1)
This parameter indicates the state of the output relay.

0: RL1O open.

1: RL1O closed.

08.08 : **Relay 2 output status**

Adjustment range : Open (0) or Closed (1)
This parameter indicates the state of the output relay.

0: RL2O open.

1: RL2O closed.

08.09 : **Secure disable input**

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the secure disable input (at the terminal block), terminals SDI1, SDI2.

Disabled (0): Drive disabled.

Enabled (1): Drive enabled.

08.10 : **Secure disable select**

Adjustment range : Drive enable (0) or Secur. disab. (1)
Factory setting : Secur. disab. (1)

Drive enable (0): The SDI input is used as an enabling input.

Secur. disab. (1): The SDI input is used as a secure disable input. In order to conform to safety standard EN 954-1 category 3, the drive must be connected in accordance with the recommended diagram in the installation manual supplied with the drive.

Note: Modifications to **08.10** must be made with the SDI1/SDI2 contact open.

⚠️ **• The secure disable input function is disabled automatically (08.10 changes to Drive enable (0)) when the drive is controlled via the fieldbus or configuration interface, for example, when 06.43 = Fieldbus (1) or LCD Keypad (3). Only conformity to EN954-1 category 1 will be provided.**

08.11 : **Digital in/out 1 invert**

08.12 : **Digital in/out 2 invert**

08.13 : **Digital in/out 3 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
These parameters are used to invert the state of the digital input or output.

Disabled (0): Not inverted.

Enabled (1): Inverted.

08.14 : **Digital input 4 invert**

08.15 : **Digital input 5 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
These parameters are used to invert the state of the digital input.

Disabled (0): Not inverted.

Enabled (1): Inverted.

08.16 : **Not used**

08.17 : **Relay 1 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the state of the relay.

Disabled (0): Not inverted.

Enabled (1): Inverted.

CAUTION:
When the secure disable function is enabled 08.10 = Secur. disab. (1), the value of 08.17 is fixed at Disabled (0), and cannot be modified.

08.18 : **Relay 2 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the state of the relay.

Disabled (0): Not inverted.

Enabled (1): Inverted.

08.19 : **Not used**

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08.20 **: Digital I/O read word**

Adjustment range : 0 to 511
This parameter is used to determine the state of the I/O with a single read operation.
Each bit of this word represents the state of parameters **08.01** to **08.09.**

Bit	8	7	6	5	4	3	2	1	0
State	08.09	08.08	08.07	-	08.05	08.04	08.03	08.02	08.01

E.g.
DIO1 = 1 = 2^0 = 1
DIO3 = 1 = 2^2 = 4
==> 8.20 = 5

08.21 **: Digital in/out 1 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **10.03**: Zero frequency
This parameter is used to select the input destination or output source of DIO1.
Any unprotected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed to the input or output, no assignment is taken into account.

08.22 **: DIO2 input destination or output source**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.45**: Reference selector
This parameter is used to select the input destination or output source of DIO2.
Any non-protected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed to the input or output, no assignment is taken into account.

08.23 **: DIO3 input destination or output source**
Adjustment range : **00.00** to **21.51**
Factory setting : **01.41**: Reference selector
This parameter is used to select the input destination or output source of DIO3.
Any non-protected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed to the input or output, no assignment is taken into account.

08.24 **: Digital input 4 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **06.30**: FWD/Stop
This parameter is used to select the destination of input DI4.
Any unprotected "bit" type parameter can be assigned to the input.
If an unsuitable parameter is addressed, no assignment is taken into account.

08.25 **: Digital input 5 destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **06.32**: Rev/Stop
This parameter is used to select the destination of input DI5.
Any non-protected "bit" type parameter can be assigned to the input.
If an unsuitable parameter is addressed, no assignment is taken into account.

08.26 **: Not used**

08.27 **: Relay 1 output source**
Adjustment range : **00.00** to **21.51**
Factory setting : **10.01**: Drive healthy
This parameter is used to select the source for the output relay.
Any non-protected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed, no assignment is taken into account.
CAUTION:
When the secure disable function is enabled, 08.10 = Secur. disab. (1), the value of 08.27 is fixed at 10.01, and cannot be modified.

08.28 **: Relay 2 output source**
Adjustment range : **00.00** to **21.51**
Factory setting : **10.52**: V_{max} alarm
This parameter is used to select the source for the output relay.
Any non-protected "bit" type parameter can be assigned.
If an unsuitable parameter is addressed, no assignment is taken into account.

08.29 **: Digital input polarity**
Adjustment range : NEGATIVE (0) or POSITIVE (1)
Factory setting : POSITIVE (1)
This parameter is used to change the polarity of digital inputs.
It has no effect when DIO1, DIO2 or DIO3 are programmed as outputs.

NEGATIVE (0): Negative logic.

POSITIVE (1): Positive logic.

08.30 **: Not used**

08.31 **: Digital in/out 1 select**
Adjustment range : Input (0) or Output (1)
Factory setting : Output (1)
Used to configure terminal DIO1 as an input or output.

Input (0): Terminal configured as an input.

Output (1): Terminal configured as an output.

08.32 **: Digital in/out 2 select**
Adjustment range : Input (0) or Output (1)
Factory setting : Input (0)
Used to configure terminal DIO2 as an input or output.

Input (0): Terminal configured as an input.

Output (1): Terminal configured as an output.

08.33 **: Digital in/out 3 select**
Adjustment range : Input (0) or Output (1)
Factory setting : Input (0)
Used to configure terminal DIO3 as an input or output.

Input (0): Terminal configured as an input.

Output (1): Terminal configured as an output.

08.34 to **08.49** **: Not used**

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08.50 to **08.53** : **Buffer variables 1 to 4**

Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
Binary parameters that can be used as buffer variables.
CAUTION:
At each power-up, parameters 08.50 to 08.53 go back to (0).

08.54 to **08.99** : **Not used**

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5.10 - Menu 9: Logic functions (motorised pot and binary sum)

5.10.1 - Menu 9 diagrams

• **Logic functions**
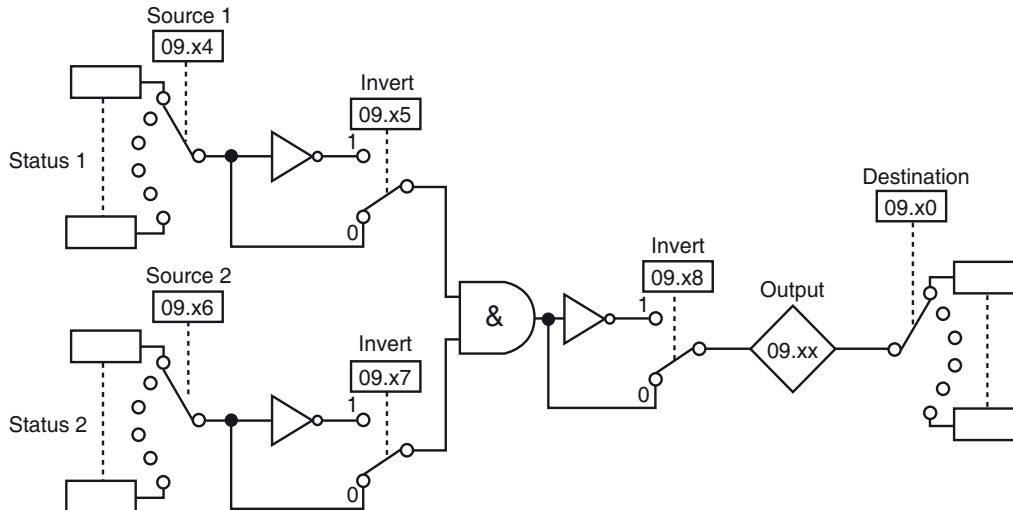
	Source 1	**Source 2**	**Source 1 invert**	**Source 2 invert**	**Output invert**	**Output**	**Source destination**
Function 1	**09.04**	**09.06**	**09.05**	**09.07**	**09.08**	**09.01**	**09.10**
Function 2	**09.14**	**09.16**	**09.15**	**09.17**	**09.18**	**09.02**	**09.20**
Function 3	**09.64**	**09.66**	**09.65**	**09.67**	**09.68**	**09.61**	**09.60**
Function 4	**09.74**	**09.76**	**09.75**	**09.77**	**09.78**	**09.71**	**09.70**
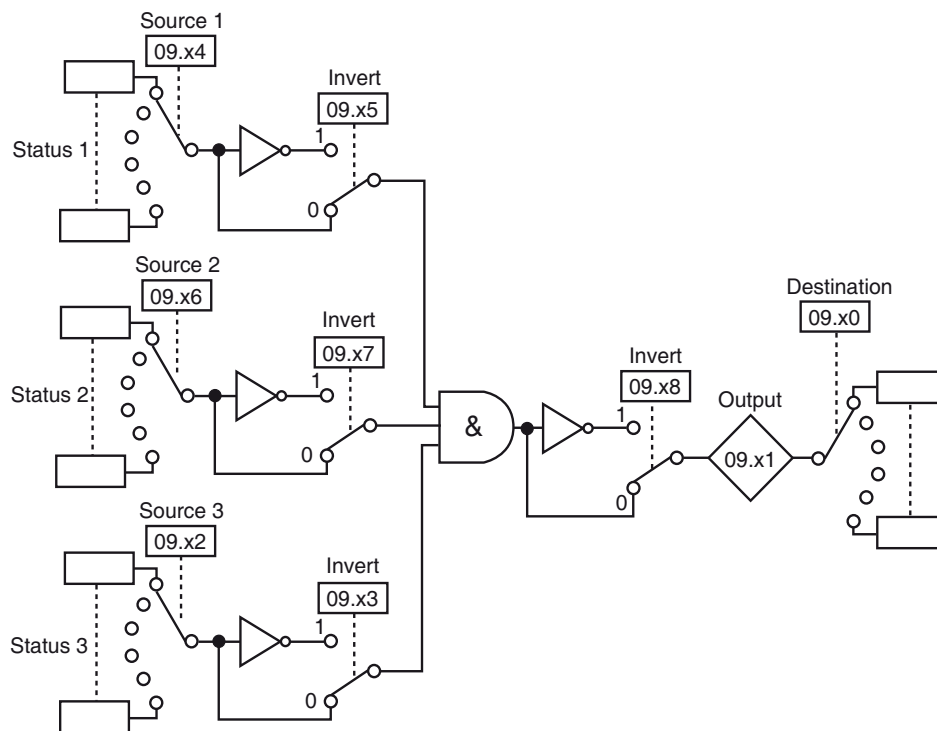
	Source 1	**Source 2**	**Source 3**	**Source 1 invert**	**Source 2 invert**	**Source 3 invert**	**Output invert**	**Output**	**Destination**
Function 5	**09.84**	**09.86**	**09.82**	**09.85**	**09.87**	**09.83**	**09.88**	**09.81**	**09.80**
Function 6	**09.94**	**09.96**	**09.92**	**09.95**	**09.97**	**09.93**	**09.98**	**09.91**	**09.90**

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• Motorised potentiometer function

Motorised pot mode
09.21

Motorised
potentiometer up
09.26

+100 %
0
t

Motorised
potentiometer
reference %
09.03

Scaling
09.24

Destination
09.25

+100 %
0
−100

Motorised
potentiometer down
09.27

09.22 Polarity

09.23 Rate

Motorised
pot reset 09.28
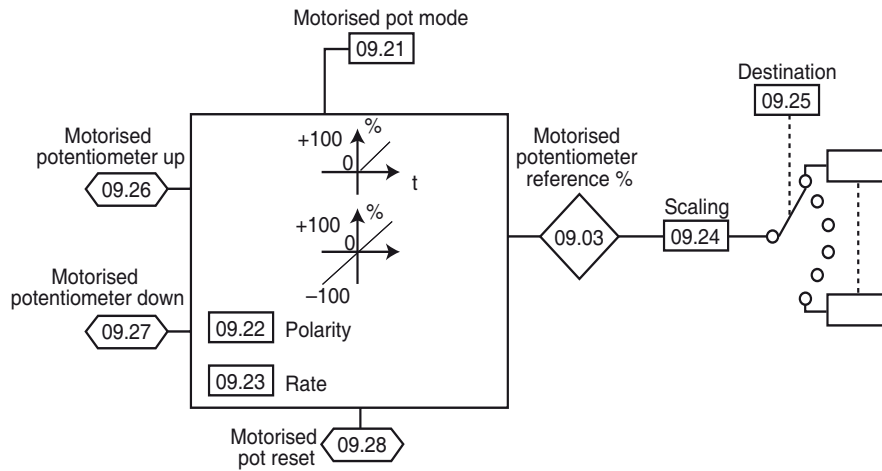
• Binary sum functions
• First converter
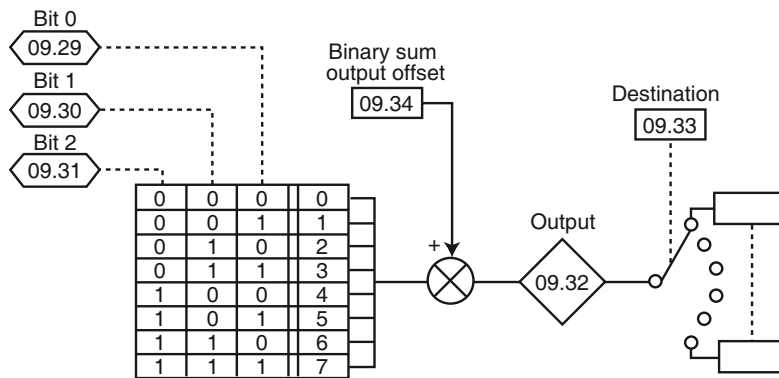
Bit 0
09.29

Bit 1
09.30

Bit 2
09.31

Binary sum
output offset
09.34

Destination
09.33

0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

+

Output
09.32

• Second converter

Source 1
09.52

Source 2
09.53

Source 3
09.54

Binary sum 2
output offset
09.55

Destination 2
09.57

0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

+

Output 2
09.56
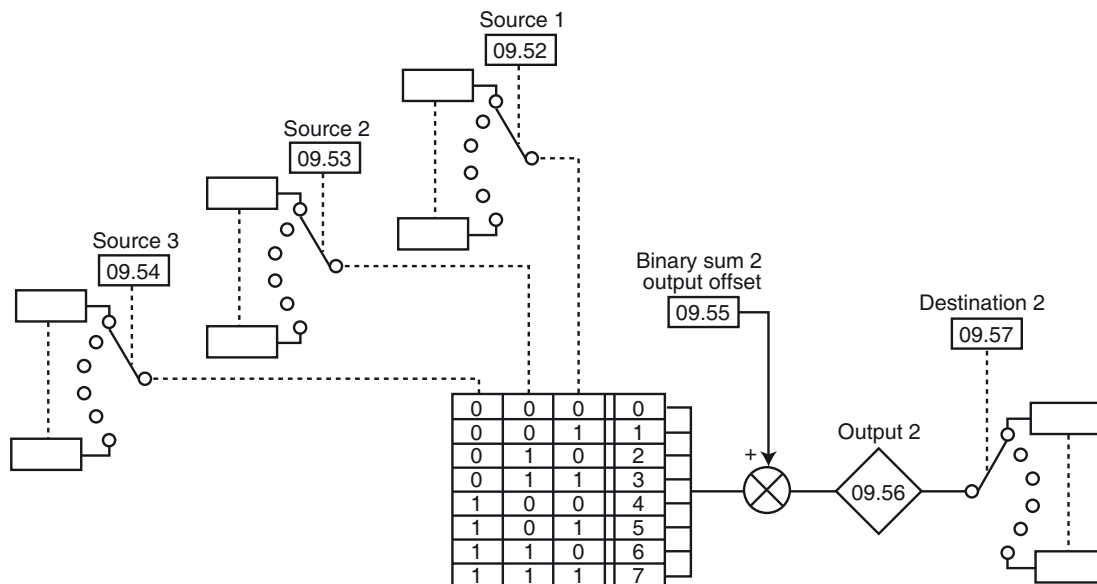
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5.10.2 - Explanation of parameters in menu 9

⟨09.01⟩ : Logic function 1 out

⟨09.02⟩ : Logic function 2 out

Adjustment range : Disabled (0) or Enabled (1)
Indicate the state of the output of logic functions 1 and 2.

⟨09.03⟩ : Motorised pot reference

Adjustment range : ± 100.0%

09.04 : Logic function 1 source 1
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 1 for logic function 1.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.05 : Logic 1 source 1 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 1 of logic function 1.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.06 : Logic function 1 source 2
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 2 for logic function 1.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.07 : Logic 1 source 2 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 2 of logic function 1.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.08 : Logic 1 output invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 1.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

09.09 : Not used

09.10 : Logic 1 output destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the output of logic function 1.
Only unprotected "bit" type parameters can be addressed.
If an unsuitable parameter is programmed, the destination will not be taken into account.

09.11 to 09.13 : Not used

09.14 : Logic function 2 source 1
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 1 for logic function 2.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.15 : Logic 2 source 1 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 1 of logic function 2.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.16 : Logic function 2 source 2
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 2 for logic function 2.
Only "bit" type parameters can be used on these inputs.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.17 : Logic 2 source 2 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 2 of logic function 2.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.18 : Logic 2 output invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 2.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

09.19 : Not used

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09.20 : **Logic 2 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the output of logic function 2.
Only non-protected "bit" type parameters can be addressed. If an unsuitable parameter is programmed, the destination will not be taken into account.

09.21 : **Motorised pot mode**
Adjustment range : Rst/ENABLE (0), Prev/ENABLE (1),
Rst/DISABLE (2), Prev/DISABLE (3)
Factory setting : Rst/DISABLE (2)

Rst/ENABLE (0): The reference is reset to 0 on each power-up. The up/down and reset inputs are active at all times.

Prev/ENABLE (1): On power-up, the reference is at the level it was on power-down. The up/down and reset inputs are active at all times.

Rst/DISABLE (2): The reference is reset to 0 on each power-up. The up/down inputs are active only when the drive output is active. The reset input is active at all times.

Prev/DISABLE (3): On power-up, the reference is at the level it was on power-down. The up/down inputs are active only when the drive output is active. The reset input is active at all times.

09.22 : **Motorised pot bipolar select**
Adjustment range : Positive (0) or Bipolar (1)
Factory setting : Positive (0)

Positive (0): The up/down pot reference is limited to positive values (0 to 100.0%).

Bipolar (1): The up/down pot reference can change from -100% to +100%.

09.23 : **Motorised pot rate**
Adjustment range : 0 to 250 s
Factory setting : 20 s
This parameter defines the time it takes for the up/down pot reference to change from 0 to 100.0%.
It will take twice as long to change from -100.0% to +100.0%.
Defines the potentiometer sensitivity.

09.24 : **Motorised pot scale factor**
Adjustment range : 0 to 2.50
Factory setting : 1.00
The maximum value of the up/down pot reference automatically takes the maximum value of the parameter to which it is assigned.
This parameter can therefore be used to adapt the maximum value of the up/down pot reference to the maximum value required by the application.
Example:
- The up/down reference is addressed to a preset reference : example : **01.06** = 1500 rpm.
- The maximum value of the up/down reference is required to correspond to 1000 rpm :

$$==> \mathbf{09.24} = \frac{1000}{\mathbf{01.06}} = 0.67 \ .$$

09.25 : **Motorised pot destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to define the numerical parameter which the up/down pot reference will control.
Example: The up/down pot reference acts as a speed reference. The up/down pot reference can be sent to a preset reference.

09.26 : **Motorised pot up**
Adjustment range : Disabled (0) or Enabled (1)
A digital input must be assigned to this parameter for controlling the motorised pot up function.

09.27 : **Motorised pot down**
Adjustment range : Disabled (0) or Enabled (1)
A digital input must be assigned to this parameter for controlling the motorised pot down function.

09.28 : **Motorised pot reset**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
When this parameter is at Enabled (1), the motorised pot reference is reset to zero.

09.29 to **09.31** : **Binary sum inputs**

Adjustment range : Disabled (0) or Enabled (1)
Used to modify, using a combination of digital inputs, a parameter whose selection includes more than 2 possible choices.
09.29: Binary sum input, bit 0.
09.30: Binary sum input, bit 1.
09.31: Binary sum input, bit 2.

09.31	09.30	09.29	Decimal conversion
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

09.32 : **Binary sum output**

Adjustment range : 0 to 39
Used to read the decimal value of the binary sum output.

09.33 : **Binary sum destination**

Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to define the parameter that the binary sum will control.
Any bit, switch or numerical type parameter can be assigned to the binary sum.

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09.34 : **Binary sum output offset**
Adjustment range : 0 to 32
Factory setting : 0
Used to add an offset to the binary sum output.

09.35 to **09.51** : **Not used**

09.52 to **09.54** : **Binary sum 2 sources**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to modify, using a combination of binary parameters, a parameter whose selection includes more than 2 possible choices.
09.52: Source bit 0
09.53: Source bit 1
09.54: Source bit 2

09.54	09.53	09.52	Decimal conversion
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

09.55 : **Binary sum 2 output offset**
Adjustment range : 0 to 32
Factory setting : 0
Used to add an offset to the binary sum 2 output.

09.56 : **Binary sum 2 output**

Adjustment range : 0 to 39
Used to read the decimal value of binary sum 2 output.

09.57 : **Binary sum 2 destination**

Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to define the parameter that binary sum 2 output will control.
Any bit, switch or numerical type parameter can be assigned to the binary sum 2 output.

09.58 to **09.59** : **Not used**

09.60 : **Logic 3 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the output of logic function 3.
Only non-protected "bit" type parameters can be addressed.
If an unsuitable parameter is programmed, the destination will not be taken into account.

09.61 : **Logic function 3 out**

Adjustment range : Disabled (0) or Enabled (1)
Indicates the state of the output of logic function 3.

