Variable Frequency Drive
xD1000

0.37-30.0kW (3Ph, 380-460VAC)

Installation & Programming Manual

Lauritz Knudsen
Electrical & Automation

Contents

Important information

NOTICE

Read these instructions carefully, and become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential injury hazards that exist at this point. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result** in death, serious injury or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result** in injury or equipment damage.

NOTICE

Notice, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

PLEASE NOTE
The word "drive" as used in this manual refers to the controller of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Lauritz Knudsen Electrical & Automation for any consequences arising out of the use of this product.

Before you begin

Read and understand these instructions before performing any procedure with this drive.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this drive system.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.
- Before performing work on the drive system:
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - Wait 15minutes to allow the DC bus capacitors to discharge. The DC bus LED is not an indicator of the absence of DC bus voltage that can exceed 800 Vdc.
  - Verify that no other voltage is present in the drive system.
- Before applying voltage to the drive system:
  - Verify that the work has been completed and that the entire installation cannot cause hazards.
  - If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
  - Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNEXPECTED MOVEMENT

Drive systems may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

⚠⚠ DANGER

ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION

Do not use damaged products or accessories.

Failure to follow these instructions will result in death or serious injury.

Contact your local Lauritz Knudsen Electrical & Automation sales office if you detect any damage whatsoever.

NOTICE

RISK OF DAMAGE TO THE DRIVE

The drive should be cleaned and maintained on a regular basis when operating in high temperature, humid, greasy, chemical, dusty or vibrating environments to prevent reduced driver lifespan and equipment damage.

Failure to follow these instructions can result in equipment damage.

Before you begin

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage, and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. (a)
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury or equipment damage.

a. For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems."

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

Before switching on and configuring the product, verify that it is approved for the mains voltage.

Failure to follow these instructions can result in equipment damage.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

Before you begin

Your application consists of a whole range of different interrelated mechanical, electrical, and electronic components, the drive being just one part of the application. The drive by itself is neither intended to nor capable of providing the entire functionality to meet all safety-related requirements that apply to your application. Depending on the application and the corresponding risk assessment to be conducted by you, a whole variety of additional equipment is required such as, but not limited to, external encoders, external brakes, external monitoring devices, guards, etc.

As a designer/manufacturer of machines, you must be familiar with and observe all standards that apply to your machine. You must conduct a risk assessment and determine the appropriate Performance Level (PL) and/or Safety Integrity Level (SIL) and design and build your machine in compliance with all applicable standards. In doing so, you must consider the interrelation of all components of the machine. In addition, you must provide instructions for use that enable the user of your machine to perform any type of work on and with the machine such as operation and maintenance in a safe manner.

The present document assumes that you are fully aware of all normative standards and requirements that apply to your application. Since the drive cannot provide all safety-related functionality for your entire application, you must ensure that the required Performance Level and/or Safety Integrity Level is reached by installing all necessary additional equipment.

⚠ WARNING

INSUFFICIENT PERFORMANCE LEVEL/SAFETY INTEGRITY LEVEL AND/OR UNINTENDED EQUIPMENT OPERATION

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage, and restart.
- Conduct a risk assessment according to EN ISO 12100 and all other standards that apply to your application.
- Use redundant components and/or control paths for all critical control functions identified in your risk assessment.
- If moving loads can result in hazards, for example, slipping or falling loads, operate the drive in closed loop mode.
- Verify that the service life of all individual components used in your application is sufficient for the intended service life of your overall application.
- Perform extensive commissioning tests for all potential error situations to verify the effectiveness of the safety-related functions and monitoring functions implemented, for example, but not limited to, speed monitoring by means of encoders, short circuit monitoring for all connected equipment, correct operation of brakes and guards.
- Perform extensive commissioning tests for all potential error situations to verify that the load can be brought to a safe stop under all conditions.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Before you begin

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

⚠ WARNING

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS

- In your hazard and risk analysis, consider all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cybersecurity concept.
- Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated as well as all organizational measures and rules covering access to this infrastructure consider the results of the hazard and risk analysis and are implemented according to best practices and standards covering IT security and cybersecurity, such as:
  - ISO/IEC 27000 series, ISO/ IEC 15408, IEC 62351, ISA/IEC 62443,
  - NIST Cybersecurity Framework,
  - Information Security Forum - Standard of Good Practice for Information Security,
  - Organization Recommended Cybersecurity Best Practices
- Verify the effectiveness of your IT security and cybersecurity systems using appropriate, proven methods.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

LOSS OF CONTROL

Perform a comprehensive commissioning test to verify that communication monitoring properly detects communication interruptions.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Using motors in parallel

Set Motor control type 309 page 66 to 03.
Motor thermal monitoring is no longer provided by the drive.

NOTICE

MOTOR OVERHEATING

Install external thermal monitoring equipment under the following conditions:
If several motor are connected to the same drive, Install external thermal monitoring equipment for each motor

Failure to follow these instructions can result in equipment damage.

Documentation structure

The following xD1000 technical documents are available on the Lauritz Knudsen Electrical & Automation website (https://www.lk-ea.com).

xD1000 Quick Start Guide SP51101 (English)

The Quick Start Guide is delivered with the drive and describes how to wire and configure the drive to start motor quickly and simply for simple applications.

xD1000 Complete Parameters list SP51102 (English)

This manual gives the full parameter list of the drive in english.

xD1000 User manual SP51099 (English)

This manual describes how to install, program and operate the drive.

xD1000 Modbus Communication manual SP51100 (English)

This manual describes the assembly, connection to the bus or network, signaling, diagnostics, and configuration of the communication-specific parameters via the 7 segment LED display.
It also describes the communication services of the Modbus protocol.
This manual includes all Modbus addresses. It explains the operating mode specific to communication (state chart).

xD1000 Modbus parameters description file

All the parameters are grouped together in an Excel file with the following data:

- Code
- Name
- Modbus Addresses
- Category
- Read/write access
- Type: signed numerical, unsigned numerical, etc.
- Unit
- Factory setting
- Minimum value
- Maximum value
- Display on the 7-segment integrated display terminal
- Relevant menu
- This file offers the option of sorting and arranging the data according to any criterion chosen by the user.

Steps 2 to 4 must be performed with the power off.

INSTALLATION

① Receive and inspect the drive

- Check that the part number printed on the label is the same as that on the purchase order.
- Remove the xD1000 from its packaging and check that it has not been damaged in transit.

② Check the line voltage

- Check that the line voltage is compatible with the voltage range of the drive page 10.

③ Mount the drive

- Mount the drive in accordance with the instructions in this document page 19.
- Install any options required.

④ Wire the drive page 21

- Connect the motor, ensuring that its connections correspond to the voltage
- Connect the line supply, after making
- sure that the power is off. Connect the control part.

⑤ Configure the drive page 37

- Apply input power to the drive, but do not give a run command.
- Set the motor parameters (in Conf mode) only if the factory configuration of the drive is not suitable.
- Perform auto-tuning.

⑥ Start

Prior to switching on the drive

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

Before switching on the device, verify that no unintended signals can be applied to the digital inputs that could cause unintended movements.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Using the drive with motor having a different size

The motor could have a different rating to the drive. In case of smaller motors, there is no specific calculation. The estimated motor current has to be set at Motor thermal current 604.0 parameter page 106. In case of large motors (with up to 2 times the capacity of the drive), e.g., using a 4 kW motor in conjunction with a 2.2 kW drive, motor current and actual motor power must not exceed the rated current and power of the drive.

Line contactor

NOTICE

RISK OF DAMAGE TO THE DRIVE

Do not switch on the drive at intervals of less than 60 s.

Failure to follow these instructions can result in equipment damage.

Use with a smaller rated motor or without a motor

- In factory settings mode, Output Phase loss 605 page 106 is active (605 = 01). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate Output Phase loss 605 (605 = 00).
- In Motor control menu 300- set Motor control type 309 page 66 to 03.

NOTICE

MOTOR OVERHEATING

Install external thermal monitoring equipment if a motor with a nominal current of less than 20% of the nominal current of the drive is connected.

Failure to follow these instructions can result in equipment damage.

Drive & ratings

Three-phase supply voltage: 380 V...460 V 50/60 Hz

For three Phase Output 380 V...460 V motors

Motor		Line supply (input)			Drive (output)			EMC category (5)	Reference	Frame Size
Power indicated on plate (1)		Maximum line current (4)		Apparent power	Nominal Current In	Max. transient current for 60 s	Power dissipated at nominal current			
HD: Heavy duty (2) ND: Normal duty (3)		at 380 V	at 460 V							
	kW	**A**	**A**	**kVA**	**A**	**A**	**W**			
HD	0.37	2.1	1.8	1.4	1.5	2.3	22.7		XD1000-01P5-4B1111	S1
HD	0.75	3.5	3.1	2.5	2.3	3.5	34.1		XD1000-02P3-4B1111	S1
HD	1.5	6.5	5.4	4.3	4.1	6.2	60.4		XD1000-04P1-4B2111	S2
HD	2.2	8.8	7.2	5.7	5.5	8.3	75.5		XD1000-05P5-4B2111	S2
HD	3	11.1	9.2	7.3	7.1	10.7	90.8		XD1000-08P9-4B2111	S3
ND	4	14.2	11.6	9.3	8.9	9.8	120.4			
HD	4	13.7	11.4	9.1	9.5	14.3	115.1		XD1000-12P1-4B2111	S3
ND	5.5	18.0	14.9	11.8	12.1	13.3	158.3			
HD	5.5	21.3	14.3	11.4	12.6	18.9	162.4		XD1000-16P0-4B2111	S3
ND	7.5	23.0	19.0	15.1	16	17.6	201.9			
HD	7.5	26.6	22.4	17.8	17	25.5	241.2		XD1000-22P8-4B2111	S4
ND	11	29.5	24.8	19.4	22.8	25.1	317.8			
HD	11	36.1	30.4	24.2	24	36.0	337.1		XD1000-30P0-4B2111	S4
ND	15	38.6	32.5	25.4	30	33.0	407.0			
HD	15	46.5	38.5	30.7	33	49.5	416.0		XD1000-36P0-4B2111	S5
ND	18.5	46.6	38.8	31.2	36	39.6	451.7			
HD	18.5	55.3	45.8	36.5	39	58.5	515.9		XD1000-43P0-4B2111	S5
ND	22	54.1	45.1	35.7	43	47.3	539.4			
HD	22	64.2	53.2	46.2	46	69	568.8		XD1000-60P0-4B2111	S6
ND	30	71.2	59.2	47	60	66	735.6			

(1) These power ratings are for a Switching frequency range of 4 kHz, in continuous operation The Switching frequency range is adjustable from 2 to 12 kHz. Above 4 kHz, the drive will reduce the Switching frequency range if an excessive temperature rise occurs. Derating should be applied to the nominal drive current if continuous operation above 4 kHz is required:
- 10% derating for 8 kHz
- 20% derating for 12 kHz

(2) Values given for applications requiring significant overload (up to 150% for 60 s).
(3) Values given for applications requiring slight overload (up to 110% for 60 s).
(4) Line current network requirements:
- ≤ 4 kW, network short circuit current Isc ≤ 5 kA
- > 4 kW, network short circuit current Isc : ≤ 22 kA for Heavy duty, ≤ 5 kA for Normal duty

(5) xD1000 drives without integrated EMC filter, need to add external EMC filter to fulfill the IEC/EN 61800-3 standard.

NOTICE

RISK OF DAMAGE TO THE DRIVE

The drive will be damaged if it operates above the nominal current (In) for an extended period of time.
Operating time should not exceed 60 s at 1.5 x In.

Failure to follow these instructions can result in equipment damage.

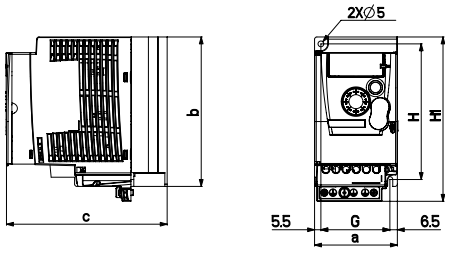
External EMC filter selection table

xD1000 drive is without integrated EMC filter, the external EMC filter is mandatory required to fulfill the IEC/EN 61800-3 C3 category.

Drive Reference	380V line input current (A)		EN 61800-3	
	HD	ND	Conduct emission	Radiated emission
XD1000-01P5-4B1111	2.1	N/A	With C3 external filter, max shielded cable 25m	With C3 external filter, max shielded cable 5m
XD1000-02P3-4B1111	3.5	N/A		
XD1000-04P1-4B2111	6.5	N/A		
XD1000-05P5-4B2111	8.8	N/A		
XD1000-08P9-4B2111	11.1	14.2		
XD1000-12P1-4B2111	13.7	18		
XD1000-16P0-4B2111	21.3	23		
XD1000-22P8-4B2111	26.6	29.5		
XD1000-30P0-4B2111	36.1	38.6		
XD1000-36P0-4B2111	46.5	46.6		
XD1000-43P0-4B2111	55.3	54.1		
XD1000-60P0-4B2111	64.2	71.2		

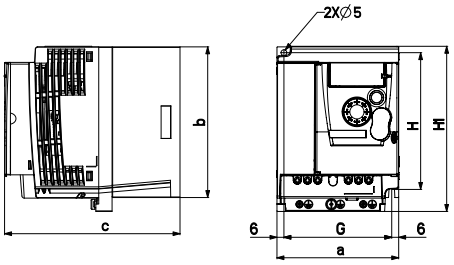
Dimensions and weights

XD1000-01P5-4B1111, XD1000-02P3-4B1111



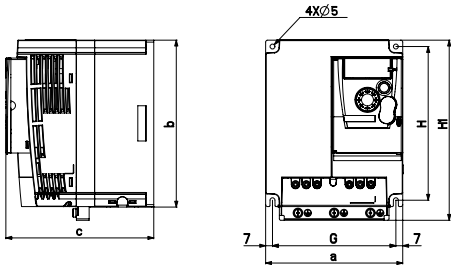
XD1000-XXXX-4B1111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
01P5	72 (2.83)	130 (5.12)	130 (5.12)	60 (2.36)	118 (4.65)	143 (5.63)	5 (0.20)	M4	0.8 (1.8)
02P3	72 (2.83)	130 (5.12)	140 (5.51)	60 (2.36)	118 (4.65)	143 (5.63)	5 (0.20)	M4	0.8 (1.8)

XD1000-04P1-4B2111, XD1000-05P5-4B2111



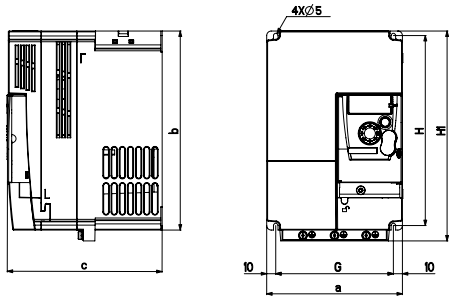
XD1000-XXXX-4B2111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
04P1	105 (4.13)	130 (5.12)	151 (5.94)	93 (3.66)	118 (4.65)	143 (5.63)	5 (0.20)	M4	1.1 (2.43)
05P5	105 (4.13)	130 (5.12)	151 (5.94)	93 (3.66)	118 (4.65)	143 (5.63)	5 (0.20)	M4	1.1 (2.43)

XD1000-08P9-4B2111, XD1000-12P1-4B2111, XD1000-16P0-4B2111



XD1000-XXXX-4B2111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
08P9	140 (5.51)	171 (6.73)	151 (5.94)	126 (4.96)	157 (6.18)	184 (7.24)	5 (0.20)	M4	1.8 (3.97)
12P1	140 (5.51)	171 (6.73)	151 (5.94)	126 (4.96)	157 (6.18)	184 (7.24)	5 (0.20)	M4	1.8 (3.97)
16P0	140 (5.51)	171 (6.73)	151 (5.94)	126 (4.96)	157 (6.18)	184 (7.24)	5 (0.20)	M4	1.8 (3.97)

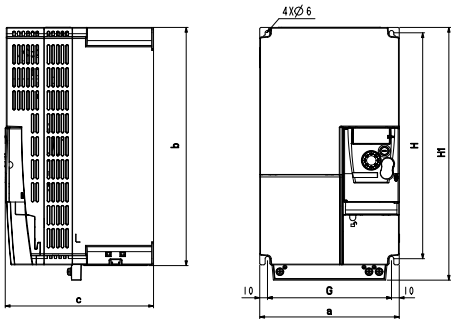
XD1000-22P8-4B2111, XD1000-30P0-4B2111



XD1000-XXXX-4B2111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
22P8	150 (5.91)	220 (8.66)	171 (6.73)	130 (5.12)	210 (8.27)	232 (9.13)	5 (0.20)	M4	3.7 (8.16)
30P0	150 (5.91)	220 (8.66)	171 (6.73)	130 (5.12)	210 (8.27)	232 (9.13)	5 (0.20)	M4	3.7 (8.16)

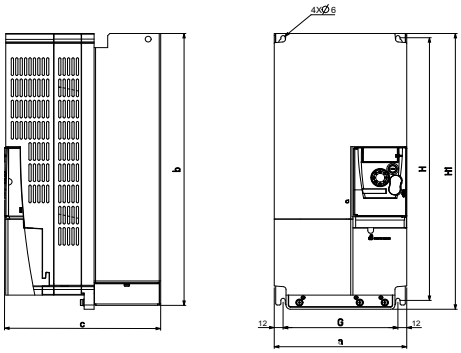
Dimensions and weights

XD1000-36P0-4B2111, XD1000-43P0-4B2111



XD1000-XXXX-4B2111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
36P0	180 (7.09)	311 (12.24)	191 (7.52)	160 (6.29)	295 (11.61)	330 (12.99)	6 (0.23)	M5	6.3 (13.9)
43P0	180 (7.09)	311 (12.24)	191 (7.52)	160 (6.29)	295 (11.61)	330 (12.99)	6 (0.23)	M5	6.3 (13.9)

XD1000-60P0-4B2111



XD1000-XXXX-4B2111	a mm (in.)	b mm (in.)	c mm (in.)	G mm (in.)	H mm (in.)	H1 mm (in.)	Ø mm (in.)	For screws	Weight kg (lb)
60P0	180 (7.09)	384.5 (15.14)	212 (8.35)	156 (6.14)	371.5 (14.63)	390 (15.35)	6 (0.23)	M5	8.5 (18.7)

Environmental Conditions

Withstand to harsh environments

- Chemical class 3C3 conforming to IEC/EN 60721
- Mechanical class 3S2 conforming to IEC/EN 60721

Temperature Conditions

Mounting types:
Type A: IP20, IP4X for top with vent cover
Type B: IP20 side by side
Type C: IP20

Ambient Air Temperature:

For	HD/ND (Heavy duty/Normal duty)	Mounting types	Temperature	
Storage	All types	All types	°C	-25...70
			°F	-13...158
Operation	HD	Type B Type C	°C	-10...55 without derating
			°F	14...131 without derating
			°C	55...60 with derating
			°F	131...140 with derating
	HD	Type A	°C	-10...50 without derating
			°F	14...122 without derating
			°C	50...60 with derating
			°F	122...140 with derating
	ND	Type C	°C	-10...50 without derating
			°F	14...122 without derating
			°C	50...60 with derating
			°F	122...140 with derating
	ND	Type A Type B	°C	-10...40 without derating
			°F	14...104 without derating
			°C	40...60 with derating
			°F	104...140 with derating

Environmental Conditions

Relative Humidity

Without dripping water and without condensation: 5...95% according to IEC 60068-2-3

Operating Altitude

Operating altitude		Supply voltage	Electrical supply network			Derating
			TT/TN	IT	Corner-Grounded	
m	Up to 1000	380 - 460 V three-phase	✓	✓	✓	Without derating
ft	Up to 3280					
m	1000 ... 2000	380 - 460 V three-phase	✓	✓	✓	With derating current by 1% (MAX) per additional 100 m (328 ft)
ft	3280 ... 6560					
m	2000 ... 3000	380 - 460 V three-phase	✓	✓	-	With derating current by 1% (MAX) per additional 100 m (328 ft)
ft	6560 ... 9840					

Pollution Degree and Degree of Protection

Ambient pollution degree according to IEC/EN 61800-5-1:

Pollution Degree	Degree of Protection
2	IP20, IP4X with top vent cover. See page 19

Mounting

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- The drive panel must be properly grounded before power is applied.
- Use the provided ground connecting point as shown in the figure below.

Failure to follow these instructions will result in death or serious injury.

DANGER

XD1000-XXXX-XXXXXX - GROUND CONTINUITY HAZARD

An anodized heatsink can create an insulation barrier to the mounting surface. Ensure that you follow the recommended grounding connections.

Failure to follow these instructions will result in death or serious injury.

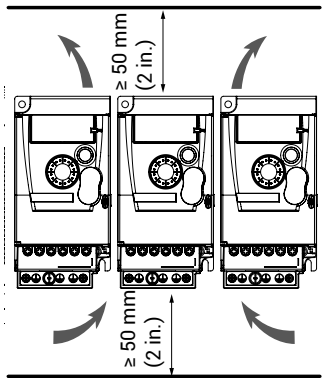
DANGER

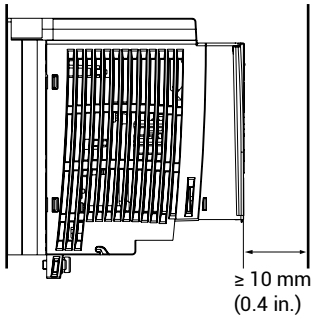
ELECTRIC SHOCK CAUSED BY FOREIGN OBJECTS OR DAMAGE

Conductive foreign objects in the product or damage may cause parasitic voltage.

- Do not use damaged products.
- Keep foreign objects such as chips, screws or wire clippings from getting into the product.

Failure to follow these instructions will result in death or serious injury.





Install the drive vertically, at ±10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the drive.

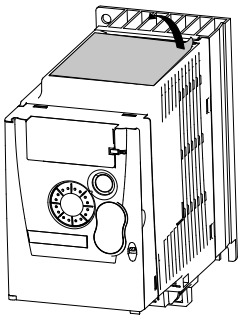
Free space in front of unit: 10 mm (0.4 in.) minimum.

When IP20 protection is adequate, we recommend that the vent cover(s) on the top of the drive be removed, as shown below.

We recommend that the drive is installed on a dissipative surface.

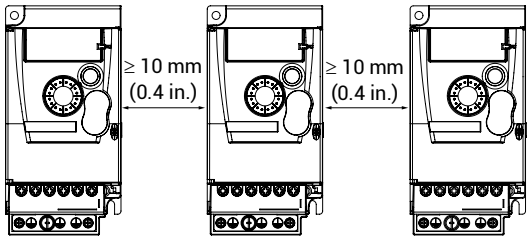
Drive installation should employ fastening washers and screws in combination.

Removing the vent cover



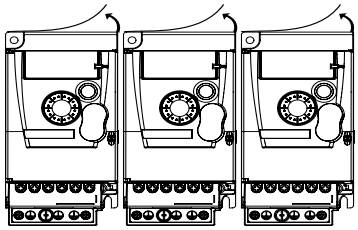
Mounting types

Type A mounting



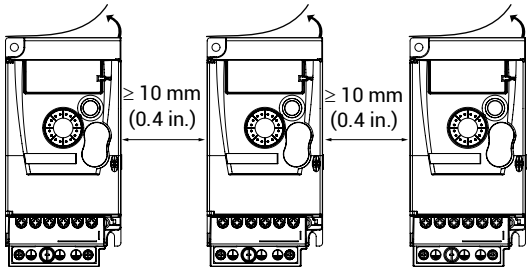
Type A mounting: IP20, IP4X for top with vent cover
Free space ⩾10 mm (0.4 in.) on each side, with vent cover fitted.
Mounting type A is suitable for drive operation at surrounding air temperatures less than or equal to 50°C (heavy duty) or 40°C (Normal duty).
When temperature exceeds 50°C (heavy duty) or 40°C (Normal duty), the top vent cover should be removed to ensure cooling.

Type B mounting



Type B mounting: IP20, side-by-side
Drives mounted side-by-side with vent covers removed. Mounting type B is suitable for drive operation at surrounding air temperatures less than or equal to 55°C (heavy duty) or 40°C (Normal duty).

Type C mounting



Type C mounting: IP20
Free space ⩾10 mm (0.4 in.) on each side, without vent cover
Mounting type C is suitable for drive operation at surrounding air temperatures less than or equal to 55°C (heavy duty) or 50°C (Normal duty).

With these types of mounting, drives with a Switching frequency range of 4 kHz can be used up to an ambient temperature which was listed below:

For XD1000-XXXX-XXXXXX @ Heavy duty
1. At ambient temperatures, Type B and Type C mounting between +55°C and +60°C:
Derate current by 2.4% for every 1°C of temperature rise
Switching frequency range will adjust according to the internal temperature of the drive

2. At ambient temperatures, Type A mounting between +50°C and +60°C:
Derate current by 6% for every 1°C of temperature rise
Switching frequency range will adjust according to the internal temperature of the drive

For XD1000-XXXX-XXXXXX @ Normal duty
1. At ambient temperatures, Type C mounting between +50°C and +60°C:
Derate current by 2.1% for every 1°C of temperature rise
Switching frequency range will adjust according to the internal temperature of the drive

2. At ambient temperatures, Type B mounting between +40°C and +60°C:
Derate current by 2.2% for every 1°C of temperature rise
Switching frequency range will adjust according to the internal temperature of the drive

3. At ambient temperatures, Type A mounting between +40°C and +60°C:
Cover top safeguard covers on drives if IP4X
Derate current by 2% for every 1°C of temperature rise
Switching frequency range will adjust according to the internal temperature of the drive

Power dissipated for enclosed drives and required air flow

Drive	Overload HD: Heavy duty ND: Normal duty	Power dissipated (W)	Minimum air flow rate required per hour (m3/h)
XD1000-01P5-4B1111	HD	22.7	6
XD1000-02P3-4B1111	HD	34.1	9
XD1000-04P1-4B2111	HD	60.4	14
XD1000-05P5-4B2111	HD	75.5	14
XD1000-08P9-4B2111	HD	90.8	50
	ND	120.4	50
XD1000-12P1-4B2111	HD	115.1	50
	ND	158.3	50
XD1000-16P0-4B2111	HD	162.4	50
	ND	201.9	50
XD1000-22P8-4B2111	HD	241.2	100
	ND	317.8	100
XD1000-30P0-4B2111	HD	337.1	100
	ND	407.0	100
XD1000-36P0-4B2111	HD	416.0	140
	ND	451.7	140
XD1000-43P0-4B2111	HD	515.9	140
	ND	539.4	140
XD1000-60P0-4B2111	HD	568.8	180
	ND	735.6	180

General instructions

⚠ DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

- Wire cross sections and tightening torques must comply with the specifications provided in this document
- Do not use multi-conductor cables without cable lugs for any connection with a voltage higher than 25 Vac.