09.62 and **09.63** : **Not used**

09.64 : **Logic function 3 source 1**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 1 for logic function 3.
Only "bit" type parameters can be used on these inputs.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.65 : **Logic 3 source 1 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 1 of logic function 3.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.66 : **Logic function 3 source 2**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 2 for logic function 3.
Only "bit" type parameters can be used on these inputs.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.67 : **Logic 3 source 2 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 2 of logic function 3.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.68 : **Logic 3 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 3.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

09.69 : **Not used**

09.70 : **Logic 4 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the output of logic function 4.
Only non-protected "bit" type parameters can be addressed.
If an unsuitable parameter is programmed, the destination will not be taken into account.

09.71 : **Logic function 4 out**

Adjustment range : Disabled (0) or Enabled (1)
Indicates the state of the output of logic function 4.

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09.72 and **09.73** : **Not used**

09.74 : **Logic function 4 source 1**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 1 for logic function 4.
Only "bit" type parameters can be used on these inputs.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.75 : **Logic 4 source 1 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 1 of logic function 4.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.76 : **Logic function 4 source 2**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 2 for logic function 4.
Only "bit" type parameters can be used on these inputs.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.77 : **Logic 4 source 2 invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 2 of logic function 4.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.78 : **Logic 4 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 4.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

09.79 : **Not used**

09.80 : **Logic function 5 destination ***
Adjustment range : **00.00** to **21.51**
Factory setting : **10.61**
This parameter defines the internal parameter which will be assigned by the output of logic function 5.
Only non-protected "bit" type parameters can be addressed.
If an unsuitable parameter is programmed, the destination will not be taken into account.

◇ **09.81** ◇ : **Logic function 5 out ***

Adjustment range : Disabled (0) or Enabled (1)
Indicates the state of the output of logic function 5.

09.82 : **Logic function 5 source 3 ***
Adjustment range : **00.00** to **21.51**
Factory setting : **10.19**
This parameter is used to select source 3 for logic function 5.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.83 : **Logic function 5 source 3 invert ***
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 3 of logic function 5.

Disabled (0): Source 3 not inverted.

Enabled (1): Source 3 inverted.

09.84 : **Logic function 5 source 1 ***
Adjustment range : **00.00** to **21.51**
Factory setting : **10.17**
This parameter is used to select source 1 for logic function 5.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.85 : **Logic function 5 source 1 invert ***
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Enabled (1)
This parameter is used to invert source 1 of logic function 5.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.86 : **Logic function 5 source 2 ***
Adjustment range : **00.00** to **21.51**
Factory setting : **10.18**
This parameter is used to select source 2 for logic function 5.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.87 : **Logic function 5 source 2 invert ***
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Enabled (1)
This parameter is used to invert source 2 of logic function 5.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.88 : **Logic function 5 output invert ***
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 5.

* In factory settings, parameters **09.80** to **09.88** are defined so that function 5 detects a drive overload. Any modification of these settings will disable this detection (see **10.61**).

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09.89 : Not used

09.90 : Logic function 6 destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the output of logic function 6.
Only non-protected "bit" type parameters can be addressed.
If an unsuitable parameter is programmed, the destination will not be taken into account.

◇ **09.91** ◇ : Logic function 6 out

Adjustment range : Disabled (0) or Enabled (1)
Indicates the state of the output of logic function 6.

09.92 : Logic function 6 source 3
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 3 for logic function 6.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.93 : Logic function 6 source 3 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 3 of logic function 6.

Disabled (0): Source 3 not inverted.

Enabled (1): Source 3 inverted.

09.94 : Logic function 6 source 1
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 1 for logic function 6.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.95 : Logic function 6 source 1 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 1 of logic function 6.

Disabled (0): Source 1 not inverted.

Enabled (1): Source 1 inverted.

09.96 : Logic function 6 source 2
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select source 2 for logic function 6.
Only "bit" type parameters can be used on this input.
If an unsuitable parameter is addressed, the input will be frozen at 0.

09.97 : Logic function 6 source 2 invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert source 2 of logic function 6.

Disabled (0): Source 2 not inverted.

Enabled (1): Source 2 inverted.

09.98 : Logic function 6 output invert
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the output of logic function 6.

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Notes

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5.11 - Menu 10: Status and trips

5.11.1 - Menu 10 diagrams

• **Operating states**

10.01	Drive healthy	10.20	Last trip (most recent trip)
10.02	Drive active	10.21	Trip - 2
10.03	Zero speed	10.22	Trip - 3
10.04	Running at minimum speed	10.23	Trip - 4
10.05	Below set speed	10.24	Trip - 5
10.06	At speed	10.25	Trip - 6
10.07	Above set speed	10.26	Trip - 7
10.08	Nominal load reached	10.27	Trip - 8
10.09	Drive output at current limit	10.28	Trip - 9
10.10	Drive regenerating	10.29	Trip - 10 (oldest trip)
10.11	Braking IGBT active	10.40	Status word **10.01** to **10.15**
10.13	Direction commanded	10.51	Vmin alarm
10.14	Direction running	10.52	Vmax alarm
10.15	Mains loss	10.53	Maximum speed
10.16	DC bus undervoltage	10.76	DC bus preload contactor closed
10.17	Motor overload alarm	10.98	Drive status
10.18	Drive overtemperature alarm	10.99	Current trip
10.19	Drive general warning		

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• Braking IGBT active

10.12	Braking resistor alarm
10.30	Full power braking time
10.31	Full power braking period
10.39	Braking overload accumulator

• Trip management

10.33	Drive reset
10.34	Number of auto-reset attempts
10.35	Auto reset delay
10.36	Hold drive healthy/auto reset
10.37	Brak. IGBT management/stop minor trip
10.38	Serial link user trip
10.54	User alarm 1
10.55	User alarm 2
10.56	User alarm 3
10.57	User alarm 4
10.59	"Motor phase missing" trip validation
10.60	"I imbalanced" trip validation
10.61	User trip 1
10.63	User trip 2
10.65	User trip 3
10.67	User trip 4
10.69	Trip active at standstill

• Miscellaneous

10.74	Preload time
10.75	DC bus powered
10.77	4 quadrant rectifier disable (applicable to FX only)

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5.11.2 - Explanation of parameters in menu 10

10.01 : Drive healthy

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the drive is not tripped.
If parameter **10.36** is at Enabled (1), this bit will remain at Enabled (1) during the trip phase if an auto-reset is supposed to occur. Once the number of auto-resets is reached, the next trip will cause this bit to change to zero.
If **10.01** is at Disabled (0), **10.99** provides information about the current trip.

10.02 : Drive active

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the drive output is active.

10.03 : Zero speed

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the absolute value of the speed is less than or equal to the threshold defined by parameter **03.05**.
10.03 changes back to Disabled (0) when the speed exceeds **03.05** + 10 rpm.

10.04 : Running at minimum speed

Adjustment range : Disabled (0) or Enabled (1)
In bipolar mode (**01.10** = Pos. and Neg. (1)), this parameter operates the same as parameter **10.03**.
In unipolar mode (**01.10** = Pos. only (0)), this parameter is at Enabled (1) if the absolute value of the ramp output is less than or equal to the minimum speed **01.07** + (30 rpm/number of pairs of motor poles).
10.04 returns to Disabled (0) when the speed exceeds [**01.07** + (30 rpm/number of pairs of poles) + 10 rpm].
The minimum speed is defined by parameter **01.07**.

10.05 : Below set speed

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the absolute value of the motor speed is less than **01.03** - (**03.06** ÷ 2).
10.05 returns to Disabled (0) when the speed exceeds [**01.03** - (**03.06** ÷ 2) + 10 rpm].
CAUTION:
If 03.06 < 20 rpm, the speed may be situated in the hysteresis dead band.

10.06 : At speed

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the absolute value of the motor speed is between **01.03** - (**03.06** ÷ 2) and **01.03** + (**03.06** ÷ 2).

10.07 : Above set speed

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the absolute value of the motor speed is greater than **01.03** + (**03.06** ÷ 2).
10.07 returns to Disabled (0) when the speed becomes less than [**01.03** + (**03.06** ÷ 2) + 10 rpm].
CAUTION:
If 03.06 < 20 rpm, the speed may be situated in the hysteresis dead band.

10.08 : Nominal load reached

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the active current **04.02** is greater than or equal to the rated active current.
Rated active current = **05.07** x **05.10**.

10.09 : Drive out at current limit

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when drive current limiting is active.

10.10 : Drive regenerating

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the power is being transferred from the motor to the DC bus (driving load).

10.11 : Braking IGBT active

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the power is being dissipated into the optional braking resistor (if this is connected).

10.12 : Braking resistor alarm

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the integration parameter for the braking resistor load becomes greater than 75%.

10.13 : Direction commanded

Adjustment range : Forward (0) or Reverse (1)
This parameter is at Reverse (1) if the pre-ramp reference is negative.
It is reset to Forward (0) if the pre-ramp reference is positive.

10.14 : Direction running

Adjustment range : Forward (0) or Reverse (1)
This parameter is at Reverse (1) if the post-ramp reference is negative.
It is reset to Forward (0) if the post-ramp reference is positive.

10.15 : Mains loss

Adjustment range : NO (0) or YES (1)
This parameter is at YES (1) during loss of the AC mains power supply. This parameter is enabled only if parameter **06.03** is not set to NO DETECTION (0).

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◇ **10.16** ◇ **: DC bus undervoltage**

Adjustment range : Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when the bus voltage level is too low.

◇ **10.17** ◇ **: Motor overload alarm**

Adjustment range : Disabled (0) or Enabled (1)
This parameter changes to Enabled (1) when parameter **04.19** "Overload accumulator" becomes greater than 95%.
It changes back to Disabled (0) when the value is < 90%.

◇ **10.18** ◇ **: Drive overtemperature alarm**

Adjustment range: Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when one of the displayed temperatures **07.51** to **07.55** exceeds 90% of the permitted maximum value.

◇ **10.19** ◇ **: Drive general warning**

Adjustment range: Disabled (0) or Enabled (1)
This parameter is at Enabled (1) when at least one of the alarms **10.12**, **10.17** or **10.18** or the "Current limit" alarm is activated. This alarm, added as from version 3.10, is activated if the drive rated current is exceeded for a time greater than the specifications (see section 1.4.2 of Installation manual).

◇ **10.20** ◇ to ◇ **10.29** ◇ : **Trips 0 to 9**

Adjustment range: 0 to 102
Contains the last 10 drive trips.
10.20: Indicates the most recent trip.
10.29: Indicates the oldest trip.
The possible trips are:

No.	HMI name	Reason for trip
1	DC UnderVolt	DC bus undervoltage
2	DC over volt	DC bus overvoltage
3	Over current	Overcurrent at drive output
4	Brak. IGBT	Braking IGBT transistor overcurrent
5	I IMBALANCED	• Phase current imbalance • Vectorial sum of 3 motor currents is non-zero
6	Out Ph. loss	Loss of a motor phase
7	Over speed	The speed is greater than 1.3 times the value of **00.02** (**01.06**)
9	IGBT U	Problem on an IGBT (U)
10	RECTIFIER Th	Rectifier bridge temperature too high, there is a ventilation problem, the ambient temperature is too high or the load is too great
11	Encoder rot	The measured position does not vary (the encoder is incorrectly connected, not powered or the shaft is not turning)
13	UVW reversed	The u, v, w commutation signals of the encoder are reversed
14	TUNE U Encod	Some encoder signals are present, but commutation channel U is missing
15	TUNE V Encod	Some encoder signals are present, but commutation channel V is missing

No.	HMI name	Reason for trip
16	TUNE W Encod	Some encoder signals are present, but commutation channel W is missing
18	Autotun.fail	Drive trips during the autotune phase
19	Brak. resist.	Braking resistor overload I x t : **10.39** = 100%
21	Th IGBT U	• IGBT (U) overheating, ventilation problem, ambient temperature too high • Load too high
24	Motor PTC	Triggering of motor thermal sensor on ADI3 or MD-Encoder
26	24V over ld	Overload on the +24 V power supply or digital outputs
27	ADI1 loss	Loss of the current reference on analog input AI1
28	ADI2 loss	Loss of the current reference on analog input ADI2
30	COM loss	Loss of serial link communication
31	EEPROM fail.	EEPROM problem or problem with transfer by XPressKey (key and drive versions different)
33	Stator res.	Trip during measurement of the stator resistance
34	Fieldbus loss	Disconnection of the fieldbus during operation or error
35	Sec. disable	Problem on secure disable input
36	U sign. loss	Loss of encoder commutation channel U
37	V sign. loss	Loss of encoder commutation channel V
38	Breakdown	Breakdown of synchronous motor in sensorless closed loop mode
41	User 1	• User 1 trip triggered by state 1 of **10.61**. • In factory settings, overload of the drive or the braking resistor. • See **10.17** to **10.19**.
42	User 2	User 2 trip triggered by state 1 of **10.63**.
43	User 3	User 3 trip triggered by state 1 of **10.65**.
44	User 4	User 4 trip triggered by state 1 of **10.67**.
45	User 5	User 5 trip triggered via the serial link.
46	User 6	User 6 trip triggered via the serial link.
47	User 7	User 7 trip triggered via the serial link.
48	User 8	User 8 trip triggered via the serial link.
49	User 9	User 9 trip triggered via the serial link.
50	User 10	User 10 trip triggered via the serial link.
51	PX-I/O EEPROM	Problem on PX-I/O EEPROM
52	PX-I/O supply	Overload of the PX-I/O power supply
53	PX-I/O CLOCK	Problem on the real-time clock of the PX-I/O
54	PX-I/O comm	Communication problem between the drive and the PX-I/O
56	IGBT V	Trip on an IGBT (V)

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No.	HMI name	Reason for trip
57	IGBT W	Trip on an IGBT (W)
58	Th IGBT V	• IGBT (V) overheating, ventilation problem, ambient temperature too high. • Load too great.
59	Th IGBT W	• IGBT (W) overheating, ventilation problem, ambient temperature too high. • Load too great.
60	DIAGNOSTIC	Problem detected during the control and interface board test, the power module test or the self-test
65	10V over ld	Overload on the +10 V power supply
101	MAINS LOSS	Loss of AC supply

Note : The trip that occur when the drive stopped (**10.02** = disabled) are not stored in the list of the last 10 trips.
For details of the trips, see section 7.

10.30 **: Full power braking time**
Adjustment range : 0 to 400.0 s
Factory setting   : 0
This parameter defines for how long the braking resistor can withstand the maximum braking voltage (780 V) without damage. It is used to determine the time before the drive trips due to braking overload.
CAUTION:
If this parameter is left at 0, the braking resistor will not be protected.

10.31 **: Full power braking period**
Adjustment range : 0 to 25.0 min
Factory setting   : 0
This parameter defines the time interval that must elapse between two consecutive braking periods at full power as defined by parameter **10.30**. It is used to configure the thermal time constant for the resistor used.
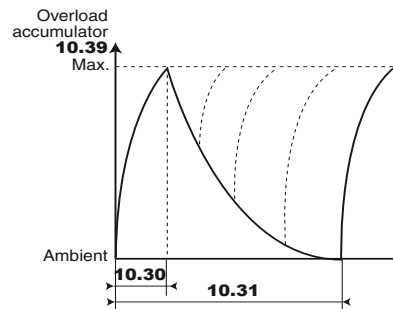
CAUTION:
If this parameter is left at 0, the braking resistor will not be protected.

10.32 **: Not used**

10.33 **: Drive reset**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting   : Disabled (0)
A change in this parameter from Disabled (0) to Enabled (1) will cause a drive reset.
If a remote drive reset is required, a terminal must be assigned to this parameter.
If the drive trips due to IGBT overcurrent (Brak. IGBT), either at the output bridge (Drive output current) or the braking transistor, the drive cannot be reset for 10 seconds (IGBT recovery time).

10.34 **: Number of auto-reset attempts**
Adjustment range : None (0) 1 to 5 (1 to 5)
Factory setting   : None (0)

None (0): There will be no automatic reset. A command must be given.

1 to 5 (1 to 5): There will be as many automatic reset attempts as have been programmed.
When the counter reaches the permitted number of reset attempts, the drive is disabled and will not auto-reset. This last trip can only be reset via a command.
If no trips occur, the counter is decremented by one value every 5 minutes.
CAUTION:
The value of 10.34 is taken into account only after repowering-up of the drive.

10.35 **: Auto reset delay**
Adjustment range : 0 to 25.0 s
Factory setting   : 1.0 s
This parameter defines the time between the drive tripping and the automatic reset (subject to a minimum stop time for trips relating to overcurrents).

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10.36 **: Hold drive healthy/auto reset**

Adjustment range : No (0) or Yes (1)
Factory setting : No (0)

No (0): 10.01 (drive healthy) is reset to No (0) each time the drive trips, without taking account of any auto-resets that might occur.

Yes (1): Parameter **10.01** is held at Yes (1) during the trip phases which are reset automatically.

10.37 **: Brak. IGBT|stop minor trip**

Adjustment range : YES|Fr.WHEEL (0), YES|Ctrled (1),
NO|FREEWHEEL (2),
NO|CONTROLED (3)
Factory setting : NO|FREEWHEEL (2)

YES|Fr.WHEEL (0): Enabling of "Brak. IGBT" trip and freewheel stop on a minor trip.
In the event of a problem on the braking IGBT, the drive trips on "Brak. IGBT".
(Used with the braking transistor option.)

YES|Ctrled (1): Enabling of the "Brak. IGBT" trip and controlled stop on a minor trip (deceleration before tripping of the drive). This type of stop is valid only if **08.10** = Drive enable.
In the event of a problem on the braking IGBT, the drive trips on "Brak. IGBT".

NO|FREEWHEEL (2): Disabling of the trip "Brak. IGBT" and freewheel stop on a minor trip.

NO|CONTROLED (3): Disabling of the trip "Brak. IGBT" and controlled stop on a minor trip (deceleration before tripping of the drive). This type of stop is valid only if **08.10** = Drive enable.

Note: Minor trips: Th IGBT U or V or W, Motor PTC, 24V over ld, ADI1 loss, ADI2 loss, COM loss, EEPROM fail., Fieldbus loss, User 5 to User 10.

10.38 **: Serial link user trip**

Adjustment range : 0 to 50
Factory setting : 0
This parameter is used to generate user trips, via the serial link.
Trips generated by the user will be indicated by trips 45 to 50.
Trips 45 to 50 correspond respectively to trips "User 5" to "User 10". Set **10.38** back to 0 before resetting the trip.

10.39 **: Braking overload accumulator**

Adjustment range: 0 to 100.0%
This parameter gives an indication of the braking resistor temperature modelled according to parameters **10.30** and **10.31**. A zero value means that the resistor is close to the ambient temperature and 100% is the maximum temperature (trip level).

10.40 **: Status word**

Adjustment range: 0 to 32767
This parameter is used with a serial communications interface. The value of this parameter is the addition of the drive bits envisaged for read-only mode, with the following binary weights:

- **10.01** = 2^0,
- **10.02** = 2^1,
- **10.03** = 2^2,
- **10.04** = 2^3,
- **10.05** = 2^4,
- **10.06** = 2^5,
- **10.07** = 2^6,
- **10.08** = 2^7,
- **10.09** = 2^8,
- **10.10** = 2^9,
- **10.11** = 2^{10},
- **10.12** = 2^{11},
- **10.13** = 2^{12},
- **10.14** = 2^{13},
- **10.15** = 2^{14}.

10.41 to **10.50** **: Not used**

10.51 **: Vmin alarm**

Adjustment range: Disabled (0) or Enabled (1)
Changes to Enabled (1) when the motor speed (**05.04**) < V_{min} (**01.07** or **21.02**) + **03.51** in open loop mode or speed (**03.02**) < V_{min} (**01.07** or **21.02**) + **03.51** in closed loop mode.
10.51 changes back to Disabled (0) when the speed becomes greater than (**05.04**) < V_{min} (**01.07** or **21.02**) + **03.51** + 10 rpm in open loop mode or greater than (**03.02**) < V_{min} (**01.07** or **21.02**) + **03.51** + 10 rpm.
Note: In bipolar mode, alarm **10.51** is not active.

10.52 **: Vmax alarm**

Adjustment range: Disabled (0) or Enabled (1)
Changes to Enabled (1) when the motor speed (**05.04**) > V_{max} (**01.06** or **21.01**) - **03.52** in open loop mode or speed (**03.02**) > V_{max} (**01.06** or **21.01**) - **03.52** in closed loop mode.
10.52 changes back to Disabled (0) when the speed is less than (**05.04**) > V_{max} (**01.06** or **21.01**) - **03.52** - 10 rpm in open loop mode, or (**03.02**) > V_{max} (**01.06** or **21.01**) - **03.52** - 10 rpm.

10.53 **: Maximum speed**

Adjustment range: Disabled (0) or Enabled (1)
Changes to Enabled (1) when the motor speed (**05.04**) > V_{max} (**01.06** or **21.01**) - 15 rpm.
10.53 changes back to Disabled (0) when the speed is less than (**05.04**) > V_{max} (**01.06** or **21.01**) - **03.53** - 25 rpm.

10.54 to **10.57** **: User alarms 1 to 4**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
When these parameters change to Enabled (1), the drive goes into alarm mode (drive does not trip).

10.58 **: Not used**

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10.59 **: Motor phase missing trip validation**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)

NO (0): "Output phase loss" trip detection disabled.

YES (1): "Output phase loss" trip detection enabled.

Note : If the brake function is enable whatever the state of **10.59** the " Output phase loss " trip is taken into account.

10.60 **: "I imbalanced" trip validation**
Adjustment range : NO (0) or YES (1)
Factory setting : YES (1)
Used to enable the Current Imbalanced trip.

10.61 **: User trip 1**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): The drive has not tripped.