Failure to follow these instructions will result in death or serious injury.

Keep power cables separate from devices containing circuits with low-level signals (detectors, PLCs, measuring apparatus, video, telephone). Always cross control and power cables at 90° if possible.

Power and circuit protection

Adhere to wire size recommendations contained in local codes and standards.
Before wiring power terminals, connect the ground terminal to the grounding screws located below the output terminals.
The drive must be grounded in accordance with the applicable safety standards.
When upstream protection by means of a residual current device is required by the installation standards, a type A circuit breaker should be used for single-phase drives and type B for 3-phase drives. Choose a suitable model incorporating:

- High frequency current filtering
- A time delay which prevents tripping caused by the load from stray capacitance on power-up. The time delay is not possible for 30mA devices.

In this case, choose devices with high interference immunity, such as RCDs with SI type leakage protection.
If the installation includes several drives, provide one "residual current device" per drive.

⚠ DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose short circuit current rating (current that flows during a short circuit) exceeds the specified permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, increase the power of the transformer or decrease the length of the cables.

Failure to follow these instructions will result in death or serious injury.

Control

For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (1 and 2 in.). Connect the shielding to ground.

⚠ WARNING

UNINTENDED BEHAVIOR OF INPUTS AND OUTPUTS

The functions of the inputs and outputs depend on the selected operating mode and the settings of the corresponding parameters.

- Verify that the wiring is appropriate for the settings.
- Only start the system if there are no persons or obstructions in the zone of operation.
- When commissioning, carefully run tests for all operating states and potential error situations.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Length of motor cables

Please use output filters for shielded motor cable lengths longer than 25 m (82 ft) and unshielded cables longer than 50 m (164 ft).
For output filter selection, please refer to the catalogue.

Wiring

Equipment Grounding

Ground the drive according to local and national code requirements. A minimum wire size of 10 mm² may be required to meet standards limiting leakage current.

⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

Insufficient grounding causes the hazard of electric shocks.

- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

⚠ ⚠ DANGER

XD1000-XXXX-XXXXXX - GROUND CONTINUITY HAZARD

An anodized heatsink can create an insulation barrier to the mounting surface. Ensure that you follow the recommended grounding connections.

Failure to follow these instructions will result in death or serious injury.

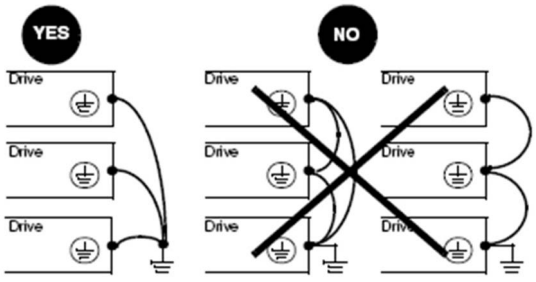
⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

This product has an increased leakage current > 3.5 mA.

- Use a protective ground conductor with at least 10 mm^2 (AWG 6) or two protective ground conductors with the cross section of the conductors supplying the power terminals.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

Failure to follow these instructions will result in death or serious injury.



- Ensure that the resistance of the ground is one ohm or less.
- When grounding several drives, you must connect each one directly, as shown in the figure to the left.
- Do not loop the ground cables or connect them in series.

NOTICE

DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE

Before switching on and configuring the product, verify that it is approved for the mains voltage.

Failure to follow these instructions can result in equipment damage.

DANGER

HAZARD OF FIRE OR ELECTRIC SHOCK

For drives ⩽ 4kW, the length of stripped part of wires connecting motors and drives and connecting to brake resistor should not exceed 10 mm (0.4 in.).

Failure to follow these instructions will result in death or serious injury.

WARNING

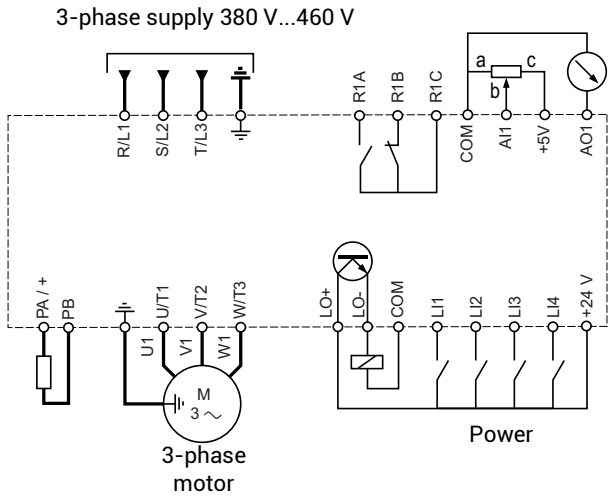
INSUFFICIENT PROTECTION AGAINST OVERCURRENTS

- Properly rated overcurrent protective devices must be used.
- Do not connect the product to a supply mains whose short-circuit current rating (Isc) exceeds the permissible value (1).

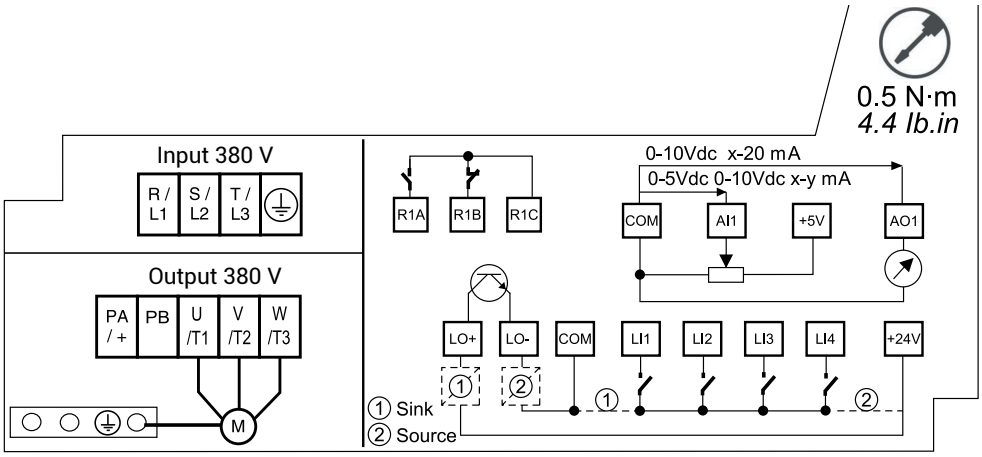
Failure to follow these instructions can result in death, serious injury or equipment damage.

(1) the permissible value of the drive short-circuit current rating is 5 kA for product up to 4kW and 22 kA above 4 kW.

General wiring diagram



Wiring label



Characteristics and functions of power terminals

Terminal	Function	For xD1000
⏚	Ground terminal	All ratings
R/L1 - S/L2 - T/L3	Power input terminal	All ratings
PA/+	Brake resistor terminal (DC Bus + output)	XD1000-04P1-4B2111...xD1000-60P0-4B2111
PB	Brake resistor terminal	XD1000-04P1-4B2111...xD1000-60P0-4B2111
U/T1 - V/T2 - W/T3	Motor wiring terminal	All ratings

Arrangement of control terminals

R1A	Normally open (NO) contact of the relay
R1B	Normally closed (NC) contact of the relay
R1C	Common pin of the relay
COM	COMmon of analog and logic I/Os
AI1	Analog input / Logic Input Plus (LIU)
5V	+5VDC supply provided by the drive
AO1	Analog Output
LO+	Logic Output (collector)
LO-	Common of the logic Output (emitter)
LI1	Logic Input
LI2	Logic Input
LI3	Logic Input
LI4	Logic Input
+24V	+24VDC supply provided by the drive
RJ45	Modbus network or remote display or panel interface

Operation on an IT System

Definition

IT system: Isolated or impedance grounded neutral. Use a permanent insulation monitoring device compatible with nonlinear loads.

Corner grounded system: System with one phase grounded.

Operation

NOTICE
OVERVOLTAGE OR OVERHEATING If the drive is operated via an IT or corner grounded system, the EMC filter must be disconnected. **Failure to follow these instructions can result in equipment damage.**

Power terminals

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

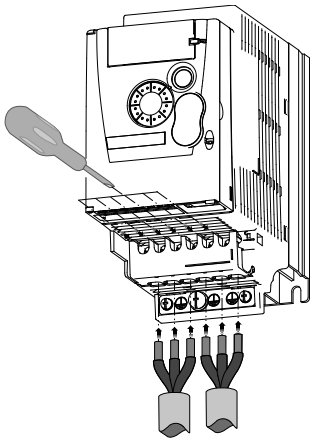
Read and understand the instructions in "Before your begin" chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

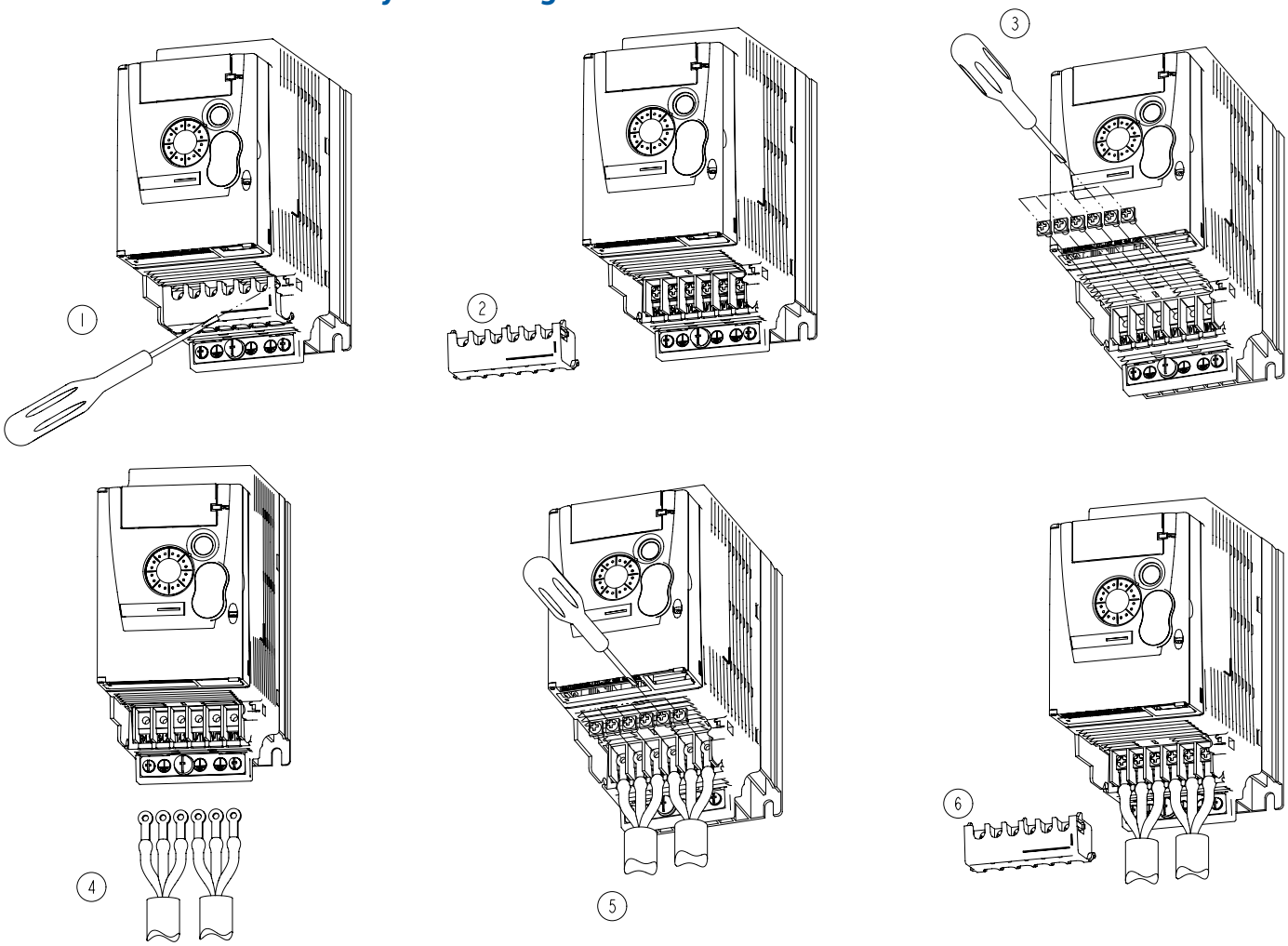
The incoming line power terminals and output terminals to the motor are located at the bottom of the drive. The power terminals can be accessed without opening the wiring trap if you use stripped wire cables.

Access to the power terminals

Access to the terminals if you use stripped wire cables



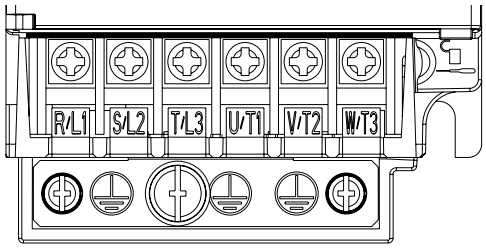
Access to the terminals if you use ring terminals



Characteristics and functions of power terminals

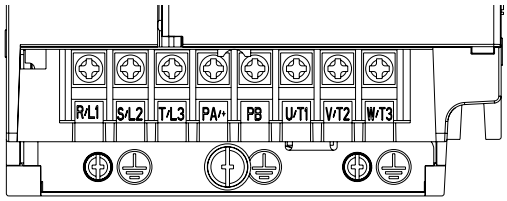
Terminal	Function	For xD1000
⏚	Ground terminal	All ratings
R/L1 - S/L2 - T/L3	Power input terminal	All ratings
PA/+	Brake resistor terminal (DC Bus + output)	XD1000-04P1-4B2111 to XD1000-60P0-4B2111
PB	Brake resistor terminal	XD1000-04P1-4B2111 to XD1000-60P0-4B2111
U/T1 - V/T2 - W/T3	Motor wiring terminal	All ratings

Arrangement of the power terminals



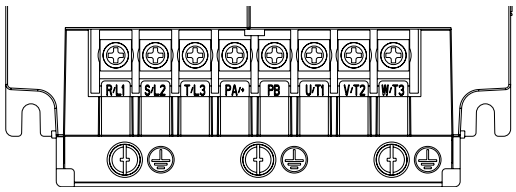
R/L1	S/L2	T/L3	U/T1	V/T2	W/T3

XD1000-XXXX-4B1111	Applicable wire size (1) mm² (AWG)	Recommended wire size (2) mm² (AWG)	Tightening torque (3) N·m (lb.in)
01P5 02P3	**1.5**~2.5 (**16**~14)	2.5 (14)	0.8~1 (7.1 to 8.9)



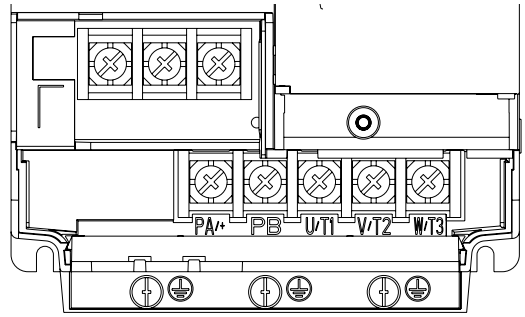
R/L1	S/L2	T/L3	PA/+	PB	U/T1	V/T2	W/T3

XD1000-XXXX-4B2111	Applicable wire size (1) mm² (AWG)	Recommended wire size (2) mm² (AWG)	Tightening torque (3) N·m (lb.in)
04P1 05P5	**1.5**~2.5 (**16**~14)	2.5 (14)	0.8~1 (7.1 to 8.9)



R/L1	S/L2	T/L3	PA/+	PB	U/T1	V/T2	W/T3

XD1000-XXXX-4B2111	Applicable wire size (1) mm² (AWG)	Recommended wire size (2) mm² (AWG)	Tightening torque (3) N·m (lb.in)
08P9 12P1 16P0	**1.5**~4 (**16**~12) **2.5**~4 (**14**~12) 4 (12)	2.5 (14) 4 (12) 4 (12)	1.2~1.4 (10.6 to 12.4)

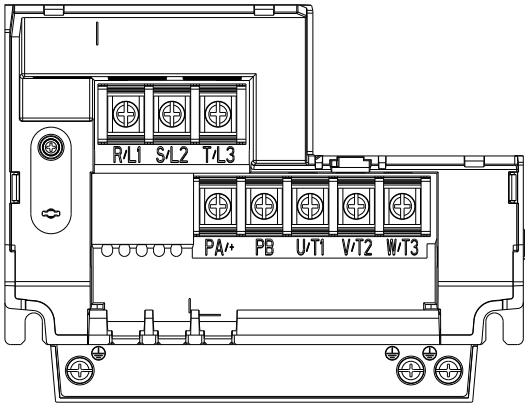


R/L1	S/L2	T/L3					
			PA/+	PB	U/T1	V/T2	W/T3

XD1000-XXXX-4B2111	Applicable wire size (1) mm² (AWG)	Recommended wire size (2) mm² (AWG)	Tightening torque (3) N·m (lb.in)
22P8 30P0	**6**~10 (**10**~7) 10 (7)	10 (7) 10 (7)	2.2~2.4 (19.5 to 21.2)

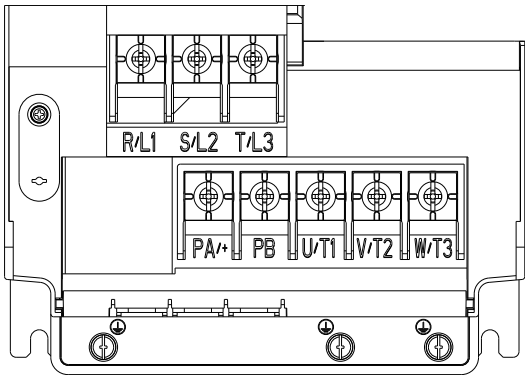
Power terminals

Arrangement of the power terminals



R/L1	S/L2	T/L3					
			PA/+	PB	U/T1	V/T2	W/T3

XD1000-XXXX-4B2111	Overload HD: Heavy duty ND: Normal duty	Applicable wire size (1) mm² (AWG)		Recommended wire size (2) mm² (AWG)		Tightening torque (3) N·m (lb.in)
		Supply terminals	Output terminals	Supply terminals	Output terminals	
36P0	HD ND	**16**~25(**4**~3) **16**~25(**4**~3)	**10**~25(**6**~3) **10**~25(**6**~3)	25(3) 25(3)	16(4) 16(4)	2.2~2.4 (19.5 to 21.2)
43P0	HD ND	25(3) **16**~25(**4**~3)	**10**~25(**6**~3) **16**~25(**4**~3)	25(3) 25(3)	16(4) 16(4)	2.2~2.4 (19.5 to 21.2)



R/L1	S/L2	T/L3					
			PA/+	PB	U/T1	V/T2	W/T3

XD1000-XXXX-4B2111	Overload HD: Heavy duty ND: Normal duty	Applicable wire size (1) mm² (AWG)		Recommended wire size (2) mm² (AWG)		Tightening torque (3) N·m (lb.in)
		Supply terminals	Output terminals	Supply terminals	Output terminals	
60P0	HD ND	35(2) **25**~35(**3**~2)	**16**~35(**4**~2) **25**~35(**3**~2)	35(2) 35(2)	25(3) 25(3)	4.5~5.0 (39~44.3)

(1) The value in bold corresponds to the minimum wire gauge to permit secureness.
(2) 70°C copper cable (minimum wire size for rated use).
(3) Recommended to maximum value.

Screwdriver(s)

For ≤18.5 kW terminal wiring, use Phillips-head screwdriver PH2 (Ø6).
For 22 kW terminal wiring, use Phillips-head screwdriver PH2 (Ø6) or PH3 (Ø8).

Power terminals

The specification of main circuit terminal

- For ≥ 15 kW, if the wire terminal is > 10mm² (AWG 6), the ring lug is required for main circuit terminal connection, please refer to **Figure 1** for the specifications of the ring lug.
- Wire should be crimped into UL compliant ring lug before putting on the insulated heat shrink tube, which is UL and CSA compliant, 600 Vac voltage withstand, YUPU2, please refer to **Figure 2** for the specifications of the heat shrink tube.

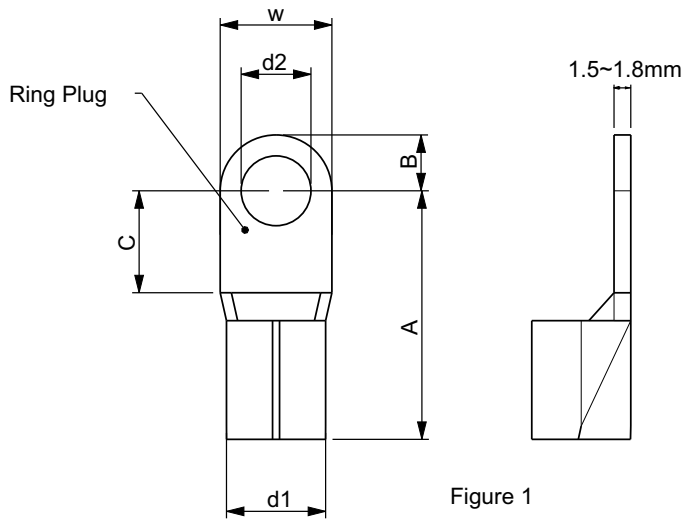


Figure 1

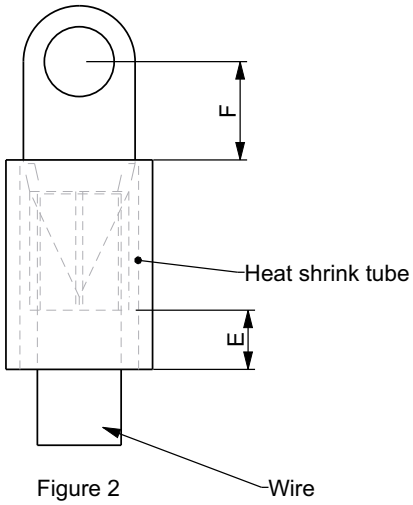


Figure 2

Ring lug size table:

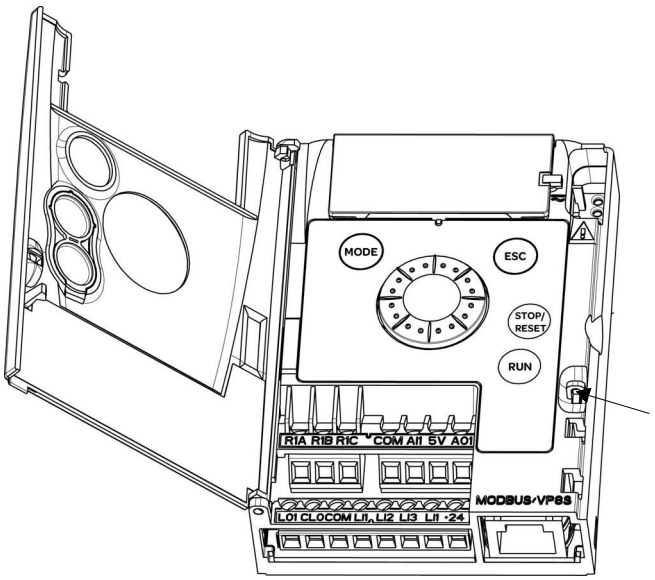
Rated Output Power (kW)	Input Cable Cross -section (mm^2)	Motor Cable Cross -section (mm^2)	A (MAX)	B (MAX)	C (MIN)	d1	d2 (MIN)	E (MIN)	F (Range)	W (MAX)
15 18.5	16~25 (AWG6~4)	10~25 (AWG6~3)	33	10	12	Depend on cable	5.2	13	10~14	13
22	25~35 (AWG3~2)	16~35 (AWG4~2)	33	8	12	Depend on cable	6.2	13	10~14	16

Control terminals

Keep the control circuits away from the power cables. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (1 and 2 in.). Connect the shield to ground as outlined on page 35.

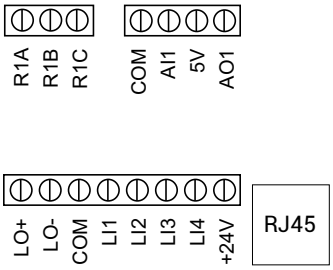
Access to the control terminals

To access the control terminals, open the cover.
NOTE: For information regarding HMI button functions, see "HMI description" on page 39.



Arrangement to lock the cover with a lead seal.

Arrangement of control terminals



R1A	Normally open (NO) contact of the relay
R1B	Normally closed (NC) contact of the relay
R1C	Common pin of the relay
COM	Common of analog and logic I/Os
AI1	Analog Input / Logic Input Plus (LIU)
5V	+5VDC supply provided by the drive
AO1	Analog Output
LO+	Logic Output (collector)
LO-	Common of the logic Output (emitter)
COM	Common of analog and logic I/Os
LI1	Logic Input
LI2	Logic Input
LI3	Logic Input
LI4	Logic Input
+24V	+24 VDC supply provided by the drive
RJ45	Modbus network or remote display panel interface.

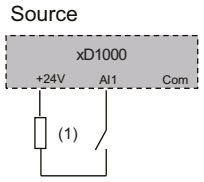
xD1000 Control terminals	Applicable wire size (1) mm^2 (AWG)	Tightening torque (2) N·m (lb.in)
R1A, R1B, R1C	**0.75** to 1.5 (**18** to 16)	0.5 to 0.6 (4.4 to 5.3)
Other terminals	**0.14** to 1.5 (**26** to 16)	

(1) The value in bold corresponds to the minimum wire gauge to permit secureness.
(2) Recommended to maximum value.

Recommended screwdriver(s)

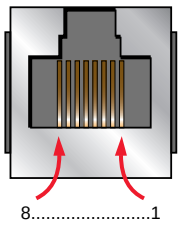
Control terminal wiring requires a Phillips-head screwdriver PH0 (Ø3).