Enabled (1): The drive trips, decelerates in freewheel mode and generates a User trip 1 code.

In factory settings, **10.61** is assigned via **09.80** which is a combination of parameters **10.12**, **10.17**, **10.18** and **10.19**. This configuring allows overuse of the drive to be detected.

Note: Automatic reset (**10.34**) is not permitted.

10.62 **: Not used**

10.63 **: User trip 2**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): The drive has not tripped.

Enabled (1): The drive trips, decelerates in freewheel mode and generates a User trip 2 code.

Note: Automatic reset (**10.34**) is not permitted.

10.64 **: Not used**

10.65 **: User trip 3**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): The drive has not tripped.

Enabled (1): The drive trips, decelerates in freewheel mode and generates a User trip 3 code.

10.66 **: Not used**

10.67 **: User trip 4**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): The drive has not tripped.

Enabled (1): The drive trips, decelerates in freewheel mode and generates a User trip 4 code.

10.68 **: Not used**

10.69 **: Trip active at standstill**
Adjustment range : OFF (0) or On (1)
Factory setting : On (1)
This parameter is used to make drive trips active at standstill. The trips concerned are: IGBT U, V and W, Autotun. fail, I IMBALANCED, V sign. loss, RECTIFIER Th, Motor PTC, ADI1 loss, ADI2 loss, Th IGBT U, V and W, Out Ph. loss, UVW reversed.

10.70 to **10.73** **: Not used**

10.74 **: Preload time**
Adjustment range : 1 to 15 s
Factory setting : 1 s
Where the drive manages the preloading of capacitors on the DC bus (**10.75** = NO (0)), this parameter sets the DC bus preload time. Used in the specific case of a rectifier supplying several inverters.

10.75 **: DC bus powered**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)

NO (0): The drive is connected to an AC supply. The drive manages the preloading of capacitors on the DC bus.

YES (1): The drive is supplied directly on its DC bus. The preloading of capacitors on the DC bus must be managed externally.

Note:
• When **10.75** = YES (1), reading of the rectifier temperature is disabled (RECTIFIER Th trip is no longer active).
• **10.75** must be set to YES (1) for Powerdrive Regen (MDR) units.

10.76 **: Preload contactor closed**

Adjustment range : NO (0) or YES (1)

NO (0): Short-circuiting of the DC bus preload system is not permitted.

YES (1): Short-circuiting of the DC bus preload system can be permitted.

10.77 **: 4 quadrant rectifier disable (applicable to FX only)**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)
This parameter allows disabling the 4 quadrant functionality of the input rectifier of FX. If set to "NO (0)", the rectifier will allow feeding the energy back to the network. If st to "YES (1)", the rectifier operates as a standard 6 pulse diode rectifier

10.78 to **10.97** **: Not used**

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◇ **10.98** ◇ **: Drive status**

Adjustment range:0 to 36
Defines the drive operating status.

Value	HMI name	Meaning
0	DISABLED	Disabled
1	ENABLED M	Enabled, motor (on load)
2	ENABLED G	Enabled, generator (driving load)
3	RAMP STOP >M	Stop on ramp, clockwise, motor
4	RAMP STOP >G	Stop on ramp, clockwise, generator
5	RAMP STOP <M	Stop on ramp, counter-clockwise, motor
6	RAMP STOP <G	Stop on ramp, counter-clockwise, generator
7	TLSP STOP >M	Stop by low-frequency current injection, clockwise, motor
8	TLSP STOP >G	Stop by low-frequency current injection, clockwise, generator
9	TLSP STOP <M	Stop by low-frequency current injection, counter-clockwise, motor
10	TLSP STOP <G	Stop by low-frequency current injection, counter-clockwise, generator
15	DC Inject.>M	DC injection, clockwise, motor
16	DC Inject.>G	DC injection, clockwise, generator
17	DC Inject.<M	DC injection, counter-clockwise, motor
18	DC Inject.<G	DC injection, counter-clockwise, generator
19	I LIMIT >M	Current limit, clockwise, motor
20	I LIMIT >G	Current limit, clockwise, generator
21	I LIMIT <M	Current limit, counter-clockwise, motor
22	I LIMIT <G	Current limit, counter-clockwise, generator
23	DC BUS Lim>M	BUS voltage limit, clockwise, motor
24	DC BUS Lim>G	BUS voltage limit, clockwise, generator
25	DC BUS Lim<M	BUS voltage limit, counter-clockwise, motor
26	DC BUS Lim<G	BUS voltage limit, counter-clockwise, generator
27	Fly. RESTART	Catch a spinning motor
28	Start. DELAY	Delay before starting
29	T.Bef.Fly.R.	Delay before flying restart
30	Ext. DISABLE	External disable (run command present, but SDI2 not connected, or **06.15** Drive output set to Disabled (0)
31	MAINS <Min.V	Supply voltage < Minimum voltage

Value	HMI name	Meaning
33	AUTOTUNE	Autotune
34	REGEN MODE	Rectifier mode (Regen drives)
35	BOARDS TEST	Test of boards (control/interface)
36	POWER TEST	Test of the power

◇ **10.99** ◇ **: Regen current trip**

Adjustment range:0 to 102
Contains the code for the current trip. See the list of trips for parameters **10.20** to **10.29**.
Value 0 indicates that the drive has not tripped.
The other values indicate the trip number.

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5.12 - Menu 11: General drive set up

5.12.1 - Menu 11 diagram

• Menu 0 configuration

11.01 Parameter **46** assignment	11.11 Parameter **56** assignment
11.02 Parameter **47** assignment	11.12 Parameter **57** assignment
11.03 Parameter **48** assignment	11.13 Parameter **58** assignment
11.04 Parameter **49** assignment	11.14 Parameter **59** assignment
11.05 Parameter **50** assignment	11.15 Parameter **60** assignment
11.06 Parameter **51** assignment	11.16 Parameter **61** assignment
11.07 Parameter **52** assignment	11.17 Parameter **62** assignment
11.08 Parameter **53** assignment	11.18 Parameter **63** assignment
11.09 Parameter **54** assignment	11.19 Parameter **64** assignment
11.10 Parameter **55** assignment	11.20 Parameter **65** assignment

• Drive configuration

11.29 Drive software version	11.33 Drive voltage rating
11.31 User drive mode	11.60 Drive identification code
11.32 Drive current rating	

• Parameter setting

11.42 Parameter cloning	11.61 Advanced menu access code
11.44 Quick setup menu access	

• Serial link

11.23 Serial address
11.24 Serial mode
11.25 Baud rate
11.26 Min comms transmit delay
11.27 Parity, number of stop bits

• Miscellaneous

11.43 Factory settings
11.45 Motor parameter select
11.64 Save parameters
11.65 Menu to be saved
11.66 Communication type between drives

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5.12.2 - Explanation of parameters in menu 11

11.01 to **11.20** : **Assignment of parameters 00.46 to 00.65**

Adjustment range : **00.00** to **21.51**
Factory settings : See table below.
These parameters can be used, in order, to define parameters **00.46** to **00.65** of menu 0.

Parameter	Default value	Menu 0 set-up
11.01	01.21	00.46
11.02	01.22	00.47
11.03	01.23	00.48
11.04	01.24	00.49
11.05	06.09	00.50
11.06	06.03	00.51
11.07	03.06	00.52
11.08	06.62	00.53
11.09	00.00	00.54
11.10	10.34	00.55
11.11	05.59	00.56
11.12	00.00	00.57
11.13	00.00	00.58
11.14	00.00	00.59
11.15	00.00	00.60
11.16	00.00	00.61
11.17	00.00	00.62
11.18	00.00	00.63
11.19	00.00	00.64
11.20	00.00	00.65

Note: Quick assignment of parameters **00.56** to **00.65** is accessible via the configuration interface
(see section 2.2.3.3).

11.21 and **11.22** : **Not used**

11.23 : **Serial address**

Adjustment range : 0 to 247
Factory setting : 1
Used to define the drive address in the case of control or supervision via the serial link in Modbus RTU. Avoid values containing a zero as they are used to address groups of drives.
Note: From software version V2.20, this parameter is used only for the Modbus RTU link of the drive's RJ45 connector. For configuration of the Modbus RTU link of the PX-Modbus option, refer to the manual ref. 4071 of the PX-Modbus option.
CAUTION:
This parameter cannot be modified with the HMI and its factory setting must be used for communication between the drive and the HMI to be established.

11.24 : **Serial mode**

Adjustment range : LS NET (0), Modbus RTU (1)
This parameter indicates which protocol is being used for the current communication on the RJ45 connector serial link.

LS NET (0): LS Net protocol.

Modbus RTU (1): Modbus RTU protocol.

11.25 : **Baud rate**

Adjustment range : 300 (0) to 115200 (9)
Factory setting : 19200 (6)
Used to select the data transfer speed in Modbus RTU.

Speed (baud)	11.25
300	0
600	1
1200	2
2400	3
4800	4
9600	5
19200	6
38400	7
57600	8
115200	9

Note: From software version V2.20, this parameter is used only for the Modbus RTU link of the drive's RJ45 connector. For configuration of the Modbus RTU link of the PX-Modbus option, refer to the manual ref. 4071 of the PX-Modbus option.
CAUTION:
This parameter cannot be modified with the HMI and its factory setting must be used for communication between the drive and the HMI to be established.

11.26 : **Min comms transmit delay**

Adjustment range : 0 to 100 ms
Factory setting : 10 ms
As the serial link is 2-wire type, Rx is connected to Tx and Rx\ to Tx\. A communication-related trip may occur if the receiver responds to a request before the transmitter has had time to switch. Parameter **11.26** is used to introduce a time between reception and return of data. After transmission of a request, the drive needs 1.5 ms before receiving the next command. The adjustment is made in 2 ms intervals.
Note: From software version V2.20, this parameter is used only for the Modbus RTU link of the drive's RJ45 connector. For configuration of the Modbus RTU link of the PX-Modbus option, refer to the manual ref. 4071 of the PX-Modbus option.

11.27 : **Parity, No of stop bit**

Adjustment range : NONE, 2STOP (0); NONE, 1STOP (1); EVEN, 1STOP (2); ODD, 1STOP (3)
Factory setting : NONE, 2STOP (0)

NONE, 2STOP (0): No parity, 2 stop bits

NONE, 1STOP (1): No parity, 1 stop bit

EVEN, 1STOP (2): Even parity, 1 stop bit

ODD, 1STOP (3): Odd parity, 1 stop bit (used in Modbus RTU)
Note: From software version V2.20, this parameter is used only for the Modbus RTU link of the drive's RJ45 connector. For configuration of the Modbus RTU link of the PX-Modbus option, refer to the manual ref. 4071 of the PX-Modbus option.
CAUTION:
This parameter cannot be modified with the HMI and its factory setting must be used for communication between the drive and the HMI to be established.

11.28 : **Not used**

◇ **11.29** : Drive software version

Adjustment range: 1.00 to 9.99
Indicates the drive software version.

11.30 : Not used

11.31 : User drive mode
Adjustment range : OPEN LOOP (0), OPEN LOOP (1),
CL LP Vector (2), SERVO (3), REGEN (4),
Syn VS REGEN (5), Asy VS REGEN (6)
Conv DC/DC (7)
Factory setting : OPEN LOOP (0)
The operating mode can only be selected when the drive is stopped.

OPEN LOOP (0 and 1) : Asynchronous motor controlled in open loop mode (see also parameter 05.14).

CL LP Vector (2) : Asynchronous motor controlled in closed loop mode (see also parameter 03.38).

SERVO (3) : Servo or synchronous motor controlled in closed loop mode (see also parameter 03.38).

REGEN (4) : Reversible mode.

Syn VS REGEN (5) : Reversible mode with variable speed synchronous generator.

Asy VS REGEN (6) : Reversible mode with variable speed asynchronous generator.

Conv DC/DC (7) : Reserved.

Note: A change from open loop mode (11.31 = OPEN LOOP (0 or 1) to closed loop mode (11.31 = CL LP Vector (2) or SERVO (3)), or vice versa, causes a return to factory settings of parameters 12.45 Brake apply frequency or brake apply speed threshold, and 12.46 Magnetisation time delay/speed threshold.

CAUTION:
If the mode is changed with a fieldbus option, reset the option (Pr 15.32 = 1).

◇ **11.32** : Max drive current rating

Adjustment range : 1.5 to 3200.0 A
This parameter indicates the drive rated current corresponding to the permitted total motor current.

◇ **11.33** : Drive voltage rating

Adjustment range:200 to 690 V
This parameter indicates the rated voltage of the drive according to its rating and 06.10.

11.34 to **11.41** : Not used

11.42 : Parameter cloning
Adjustment range : Disabled (0), Key to drive (1), Drive to key (2),
Auto key mem (3)
Factory setting : Disabled (0)
Disable the drive before cloning or transferring parameters using the XPressKey (SDI terminal open).
Disabled (0): No action.

Key to drive (1): The "Key to drive" function is activated using the pushbutton located on the copy key. After disconnecting the configuration interface cable from the RJ45 connector, connect the XPressKey instead. A first press on the button corresponds to parameter 11.42 changing to "Key to drive" (the XPressKey LED flashes quickly) and a second press confirms the transfer of data from the XPressKey to the drive (the XPressKey LED is then on continuously). The LED going out indicates the end of the transfer. Disconnect the XPressKey and reconnect the interface cable.

Note: If the transfer cannot be performed, the XPressKey LED flashes quickly.

CAUTION:
Press the button on the key within a maximum of 10 seconds after selecting "Key to drive" in 11.42, otherwise the action is cancelled.

Drive to key (2): After configuring 11.42 = "Drive to key", disconnect the configuration interface cable from the RJ45 connector and connect the XPressKey instead (the XPressKey LED flashes slowly). Pressing the button on the key causes the parameters contained in the drive to be stored in the copy key (the XPressKey LED is then on continuously). The LED going out indicates the end of the transfer. Disconnect the XPressKey and reconnect the configuration interface cable.
Parameter 11.42 automatically changes back to Disabled (0) once the transfer has been performed.
Note: If the transfer cannot be performed, the XPressKey LED flashes quickly.

CAUTION:
Press the button on the key within a maximum of 10 seconds after selecting "Drive to key (2)" in 11.42, otherwise the action is cancelled.

Auto key mem (3): Not available.
CAUTION:
If the ratings of the source and destination drives are different:
- Destination drive software < V3.00: the transfer is not permitted
- Destination drive software ≥ V3.00: the transfer is performed, except for menus 5 and 21.

11.43 : Factory settings
Adjustment range : DISABLED (0), 50Hz HIGH (1),
60Hz HIGH (2),
50Hz LOW Trq (3), 60Hz LOW Trq (4),
Mot.EXCLUDED (5)
Factory setting : DISABLED (0)

DISABLED (0): No return to factory settings.

50Hz HIGH (1): Used to set the drive to factory settings with a 400 V/50 Hz motor and a high overload (heavy duty).

60Hz HIGH (2): Used to set the drive to factory settings with a 460 V/60 Hz motor and a high overload (heavy duty).

50Hz LOW Trq (3): Used to set the drive to factory settings with a 400 V/50 Hz motor and a low overload (normal duty).

60Hz LOW Trq (4): Used to set the drive to factory settings with a 460 V/60 Hz motor and a low overload (normal duty).

Mot.EXCLUDED (5): Used to set the drive to factory settings with the exception of parameters linked to the motor.
Function 5 is not available in the current version.
Note: The factory settings for 05.07 and 05.08 according to 11.43 are listed in section 5.6.3.

CAUTION:
For modifying 11.43, the drive must be disabled, 06.15 = Disabled (0) or SDI input open.

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11.44 : **Quick setup menu access**
Adjustment range : Level 1 (0), Level 2 (1),
Factory setting : Level 2 (1)
This parameter determines the access level in menu 0.

11.44	Keypad	Access level
0	Level 1	Access to parameters **00.01** to **00.10**
1	**Level 2**	**Access to parameters 00.01 to 00.65**

11.45 : **Motor parameter select**
Adjustment range : Motor 1 (0) or Motor 2 (1)
Factory setting : Motor 1 (0)
This parameter is used to select the set of parameters corresponding to the characteristics of motor 1 or 2.

11.45 = 0 (motor 1)	11.45 = 1 (motor 2)	Description
01.06	21.01	Maximum reference clamp
01.07	21.02	Minimum reference clamp
01.14	21.03	Reference selector
02.11	21.04	Acceleration rate
02.21	21.05	Deceleration rate
05.06	21.06	Motor rated frequency
05.07	21.07	Motor rated current
05.08	21.08	Motor rated speed
05.09	21.09	Motor rated voltage
05.10	21.10	Rated power factor (cos φ)
05.11	21.11	Number of motor poles
05.17	21.12	Stator resistance
05.23	21.13	Voltage offset
05.24	21.14	Motor transient inductance
-	21.15	Motor 2 map enable
05.25	21.24	Motor stator inductance
05.33	21.30	Motor volt per 1000 rpm (Ke)
05.51	21.51	Q axis inductance (synchronous motor)

11.46 to **11.59** : **Not used**

11.60 : **Drive identification code**

Adjustment range : 0 to 32000
This product code gives information on the drive rating, size, hardware version and variant.
When the nameplate is not visible, this code can be given to your LEROY-SOMER contact.

11.61 : **Advanced menu access code**
Adjustment range : 0 to 9999
Factory setting : 149
This parameter is used to limit access to menus 1 to 21 when setting the parameters via the configuration interface.
If this parameter is not equal to 0, the value of parameter **11.61** must be entered to enable switching from Menu 0 to Menu 1.
In factory settings mode, simply enter the value 149 to access all menus.

11.62 : **Not used**

11.63 : **Standard serial link timeout**
Adjustment range : 0 to 25.0 s
Factory setting : 0
Used to generate the "COM loss" trip if no communication has taken place within the time period set by this parameter. The value 0 deactivates monitoring of the communication on the drive's RJ45 connector.

11.64 : **Save parameters**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)
This parameter is used to store in EEPROM the values of drive parameters that have been changed via the fieldbus.
1) Choose the menu(s) to be saved (**11.65** = 0 to save all menus)
2) Initiate the save operation, **11.64** = YES (1)
3) The end of the save operation is indicated by **11.64** changing to NO (0).

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11.65 **: Menu to be saved**

Adjustment range : 0 to 21
Factory setting   : 0
This parameter is used to choose the menu(s) to be saved
(**11.65** = 0 for all menus)

11.66 **: Communication type between drives**
Adjustment range : NONE (0), Invert. REGEN (1),
                   Rectif. REGEN (2), MASTER TWIN (3),
                   SLAVE TWIN (4), MASTER Synch (5),
                   SLAVE Synchr (6)
Factory setting   : NONE (0)
0 : NONE
1: Invert. REGEN
2: Rectif. REGEN
3: MASTER TWIN
4: SLAVE TWIN
5: MASTER Synch
6: SLAVE Synchr
The modification is not taken into account until after the drive has been powered down.
Note: For versions < 03.00, communication types 2, 4 and 6 can be used only with a specific control board.