Characteristics and functions of the control terminals

Terminal	Function	Electrical Characteristics
R1A	NO contact of the relay	Minimum switching capacity: • 5 mA for 24 V ⎓ Maximum switching capacity: • on inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 V ∿ and 30 V ⎓ • on resistive load (cos φ = 1 and L/R = 0): 3 A for 250 V ∿, 4 A for 30 V ⎓ • response time: 30ms maximum.
R1B	NC contact of the relay	
R1C	Common pin of the relay	
COM	Common of analog and logic I/Os	
AI1	Voltage or current analog input	• resolution: 10 bits • precision: ± 1% at 25°C (77°F) • linearity: ± 0.3% (of full scale) • sampling time: 20 ms ± 1 ms • analog voltage input 0 to +5 V or 0 to + 10 V (maximum voltage 30 V) impedance: 30 kΩ • Analog current input x to y mA, impedance: 250 Ω
LIU	Logic input plus	• When the inverter input is positive logic connection (source mode), by setting the AI1 type to LIU, and adding the pull-up resistor, AI1 can be used as a logic input. • When the inverter input is negative logic connection (sink mode), AI1 do not support to use as LIU logic input. • When AI1 is used as a logic input, the input impedance is 30kΩ; Internal power supply or external power supply, the maximum input voltage of AI1 port is 20 V - if ≤3 V, state 0 - if ≥7 V, state 1  (1) The series resistance is 15kΩ.
5V	Power supply for reference potentiometer	• precision: ± 5% • maximum current: 10 mA
AO1	Voltage or current analog output	• resolution: 8 bits • precision: ± 1% at 25°C (77°F) • linearity: ± 0.3% (of full scale) • sampling time: 4 ms (max. 7 ms) • analog voltage output: 0 to +10 V (maximum voltage +1%) • minimum output impedance: 470 Ω • analog current output: x to 20 mA • maximum output impedance: 800 Ω
LO+	Logic output	• voltage: 24 V (maximum 30 V) • impedance: 1kΩ • max current output: 100mA (1) • linearity: ± 1% • sampling time: 20 ms ± 1 ms.
LO-	Common of the logic output (emitter)	
LI1 LI2 LI3 LI4	Logic inputs	Programmable logic inputs • +24 VDC power supply (maximum 30 V) • impedance: 3.5 kΩ • state: 0 if < 5 V, state 1 if > 11 V in positive logic • state: 1 if < 10 V, state 0 if > 16 V or switched off (not connected) in negative logic • sampling time: < 20 ms ± 1 ms.
+24V	+24 VDC supply provided by the drive	+24 VDC -15% +20% protected against short-circuits and overloads. Maximum customer current available: 100 mA

(1) LO logic output maximum current could be 100 mA when external power supply or internal +24 V supply alone to LO. If the internal +24 V supply logic inputs also, the maximum current will be 80 mA

Modbus Connection (RJ45)



Pin	Signal
1	Reserved
2	
3	
4	D1 (1) is defined as '+' pin
5	D0 (1) is defined as '-' pin
6	Reserved
7	VP **NOTE:** Supply for RS232 / RS485 converter or a remote terminal.
8	Common (1) ***NOTICE*** **RISK OF SERIAL PORT DAMAGE** Do not connect shield layer of the cable to Common (pin8). **Failure to follow these instructions can result in equipment damage.**
(1) Modbus signals.	

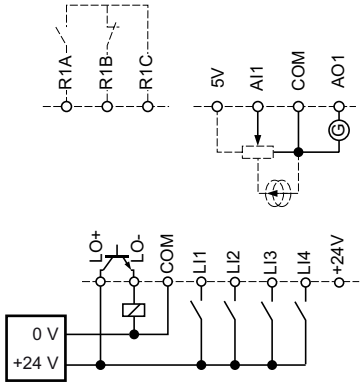
Control connection diagrams

Logic inputs type 203 parameter page 59 is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

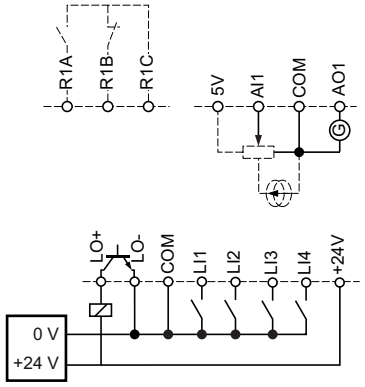
- Set the parameter to 00 for Source operation.
- Set the parameter to 01 for internal Sink operation.
- Set the paramters to 02 for external Sink operation.

NOTE: The modification will be taken into account only at the next control power-on.

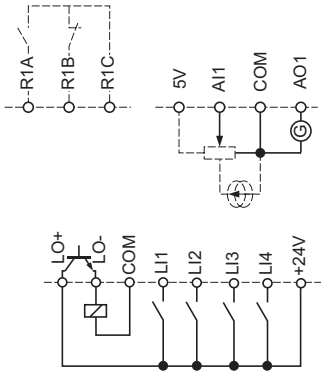
Source - using external supply
Logic input type 203 to 00



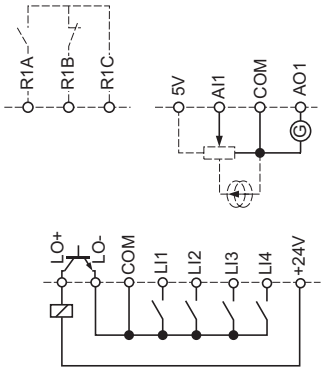
Sink - using external supply
Logic input type 203 to 02



Source - using internal supply
Logic input type 203 to 00



Sink - using internal supply
Logic input type 203 to 01



⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

- If the function Logic input type 203 is set to "01" or "02", do not connect the "0 V" terminal to ground or to protective ground.
- Verify that accidental grounding of digital inputs configured for sink logic, caused, for example, by damage to the signal cables, cannot occur.
- Follow all applicable standards and directives such as NFPA 79 and EN 60204 for proper control circuit grounding practices.
- If you connect a PLC with sink output to the drive:
  - Make sure to set the parameter 203 to "02" before you connect the PLC to the drive.
  - Disconnect the hardware wiring between PLC and drive when you try to restore the factory setting 102 to "64" of the drive.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Electromagnetic Compatibility (EMC), Wiring

EMC requirements for the control cabinet

EMC measures	Objective
Use mounting plates with good electrical conductivity, connect large surface areas of metal parts, remove paint from contact areas.	Good conductivity due to large surface contact.
Ground the control cabinet, the control cabinet door and the mounting plate with ground straps or ground wires. The conductor cross section must be at least 10 mm^2 (AWG 8).	Reduces emissions.
Fit switching devices such as power contactors, relays or solenoid valves with interference suppression units or arc suppressors (for example, diodes, varistors, RC circuits).	Reduces mutual interference.
Install power components and control components separately.	

Shielded cables

EMC measures	Objective
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Use cable clamps to connect a large surface area of the shields of all shielded cables to the mounting plate at the control cabinet entry.	
Ground shields of digital signal wires at both ends by connecting them to a large surface area or via conductive connector housings	Reduces interference affecting the signal wires, reduces emissions
Ground the shields of analog signal wires directly at the device (signal input); insulate the shield at the other cable end or ground it via a capacitor (for example, 10 nF, 100 V or higher).	Reduces ground loops due to low-frequency interference.
Use only shielded motor cables with copper braid and a coverage of at least 85%, ground a large surface area of the shield at both ends.	Diverts interference currents in a controlled way, reduces emissions.

Cable Installation

EMC measures	Objective
Do not route fieldbus cables and signal wires in a single cable duct together with lines with DC and AC voltages of more than 60 V (fieldbus cables, signal lines and analog lines may be in the same cable duct). Recommendation: Use separate cable ducts at least 20 cm apart.	Reduces mutual interference.
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Use equipotential bonding conductors in the following cases: wide-area installations, different voltage supplies and installation across several buildings.	Reduces current in the cable shield, reduces emissions.
Use fine stranded equipotential bonding conductors.	Diverts high-frequency interference currents
If motor and machine are not conductively connected, for example by an insulated flange or a connection without surface contact, you must ground the motor with a ground strap or a ground wire. The conductor cross section must be at least 10 mm^2 (AWG 6).	Reduces emissions, increases immunity.
Use twisted pair for the DC supply. For digital and analog inputs use shielded twisted cables with a pitch of between 25...50 mm (1...2 in).	Reduces interference affecting the signal cables, reduces emissions.

Power Supply

EMC measures	Objective
Operate product on mains with grounded neutral point.	Enables effectiveness of mains filter.
Surge arrester if there is a risk of overvoltage.	Reduces the risk of damage caused by overvoltage.

Check list Before Switching On

Mechanical Installation

Verify the mechanical installation of the entire drive system:

Step	Action	✔
1	Does the installation meet the specified distance requirements?	
2	Did you tighten all fastening screws with the specified tightening torque?	

Electrical installation

Verify the electrical connections and the cabling:

Step	Action	✔
1	Did you connect all protective ground conductors?	
2	Does circuit breaker has the correct rating refer to page 13.	
3	Did you connect or insulate all wires at the cable ends?	
4	Did you properly connect and install all cables and connectors?	
5	Do all plug-in terminals colors and markings correspond to the colors and marking of the control block?	
6	Did you properly connect the signal wires?	

Covers And Seals

Verify that all covers and seals of the control cabinet are properly installed to meet the required degree of protection.

Drive factory settings

The xD1000 is factory-set for the most common operating conditions (motor rating according to drive rating):

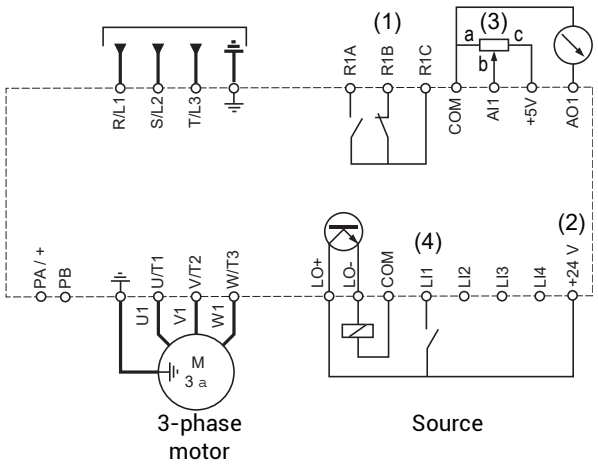
- Display: drive ready (- - 00) with motor stopped or motor frequency reference while running
- Automatic adaptation of the deceleration ramp in the event of overvoltage on braking
- No automatic restarting after a detected fault is cleared
- Logic inputs:
  - LI1: forward (2-wire transitional control)
  - LI2, LI3, LI4: no assignment
- Logic output: LO1: no assignment
- Analog input: AI1 (0 to + 5 V) speed reference
- Relay R1: fault as default setting. R1A opens and R1B closes when a fault is detected or no line voltage is present.
- Analog output AO1: no assignment

Code	Description	Value	Page
301	Standard motor frequency	50 Hz	65
304	Rated motor voltage	380 V	65
501.0	Acceleration	3 s	74
501.1	Deceleration	3 s	74
512.0	Low speed	0 Hz	102
512.2	High speed	50 Hz	102
309	Motor control type	Standard U/F law	66
310	IR compensation	100%	67
604.0	Motor thermal current	equal to nominal motor current (value determined by drive rating)	106
504.1	Automatic DC injection current	0.7 x rated drive current, for 0.5 seconds.	79
315	Switching frequency	4 kHz	68

If the above values are compatible with the application, the drive can be used without changing the settings.

Drive factory wiring diagram

XD1000-XXXX-XXXXXX



(1) R1 relay contacts, for remote indication of the drive status.
(2) Internal + 24 V ⎓. If an external source is used (+ 30 V ⎓ maximum), connect the 0 V of the source to the COM terminal, and do not use the + 24 V ⎓ terminal on the drive.
(3) Reference potentiometer 2.2 kΩ or 10 kΩ maximum.
(4) Forward.

Status relay, unlocking

The R1 status relay is energized when the drive power is applied with no fault detected. It de-energizes in the event of a detected fault or when the drive power is removed.

The drive is reset after a detected fault:
- by switching off the drive until the display disappears completely, then switching on again.
- automatically when "automatic restart" function is enabled, fault detection menu 600-, Automatic restart 602.0 parameter page 104 set to 01.
- via a logic input when this input is assigned to the "drive reset" function, fault detection menu 600- menu, Detected fault reset assignment 601 page 103 set to L●H.
- by using the "run" key on the drive to reset section fault. See Reset all previous detected faults via Run key of HMI 614 parameter page 109.

Drive thermal detection

Thermal detection is provided by a built-in PTC probe in the power module.

Drive ventilation

Ratings up to 0.75 kW (1 HP) do not include a fan. Other ratings do contain a built-in cooling fan. There are two cooling fan run modes: in the first, the fan runs when drive is running; in the second, the fan runs when the drive thermal state requires ventilation. The fan runs only when the drive thermal state requires ventilation.

Motor thermal detection

Function:

Thermal detection by calculating the I^2t.

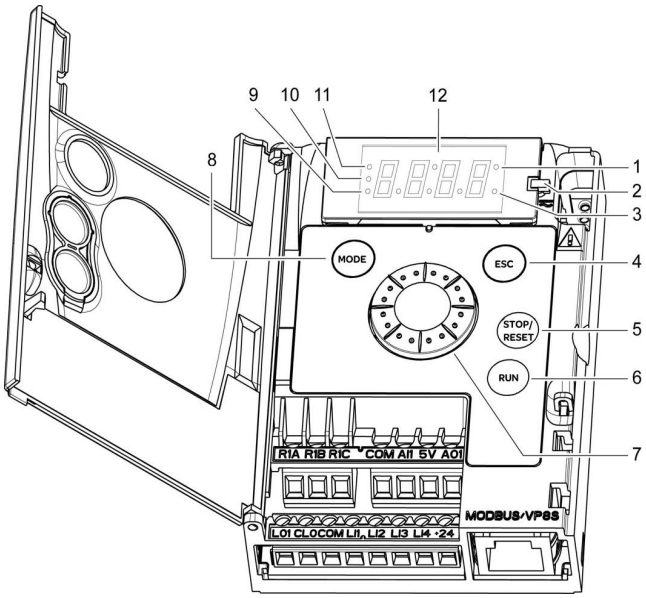
NOTE: The motor thermal state memo returns to zero when the drive power is cycled if Motor thermal state memo 604.3 parameter page 106 **is not set to 01.**

NOTICE
MOTOR OVERHEATING The motor thermal state is not saved when drive is switched off. When the drive is switched on, it is not aware of the thermal state of the connected motor or motors. To enable correct temperature monitoring of the motors, install an external temperature sensor for each motor. **Failure to follow these instructions can result in equipment damage.**

NOTICE
MOTOR OVERHEATING Install external thermal monitoring equipment under the following conditions: • If a motor with a nominal current of less than 20% of the nominal current of the drive is connected. • If you use the function Motor Switching. • If several motors are connected to the same drive **Failure to follow these instructions can result in equipment damage.**

HMI description

Functions of the display and keys



1. Value LED (a) (b)
2. Charge LED
3. Unit LED (c)
4. ESC button: Exits a menu or parameter, or aborts the displayed value to return to the previous value in the memory. In LOCAL configuration, a 2 sec press on ESC button switches between the control/programming modes.
   NOTE: In LOCAL configuration, the three Leds 9, 10, 11 are blinking simultaneously in programming mode and are working as a Led chaser in control mode.
5. **STOP/RESET button: stops the motor (could be hidden by door if function disabled). Important: See instructions for "RUN/ STOP" cover removal.**
6. RUN button: Starts running in LOCAL configuration and in REMOTE configuration if the function is configured (could be hidden by door if function disabled).
7. Jog Dial
   - Acts as a potentiometer in local mode in LOCAL configuration and in REMOTE configuration if the function is configured
   - For navigation when turned clockwise or counterclockwise
   - And selection / validation when pushed
   This action is represented by the symbol on the right.

8. MODE button
   Switches between the control/programming modes. A 3 sec press on MODE button switches between the REMOTE/LOCAL configurations.
9. CONFIGURATION mode LED (b)
10. MONITORING mode LED
11. REFERENCE mode LED
12. Four "7-segment" displays

NOTE: In LOCAL configuration, the three Leds **9, 10, 11** are blinking simultaneously in programming mode and are working as a Led chaser in control mode.
(a) If illuminated, indicates that a **value** is displayed, for example, 0.5. is displayed for “0.5”.
(b) When changing a value the Configuration mode LED and the value LED are on steady.
(c) If illuminated, indicates that a unit is displayed, for example, AMP is displayed for “Amps”.

⚠ WARNING

LOSS OF CONTROL

The function Stop key priority 405 parameter disables the Stop keys of the drive and of the Remote Display Terminal if the setting of the parameter is 00.
Only set this parameter to 00 if you have implemented appropriate alternative stop functions.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Remote control

Remote operation and programming by HMI is possible using the optional display terminal part XDOP-DOP-100. The dimensions of the display terminal part are 70 mm (2.76 in) x 50 mm (2.76 in).

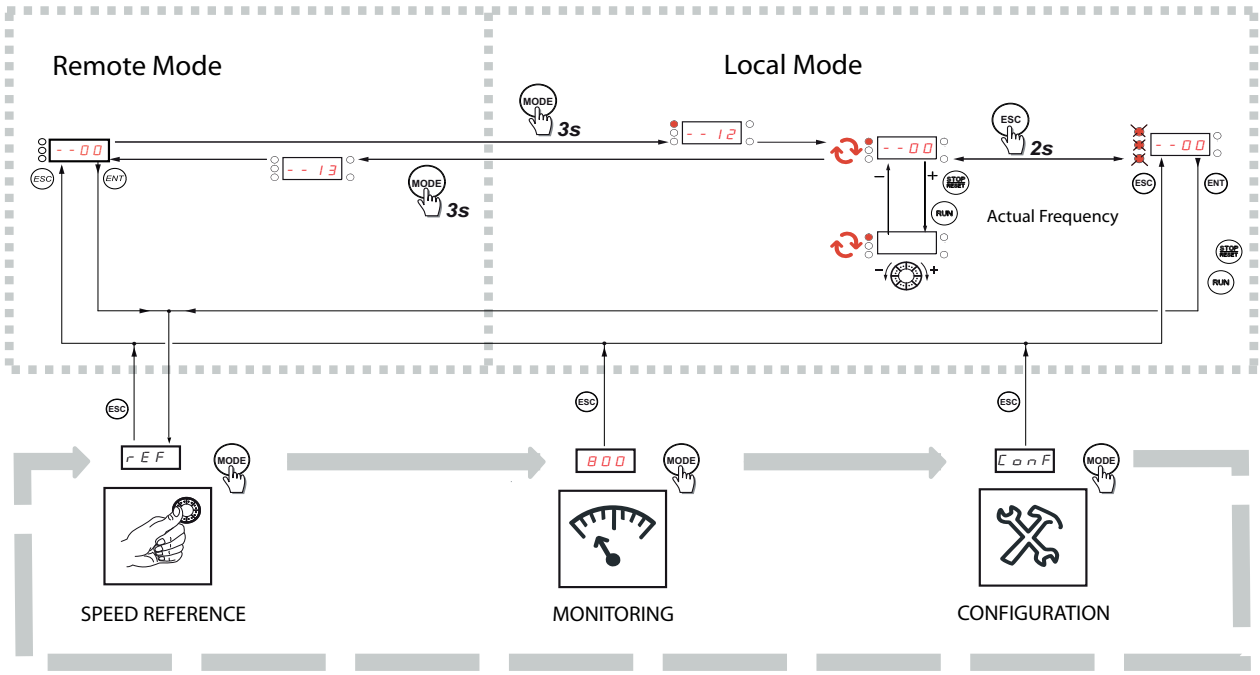
NOTE: Set the remote display terminal with:
- Modbus rate = 19.2 Kbps, (see 702, page 110)
- Modbus format = 8E1, 8 bit, even parity, 1 stop bit (see 703, page 110).

First power-up

At first power-up you are prompted to set Standard motor frequency 301 page 65. Next time power is applied --00 appears. Operating mode selection is then possible using the MODE or JOG key as detailed below.

Menus structure

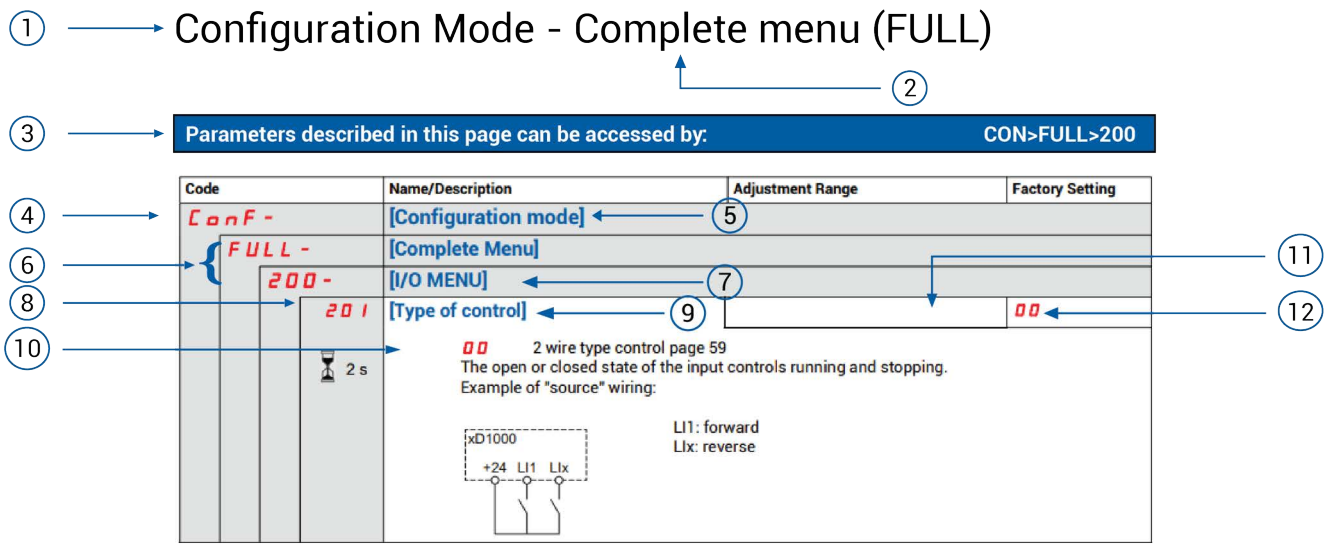
Access to menus and parameters is possible through the Reference (rEF) mode page 44, Monitoring (800-) mode page 46 and Configuration (ConF) mode page 52. Switching between these modes is possible at any time using the MODE key or Jog Dial on the keyboard. The first MODE key depression moves from current position to the top of the branch. A second depression switches to next mode.



Structure of parameter tables

The mode, sectional, menu, sub-menu and parameter table structure is laid out below.
NOTE: Parameters containing the sign in the code column can be modified with the drive running or stopped.

Example:



1. Name of mode
2. Name of section, if any
3. Way to access parameter
4. Menu code on 4-digit 7-segment display, followed by a "-"
5. Name of menu
6. Sub-menu code on 4-digit 7-segment display, if any
7. Name of sub-menu
8. Parameter code
9. Parameter name
10. Value code, if any
11. Adjustment range, if any
12. Factory setting, if any

Function compatibility table

	Preset speed page 83	PI regulator page 84	Jog operation page 84	Auto DC injection page 79	Catch on the fly page 104	Fast stop page 76	Freewheel page 76	DC injection page 77
Preset speed page 83			↑					
PI regulator page 84			●					
Jog operation page 84	←	●		←				
Auto DC injection page 79			↑				↑	↑
Catch on the fly page 104							←	
Fast stop page 76							↑	● (1)
Freewheel page 76				←	↑	←		←
DC injection page 77				←		● (1)	↑	

● Incompatible functions

Compatible functions

Not applicable

The function indicated by the arrow has priority over the other.

← ↑ Priority function (function which can be active at the same time)

(1) Priority is given to the first of these two stop modes to be activated.

Stop functions have priority over run commands.
Speed references via logic command have priority over analog references.

Reference Mode rEF

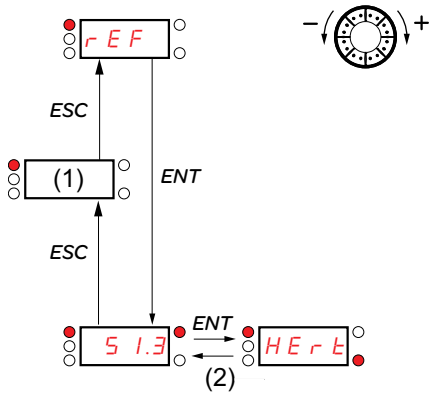
Use the reference mode to monitor and if local control is enabled (Reference channel 1 401 page 72 = 183), adjust the actual reference value by rotating the jog dial.
When local control is enabled, the jog dial of the HMI acts as a potentiometer to change the reference value up and down within the limits preset by other parameters (512.0 and 512.2). There is no need to press the ENT key to confirm the change of the reference.
If local command mode is disabled, using Command channel 1 407 page 73, only reference values and units are displayed. The value will be "read only" and cannot be modified by the jog dial (the reference is no longer given by the jog dial but from an AI or other source).
The actual reference displayed determined by the choice made in Reference channel 1 401 page 72.

Organization tree

(1) Determined by active reference channel.
Possible values:
402
403
801
59.11
806

(2) 2sec or ESC

Displayed parameter value and unit of the diagram are given as examples.