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5.13 - Menu 12: Comparator and function blocks

5.13.1 - Menu 12 diagrams

• **Comparators**
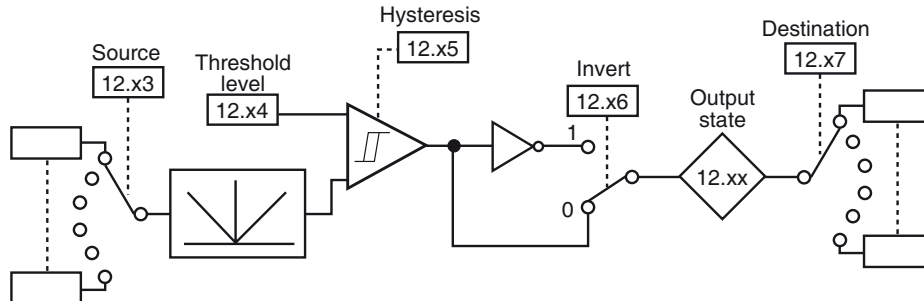
	Source	Threshold level	Hysteresis	Output state	Invert	Destination
Comparator 1	**12.03**	**12.04**	**12.05**	**12.01**	**12.06**	**12.07**
Comparator 2	**12.23**	**12.24**	**12.25**	**12.02**	**12.26**	**12.27**
Comparator 3	**12.63**	**12.64**	**12.65**	**12.61**	**12.66**	**12.67**
Comparator 4	**12.73**	**12.74**	**12.75**	**12.71**	**12.76**	**12.77**

• **Processing of internal variables**
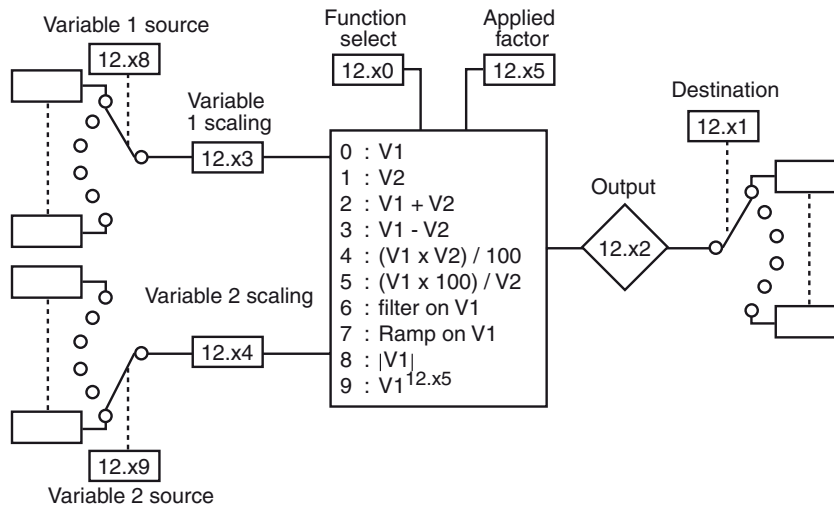
	Source Variable 1	Scaling Variable 1	Source Variable 2	Scaling Variable 2	Selection function	Applied factor	Destination output	Output
Block 1	**12.08**	**12.13**	**12.09**	**12.14**	**12.10**	**12.15**	**12.11**	**12.12**
Block 2	**12.28**	**12.33**	**12.29**	**12.34**	**12.30**	**12.35**	**12.31**	**12.32**

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• Brake control in open loop mode
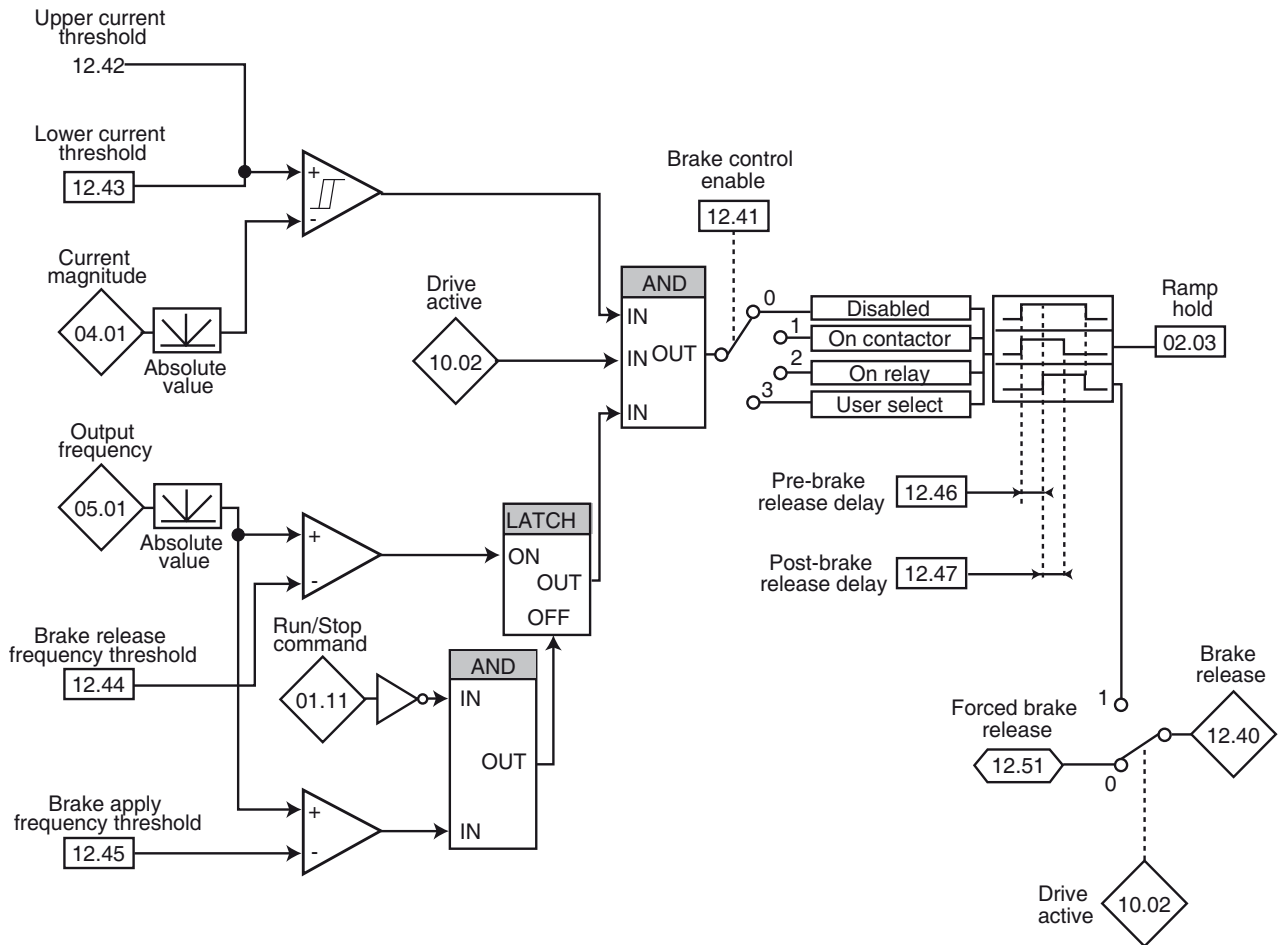
Sequencing
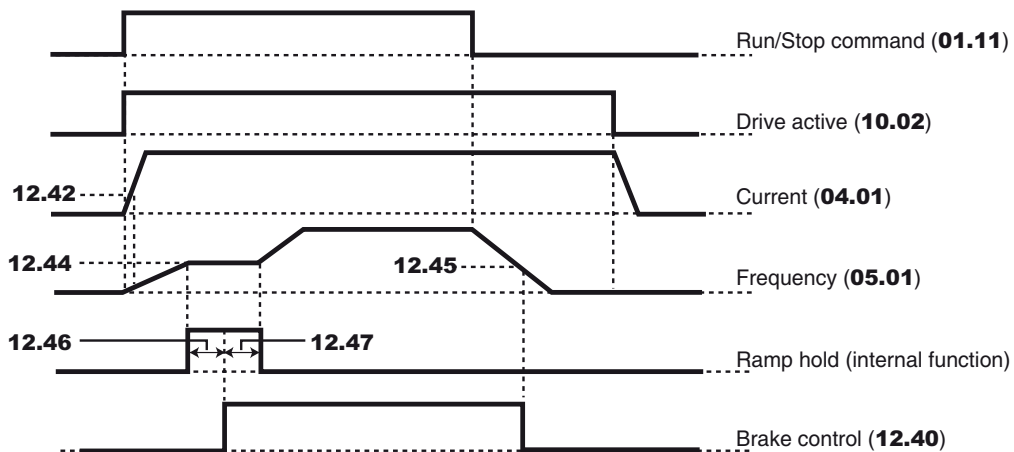
POWERDRIVE MD
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• **Brake control in closed loop mode**
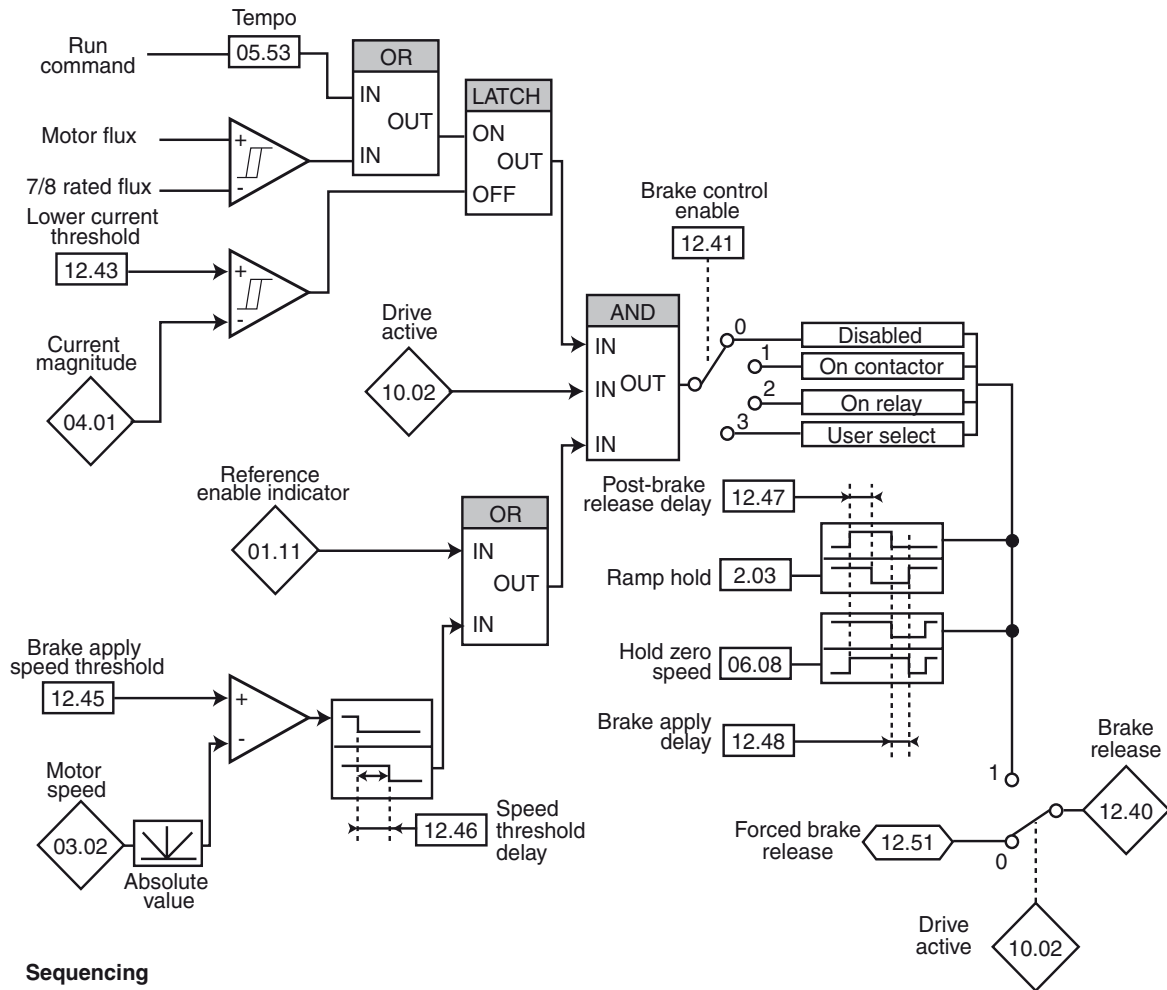
Sequencing

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5.13.2 - Explanation of parameters in menu 12

12.01 : **Comparator 1 output**

12.02 : **Comparator 2 output**

Adjustment range : Disabled (0) or Enabled (1)

Disabled (0): The input variable is less than or equal to the comparator threshold.

Enabled (1): The input variable is greater than the comparator threshold.

12.03 : **Comparator 1 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable which is to be compared to the configured threshold.
The absolute value of the variable is taken into account.

12.04 : **Comparator 1 threshold**
Adjustment range : 0 to 100.0%
Factory setting : 0
This parameter is used to adjust the comparator trip threshold.
The threshold is expressed as a percentage of the maximum value of the compared variable.

12.05 : **Comparator 1 hysteresis**
Adjustment range : 0 to 25.0%
Factory setting : 0
This parameter defines the window within which the comparator output will not change state.
The output will change to Enabled (1) when the variable reaches the threshold value + (hysteresis/2).
The output will change to Disabled (0) when the variable drops below the threshold value - (hysteresis/2).
The hysteresis is expressed as a percentage of the maximum value of the compared variable.

12.06 : **Comparator 1 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the comparator output.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

12.07 : **Comparator 1 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the comparator output.
Only bit type parameters can be programmed.
If an unsuitable parameter is programmed, the output is not sent anywhere.

12.08 : **Function 1 variable 1 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the source parameter for variable 1 to be processed.
Only "numerical" parameters can be assigned.
If an unsuitable parameter is selected, the value of the variable will be 0.

12.09 : **Function 1 variable 2 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the source parameter for variable 2 to be processed.
Any "numerical" parameter can be assigned.
If an unsuitable parameter is selected, the value of the variable will be 0.

12.10 : **Function block 1 select**
Adjustment range : See table below
Factory setting : O = V1 (0)
This parameter is used to define the function of the internal variables processing block.

	HMI name	Output	Comment
0	**O = V1**	**= V1**	Used to transfer an internal variable
1	O = V2	= V2	Used to transfer an internal variable
2	O=V1+V2	= V1 + V2	Addition of 2 variables
3	O=V1-V2	= V1 - V2	Subtraction of 2 variables
4	=V1xV2/100	= (V1 x V2) ÷ 100	Multiplication of 2 variables
5	=V1/V2x100	= (V1 x 100) ÷ V2	Division of 2 variables
6	=filter/V1	$=V1(1 - e^{\frac{-t}{12.X5}})$	Creation of a first-order filter
7	O= ramp/V1	= ramped V1	Creation of a linear ramp. **12.15** is used to adjust the value of the ramp
8	O = abs (V1)	= |V1|	Absolute value
9	O = V1^**12.15**	$= V1^{12.x5}$	V1 to the power **12.15**

• **If 12.10 or 12.30 equals 2, 3, 4 or 5:**
When the result of the calculation is greater than or equal to 32767, the output **12.11** or **12.31** is limited at 32767.
When the result of the calculation is less than or equal to -32768, the output **12.11** or **12.31** is limited at -32768.
• **If 12.10 or 12.30 equals 5:**
To avoid a calculation error if V2 = 0, the result of the operation will be 0.
• **If 12.10 or 12.30 equals 9:**
To avoid a calculation error, it is the absolute value of the signal V1 which is taken into account before calculating its square root or cube root.

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12.11 : **Function 1 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the processed variable.
Any unprotected "non-bit" parameter can be assigned.
If an unsuitable parameter is selected, the value of the variable taken into account is zero.

12.12 : **Function block 1 output**

Adjustment range : ± 100.00%
Indicates the value of the function output as a percentage of the adjustment range for the destination parameter.

12.13 : **Function 1 variable 1 scale**
Adjustment range: ± 4.000
Factory setting : 1.000
Used to scale variable 1 before processing.
CAUTION:
The value at the output of the scaling can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

12.14 : **Function 1 variable 2 scale**
Adjustment range : ± 4.000
Factory setting : 1.000
Used to scale variable 2 before processing.
CAUTION:
The value at the output of the scaling can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

12.15 : **Function 1 applied factor**
Adjustment range : 0 to 100.00
Factory setting : 0
Depending on its function, the internal variables processing block may need an associated parameter.
If the block is used to create a first-order filter, the associated parameter is used as a time constant ; if it is used to generate a ramp, this parameter is used to adjust the ramp value (in seconds). The ramp time corresponds to the time taken to change from 0 to 100% of the source parameter maximum value.
If the block is used as power, this parameter is used as follows:

Function	Associated parameter value
$V1^2$	2.00
$V1^3$	3.00
$\sqrt{V1}$	12.00
$\sqrt[3]{V1}$	13.00

12.16 to **12.22** : **Not used**

12.23 : **Comparator 2 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable that is to be compared to the configured threshold.
The absolute value of the variable is used. Only non-bit parameters can be programmed as the source.
If an unsuitable parameter is programmed, the input value is taken to equal 0.

12.24 : **Comparator 2 threshold**
Adjustment range : 0 to 100.0%
Factory setting : 0
This parameter is used to set the comparator trip threshold.
The threshold is expressed as a percentage of the maximum value of the compared variable.

12.25 : **Comparator 2 hysteresis**
Adjustment range : 0 to 25.0%
Factory setting : 0
This parameter defines the window within which the comparator output will not change state.
The output will change to Enabled (1) when the variable reaches the value of the threshold + (hysteresis/2).
The output will change to Disabled (0) when the variable goes below the value of the threshold - (hysteresis/2).
The hysteresis is expressed as a percentage of the maximum value of the compared variable.

12.26 : **Comparator 2 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the comparator output.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

12.27 : **Comparator 2 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the comparator output.
Only bit type parameters can be programmed.
If an unsuitable parameter is programmed, the output is not sent anywhere.

12.28 : **Function 2 variable 1 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the source parameter for variable 1 to be processed.
Only "numerical" parameters can be assigned.
If an unsuitable parameter is selected, the value of the variable will be 0.

12.29 : **Function 2 variable 2 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the source parameter for variable 2 to be processed.
Any "numerical" parameter can be assigned.
If an unsuitable parameter is selected, the value of the variable will be 0.

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12.30 : **Function block 2 select**
Adjustment range : See table below
Factory setting : O = V1 (0)
This parameter is used to define the function of the internal variables processing block.

	HMI name	Output	Comment
0	**O = V1**	**= V1**	Used to transfer an internal variable
1	O = V2	= V2	Used to transfer an internal variable
2	O=V1+V2	= V1 + V2	Addition of 2 variables
3	O=V1-V2	= V1 - V2	Subtraction of 2 variables
4	=V1xV2/100	= (V1 x V2) ÷ 100	Multiplication of 2 variables
5	=V1/V2x100	= (V1 x 100) ÷ V2	Division of 2 variables
6	=filter/V1	$=V1(1 - e^{\frac{-t}{12.X5}})$	Creation of a first-order filter
7	O=ramp/V1	= ramped V1	Creation of a linear ramp. **12.35** is used to adjust the value of the ramp
8	O = abs (V1)	= |V1|	Absolute value
9	O = V1^**12.35**	$= V1^{12.x5}$	V1 to the power **12.35**

• **If 12.10 or 12.30 is equal to 2, 3, 4 or 5:**
When the result of the calculation is greater than or equal to 32767, the output **12.11** or **12.31** is limited at 32767.
When the result of the calculation is less than or equal to -32768, the output **12.11** or **12.31** is limited at -32768.
• **If 12.10 or 12.30 is equal to 5:**
To avoid a calculation error if V2 = 0, the result of the operation will be 0.
• **If 12.10 or 12.30 is equal to 9:**
To avoid a calculation error, the absolute value of the signal V1 is taken before calculating its square root or cube root.

12.31 : **Function 2 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the processed variable.
Any non-protected "non-bit" parameter can be assigned.
If an unsuitable parameter is selected, the value of the variable taken into account is zero.

12.32 : **Function block 2 output**

Adjustment range : ± 100.00%
Indicates the value of the function output as a percentage of the adjustment range of the destination parameter.

12.33 : **Function 2 variable 1 scale**
Adjustment range : ± 4.000
Factory setting : 1.000
Used to scale variable 1 before processing.
CAUTION:
The value at the output of the scaling can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

12.34 : **Function 2 variable 2 scale**
Adjustment range : ± 4.000
Factory setting : 1.000
Used to scale variable 2 before processing.
CAUTION:
The value at the output of the scaling can only be between -32767 and +32767. Take this into account according to the adjustment range of the source parameter.

12.35 : **Function 2 applied factor**
Adjustment range : 0 to 100.00
Factory setting : 0
Depending on its function, the internal variables processing block may require an associated parameter.
If the block is used to create a first-order filter, the associated parameter is used as a time constant ; if it is used to generate a ramp, this parameter is used to adjust the value of the ramp (in seconds). The ramp time corresponds to the time for changing from 0 to 100% of the maximum value of the source parameter.
If the block is used as a power, this parameter is used as follows:

Function	Associated parameter value
$V1^2$	2.00
$V1^3$	3.00
$\sqrt{V1}$	12.00
$\sqrt[3]{V1}$	13.00

12.36 to **12.39** : **Not used**

12.40 : **Brake release**

Adjustment range : Disabled (0) or Enabled (1)
Indicates the state of the brake control output.

Disabled (0): The brake is applied.

Enabled (1): The brake is released.

12.41 : **Brake controller**
Adjustment range : Disabled (0), On contactor (1),
On relay (2), User select (3)
Factory setting : Disabled (0)
Used to enable brake control and to select to which digital output it will be assigned.

Disabled (0): Brake control is not enabled.

On contactor (1): Brake control is enabled. The output is not assigned automatically, it is up to the user to select the destination for parameter **12.40**.

On relay (2): Brake control is enabled. Route the brake control to the relay by setting **08.28** = **12.40**.

User select (3): Brake control is enabled. The output is not assigned automatically; it is up to the user to select the destination for parameter **12.40**.

12.42 : **Upper current threshold (▉)**
Adjustment range : 0 to 200%
Factory setting : 30%
Used to set the current threshold at which the brake will be controlled. This current level should provide sufficient torque at the time the brake is released.

12.43 : **Lower current threshold**
Adjustment range : 0 to 200%
Factory setting : 10%
Used to set the current threshold below which brake control will be disabled. It should be set so that loss of the motor power supply is detected.

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12.44 : **Brake release frequency (▣)**
Adjustment range : 0 to 20.0 Hz
Factory setting : 1.0 Hz
Used to set the frequency threshold at which the brake will be controlled. This frequency level should ensure sufficient torque is provided to drive the load in the right direction when the brake is released. This threshold is usually set at a value slightly above the frequency corresponding to the motor slip at full load.
Example:
- 1500 rpm = 50 Hz
- Rated on-load speed = 1470 rpm
- Slip = 1500 - 1470 = 30 rpm
- Slip frequency = 30/1500 x 50 = 1 Hz

12.45 : **Brake apply frequency (▣) or speed (▣) threshold**
Adjustment range : 0 to 20.0 Hz ▣, 0 to 100 rpm ▣
Factory setting : 2.0 Hz ▣, 5 rpm ▣
Used to set the frequency or speed threshold at which brake control will be disabled. This threshold enables the brake to be applied before zero speed so as to avoid load veering while the brake is being engaged.
If the frequency or speed drops below this threshold when no stop request has been made (change of direction of rotation), brake control will remain activated. This exception can be used to avoid the brake being applied as the motor passes through zero speed.

12.46 : **Pre-brake release delay (▣)**
         Speed threshold delay (▣)
Adjustment range : 0 to 25.00 s
Factory setting : 0.30 s
▣ : This time delay is triggered when all the conditions for brake release have been met. It allows enough time to establish an adequate level of reactive current in the motor and to ensure that the slip compensation function is fully activated. When this time delay has elapsed, brake control is enabled (**12.40** = Enabled (1)).
During the whole of this time delay, the ramp applied to the reference is held constant (**02.03** = On (1)).

▣ : This time delay is used to delay the brake apply command in relation to the passage below the minimum speed threshold (**12.45**). It is useful for avoiding repeated oscillation of the brake when it is being applied around zero speed.