Value - Unit

Parameters described in this page can be accessed by:	REF

Code		Name / Description	Adjustment range	Factory setting
rEF		**[Reference Mode]**		
	402 ↻ (1)	**[External reference value]** Frequency reference visible if reference channel active is remote display. Reference channel 1 401 page 72 set to 163. or Forced local reference 409 page 73 set to 163. This parameter allows modification of the frequency reference with the jog dial. Visibility determined by drive settings.	-400 to +400 Hz	-
	403 ↻ (1)	**[Integrated display jog dial reference]** This parameter allows modification of the frequency reference by integrated jog dial. Reference channel 1 401 page 72 set to 183 or Forced local reference 409 page 73 set to 183 or PID manual reference 59.18 page 87 set to 02. Visibility determined by drive settings.	0 to 100% of 512.2 parameter value	-
	801	**[Speed reference]** Actual frequency reference. This parameter is in read-only mode. Visibility determined by drive settings. 01 Analog input terminal 63 Remote display 164 Modbus 183 Integrated display with Jog dial	512.0 parameter value - 512.2 parameter value	-
	59.11 ↻ (1)	**[Internal PID reference value]** This parameter allows modification of the PID internal reference with the jog dial. Visibility determined by drive settings.	0 to 100%	-
	806	**[PID reference value value]** This parameter is the PID reference value expressed as a %.	0 to 100%	-

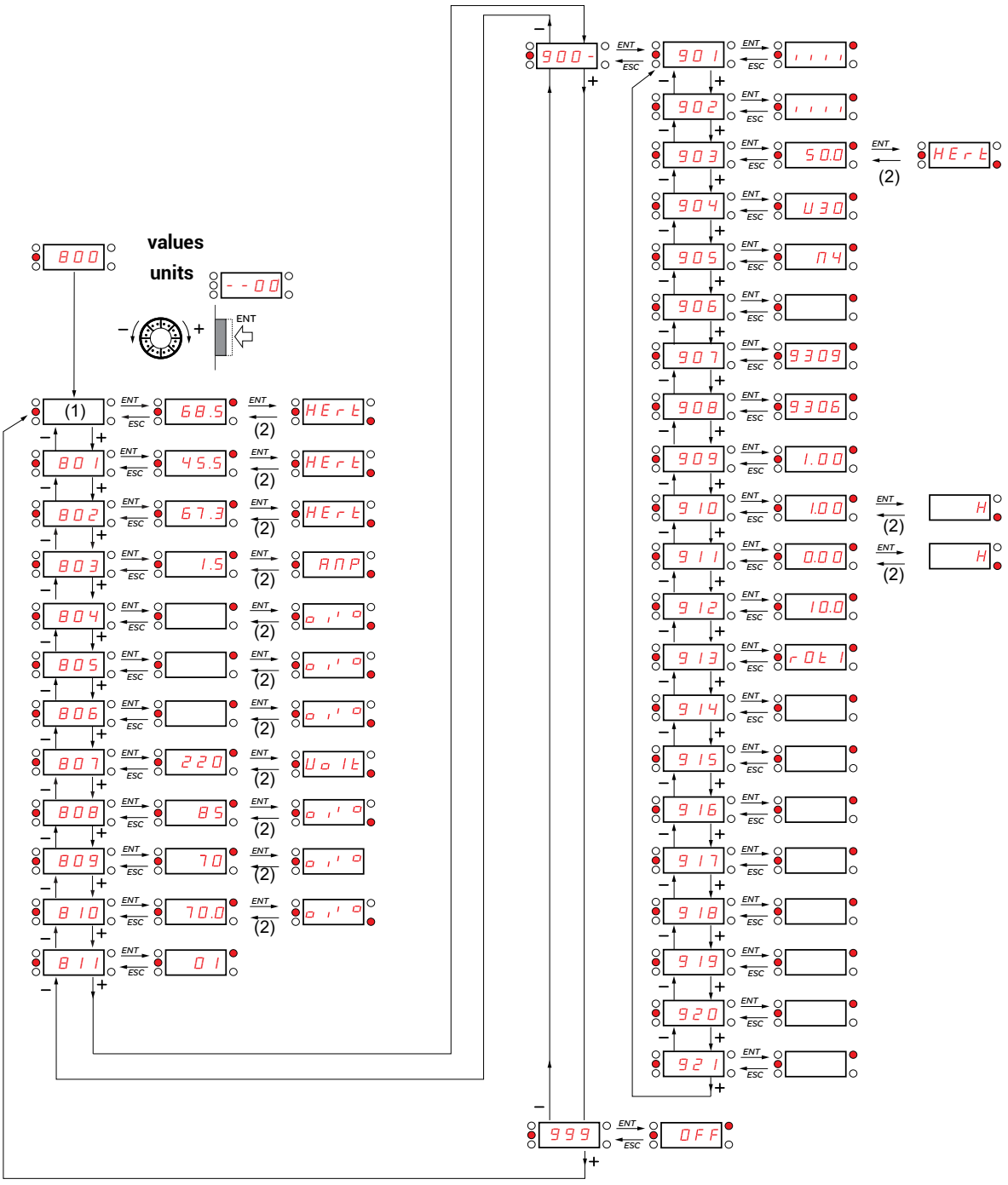
(1) It is not necessary to press ENT key to confirm modification of the reference.

↻ Parameter that can be modified during operation or when stopped.

Monitoring mode MOn

When the drive is running, the value displayed is that of one of the monitoring parameters. The default value displayed is the motor **[Output frequency]** 802 page 46.
While the value of the desired new monitoring parameter is being displayed, press the jog dial button a second time to display the unit.

Organization tree



(1) Determined by active reference channel.
Possible values:
402
403

(2) 2sec or ESC

Displayed parameter values and units of the diagram are given as examples.

Monitoring mode MOn

Parameters described in this page can be accessed by: MON

Code	Name / Description	Unit
MOn	**[Monitoring mode]**	
402	**[External reference value]**	Hz
	External display terminal or local force mode configured. Forced local reference 409 page 73 set to 163 and Forced local assignment 408 page 73 is not 00. Displays the Actual speed reference coming from the remote display terminal. This value is not visible in factory setting.	
403	**[Integrated display jog dial reference]**	%
	Embedded display terminal or local force mode configured. Forced local reference 409 page 73 set to 183 and Forced local assignment 408 page 73 is not 00. Displays the Actual speed reference coming from the jog dial. This value is not visible in factory setting.	
801	**[Speed reference]**	Hz
	Actual frequency reference.	
802	**[Output frequency]**	Hz
	This parameter provides the estimated motor speed. It corresponds to the estimated motor frequency (on the motor shaft). In Standard Motor control type 03 page 66, Output frequency 802 is equal to motor stator frequency. In Motor control type 309 selection of high performance motor control type 00 page 66, Output frequency 802 is equal to the frequency corresponding to estimated motor speed. Range: -400 to 400 Hz	
803	**[Motor current]**	A
	Estimation of the effective motor current (output of the drive) from phase current measurements with an accuracy of 5%. During DC injection, the current displayed is the maximum value of current injected in the motor.	
804	**[PID error]**	%
	Visible only if the PID function is configured PID feedback assignment 59.00 page 85 set to 01]. See PID diagram on page 84.	
805	**[PID feedback]**	%
	Visible only if the PID function is configured PID feedback assignment 59.00 page 85 set to 01]. See PID diagram on page 84.	
806	**[PID reference]**	%
	Visible only if the PID function is configured PID feedback assignment 59.00 page 85 set to 01]. See PID diagram on page 84.	
807	**[Main voltage]**	V
	Line voltage from the point of view of the DC bus, motor running or stopped.	
808	**[Motor thermal state]**	%
	Display of the motor thermal state. Above 118%, drive displays page 116 Motor overload F013 fault.	
809	**[Drive thermal state]**	%
	Display of the drive thermal state. Above 118%, drive displays page 116 Drive overheat F011 fault.	
810	**[Output power]**	%
	The parameter displays the ratio between “estimated motor power (on the shaft) versus drive rating."	

Parameter that can be modified during operation or when stopped.

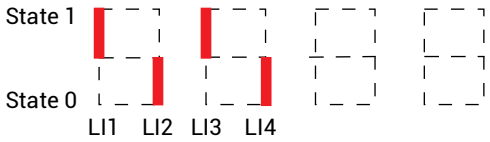
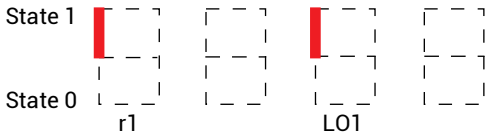
Monitoring mode MOn

Parameters described in this page can be accessed by:	MON

Code	Name / Description
MOn	**[Monitoring mode]**
bII	**[External reference value]** **This parameter displays the state of the drive and motor.** --00 Drive ready --01 Drive running, the last 6-segment digit to the right of the code also indicates direction and speed --02 Accleleration, the last 6-segment digit to the right of the code also indicates direction and speed --03 Deceleration, the last 6-segment digit to the right of the code also indicates direction and speed --04 DC injection braking in progress --05 Current limitation state, 4-segment digit blinks --06 Freewheel stop control --07 Auto-adapted deceleration --08 Controlled stop on mains phase loss --09 Auto-tuning in progress --10 Fast stop state --11 No line power state. When the control part is energized via the RJ45 connector and there is no line voltage and no run order present. --12 Drive is running and using the Fall back speed --13 Remote configuration --14 Local configuration

Monitoring mode MOn

Parameters described in this page can be accessed by: MON

Code	Name / Description	Unit
Mon-	**[Monitoring mode]**	
900-	**[Maintenance menu]** **Parameters of 900- cannot be selected for monitoring.**	
901	**[State of logic inputs LI1 to LI4]** Can be used to visualize the state of the 4 logic inputs.  Example above: LI1 and LI3 are at 1; LI2 and LI4 are at 0.	-
902	**[State of the logic output LO1 and relay R1]** Can be used to visualize the state of the logic output.  Can be used to visualize the state of the 4 logic inputs.	-
903	**[Display of high speed value]** Displays frequency corresponding to the high speed value. Range from Low speed 5 12.0 page 101 to Maximum frequency 308 page 66 is not set to 06. Visible only if 2 High speed assignment 5 12.3 or 4 High speed assignments 5 12.4 page 102 is configured.	Hz
904	**[Drive Power rating]** Indicates the drive power rating. This is part the of the drive reference. Refer to page 12. Possible values: 037 = 0.37 kW 075 = 0.75 kW U15 = 1.5 kW U22 = 2.2 kW U30 = 3.0 kW U40 = 4.0 kW U55 = 5.5 kW U75 = 7.5 kW D11 = 11 kW D15 = 15 kW D18 = 18.5 kW D22 = 22 kW	-
905	**[Drive voltage rating]** Indicates the Drive rate voltage. This is part of the drive reference, see page 12. Possible values: XD1000-XXXX-4XXXXX = 360 V~460 V 3-phase in, 360 V~460 V 3-phase out.	-
906	**[Specific Product number]** This parameter is used to identify the specific version of the product. When the product is in standard version, this parameter value will be 0 and invisible. When the product is in specific or customized version, the value will be non-zero and visible in the menu.	-
907	**[Card 1 Software Version]** Application software version Example: 1105 for 1.1 ie 05 1 (version, major), 1 (version, minor), 05 (ie, evolution number)	-

Monitoring mode MOn

Parameters described in this page can be accessed by: **MON>900**

Code	Name/Description	Unit
MOn-	**[Monitoring mode]**	
900-	**[Maintenance menu]**	
908	**[Card 2 Software Version]**	-
	Motor control software version Example: 1105 for 1.1 ie 05 1 (version, major), 1 (version, minor), 05 (ie, evolution number)	
909	**[Run elapsed time display]**	0.01
	Motor control software version Example: 1105 for 1.1 ie 05 1 (version, major), 1 (version, minor), 05 (ie, evolution number)	

Hours	Display
1	0.01
10	0.10
100	1.00
1000	10.0
10000	100

910	**[Powe on time time display]**	0.01
	Total time the drive has been powered on. Range: 0 to 65535 hours. Value displayed is as described in the table above. Parameter resettable by services.	
911	**[Fan time display]**	0.01
	Range: 0 to 65535 hours. Value displayed is as described in the table above. Parameter resettable by customer.	
912	**[Process elapsed time]**	0.01
	Range: 0 to 65535 hours. Value displayed is as described in the table above. Parameter resettable by customer.	
913	**[Modbus communication status]**	-
	rDtO Modbus no reception, no transmission = communication idle rDt1 Modbus no reception, transmission r1tO Modbus reception, no transmission r1t1 Modbus reception and transmission	
914	**[Last fault 1]**	-
	This parameter describes the Last fault.	

Monitoring mode MOn

Parameters described in this page can be accessed by: **MON>900**

Code	Name/Description	Unit
MOn-	**[Monitoring mode]**	
900-	**[Maintenance menu]**	
915	**[State of drive at fault 1]**	-

This parameter describes the drive state at the moment of the first detected fault.

bit 0	bit 1	bit 2	bit 3	bit 4
ETA.1: Switched on	ETA.5: Fast stop	ETA.6: Switch on disabled	Forced local enabled	ETA.15 : Motor rotation in forward direction (or stopped)

bit 5	bit 6	bit 7	bit 8	bit 9
ETI.4: Run order present	ETI.5: DC injection running	ETI.7: Motor thermal threshold reached	ETI.8: Reserved	ETI.9: Product in acceleration

bit 10	bit 11	bit 12	bit 13 - 14	bit 15
ETI.10 : Product in deceleration	ETI.11 : Current limitation or torque limitation is running	Fast stop in progress	ETI.14= 0 + ETI.13=0 : Drive controlled by terminal or local display terminal ETI.14= 0 + ETI.13=1 : Drive controlled by remote display terminal ETI.14= 1 + ETI.13=0 : Drive controlled by Modbus ETI.14= 1 + ETI.13=0 : Reserved	ETI.15 : Reverse direction applied to the ramp

916	**[Last fault 2]**	-

This parameter describes the second detected fault.

917	**[State of drive at fault 2]**	-

This parameter describes the drive state at the moment of the second detected fault. See 915.

918	**[Last fault 3]**	-

This parameter describes the third detected fault.

919	**[State of drive at fault 3]**	-

This parameter describes the drive state at the moment of the third detected fault. See 915.

920	**[Last fault 4]**	-

This parameter describes the fourth detected fault.

921	**[State of drive at fault 4]**	-

This parameter describes the drive state at the moment of the fourth detected fault. See 915.

Monitoring mode MOn

Parameters described in this page can be accessed by:	MON>900

Code	Name / Description	Adjustment range	Factory setting
MOn-	**[Monitoring mode]**		
999	**[HMI Password]**	2 - 9999	OFF
	Possible state value: OFF Possible disabled On Password activated Range: 2 - 9999 If you have lost your password, please contact Lauritz Knudsen Electrical & Automation. This parameter is used to restrict access to the drive. To lock the drive, go to the HMI Password 999 parameter and enter a password within the above range. Once activated, the password state changes to On: Password protection only enables access to Reference (rEF) see page 44 mode and Monitor (BOO-) see page 45 mode. Return to factory settings or access to FULL section are disabled. To unlock the drive, go to the 999 parameter, enter the valid password, then press ENT. Password protection removal is then possible and carried out by entering OFF using the jog dial and then pressing ENT.		