12.47 : **Post-brake release delay**
Adjustment range : 0 to 25.00 s
Factory setting : 1.00 s
This time delay is triggered when brake control is enabled. It is used to allow time for the brake to release before unlocking the ramp (**02.03** = Off (0)).

12.48 : **Brake apply delay (▣)**
Adjustment range : 0 to 25.00 s
Factory setting : 1.00 s
This time delay is used to maintain the torque at standstill while the brake is applied. When this time delay has elapsed, the drive output is deactivated.

12.49 : **Position controller during brake release (▣)**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): The ramp is held when the drive output is not active, until the post-brake release delay (12.47) has expired. This allows the speed reference to remain at 0 until the brake is released.

Enabled (1): Position controller enabled while the ramp is held. This function avoids the load moving during the brake release phase.
Function not available in the current version.

12.50 : **Not used**

12.51 : **Forced brake release**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
When the drive output is active (**10.02** = Enabled (1)), the brake control output **12.40** is enabled when the release conditions determined by the brake control are met. When the drive output is inactive, the brake control output **12.40** is forced to Enabled (1) if **12.51** is at Enabled (1).
12.51 can be assigned to a digital input but cannot be written to.

12.52 to **12.60** : **Not used**

12.61 : **Comparator 3 output**

Adjustment range : Disabled (0) or Enabled (1)

Disabled (0): The input variable is less than or equal to the comparator threshold.

Enabled (1): The input variable is greater than the comparator threshold.

12.62 : **Not used**

12.63 : **Comparator 3 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable that is to be compared to the configured threshold.
The absolute value of the variable is used. Only non-bit parameters can be programmed as the source.
If an unsuitable parameter is programmed, the input value is taken as equal to 0.

12.64 : **Comparator 3 threshold**
Adjustment range : 0 to 100.0%
Factory setting : 0
This parameter is used to set the comparator trip threshold.
The threshold is expressed as a percentage of the maximum value of the compared variable.

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12.65 : **Comparator 3 hysteresis**
Adjustment range : 0 to 25.0%
Factory setting : 0
This parameter defines the window within which the comparator output will not change state.
The output will change to Enabled (1) when the variable reaches the value of the threshold + (hysteresis/2).
The output will change to Disabled (0) when the variable goes below the value of the threshold - (hysteresis/2).
The hysteresis is expressed as a percentage of the maximum value of the compared variable.

12.66 : **Comparator 3 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the comparator output.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

12.67 : **Comparator 3 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the comparator output.
Only bit type parameters can be programmed.
If an unsuitable parameter is programmed, the output is not sent anywhere.

12.68 to **12.70** : **Not used**

12.71 : **Comparator 4 output**

Adjustment range : Disabled (0) or Enabled (1)

Disabled (0): The input variable is less than or equal to the comparator threshold.

Enabled (1): The input variable is greater than the comparator threshold.

12.72 : **Not used**

12.73 : **Comparator 4 source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable that is to be compared to the configured threshold.
The absolute value of the variable is used. Only non-bit parameters can be programmed as the source.
If an unsuitable parameter is programmed, the input value is taken as equal to 0.

12.74 : **Comparator 4 threshold**
Adjustment range : 0 to 100.0%
Factory setting : 0
This parameter is used to set the comparator trip threshold.
The threshold is expressed as a percentage of the maximum value of the compared variable.

12.75 : **Comparator 4 hysteresis**
Adjustment range : 0 to 25.0%
Factory setting : 0
This parameter defines the window within which the comparator output will not change state.
The output will change to Enabled (1) when the variable reaches the value of the threshold + (hysteresis/2).
The output will change to Disabled (0) when the variable goes below the value of the threshold - (hysteresis/2).
The hysteresis is expressed as a percentage of the maximum value of the compared variable.

12.76 : **Comparator 4 output invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter is used to invert the comparator output.

Disabled (0): Output not inverted.

Enabled (1): Output inverted.

12.77 : **Comparator 4 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the internal parameter which will be assigned by the comparator output.
Only bit type parameters can be programmed.
If an unsuitable parameter is programmed, the output is not sent anywhere.

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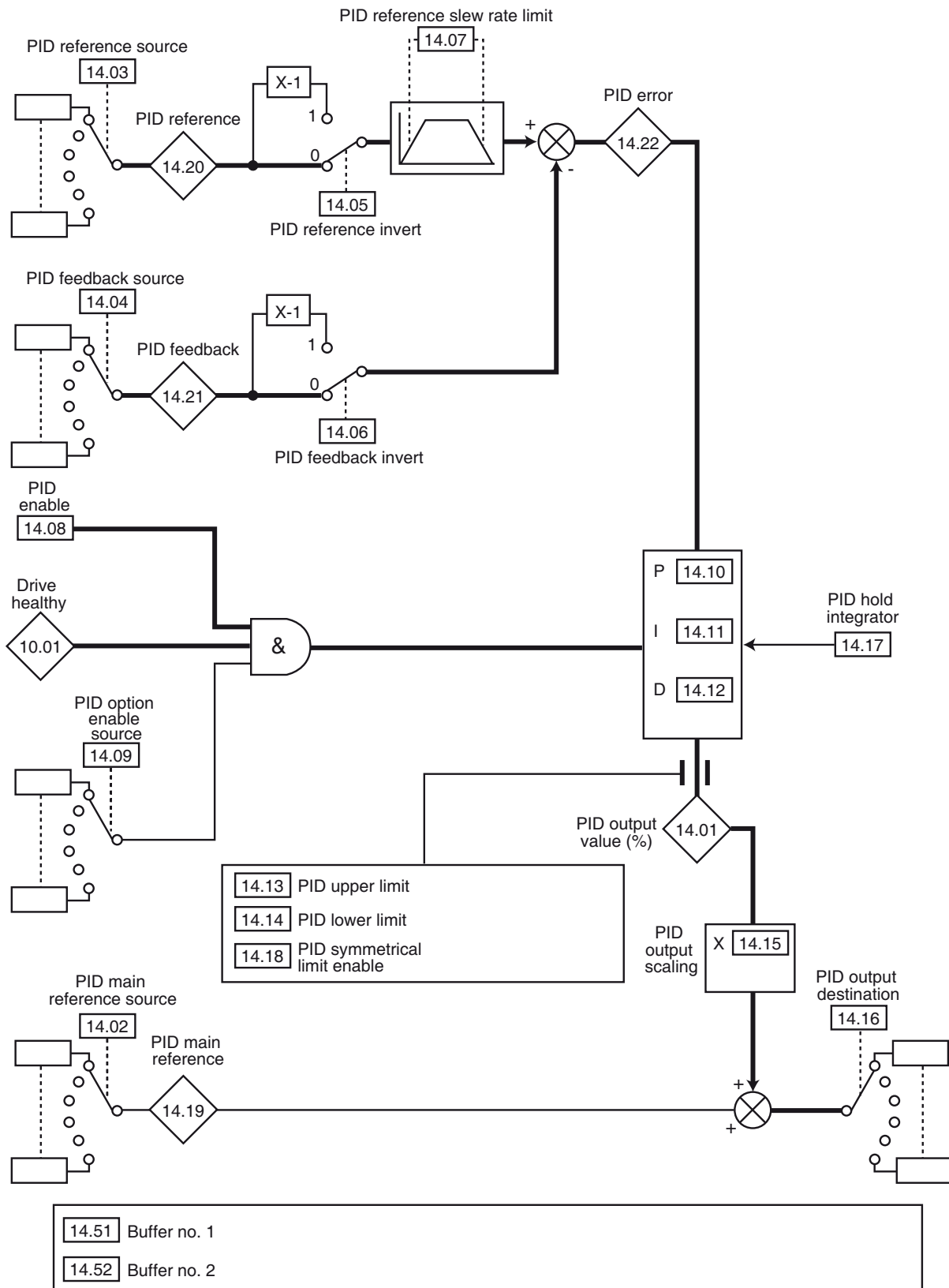### MENUS AND DIAGRAMS IN ADVANCED SET UP MODE

5.14 - MENU 13 : Reserved

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5.15 - Menu 14: PID controller

5.15.1 - Menu 14 diagram

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5.15.2 - Explanation of parameters in menu 14

14.01 : **PID output**

Adjustment range : ± 100.0 %
This parameter indicates the level of the PID controller output before scaling.

14.02 : **PID main reference source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable which acts as the main reference for the PID controller.
All PID variables are automatically scaled so that these variables have an adjustment range of ±100.0% or 0 to 100.0% if they are unipolar.

14.03 : **PID reference source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable which acts as a reference for the PID controller.
All PID variables are automatically scaled so that these variables have an adjustment range of ±100.0% or 0 to 100.0% if they are unipolar.

14.04 : **PID feedback source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter defines the variable which acts as the feedback for the PID controller.
All PID variables are automatically scaled so that these variables have an adjustment range of ±100.0% or 0 to 100.0% if they are unipolar.

14.05 and **14.06** : **PID invert**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
These parameters are used to invert the sign of the PID reference and feedback.

Disabled (0): Input not inverted.

Enabled (1): Input inverted.
14.05: PID reference invert.
14.06: PID feedback invert.

14.07 : **PID reference slew rate limit**
Adjustment range : 0 to 600.0 s
Factory setting : 0
This parameter defines the time taken for the PID reference to go from 0 to 100.0% after an abrupt variation of the input from 0 to 100%. A variation from -100.0% to +100.0% will take twice as long.

14.08 : **PID enable**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
Disabled (0): The PID controller is disabled.

Enabled (1): The PID controller is enabled.

14.09 : **PID option enable source**
Adjustment range : **00.00** to **21.51**
Factory setting : **10.01**
This parameter is used to enable the PID controller on a condition in addition to **14.08**.
For the PID controller to be enabled, **14.08**, **10.01** and the additional condition must be at 1.
Only bit parameters can be assigned.
If an unsuitable parameter is chosen, the input will automatically take the value 1 to avoid locking the enable output.

14.10 : **PID proportional gain**
Adjustment range : 0 to 32.000
Factory setting : 1.00
This is the proportional gain applied to the PID error.

14.11 : **PID integral gain**
Adjustment range : 0 to 32.000
Factory setting : 0.50
This is the integral gain applied to the PID error before integration.

14.12 : **PID derivative gain**
Adjustment range : 0 to 32.000
Factory setting : 0
This is the derivative gain applied to the PID error before differentiation.

14.13 : **PID upper limit**
Adjustment range : -100.0% to +100.0%
Factory setting : 100.0%
This parameter is used to limit the maximum value of the PID output (see **14.18**).

14.14 : **PID lower limit**
Adjustment range : ± 100.0%
Factory setting : -100.0%
This parameter is used to limit the maximum negative value or the minimum positive value of the PID output.
This parameter is inactive if **14.18** = Enabled (1) (see **14.18**).

14.15 : **PID output scaling**
Adjustment range : 0 to 2.50
Factory setting : 1.00
This parameter is used to scale the PID output before it is added to the main reference.
The sum of both references is automatically scaled according to the adjustment range of the parameter to which it is addressed.

14.16 : **PID output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
Used to define the parameter to which the PID output is addressed.
Only unprotected non-bit parameters can be assigned.
If an unsuitable parameter is assigned, the output will not be sent to any address.
If the PID output is supposed to affect the speed, it is advisable to address it to a preset reference.

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14.17 **: PID hold integrator**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)

Disabled (0): Integration is carried out normally when the PID loop is activated.

Enabled (1): The value of the integrator is frozen and remains at this value until **14.17** goes back to Disabled (0). In both cases, when the PID controller has been disabled, the integrator value is reset to Disabled (0).

14.18 **: PID symmetrical limit enable**
Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
When **14.18** is set to Enabled (1), **14.13** and **14.14** take the same value and **14.13** is the parameter that takes effect.

14.19 **: PID main reference**

Adjustment range : ± 100.0%
This parameter indicates the value of the main reference.

14.20 **: PID reference**

Adjustment range : ± 100.0%
This parameter indicates the value of the PID reference.

14.21 **: PID feedback**

Adjustment range : ± 100.0%
This parameter indicates the value of the PID feedback.

14.22 **: PID error**

Adjustment range : ± 100.0%
This parameter indicates the error between the main reference and the feedback.

14.23 to **14.50** **: Not used**

14.51 **: Buffer no. 1**
Adjustment range : ± 100.00%
Factory setting : 0%
This parameter is used to assign an analog input to the PID reference or feedback.

14.52 **: Buffer no. 2**
Adjustment range :± 100.00%
Factory setting : 0%
This parameter is used to assign an analog input to the PID reference or feedback.

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5.16 - Menu 15 : MODBUS RTU and Fieldbus connection options and additional I/O

(Please, consult the manuals for the corresponding options)

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5.17 - Menu 16: Timers, latches, counters

5.17.1 - Menu 16 diagrams

• **Timer relays**
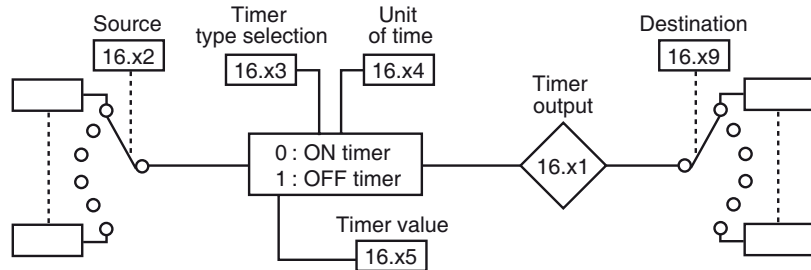
	Source	Timer type selection	Time delay	Unit of time	Output state	Destination
Timer 1	**16.02**	**16.03**	**16.05**	**16.04**	**16.01**	**16.09**
Timer 2	**16.12**	**16.13**	**16.15**	**16.14**	**16.11**	**16.19**
Timer 3	**16.22**	**16.23**	**16.25**	**16.24**	**16.21**	**16.29**
Timer 4	**16.32**	**16.33**	**16.35**	**16.34**	**16.31**	**16.39**

• **Latching relays**
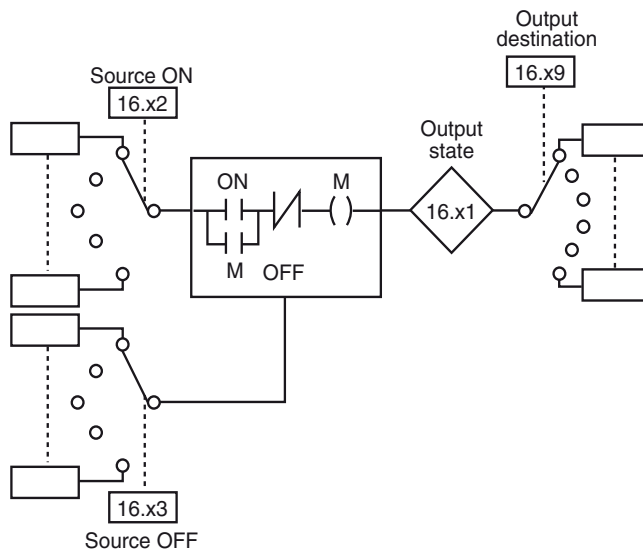
	ON source	OFF source	Output state	Output destination
LR 1	**16.42**	**16.43**	**16.41**	**16.49**
LR 2	**16.52**	**16.53**	**16.51**	**16.59**
LR 3	**16.62**	**16.63**	**16.61**	**16.69**
LR 4	**16.72**	**16.73**	**16.71**	**16.79**

LR : Latching Relays

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5.17.2 - Explanation of parameters in menu 16

16.01 : Timer 1 output

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of timer 1.

16.02 : Timer 1 source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the input source for timer relay 1.
Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.03 : Timer 1 mode select
Adjustment range : ON timer (0) or OFF timer (1)
Factory setting : ON timer (0)

ON timer (0): The relay is used for on-delay timing. The output changing to Enabled (1) is delayed in relation to the input changing to 1.

OFF timer (1): The relay is used for off-delay timing. The output changing to Disabled (0) is delayed in relation to the input changing to 0.
Note: Powering-up of the drive is not taken into account as a transition of the input; the timer is therefore not activated.

16.04 : Timer 1 unit
Adjustment range : Second (0), Minute (1), Hour (2)
Factory setting : Second (0)

Second (0): The unit of time for the timer relay is the second.

Minute (1): The unit of time for the timer relay is the minute.

Hour (2): The unit of time for the timer relay is the hour.

16.05 : Timer 1 value
Adjustment range : 0 to 60.0
Factory setting : 0
This parameter is used to set the delay period for timer 1. The unit depends on the setting of **16.04**.

16.06 to **16.08** : Not used

16.09 : Timer 1 output destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output for timer 1.
Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.10 : Not used

16.11 : Timer 2 output

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of timer 2.

16.12 : Timer 2 source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the input source for timer relay 2.
Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.13 : Timer 2 mode select
Adjustment range : ON timer (0) or OFF timer (1)
Factory setting : ON timer (0)

ON timer (0): The relay is used for on-delay timing. The output changing to Enabled (1) is delayed in relation to the input changing to 1.

OFF timer (1): The relay is used for off-delay timing. The output changing to Disabled (0) is delayed in relation to the input changing to 0.
Note: Powering-up of the drive is not taken into account as a transition of the input; the timer is therefore not activated.

16.14 : Timer 2 unit
Adjustment range : Second (0), Minute (1), Hour (2)
Factory setting : Second (0)

Second (0): The unit of time for the timer relay is the second.

Minute (1): The unit of time for the timer relay is the minute.

Hour (2): The unit of time for the timer relay is the hour.

16.15 : Timer 2 value
Adjustment range : 0 to 60.0
Factory setting : 0
This parameter is used to set the delay period for timer 2. The unit depends on the setting of **16.14**.

16.16 to **16.18** : Not used

16.19 : Timer 2 output destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output for timer 2.
Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.20 : Not used

16.21 : Timer 3 output

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of timer 3.

16.22 : Timer 3 source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the input source for timer relay 3.
Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed, the input will be frozen at 0.

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16.23 : Timer 3 mode select
Adjustment range : ON timer (0) or OFF timer (1)
Factory setting : ON timer (0)

ON timer (0): The relay is used for on-delay timing. The output changing to Enabled (1) is delayed in relation to the input changing to 1.

OFF timer (1): The relay is used for off-delay timing. The output changing to Disabled (0) is delayed in relation to the input changing to 0.
Note: Powering-up of the drive is not taken into account as a transition of the input; the timer is therefore not activated.

16.24 : Timer 3 unit
Adjustment range : Second (0), Minute (1), Hour (2)
Factory setting : Second (0)

Second (0): The unit of time for the timer relay is the second.

Minute (1): The unit of time for the timer relay is the minute.

Hour (2): The unit of time for the timer relay is the hour.

16.25 : Timer 3 value
Adjustment range : 0 to 60.0
Factory setting : 0
This parameter is used to set the delay period for timer 3. The unit depends on the setting of **16.24**.

16.26 to **16.28** : Not used

16.29 : Timer 3 output destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output for timer 3.
Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.30 : Not used

16.31 : Timer 4 output

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of timer 4.

16.32 : Timer 4 source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the input source for timer relay 4.
Only "bit" type parameters can be assigned to these inputs. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.33 : Timer 4 mode select
Adjustment range : ON timer (0) or OFF timer (1)
Factory setting : ON timer (0)

ON timer (0): The relay is used for on-delay timing. The output changing to Enabled (1) is delayed in relation to the input changing to 1.

OFF timer (1): The relay is used for off-delay timing. The output changing to Disabled (0) is delayed in relation to the input changing to 0.
Note: Powering-up of the drive is not taken into account as a transition of the input; the timer is therefore not activated.

16.34 : Timer 4 unit
Adjustment range : Second (0), Minute (1), Hour (2)
Factory setting : Second (0)

Second (0): The unit of time for the timer relay is the second.

Minute (1): The unit of time for the timer relay is the minute.

Hour (2): The unit of time for the timer relay is the hour.

16.35 : Timer 4 value
Adjustment range : 0 to 60.0
Factory setting : 0
This parameter is used to set the delay period for timer 4. The unit depends on the setting of **16.34**.

16.36 to **16.38** : Not used

16.39 : Timer 4 output destination
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output for timer 4.
Only "bit" type parameters can be assigned to these outputs. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.40 : Not used

16.41 : Latch 1 output

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of latching relay 1.

16.42 : Latch 1 ON source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the enable source for latching relay 1. A pulse on the input causes the output to change to Enabled (1).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.43 : Latch 1 OFF source
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the disable source for latching relay 1. A pulse on the input causes the output to change to Disabled (0).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.44 to **16.48** : Not used

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16.49 : **Latch 1 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output of latching relay 1.
Only "bit" type parameters can be assigned to this output. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.50 : **Not used**

16.51 : **Latch 2 output**

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of latching relay 2.

16.52 : **Latch 2 ON source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the enable source for latching relay 2. A pulse on the input causes the output to change to Enabled (1).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.53 : **Latch 2 OFF source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the disable source for latching relay 2. A pulse on the input causes the output to change to Disabled (0).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.54 to **16.58** : **Not used**

16.59 : **Latch 2 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output of latching relay 2.
Only "bit" type parameters can be assigned to this output. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.61 : **Latch 3 output**

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of latching relay 3.

16.62 : **Latch 3 ON source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the enable source for latching relay 3. A pulse on the input causes the output to change to Enabled (1).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.63 : **Latch 3 OFF source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the disable source for latching relay 3. A pulse on the input causes the output to change to Disabled (0).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.64 to **16.68** : **Not used**

16.69 : **Latch 3 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output of latching relay 3.
Only "bit" type parameters can be assigned to this output. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.70 : **Not used**

16.71 : **Latch 4 output**

Adjustment range : Disabled (0) or Enabled (1)
This parameter indicates the state of the output of latching relay 4.

16.72 : **Latch 4 ON source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the enable source for latching relay 4. A pulse on the input causes the output to change to Enabled (1).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.73 : **Latch 4 OFF source**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the disable source for latching relay 4. A pulse on the input causes the output to change to Disabled (0).
Only "bit" type parameters can be assigned to this input. If an unsuitable parameter is addressed, the input will be frozen at 0.

16.74 to **16.78** : **Not used**

16.79 : **Latch 4 output destination**
Adjustment range : **00.00** to **21.51**
Factory setting : **00.00**
This parameter is used to select the destination of the output of latching relay 4.
Only "bit" type parameters can be assigned to this output. If an unsuitable parameter is addressed, the output will be frozen at 0.

16.80 to **16.89** : **Not used**

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5.18 - Menu 17: Diagnostics

Parameters **17.01** to **17.19** are only available on MDS or MD0S.

17.01 : **Control/interface board test**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)
This test consists of checking that the control and interface boards are working correctly. Before enabling the test:
- If an external power supply is being used, disconnect the power module and leave only the supply to the electronics.
- If an internal power supply is being used for the electronics, disconnect the internal wiring and connect an external power supply, so as to disconnect the power module and leave only the electronics supplied with power. (For this connection, refer to the installation manual, sections 1 and 3 for the drive concerned.)
All I/O and relays must also be disconnected, apart from the secure disable input (terminals SDI1 and SDI2), which must be closed. The test only starts if the bus voltage is less than 50 V. The test result is displayed in parameter **17.10**.
At the end of the test, an automatic reset is carried out (equivalent to the reset when the drive is powered down and then powered up again), in particular a reset to zero of parameters **17.33** to **17.39**, **17.42** to **17.49**, and **17.52** to **17.59**).
After the test, reconnect everything.
NO (0): The board test is not enabled.
YES (1): The board test is enabled.

17.02 : **Power module test**
Adjustment range : NO (0) or YES (1)
Factory setting : NO (0)
This test consists of checking that the power circuits are working correctly. The drive must be powered up and disabled.
Note: This test is available only for POWERDRIVE MDS or MD0S versions (the drive must control the preloading of capacitors on the DC bus, therefore **10.75** must be set to NO (0)).
NO (0): The power test is not enabled.
YES (1): The power test is enabled. If the bus voltage is higher than 70 V, the drive waits for the bus to discharge naturally (this can take over 5 minutes). For the test to be performed, the secure disable input must be closed. If this is not the case, a "Diagnostic" trip is generated and the test result **17.11** indicates " Err ENABLE".

⚠ • **During this test, current is flowing in the motor.**

17.03 : **Power module autotest**
Adjustment range : NO (0) or YES (1)
Factory setting : YES (1)
This self-test is recommended for checking the power components on each power-up. It lasts for less than 5 seconds since, in this instance, the bus is not loaded. It is the same test as in **17.02**.
Note: This self-test is available only for standard versions of POWERDRIVE MDS or MD0S (the drive must control the preloading of capacitors on the DC bus, therefore **10.75** must be set to NO (0)).
NO (0): The power self-test is not enabled.
YES (1): Enabling of the power module test, which will be performed each time the drive is powered up.
To operate, the secure disable input must be closed.
At the end of the test, if a "Diagnostics" fault appears, read the result of the power module test in 17.11, and then get in touch with your usual LEROY-SOMER contact.

⚠ • **Caution, during this test, current is flowing in the motor.**

17.04 to **17.09** : **Not used**

17.10 : **Control and interface board test result**

Adjustment range : PROGRESS (0), PASSED (1), Err Ctrl (2), Err Itfce (3), None (4)
PROGRESS (0): The test is in progress. If this state lasts for several seconds, check that the power module has been disconnected (only the electronics should still be supplied with power) and that the bus voltage is less than 50 V.
PASSED (1): The test has been performed successfully, or has not yet been enabled.
Err Ctrl (2): A problem has been detected on the control board. Check that the conditions given in **17.01** have been complied with. If so, note the values of **17.18** and **17.19** and get in touch with your usual LEROY-SOMER contact.
Err Itfce (3): A problem has been detected on the interface board. Check that the conditions given in **17.01** have been complied with. If so, note the values of **17.18** and **17.19** and get in touch with your usual LEROY-SOMER contact.
None (4): No test has been performed.

17.11 : **Power test result**

Adjustment range : PROGRESS (0), PASSED (1), Err U (2), Err V (3), Err W (4), Err Rectif. (5), Err MOTOR (6), Err U V (7), Err V W (8), Err U W (9), Err ENABLE (10), None (15)
PROGRESS (0): The test is in progress.
PASSED (1): The test has been performed successfully, or has not yet been enabled.
Err U (2): Error on arm U.
Err V (3): Error on arm V.
Err W (4): Error on arm W.
Err Rectif. (5): Error on the rectifier.
Err MOTOR (6): Error on the motor.
Err U V (7): Error on arm U and/or V.
Err V W (8): Error on arm V and/or W.
Err U W (9): Error on arm U and/or W.
Err ENABLE (10): The enabling input is not active. Check that terminals SDI1 and SDI2 are connected correctly and restart the test.
None (15): No test has been performed.
In the event of an error (**17.11** = 2 to 10), if the problem persists, note the value of **17.18**. Then run a control and interface board test, and note the values of **17.18** and **17.19** before getting in touch with your usual LEROY-SOMER contact.

17.12 : **Memory test result**

Adjustment range : PROGRESS (0), PASSED (1), Err MEMORY (2)
Function not available in the current version.

17.13 to **17.17** : **Not used**

17.18 : **Error code 1**

Adjustment range : 0 to 65535
An internal code, for more accurately determining the problems on the control and interface board or power test. Make a note of this before getting in touch with your usual LEROY-SOMER contact.

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17.19 : **Error code 2**

Adjustment range : 0 to 65535
An internal code, for more accurately determining the problems on the control and interface board test. Make a note of this before getting in touch with your usual LEROY-SOMER contact.

17.20 : **Not used**

17.21 : **Time constant, temperature**

Adjustment range : 32ms (0), 64ms (1), 128ms (2), 256ms (3), 512ms (4), 1s (5), 2s (6), 4s (7), 8s (8), 16s (9) and 32s (10).
Factory setting   : 128 ms (2)
Used to set the time constant of the filter for the temperatures displayed in **17.22** to **17.26**. The factory setting is usually suitable.

17.22 : **Average temperature, U phase**

Adjustment range : 0 to 200°C
Average temperature of module U at the time of the last drive trip, filtered by **17.21**. This value is stored, including after the power supply to the electronics is disconnected.

17.23 : **Average temperature, V phase**

Adjustment range : 0 to 200°C
Average temperature of module V at the time of the last drive trip, filtered by **17.21**. This value is stored, including after the power supply to the electronics is disconnected.

17.24 : **Average temperature, W phase**

Adjustment range : 0 to 200°C
Average temperature of module W at the time of the last drive trip, filtered by **17.21**. This value is stored, including after the power supply to the electronics is disconnected.

17.25 : **Average temperature, rectifier**

Adjustment range : 0 to 200°C
Average temperature of the rectifier at the time of the last drive trip, filtered by **17.21**. This value is stored, including after the power supply to the electronics is disconnected.

17.26 : **Average temperature, control board**

Adjustment range : 0 to 200°C
Average temperature of the control board at the time of the last drive trip, filtered by **17.21**. This value is stored, including after the power supply to the electronics is disconnected.

17.27 to **17.29** : **Not used**

17.30 : **Average supply voltage**

Adjustment range : 0 to 999 V
Average supply voltage at the time of the last drive trip, filtered by **17.31**. This value is stored, including after the power supply to the electronics is disconnected.

17.31 : **Time constant, supply voltage**

Adjustment range : 32ms (0), 64ms (1), 128ms (2), 256ms (3), 512ms (4), 1s (5), 2s (6), 4s (7), 8s (8), 16s (9) and 32s (10).
Factory setting   : 128 ms (2)
Used to set the time constant of the filter for the average supply voltage **17.30**. The factory setting is usually suitable.

17.32 : **Value of the supply voltage at the time of the trip (instant 0)**

Adjustment range : 0 to 999 V
This value is stored, including after the power supply to the electronics is disconnected.

17.33 : **Value of the supply voltage 4 ms before the trip (instant -1)**

Adjustment range : 0 to 999 V

17.34 : **Value of the supply voltage 8 ms before the trip (instant -2)**

Adjustment range : 0 to 999 V

17.35 : **Value of the supply voltage 12 ms before the trip (instant -3)**

Adjustment range : 0 to 999 V

17.36 : **Value of the supply voltage 16 ms before the trip (instant -4)**

Adjustment range : 0 to 999 V

17.37 : **Value of the supply voltage 20 ms before the trip (instant -5)**

Adjustment range : 0 to 999 V

17.38 : **Value of the supply voltage 24 ms before the trip (instant -6)**

Adjustment range : 0 to 999 V

17.39 : **Value of the supply voltage 28 ms before the trip (instant -7)**

Adjustment range : 0 to 999 V

17.40 : **Average DC bus**

Adjustment range : 0 to 1300 V
Average bus voltage at the time of the last drive trip, filtered by **17.41**. This value is stored, including after the power supply to the electronics is disconnected.

17.41 : **Time constant, DC bus**

Adjustment range : 32ms (0), 64ms (1), 128ms (2), 256ms (3), 512ms (4), 1s (5), 2s (6), 4s (7), 8s (8), 16s (9) and 32s (10).
Factory setting   : 128 ms (2)
Used to set the time constant of the filter for the average bus voltage **17.40**. The factory setting is usually suitable.

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17.42 : **Value of the bus voltage at the time of the trip (instant 0)**
Adjustment range : 0 to 1300 V
This value is stored, including after the power supply to the electronics is disconnected.

17.43 : **Value of the bus voltage 4 ms before the trip (instant -1)**
Adjustment range : 0 to 1300 V

17.44 : **Value of the bus voltage 8 ms before the trip (instant -2)**
Adjustment range : 0 to 1300 V

17.45 : **Value of the bus voltage 12 ms before the trip (instant -3)**
Adjustment range : 0 to 1300 V

17.46 : **Value of the bus voltage 16 ms before the trip (instant -4)**
Adjustment range : 0 to 1300 V

17.47 : **Value of the bus voltage 20 ms before the trip (instant -5)**
Adjustment range : 0 to 1300 V

17.48 : **Value of the bus voltage 24 ms before the trip (instant -6)**
Adjustment range : 0 to 1300 V

17.49 : **Value of the bus voltage 28 ms before the trip (instant -7)**
Adjustment range : 0 to 1300 V

17.50 : **Average motor speed**

Adjustment range : ± 32000 rpm
Average speed filtered by **17.51** at the time of the last trip. This value is stored, including after the power supply to the electronics is disconnected.

17.51 : **Time constant, motor speed**
Adjustment range : 32ms (0), 64ms (1), 128ms (2), 256ms (3), 512ms (4), 1s (5), 2s (6), 4s (7), 8s (8), 16s (9) and 32s (10).
Factory setting : 128 ms (2)
Used to set the time constant of the filter for the average speed **17.50**. The factory setting is usually suitable.

17.52 : **Value of the speed at the time of the trip (instant 0)**
Adjustment range : ± 32000 rpm
This value is stored, including after the power supply to the electronics is disconnected.

17.53 : **Value of the speed 4 ms before the trip (instant -1)**
Adjustment range : ± 32000 rpm

17.54 : **Value of the speed 8 ms before the trip (instant -2)**
Adjustment range : ± 32000 rpm

17.55 : **Value of the speed 12 ms before the trip (instant -3)**
Adjustment range : ± 32000 rpm

17.56 : **Value of the speed 16 ms before the trip (instant -4)**
Adjustment range : ± 32000 rpm

17.57 : **Value of the speed 20 ms before the trip (instant -5)**
Adjustment range : ± 32000 rpm

17.58 : **Value of the speed 24 ms before the trip (instant -6)**
Adjustment range : ± 32000 rpm

17.59 : **Value of the speed 28 ms before the trip (instant -7)**
Adjustment range : ± 32000 rpm

17.60 : **Average motor current**

Adjustment range : 0 to max. drive current
Average motor current at the time of the last drive trip, filtered by **17.61**. This value is stored, including after the power supply to the electronics is disconnected.

17.61 : **Time constant, motor current**
Adjustment range : 2ms (0), 4ms (1), 8ms (2), 16ms (3), 32ms (4), 64ms (5), 128ms (6), 256ms (7), 512ms (8), 1s (9) and 2s (10).
Factory setting : 8 ms (2)
Used to set the time constant of the filter for the average motor current **17.60**.

17.62 : **Maximum inst. motor current**

Adjustment range: 0 to max. drive current
This is the maximum of the saved values **17.63** to **17.74**. This value is stored, including after the power supply to the electronics is disconnected.

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17.63 : Value of the motor current at the time of the trip (instant 0)

17.64 : Value of the motor current before the trip (instant -1)

17.65 : Value of the motor current before the trip (instant -2)

17.66 : Value of the motor current before the trip (instant -3)

17.67 : Value of the motor current before the trip (instant -4)

17.68 : Value of the motor current before the trip (instant -5)

17.69 : Value of the motor current before the trip (instant -6)

17.70 : Value of the motor current before the trip (instant -7)

17.71 : Value of the motor current before the trip (instant -8)

17.72 : Value of the motor current before the trip (instant -9)

17.73 : Value of the motor current before the trip (instant -10)

17.74 : Value of the motor current before the trip (instant -11)

Adjustment range : 0 to max. drive current
These parameters indicate the current values at a given instant, prior to the drive trip, such that:
Instant -1 corresponds to 1/(switching frequency **5.18**)
Instant -2 corresponds to 2/(switching frequency **5.18**)
Instant -3 corresponds to 3/(switching frequency **5.18**)
…..
Instant -11 corresponds to 11/(switching frequency **5.18**)
Example:
For the factory-set switching frequency (3 kHz), instant -1 corresponds to 1/3000, i.e. 333 µs before the drive trip.

17.75 and **17.76** : Not used

17.77 : Status preceding fault

Adjustment range: see **10.98**
This is the drive status before the trip. This value is stored, including after the power supply to the electronics is disconnected.

17.78 : Time between status

Adjustment range : 0 to 32.767 s
Indicates the time that has elapsed between drive states **17.77** and **17.79**. This time is a multiple of 2 ms. If the parameter displays 32.767 s, this indicates that the elapsed time exceeds the display capacity.

17.79 : Status at fault

Adjustment range : see **10.98**
This is the drive status at the time of the trip. This value is stored, including after the power supply to the electronics is disconnected.

| **10.98** = Disabled | **10.98** = Enabled m | **10.98** = Ramp stop>M | **10.98** = Disabled |
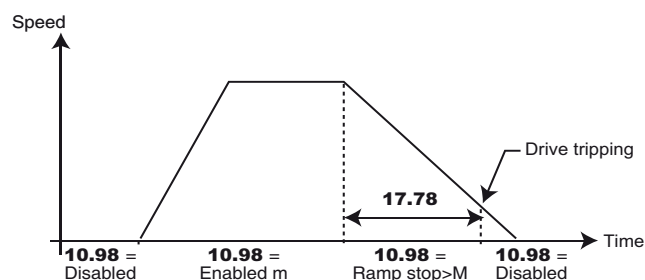
17.80 : Counter 1 duration fault -5

Adjustment range : 0.000 to 9.364 (y.ddd)

17.81 : Counter 2 duration fault -5

Adjustment range : 00.00 to 23.59 (hh.mm)

These counters indicate the operating time since the drive was first commissioned until the occurrence of trip -5 (see **06.22** and **06.23**).
Note: Trip -5 corresponds to the trip displayed in **10.24**.

17.82 : Counter 1 duration fault -4

Adjustment range : 0.000 to 9.364 (y.ddd)

17.83 : Counter 2 duration fault -4

Adjustment range : 00.00 to 23.59 (hh.mm)

These counters indicate the operating time since the drive was first commissioned until the occurrence of trip -4 (see **06.22** and **06.23**).
Note: Trip -4 corresponds to the trip displayed in **10.23**.

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17.84 : **Counter 1 duration fault -3**

Adjustment range : 0.000 to 9.364 (y.ddd)

17.85 : **Counter 2 duration fault -3**

Adjustment range : 00.00 to 23.59 (hh.mm)

These counters indicate the operating time since the drive was first commissioned until the occurrence of trip -3 (see **06.22** and **06.23**).
Note: Trip -3 corresponds to the trip displayed in **10.22**.

17.86 : **Counter 1 duration fault -2**

Adjustment range : 0.000 to 9.364 (y.ddd)

17.87 : **Counter 2 duration fault -2**

Adjustment range : 00.00 to 23.59 (hh.mm)

These counters indicate the operating time since the drive was first commissioned until the occurrence of trip -2 (see **06.22** and **06.23**).
Note: Trip -2 corresponds to the trip displayed in **10.21**.

17.88 : **Counter 1 duration fault -1**

Adjustment range : 0.000 to 9.364 (y.ddd)

17.89 : **Counter 2 duration fault -1**

Adjustment range : 00.00 to 23.59 (hh.mm)

These counters indicate the operating time since the drive was first commissioned until the occurrence of the last trip (see **06.22** and **06.23**).
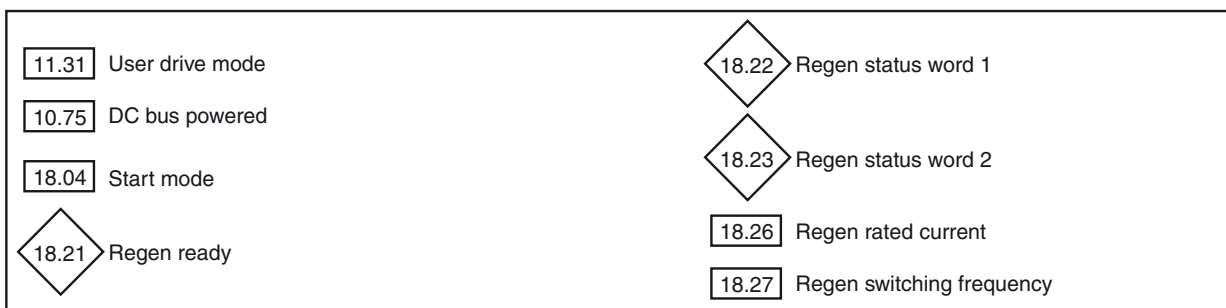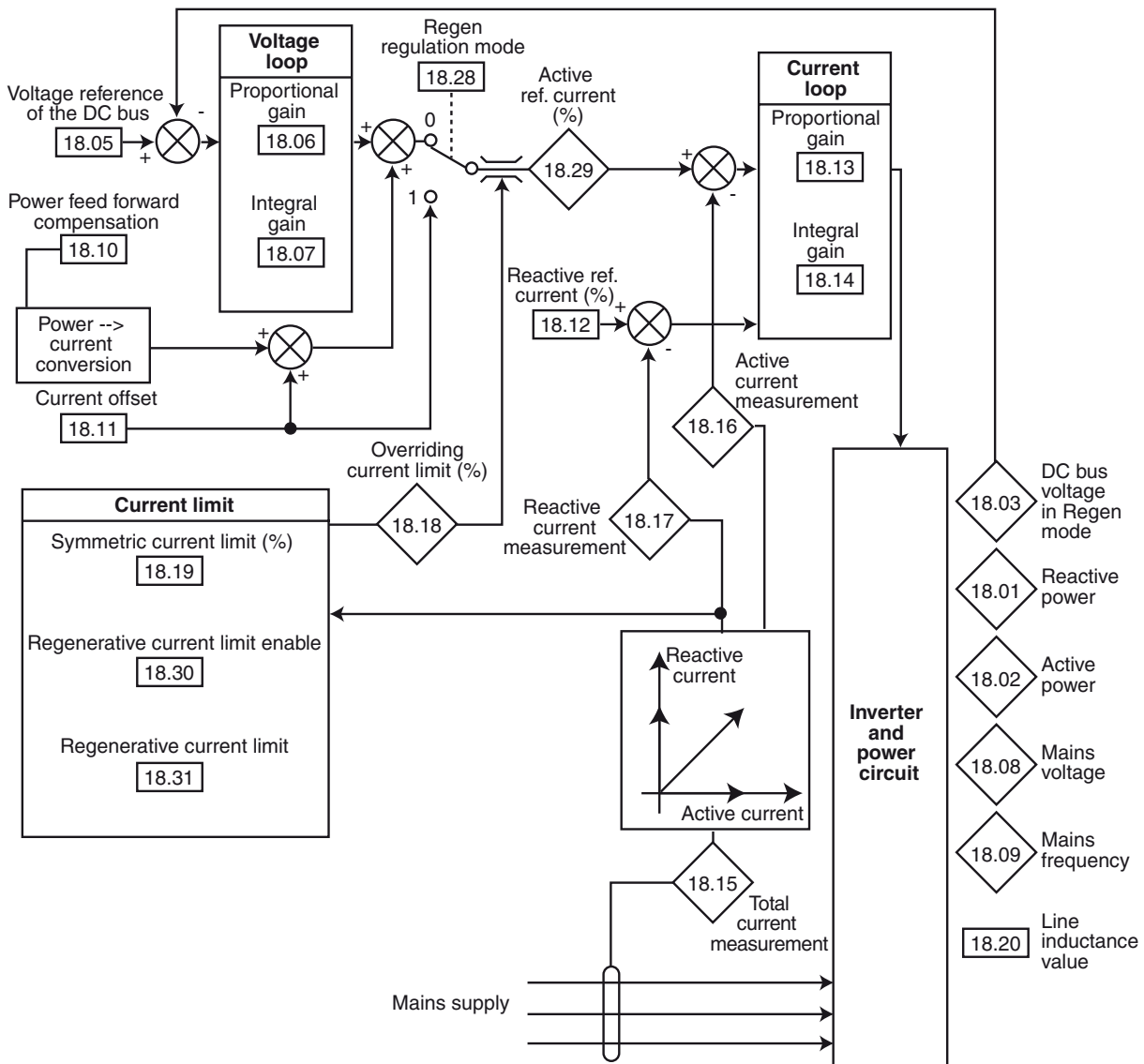**Note:** The last trip corresponds to the trip displayed in **10.20**.

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5.19 - Menu 18: Regenerative mode (MDR)

5.19.1 - Menu 18 diagram

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5.19.2 - Explanation of parameters in menu 18

Before changing settings in menu 18:
- Connect the HMI to the rectifier
- Set **11.66** = Rectif.REGEN (2)
- Make sure that **11.31** = REGEN (4) and that
10.75 = YES (1)
- Connect the HMI to the inverter
- Then set **11.66** = Invert. REGEN (1)
- Set **11.31** to the desired operating mode (open loop ■),
closed loop ■, or servo ■)
- Leave **10.75** = YES (1)
- Power down the drive, then power it up again
- Then configure menu 18
For any further information, please get in touch with your
usual LEROY-SOMER contact.

18.01 : **Reactive power**

Adjustment range : ± **11.33** x **11.32** x 2.22 x $\dfrac{\sqrt{3}}{1000}$ kVAR

If the parameter is positive, the current is lagging the voltage.
If the parameter is negative, the current is leading the voltage.

18.02 : **Active power**

Adjustment range : ± **11.33** x **11.32** x 2.22 x $\dfrac{\sqrt{3}}{100}$ kW

18.02 is the absorbed active power measured by the drive.
If this parameter has been assigned to an analog output via
menu 7, 10 V corresponds to the maximum power measurable
by the drive (I max = 150% of drive rated current).

18.03 : **DC bus voltage in Regen mode**

Adjustment range : 0 to 1300 V
Indicates the DC bus voltage measurement in Regen mode
only.

18.04 : **Regen restart mode**
Adjustment range : Synchro x3 (0), Synchro x1 (1),
             NO Synchro (2)
Factory setting : Synchro x1 (1)
Defines the start mode when enabled.
Synchro x3 (0): Three attempts to resynchronise. Then, in
the event of failure, the "Mains synchronisation" trip is
generated.
**Synchro x1 (1): Only one attempt to synchronise. In the
event of failure, the "Mains synchronisation" trip is
generated immediately.**
NO Synchro (2): Function not available in the current
version.

18.05 : **DC voltage set point**
Adjustment range : 0 to 1300 V
Factory setting : T: 660 V, TH: 1070 V
The sinusoidal rectifier sets the DC bus to the level specified
by this parameter. The bus voltage must always be greater
than the supply voltage between phases x √2.
Recommended values:
Mains supply 400 V: 660 V
Mains supply 460 V: 740 V
Mains supply 480 V: 760 V
Mains supply 690 V: 1070 V

18.06 : **Voltage loop proportional gain**
Adjustment range : 0 to 32000
Factory setting : 1000

18.07 : **Voltage loop integral gain**
Adjustment range : 0 to 32000
Factory setting : 20

18.08 : **Mains voltage**

Adjustment range : 0 to 999 V
This is the rms voltage at the Regen drive input.

18.09 : **Mains frequency**

Adjustment range : ± 590.0 Hz
Indicates the mains frequency.

18.10 : **Power feed forward compensation**
Adjustment range : 0.00 to 100.00%
Factory setting : 0.00%
This parameter can be used to reduce the transient voltages
of the DC bus in the event of load power impacts.

18.11 : **Current offset**
Adjustment range : ± 300.0%
Factory setting : 0.0%
This parameter is used as the active current reference when
the drive is configured for current control (**18.28**). Specify a
positive reference for the power to be absorbed from the
mains supply to the drive and a negative reference for the
power to flow from the drive to the mains supply.

18.12 : **Reactive reference current**
Adjustment range : ± **04.24**
Factory setting : 0.0%
This parameter is used as the reactive current reference. With
a value of zero, the input power factor is around 1. A value not
equal to zero enables reactive current to be absorbed or
produced:
- If the parameter is positive, the absorbed current will lag the
supply voltage
- If the parameter is negative, the absorbed current will lead
the supply voltage

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18.13 : **Current loop proportional gain**

18.14 : **Current loop integral gain**

Adjustment range : 0 to 250
Factory setting : **18.13** = 30
18.14 = 40

Due to a number of factors internal to the drive, oscillations may occur in the following cases:
- Frequency control with current limiting around the rated frequency and on load impacts
- Torque control on machines with a low load and around the rated speed
- On a mains supply break or on a controlled deceleration ramp when control via the DC bus is requested

To reduce these oscillations, we recommend that you first:
- Increase the proportional gain **18.13**
- Then reduce the integral gain **18.14**

18.15 : **Current magnitude**

Adjustment range : 0.0 to max. drive current (A)
Reading of the rms current in each drive input phase. This is the result of the vectorial sum of the reactive current and the active current.
Note: The adjustment range of **18.15** is limited by the maximum drive current (drive I_{max} = 2.22 x **11.32**).

18.16 : **Active current**

Adjustment range : ± Max. drive current (A)
Reading of the active current absorbed by the drive. The active current reflects the drive load. A negative value indicates that power is returned to the mains supply, whilst a positive value indicates that the drive absorbs the power from the mains supply.
Note: Max. drive current = 2.22 x **11.32**.

18.17 : **Reactive current**

Adjustment range : ± Max. drive current (A)
Reading of the reactive current on the mains supply side: This current is not directly linked to the load level and is used to vary the power factor (cos φ):
- If the parameter is positive, the absorbed current lags the supply voltage
- If the parameter is negative, the absorbed current leads the supply voltage
Note: Max. drive current = 2.22 x **11.32**.

18.18 : **Overriding current limit**

Adjustment range : 0% to 300% (% active In)
Indication of the effective current limit value of the Regen drive.
This value depends on **18.19** and limits internal to the drive.

18.19 : **Symmetric current limit**

Adjustment range : 0,0% to 300,0% (% active In)
Factory setting : 150,0%
Used to set the maximum permanent current limit permitted when both absorbing and returning power.
The **18.19** current limit depends on **18.26**.

18.20 : **Input inductance**

Adjustment range : 0.000 to 32.000 mH
Factory setting : 0.000 mH

18.21 : **Regen healthy**

Adjustment range : Disabled (0) or Enabled (1)
Indicates whether the drive is synchronised with the mains supply in regenerative mode. In this mode, after a run command, the drive first detects the mains supply phase and synchronises with it. Until this synchronisation is achieved, this parameter indicates "Disabled". Once it is finished, the parameter changes to "Enabled" and load can be applied to the DC bus.

18.22 : **Binary statuses 10.01 to 10.15 in Regen**

Adjustment range : 0 to 32767
Binary state of parameters **10.01** to **10.15** of the Regen drive. A copy of parameter **10.40** of the Regen drive.

18.23 : **Regen drive status**

Adjustment range : 0 to 36
A copy of parameter **10.98** of the Regen drive.

18.24 : **Current trip**

Adjustment range : 0 to 102
Contains the code for the current trip. See the list of trips for parameters **10.20** to **10.29**. Value 0 indicates that the drive has not tripped. The other values indicate the trip number.

18.25 : **Not used**

18.26 : **Regen rated current**

Adjustment range : 0 to Ico
Factory setting : see section 5.6.3
Value of Regen drive rated current. See section 5.6.3 according to the drive rating (**18.26** is equivalent to **05.07**). The **18.19** current limit depends on **18.26**.

18.27 : **Regen switching frequency**

Adjustment range : 1,5 kHz to 14 kHz (see table below)
Factory setting : 4 kHz
Sets the PWM switching frequency.

Frequency	18.27	Frequency	18.27
2 kHz	0	6.5 kHz	9
2.5 kHz	1	7 kHz	10
3 kHz	2	8 kHz	11
3.5 kHz	3	9 kHz	12
4 kHz	**4**	10 kHz	13
4.5 kHz	5	11 kHz	14
5 kHz	6	12 kHz	15
5.5 kHz	7	13 kHz	16
6 kHz	8	14 kHz	17
		1,5 kHz	18

Note : For frequencies higher than 6 kHz, please contact LEROY-SOMER.

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18.28 **: Regulation mode selector**

Adjustment range : VOLTAGE (0) OR CURRENT (1)
Factory setting : VOLTAGE (0)
Sets the control mode of the Regen drive.

VOLTAGE (0): In this mode, the drive sets the voltage at the DC bus terminals to the reference specified in 18.05.

CURRENT (1): In this mode, the drive is controlled current-wise by the value defined in **18.11**: This enables, for example, two Regen inverters to operate simultaneously; a master sets the voltage at the common DC bus terminals and a slave shares the current reference with the master.

18.29 **: Active ref current**

Adjustment range : -300% to +300%
This parameter indicates the current reference for the drive in regen mode, coming from the DC voltage regulation when **18.28** is in voltage regulation mode or from the current offset **18.11** when **18.28** is in current control mode. It is expressed as a percentage of the regen rated current **18.26**. Output via analog channel or serial link assigned to the current reference of another regen, it can be used to operate two rectifiers in tandem, the master controlling the DC bus voltage, and the slave controlling the current reference **18.29**.
CAUTION:
This tandem operation requires the rectifiers to be connected in a specific manner. Please consult LEROY-SOMER.

18.30 **: Regenerative current limit enable**

Adjustment range : Disabled (0) or Enabled (1)
Factory setting : Disabled (0)
This parameter allows enabling the maximum regenerated current set in **18.31**.

18.31 **: Regenerative current limit**

Adjustment range : 0.0% to 300.0% (% nom active current)
Factory setting : 150.0% (this level being safe if **18.30** is enabled by error)
If **18.30** is enabled (1), this parameter sets the maximum level of current regenerated to the network (from DC bus to power supply). In this case, **18.19** becomes the maximum current drawn by the motor (from power supply to DC bus).
If **18.30** is disabled (0), **18.31** has no effect.

18.32 to **18.39** **: Not used**

18.40 **: Regen start order**

Adjustment range : NO (0) or YES (1)
Indicates to the synchronous rectifier the start and stop order in the case where the start order for the synchronous rectifier is controlled automatically by the output inverter.
18.40 = **01.11** (inverter run command) or **10.02** (inverter output activated).

18.41 **: Inverter healthy**

Adjustment range : NO (0) or YES (1)
Indicates to the input synchronous rectifier that the output inverter bridge is tripped NO (0) or healthy YES (1).

18.42 to **18.99** **: Not used**

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5.20 - Menu 21: Second motor map

Explanation of parameters in menu 21

21.01 **Motor 2 maximum speed**
Adjustment range : 0 to 32000 rpm
Factory setting : **Eur = 1500 rpm**
                   USA = 1800 rpm
This parameter defines the maximum speed in both directions of rotation.
This parameter is equivalent to 1.06 in motor 1.

⚠ • **Before setting the maximum limit, check that the motor and the driven machine can withstand it.**

21.02 : **Motor 2 minimum speed**
Adjustment range : 0 to **21.01** rpm
Factory setting : 0
In unipolar mode, this parameter defines the minimum speed.
CAUTION:
This parameter is inactive during jog operation.
This parameter is equivalent to 01.07 in motor 1.

21.03 : **Motor 2 reference selected**
Adjustment range : Term. inputs (0), Analog 1 (1),
                   Analog 2 (2), Preset (3),
                   Keypad (4)
Factory setting : Term. inputs (0)

Term. inputs (0): The speed reference is selected by combining the digital inputs assigned to parameters 01.41 and 01.42.

Analog 1 (1): The speed reference comes from analog input 1 or from a preset reference.

**Analog 2 (2):** The speed reference comes from analog input 2 or from a preset reference.

Preset (3): The speed reference comes from the preset references.

Keypad (4): The speed reference comes from the configuration interface.

21.04 : **Motor 2 acceleration rate**
Adjustment range : 0 to 3200.0 s/1000 rpm*
Factory setting : 20.0 s/1000 rpm
Sets the time for acceleration from 0 to 1000 rpm *.

$$21.04 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$
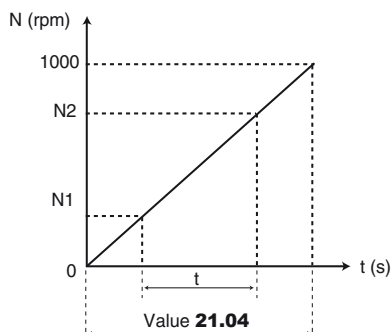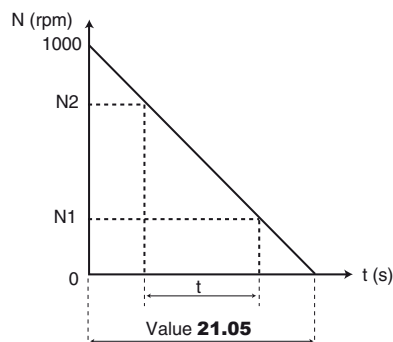

This parameter is equivalent to 02.11 in motor 1.

21.05 : **Motor 2 deceleration rate**
Adjustment range : 0 to 3200.0 s/1000 rpm*
Factory setting : 20.0 s/1000 rpm
Sets the time for deceleration from 1000 rpm * to 0.

$$21.05 = \frac{t(s) \times 1000 \text{ min}^{-1}}{(N2 - N1) \text{ min}^{-1}}$$

This parameter is equivalent to 02.21 in motor 1.

21.06 : **Motor 2 nominal frequency**
Adjustment range : 0 to 590.0 Hz
Factory setting : **Eur = 50.0 Hz**
                   USA = 60.0 Hz
This is the point at which motor operation changes from constant torque to constant power.
In standard operation, it is the frequency indicated on the motor nameplate.
This parameter is equivalent to 05.06 in motor 1.

21.07 : **Motor 2 rated current**
Adjustment range : 0 to I_{co} (A)
Factory setting : Motor rated current corresponding to drive rating (see section 5.6.3)
This is the value of the motor rated current indicated on the nameplate. Above this value the motor is overloaded.
This parameter is equivalent to 05.07 in motor 1.

21.08 : **Motor 2 nominal speed**
Adjustment range : 0 to 32000 rpm
Factory setting : Motor rated speed corresponding to the drive rating (see section 5.6.3)
This is the on-load speed of the motor shown on the nameplate.
This parameter is equivalent to 05.08 in motor 1.

* Note: The reference speed can be changed from 1000 to 100 rpm in parameter **02.56**. This makes it possible to multiply the acceleration and deceleration times by 10.
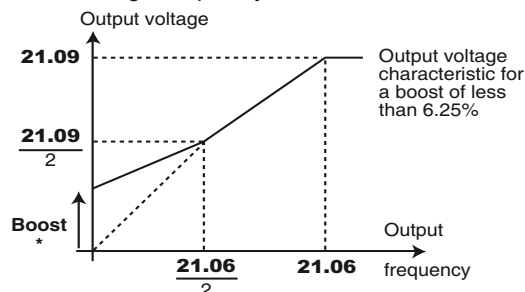
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21.09 : **Motor 2 nominal voltage**
Adjustment range : 0 to 999 V
Factory setting   : **Eur: 400 V**
                     USA: 460 V
Defines the voltage/frequency ratio as follows:

* If fixed boost has been selected **05.14** = LINEAR V/F (2), the boost value is set via **05.15**.
This parameter is equivalent to 05.09 in motor 1.

21.10 : **Motor 2 power factor (Cos φ)**
Adjustment range : 0 to 1.00
Factory setting   : 0.85
The power factor is measured automatically during a level 2 autotune phase (see **05.12**) and set in this parameter. If it has not been possible to carry out the autotune procedure, enter the Cos φ value indicated on the motor nameplate.
This parameter is equivalent to 05.10 in motor 1.

21.11 : **Motor 2 number of poles**
Adjustment range : Auto (0), 2 Poles (1), 4 Poles (2),
                    6 Poles (3), 8 Poles (4), 10 Poles (5),
                    12 Poles (6), 14 Poles (7), 16 Poles (8)
Factory setting   : Auto (0)
When this parameter is at 0 (Auto), the drive automatically calculates the number of poles according to the rated speed (**21.08**) and the rated frequency (**21.06**). However, the value can be entered directly as number of pairs of poles.

Number of poles	21.11
2	1
4	2
6	3
8	4
10	5
12	6
14	7
16	8

This parameter is equivalent to 05.11 in motor 1.

21.12 : **Motor 2 stator resistance**
Adjustment range : 0 to 32.000 xΩ
Factory setting   : 0.000 xΩ
This parameter stores the motor stator resistance for flux vector control mode (see parameter **05.14**).
If the stator resistance cannot be measured (motor not connected, value higher than the max. rating) an "Stator res." trip occurs.
During autotuning (**05.12** = Stationary (1) or Rotating (2)), the value of the stator resistance is automatically stored in **21.12**.
This parameter is equivalent to 05.17 in motor 1.

21.13 : **Motor 2 voltage offset**
Adjustment range : 0 to 25.5 V
Factory setting   : 0.0 V
This voltage offset is measured by the drive (see parameter **05.14**). It is used to correct imperfections in the drive, especially voltage drops in the IGBTs and idle times. This parameter has an important role in low-speed operation, i.e. when the drive output voltage is low.
During autotuning (**05.12** = Stationary (1) or Rotating (2)), the value of the voltage offset is automatically stored.
This parameter is equivalent to 05.23 in motor 1.

21.14 : **Motor 2 transient inductance**
Adjustment range : 0 to 32.000 mH
Factory setting   : 0.000 mH
During autotuning with rotation (**05.12** = Rotating (2)), the motor leakage inductance is stored in this parameter.
This parameter is equivalent to 05.24 in motor 1.

21.15 : **Motor 2 map enable**

Adjustment range : 0 or 1
21.15 changes from 0 to 1 when the motor 2 parameters are active.
They are taken into account when **11.45** is set to Motor 2 (1) and the drive is disabled or in the trip state. During drive operation, **11.45** can be set to Motor 2 (1), but the characteristics of motor 2 are not taken into account. This parameter can be assigned to a digital output, in order to control closing of the second motor contactor when the motor 2 characteristics have been enabled.

21.16 to **21.23** : **Not used**

21.24 : **Motor 2 stator inductance L$_S$ (■)**
Adjustment range : 0 to 320.00 mH
Factory setting   : 0.00 mH
This is the motor stator inductance at rated flux. During autotuning with rotation (**05.12**: Rotating (2)), the total motor inductance is stored in this parameter.
This parameter is equivalent to 05.25 in motor 1.

21.25 to **21.29** : Not used

21.30 : **Motor 2 volt per 1000 rpm (Ke) (■)**
Adjustment range : 0 to 10000 V
Factory setting   : 98 V
Used to set the motor voltage per 1000 rpm. Is used to adjust the current loop integral gain to prevent current peaks when the drive is enabled with a spinning motor.
This parameter is equivalent to 05.33 in motor 1.

21.31 to **21.50** : **Not used**

21.51 : **Q axis inductance (synchronous motor 2) (■)**
Adjustment range : 40% to 250% of **21.14**
Factory setting   : 100%
Used to set an inductance value in quadrature with the pole axis for salient-pole synchronous machines.
This parameter is equivalent to 05.51 in motor 1.

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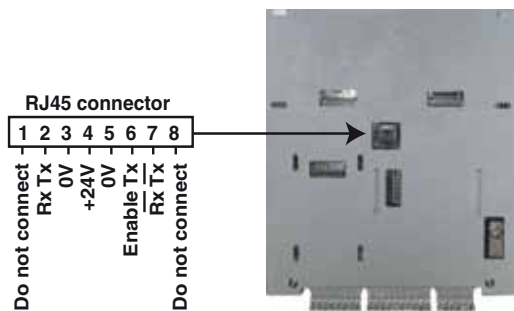### OPERATION WITH MODBUS RTU

6 - OPERATION WITH MODBUS RTU

6.1 - Serial link

The **POWERDRIVE MD** incorporates as standard a non-isolated RS485/2-wire serial link port accessible via an RJ45 connector.

For users who wish to keep the configuration interface permanently connected, it is then necessary to add the PX-Modbus option with an isolated 2 or 4-wire serial link port. For further details, please refer to the PX-Modbus manual, ref. 4071.

6.1.1 - Location and connection

RJ45 connector

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Do not connect / Rx Tx / 0V / +24V / 0V / Enable Tx / Rx Tx / Do not connect

CAUTION:
Do not connect a computer ETHERNET RJ45 port to the drive's RJ45 connector.

6.1.2 - Protocols

The drive handles the following protocols:
- Modbus RTU
- LS Net
The drive automatically recognises the protocol used, and this can be read in **11.24** "Serial mode".

6.1.3 - Parameter setting

Depending on the application, the following parameters need to be modified.
11.23: Serial address
11.25: Baud rate
11.27: Parity, number of Stop bits
For more information on these parameters, refer to menu 11, section 5.12.2.

6.1.4 - Networking

The **POWERDRIVE MD** serial port allows the drive to communicate with a 2-wire RS485 network.
• The network must then be connected in a "daisy-chain" (and not a star).
• At minimum, terminals 2, 3, 7 and the shielding must be connected.

The CT Comms cable or USB/485 converter option allows a PC to be connected directly to the **POWERDRIVE MD**. This cable, with a 9-pin SUB-D connector at one end and an RJ45 at the other, incorporates an isolated RS232/RS485 converter.
CAUTION:
Do not use this cable to network several POWERDRIVE MD ("24Vs" should not be connected).

6.2 - Parameter setting using the PC

With the POWERSOFT configuring software, setting up the **POWERDRIVE MD** from a PC is very user-friendly.
- Quick configuration: the drive parameters are set very quickly using a "quick configuration" screen.
- Supervision during commissioning: used to supervise the various data relating to operation on a single screen.
- File storing: used to save all the parameter files thus enabling very quick duplication of an already existing setting.
To connect the PC to the **POWERDRIVE MD**, use the CT Comms cable or USB/485 converter option or a 2-wire RS232/RS485 converter (e.g. Amplicon 485 FI).

6.3 - Control word and status word

POWERDRIVE MD control commands can be managed using a single parameter **06.42**, called the "control word".
This is because the value of **06.42** corresponds to a word in which each bit is associated with a command. The command is enabled when the bit is at 1, and disabled when the bit is at 0.
To enable commands using the control word, set **06.43** = 1 (control commands via the terminals are no longer active), when the drive is disabled.

Parameter **10.40**, called the status word, is used to group together information about the drive. The value of **10.40** corresponds to a 15-bit word, and each bit is associated with a drive status parameter.

06.42: Control word

Control word bits 06.42	Decimal conversion	Functions	Equivalent parameter
0	1	Drive enable	**06.15**
1	2	Run forward	**06.30**
2	4	Jog	**06.31**
3	8	Run reverse	**06.32**
4	16	Forward/Reverse	**06.33**
5	32	Run	**06.34**
6	64	Reserved	
7	128	Reserved	
8	256	Analog ref./ Preset ref.	**01.42**
9	512	Reserved	
10	1024	Reserved	
11	2048	Reserved	
12	4096	Reserved	
13	8192	Drive reset	**10.33**
14	16384	Reserved	

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10.40: Status word

Status word bits 10.40	Corresponding parameters	Drive status
0	**10.01**	Drive healthy
1	**10.02**	Drive active
2	**10.03**	Zero speed
3	**10.04**	Running at minimum speed
4	**10.05**	Below set speed
5	**10.06**	At speed
6	**10.07**	Above set speed
7	**10.08**	Nominal load reached
8	**10.09**	Drive out at current limit
9	**10.10**	Drive regenerating
10	**10.11**	Braking IGBT active
11	**10.12**	Braking resistor alarm
12	**10.13**	Direction commanded
13	**10.14**	Direction running
14	**10.15**	Mains loss

6.4 - MODBUS RTU

6.4.1 - General

The MODBUS RTU protocol is a master-slave type protocol (a single master per network).

Description	Characteristics
Normal physical layer for multi-drop operation	2-wire RS485
Bit stream	Standard UART asynchronous symbols with Non-Return to Zero (NRZ)
Symbol	Each symbol consists of: 1 start bit 8 data bits (least significant bit transmitted first) 1 or 2 stop bits according to **11.27**
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 baud

Note: If the CT Comms cable is used, the baud rate is limited to 38400 baud.

6.4.2 - Description of exchanges

Exchanges are initiated by the master, which sends its request: if the slave concerned has understood it, it sends its response. Each frame (question or response) contains four types of data:
- The address of the slave concerned which receives the question frame (master request) or the address of the slave which sends the response frame (encoded in one byte)
- The function code which selects a command (read or write words, bits etc) for question and response frames (encoded in one byte)
- The data field containing the parameters relating to the command (encoded in "n" bytes)
- The frame CRC, calculated over sixteen bits, which is used to detect transmission errors.

The frame is terminated with a minimum silence period, equivalent to the transmission time for 3.5 characters (e.g. at 19200 baud, the silence period must be at least 1/19200 x 11 bits x 3.5, i.e. 2 ms). This silence period indicates the end of the message, and the slave can start to process the transmitted data.

All data is encoded in hexadecimal format.

Slave address	Function code	Message data	CRC 16-bit	Interval silence

All master requests will lead to a response from a single slave. The slave will respond within the maximum allotted time (the minimum response time is never less than the silence period).

See diagram below.
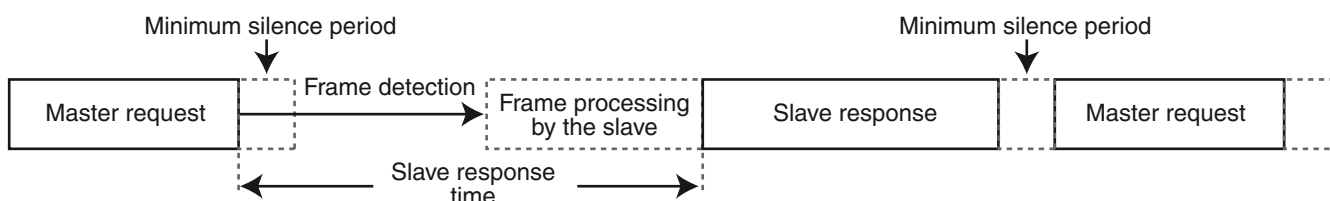
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6.4.3 - Parameter mapping

POWERDRIVE MD drives are configured using a **menu.parameter** notation.
The "menu" and "parameter" indices can take the values 0 to 99. Menu.parameter is assigned to a MODBUS RTU register **menu x 100 + parameter**.

In order to map the parameters correctly, the slave increments (+1) the address of the received register.
Example: X = menu; Y = parameter

Drive parameter	Register address (protocol level)
X.Y	(X x 100) + (Y − 1)
Examples:	
01.02	101
01.00	99
00.01	0
12.33	1232

6.4.4 - Data encoding

MODBUS RTU uses a "big-endian" representation for the addresses and data items (except for the CRC which is "little-endian"). This means that, when a numerical quantity "bigger" than one byte is transmitted, the most significant byte is sent first.
For example:

16 – 0x1234   would be: 1st 2nd ...
                                         0x1 0x3

6.4.5 - Function codes

The function code determines the context and format of the message data.

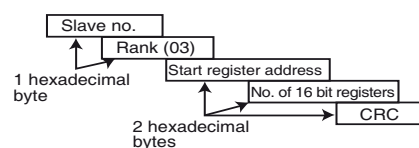| Function code		Description
Decimal	**Hexadecimal**	
3	0x03	Read multiple 16-bit registers or words
6	0x06	Write single 16-bit register or word
16	0x10	Write multiple 16-bit registers or words
23	0x17	Read and write multiple 16-bit registers or words

• Function code 3: Read multiple
Reads a contiguous array of registers. The slave imposes an upper limit on the number of registers which can be read. If the limit is exceeded, the slave does not respond.
**Note:** 99 parameters maximum can be read.

Frame sent by the Master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x03
2	Start word address MS byte
3	Start word address LS byte
4	Number of words to be read MS byte
5	Number of words to be read LS byte
6	CRC LS byte
7	CRC MS byte

Frame returned by the slave:

Bytes	Description
0	Slave address
1	Function code 0x03
2	Number of bytes to be read
3	Word 0 MS byte
4	Word 0 LS byte
5	Word 1 MS byte
6	Word 1 LS byte
...	...
n	CRC LS byte
n + 1	CRC MS byte

Where n = 3 + number of bytes to be read.
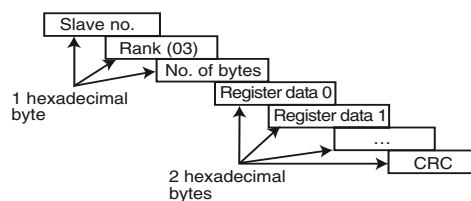
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• Function code 6: Write single register

Writing of a value to a single 16-bit register. The normal response is an echo of the request, returned after the register contents have been written.

Frame sent by the master:

Bytes	Description
0	Slave address (0 to 247)
1	Function code 0x06
2	Register address MS byte
3	Register address LS byte
4	Register value MS byte
5	Register value LS byte
6	CRC LS byte
7	CRC MS byte
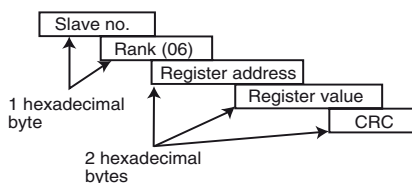
Frame sent by the slave:

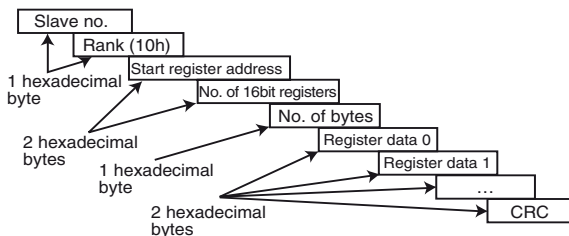| Bytes	Description
0	Slave address
1	Function code 0x06
2	Register address MS byte
3	Register address LS byte
4	Register value MS byte
5	Register value LS byte
6	CRC LS byte
7	CRC MS byte

• Function code 16: Write multiple

Writes a contiguous array of registers. The slave imposes an upper limit on the number of registers which can be written. If the limit is exceeded, the slave does not respond.
Note: 12 parameters maximum can be written.
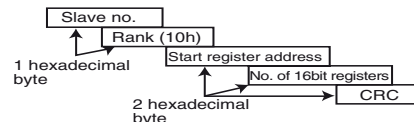
Frame sent by the Master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x10
2	Start word address MS byte
3	Start word address LS byte
4	Number of words to be written MS byte
5	Number of words to be written LS byte
6	Number of bytes to be written
7	Word 0 to be written MS byte
8	Word 0 to be written LS byte
9	Word 1 to be written MS byte
10	Word 1 to be written LS byte
...	…
n	CRC LS byte
n + 1	CRC MS byte

Where n = 7 + number of bytes to be written.

Frame returned by the slave:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x10
2	Start word address MS byte
3	Start word address LS byte
4	Number of words written MS byte
5	Number of words written LS byte
6	CRC LS byte
7	CRC MS byte

• Function code 23: Read/write

Writes and reads two contiguous arrays of registers. The slave imposes an upper limit on the number of registers which can be written. If the limit is exceeded, the slave does not respond.
Note: 99 parameters maximum can be read and 10 parameters maximum can be written.

Frame sent by the Master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	Start word to be read address MS byte
3	Start word to be read address LS byte
4	Number of words to be read MS byte
5	Number of words to be read LS byte
6	Start word to be written address MS byte
7	Start word to be written address LS byte
8	Number of words to be written MS byte
9	Number of words to be written LS byte
10	Number of bytes to be written
11	Word 0 MS byte
12	Word 0 LS byte
13	Word 1 MS byte
14	Word 1 LS byte
...	…
n	CRC LS byte
n + 1	CRC MS byte

Where n = 11 + number of bytes to be written.

Frame returned by the slave:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	Number of bytes to be read
3	Word 0 MS byte
4	Word 0 LS byte
5	Word 1 MS byte
6	Word 1 LS byte
...	…
n	CRC LS byte
n + 1	CRC MS byte

Where n = 3 + number of bytes to be read.

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6.4.6 - Example

Drive address = 1 (Default address).
Reading of 3 drive parameters from **1.05**.
1.05 becomes **1.04** which is equal to 68 in hexadecimal (Modbus address = drive parameter address - 1).

• **Request**

	Example (hex)	RTU (binary)
Slave address	1	0000 0001
Function	03	0000 0011
Start word or register address (MS byte)	00	0000 0000
Start word or register address (LS byte)	68	0110 1000
Number of words or registers (MSB)	00	0000 0000
Number of words or registers (LSB)	03	0000 0011
CRC:LSB	84	1000 0100
MSB	17	0001 0111
Total bytes:		8

• **Response**

	Example (hex)	RTU (binary)
Slave address	1	0000 0001
Function	03	0000 0011
Number of bytes	06	0000 0110
Word or register 0 (MS byte)	00	0000 0000
Word or register 0 (LS byte)	2D	0010 1101
Word or register 1 (MS byte)	05	0000 0101
Word or register 1 (LS byte)	DC	1101 1100
Word or register 2 (MS byte)	00	0000 0000
Word or register 2 (LS byte)	00	0000 0000
CRC check:LS byte	4C	0100 1100
MS byte	45	0100 0101
Total bytes:		11

6.4.7 - Wait time

In MODBUS RTU, when the master sends a message to a slave, it imposes a wait time between the end of its request and the start of the response from the slave, which makes it possible to detect any missing response.

6.4.8 - Exceptions

If the message is incorrect and the frame is not received, or if the CRC trips, the slave will not produce an exception, and in this case the master will not receive a response from the slave ("timeout"). If a write request (function code 16 or 23) exceeds the maximum size accepted by the slave, then the slave will reject the message. No exception will be transmitted and the master will not receive a response.

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6.4.9 - CRC

This check word is used to detect transmission errors. It is calculated over 16 bits from all the bytes in the question and response frames.

Algorithm:

```
START
    CRC = 0xFFFF
    Number of bytes processed = 0
    Next byte = first byte
    REPEAT
    {
        Byte to be processed = next byte;
        CRC = CRC XOR byte to be
        processed
        REPEAT eight times
        {
            IF (CRC odd) then
                CRC = CRC/2 XOR
                0xA001
            else
                CRC = CRC/2
        }
        Number of bytes processed = Number of
        bytes processed + 1
    }
    WHILE(Number of bytes processed ≤
            Number of bytes to be processed)
END.
```

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7 - TRIPS - DIAGNOSTICS

7.1 - Warning

⚠️ • **The user must not attempt to repair the drive himself, nor perform diagnostics other than those listed in this section. If the drive malfunctions, it should be returned to LEROY-SOMER via your usual contact.**

7.2 - Tripping on a fault

If the drive trips, the drive output bridge is inactive, and the drive no longer controls the motor.
The screen displays an active trip page, or "TRIP" flashes at the bottom of the screen.
All the trips indicated by the display are listed in the following table.

No.	Configuration interface name	Reason for trip	Solution
1	DC UnderVolt	• DC bus undervoltage	• Check the mains supply • This trip is not saved in the list of the 10 most recent trips
2	DC over volt	• DC bus overvoltage	• Provide a braking resistor (optional) • If a resistor is already connected, reduce its value (within the permitted limits) • Check that the mains supply is not subject to interference • Check the motor insulation • Increase the deceleration time in **00.04** (**02.21**). • Check the deceleration mode
3	Over current	• Overcurrent at drive output	• Check the motor insulation and connection • Increase the acceleration and deceleration ramps • Check the wiring, coupling and signals (interference) of the speed feedback • Check that the motor cables are not too long • Reduce the speed loop gains **00.18** (**03.10**), **00.19** (**03.11**) and **03.12** • If it has not already been done, perform autotuning **00.42** = 2. • Reduce the current loop gains **04.13** and **04.14** .
		This trip cannot be reset for a period of 10 seconds.	
4	Brak. IGBT	• Braking IGBT transistor overcurrent	• Check the resistor insulation • Remove the short-circuit at the resistor output • Put in a resistor of higher ohmic value • If there is no braking IGBT, see **10.37**
		This trip cannot be reset for a period of 10 seconds.	
5	I IMBALANCED	• Phase current imbalance • Vectorial sum of the 3 motor currents is not zero	• Test the motor insulation • Check the speed and current stability
6	Out Ph. loss	• Loss of a motor phase	• Check the connection of the U, V and W phases at the motor and the drive
7	Over speed	• The speed is higher than 1.3 times the value of **00.02** (**01.06**)	• Check that the load is not driving • Adjust the speed loop gains • Increase the deceleration ramp
9	IGBT U	• Problem on an IGBT (U)	• Reduce the motor load, the cycle, the switching frequency (see **00.12** or **05.18**), and lengthen the acceleration ramp (see **00.03** or **02.11**) and deceleration ramp (see **00.04** or **02.21**).
10	RECTIFIER Th	• Rectifier bridge temperature too high, there is a ventilation problem, the ambient temperature is too high or the load is too great	• Check the ambient temperature • Check the drive load level • Check that all the fans are working • See **10.75**
11	Encoder rot	• The measured position does not vary (the encoder is incorrectly connected, not powered or the shaft is not turning)	• Check the encoder wiring • Make sure that the motor is rotating normally

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No.	Configuration interface name	Reason for trip	Solution
13	UVW reversed	• The u, v, w commutation signals of the encoder are reversed	• Check the encoder and motor wiring
14	TUNE U Encod	• Some encoder signals are present, but commutation channel U is missing	• Check the encoder connection
15	TUNE V Encod	• Some encoder signals are present, but commutation channel V is missing	
16	TUNE W Encod	• Some encoder signals are present, but commutation channel W is missing	
18	Autotun.fail	• Drive trips during the autotune phase	• A stop has been requested • The SDI2 contact has been opened during the autotuning phase
19	Brak. resist.	• Braking resistor overload I x t: **10.39** = 100%	• Read the accumulator value in **10.39** • Check that **10.30** and **10.31** = 0, if there is no braking resistor If there is one, check that the configuring and the braking resistor capacities match • Increase the value of the resistor • Check the resistor wiring • Check the built-in transistor
21	Th IGBT U	• IGBT (U) overheating, ventilation problem, ambient temperature too high • Load too great	• Check the ambient temperature • Check the drive load level • Check the frequency and temperature derating of the drive (see Installation manual) • Check that all the fans are working • Check the state of the door filters
24	Motor PTC	• Triggering of motor thermal sensor on ADI3 or MD-Encoder	• Check the motor load • Reduce the overload level • Check the motor ventilation and the ambient temperature • Check the wiring of terminal ADI3 on the control terminal block • Check terminals T1 and T2 of the MD-Encoder option • See **10.37**
26	24V over ld	• Overload on the +24 V power supply or digital outputs	• Check the 24 V power supply • Check the digital outputs • Check the total current consumption • See **10.37**
27	ADI1 loss	• Loss of the current reference on analog input AI1	• Check that the reference is > 3 mA • See **10.37**
28	ADI2 loss	• Loss of the current reference on analog input ADI2	
30	COM loss	• Loss of serial link communication	• Check the connectors between the configuration interface and the drive • Check that the cable is not damaged • See **10.37**
31	EEPROM fail.	• EEPROM problem or problem with transfer by XPressKey (key and drive versions different)	• Return to factory settings (see **00.45**) • See **10.37** • Switch off and then on again. Transfer via the XPressKey has still taken place.
33	Stator res.	• Trip during measurement of the stator resistance	• Adapt the drive power to that of the motor • Check the connection of the motor cables
34	Fieldbus loss	• Disconnection of the fieldbus during operation or error	• See **10.37** • Check the connection of the fieldbus option with the drive
35	Sec. disable	• Problem on the secure disable input	• Give a stop command before enabling the drive

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No.	Configuration interface name	Reason for trip	Solution
36	U sign. loss	• Loss of encoder commutation channel U	• Check the speed feedback • Replace the encoder
37	V sign. loss	• Loss of encoder commutation channel V	• Check the encoder voltage and connections
38	Breakdown	• Breakdown of synchronous motor in sensorless closed loop mode	• Check the machine configuration in **05.17**, **05.24**, **05.33** and **05.51**
41	User 1	• User 1 trip triggered by state 1 of **10.61** • In factory settings, overload of the drive or the braking resistor • See **10.17** to **10.19**.	• See **10.61**
42	User 2	• User 2 trip triggered by state 1 of **10.63**	• See **10.63**
43	User 3	• User 3 trip triggered by state 1 of **10.65**	• See **10.65**
44	User 4	• User 4 trip triggered by state 1 of **10.67**	• See **10.67**
45	User 5	• User 5 trip triggered via serial link	• See **10.38** • See **10.37**
46	User 6	• User 6 trip triggered via serial link	• See **10.38** • See **10.37**
47	User 7	• User 7 trip triggered via serial link	• See **10.38** • See **10.37**
48	User 8	• User 8 trip triggered via serial link	• See **10.38** • See **10.37**
49	User 9	• User 9 trip triggered via serial link	• See **10.38** • See **10.37**
50	User 10	• User 10 trip triggered via serial link	• See **10.38** • See **10.37**
51	PXIO EEPROM	• Problem on PX-I/O EEPROM	• Power down and then power up again • Return to factory settings (see **00.45**)
52	PXIO power	• Overload of the PX-I/O power supply	• Loss of 24 V detected by the option • Check the current consumption • Make sure there has not been a temporary overload of the 24 V
53	PXIO CLOCK	• Problem on the real-time clock of the PX-I/O	• Power down and then power up again • Set the time again
54	PXIO COMM	• Communication problem between the drive and the PX-I/O	• Power down the drive, then check that the option is positioned correctly
56	IGBT V	• Trip on an IGBT (V)	• Reduce the motor load, the cycle, the switching frequency (see **00.12** or **05.18**), and lengthen the acceleration ramp (see **00.03** or **02.11**) and deceleration ramp (see **00.04** or **02.21**).
57	IGBT W	• Trip on an IGBT (W)	• Reduce the motor load, the cycle, the switching frequency (see **00.12** or **05.18**), and lengthen the acceleration ramp (see **00.03** or **02.11**) and deceleration ramp (see **00.04** or **02.21**).
58	Th IGBT V	• IGBT (V) overheating, ventilation problem, ambient temperature too high • Load too great	• Check the ambient temperature • Check the drive load level • Check that all the fans are working • Check the state of the door filters • Check the frequency and temperature derating of the drive (see Installation manual)

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No.	Configuration interface name	Reason for trip	Solution
59	Th IGBT W	• IGBT (W) overheating, ventilation problem, ambient temperature too high • Load too great	• Check the ambient temperature • Check the drive load level • Check that all the fans are working • Check the state of the door filters • Check the frequency and temperature derating of the drive (see Installation manual)
60	DIAGNOSTIC	• Problem detected during the control and interface board test, the power module test or the self-test	• Check that the SDI input is closed • Look at parameters **17.01**, **17.02** and **17.03**. • Read the test results in parameters **17.10**, **17.11**, **17.18** and **17.19**, then get in touch with your usual LEROY-SOMER contact
65	10V over ld	• Overload on the +10 V power supply	• Check the current consumption
101	MAINS LOSS	• Loss of AC supply	• Check the mains power supply • Check the power supply fuses • Check that the mains supply connections are tightened • Check parameters **00.51** (**06.03**)

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