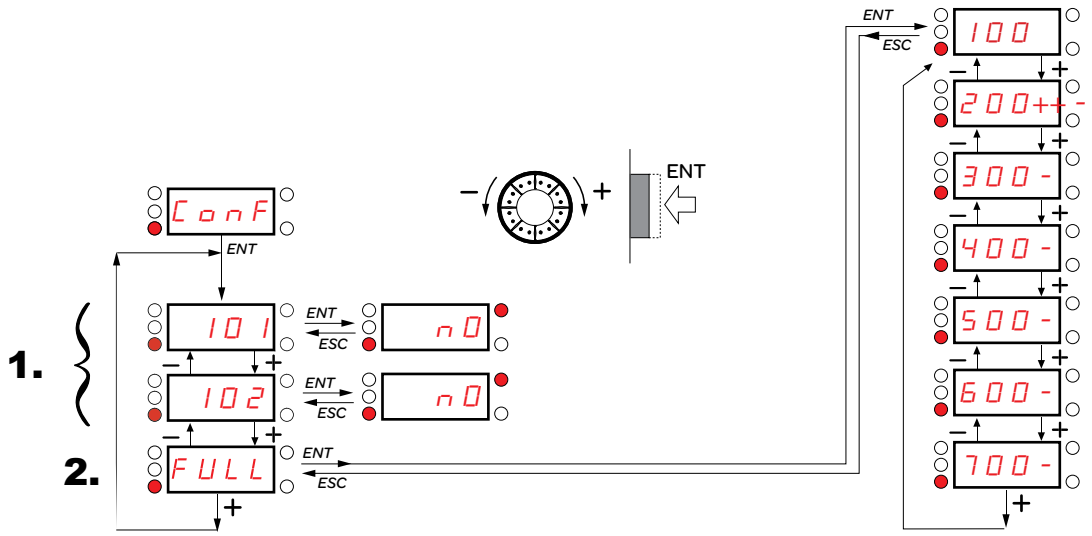
Configuration mode, ConF

The Configuration mode comprises 2 parts :

1. Store/recall parameter set: these 2 functions are used to store and recall customer settings.

2. FULL: This menu permits to access to all other parameters. It includes 6 sub-menus:
   - Macro-configuration 100 - page 54
   - Input Output menu 200 - page 55
   - Motor Control menu 300 - page 65
   - Control menu 400 - page 72
   - Function menu 500 - page 74
   - Fault detection management menu 600 - page 103
   - Communication menu 700 - page 110

Organization tree



Displayed parameter values are given as examples only.

(1) Determined by active reference channel.
Possible values: 402 or 403

(2) 2sec or ESC

Configuration mode, ConF

Parameters described in this page can be accessed by:	CONF

Code	Name / Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
101 2 s	**[Store customer parameter set]** This function creates a backup of the present configuration: 00 Function inactive 01 Saves the current configuration in the drive memory. 101 automatically switches to 00 as soon as the save has been performed. When a drive leaves the factory the current configuration and the backup configuration are both initialized with the factory configuration.		00
102 2 s	**[Factory / recall customer parameter set]** This function permits restoration of a configuration. 00 Function inactive As soon as one of the following action has been performed, 102 automatically changes to 00. 02 The current configuration becomes identical to the backup configuration previously saved by 101. As soon as this action has been performed, 102 automatically changes to 0002 is only visible if the backup has been carried out. If this value appears, 64 is not visible. 64 The current configuration becomes identical to the factory setting. If this value appears, 64 is not visible. **⚠ WARNING** **UNANTICIPATED EQUIPMENT OPERATION** Verify that restoring the factory settings is compatible with the type of wiring used. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**		00

2 s To change the assignment of this parameter, press ENT key for 2sec.

How to control the drive locally

In factory setting, RUN, STOP and jog dial are inactive. To control the drive locally, adjust the following parameters:
Set Reference channel 1 401 page 72 to 183 (use integrated display with jog dial).

LI assignment information

It is possible with xD1000 to use multi assignment function (ie: 501.4 and 503 on the same LI).
It is also possible on some functions to assign LIH (high) or LIL (low), which means that the assigned function will be activated to high (LIH) or low level (LIL) of LI

Parameter that can be modified during operation or when stopped.

Configuration mode, ConF

Parameters described in this page can be accessed by: CONF>FULL>200

Code	Name / Description	Adjustment range	Factory setting
ConF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
100	**[Macro Configuration]**		00

2 s

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

Verify that the selected macro configuration is compatible with the type of wiring used.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Macro configuration provides a shortcut to configure a set of parameters suited to a specific field of application.

3 macro configurations are available:

- 00 Sart/stop. Only forward is assigned.
- 04 PID regulation. Activate PID function, dedicate AI1 for feedback and AIV1 for reference.
- 09 Speed. Allocate LI to a preset speed which provides a means of configuring speed functions for a specific field of application.

This parameter must be set before performing an auto tuning.

Selecting a macro configuration assigns the parameters in this macro configuration.

Each macro configuration can still be modified in other menus.

Input / output or parameter	Start/stop	PID regulation	Speed
AI1	Ref. channel 1	PID feedback	NONE
AIV1	NONE	Ref. channel 1	
AO1	NONE		
LO1	NONE		
R1	No drive detected fault		
L1H (2-wire)	Forward		
L2H (2-wire)	NONE		Reverse
L3H (2-wire)	NONE	Auto/Manual	2 preset speeds
L4H (2-wire)	NONE		4 preset speeds
L1H (3-wire)	Stop		
L2H (3-wire)	Forward		
L2H (3-wire)	NONE		Reverse
L4H (3-wire)	NONE	Auto/Manual	2 preset speeds
401 (Reference source 1)		Integrated Jog dial	Integrated Jog dial
309 (Motor control type)		Pump: 309=06	
404 (Reverse inhibition)		Yes	
204.0 (AI1 type)		10A	
LFLL (4-20 mA signal loss)		YES	
507.3 (Preset speed 2)			10.0Hz
507.4 (Preset speed 3)			25.0Hz
507.5 (Preset speed 4)			50.0Hz
319 (Motor parameter choice)			Motor power factor
504.0 (Automatic DC injection)	Limited DC injection	Limited DC injection	Limited DC injection

2 s To change the assignment of this parameter, press ENT key for 2sec.

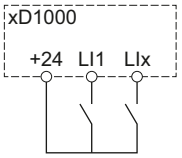
Configuration mode, ConF

Parameters described in this page can be accessed by: CONF>FULL>200

Code	Name/Description	Adjustment Range	Factory Setting
ConF -	**[Configuration mode]**		
FULL -	**[Complete Menu]**		
200 -	**[I/O MENU]**		
201	**[Type of control]**		00

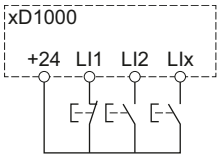
2 s

00 2 wire type control page 59
The open or closed state of the input controls running and stopping.
Example of "source" wiring:



LI1: forward
LIx: reverse

01 3-wire control (see page 59)
"Forward" or "reverse" pulse send a run command. A "stop" pulse sends a stop command.
Example of "source" wiring:



LI1: stop
LI2: forward
LIx: reverse

This parameter must be set before performing an autotuning.

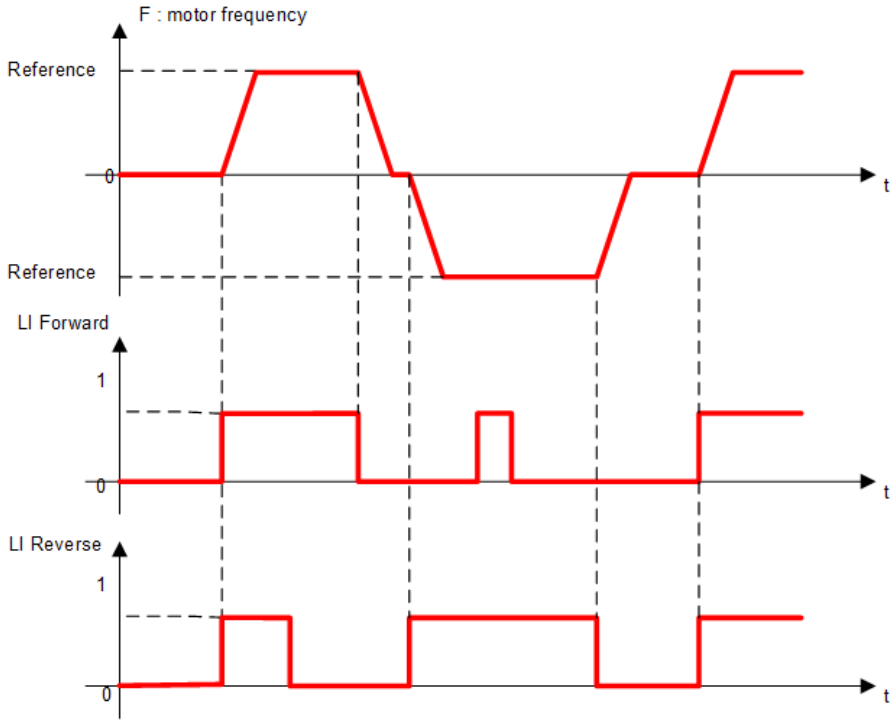
⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION
If this parameter is changed, the parameters 2-wire type control 202 page 59 and the assignments of the digital inputs are reset to the factory setting. Verify that this change is compatible with the type of wiring used.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

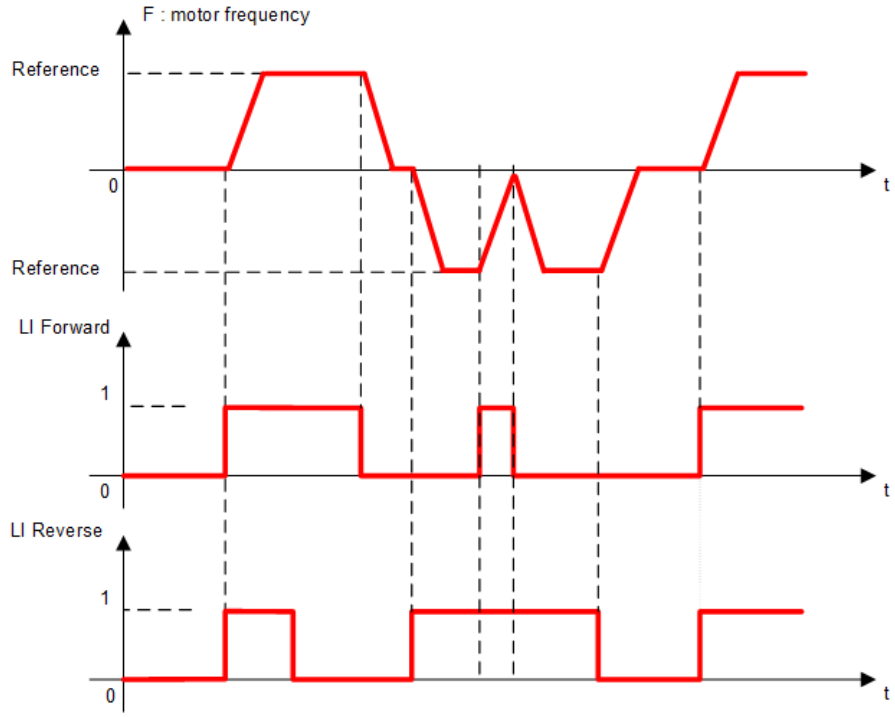
2 s To change the assignment of this parameter, press ENT key for 2sec.

2 wire type control diagrams (see page 59)

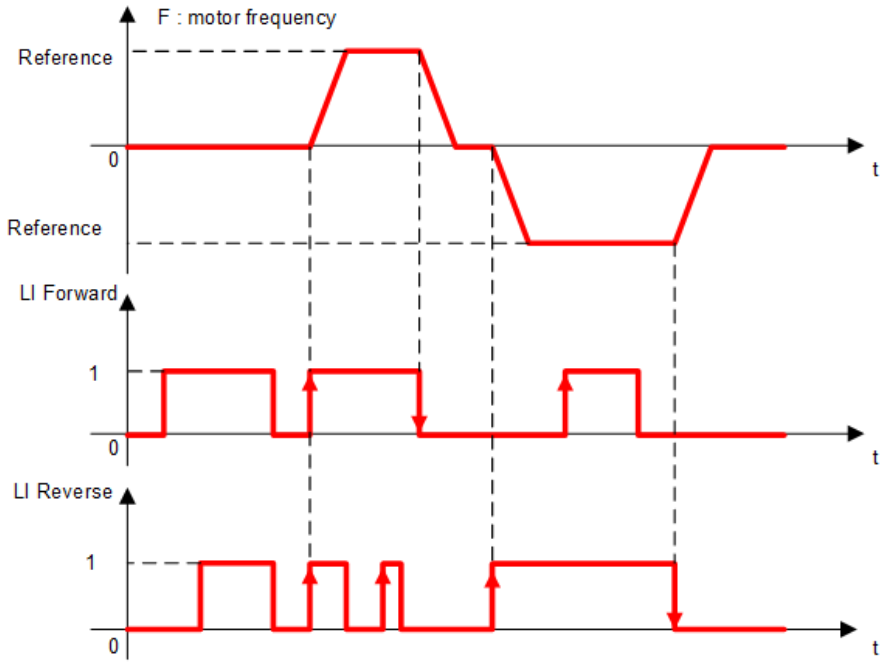
Level detection diagram with no priority



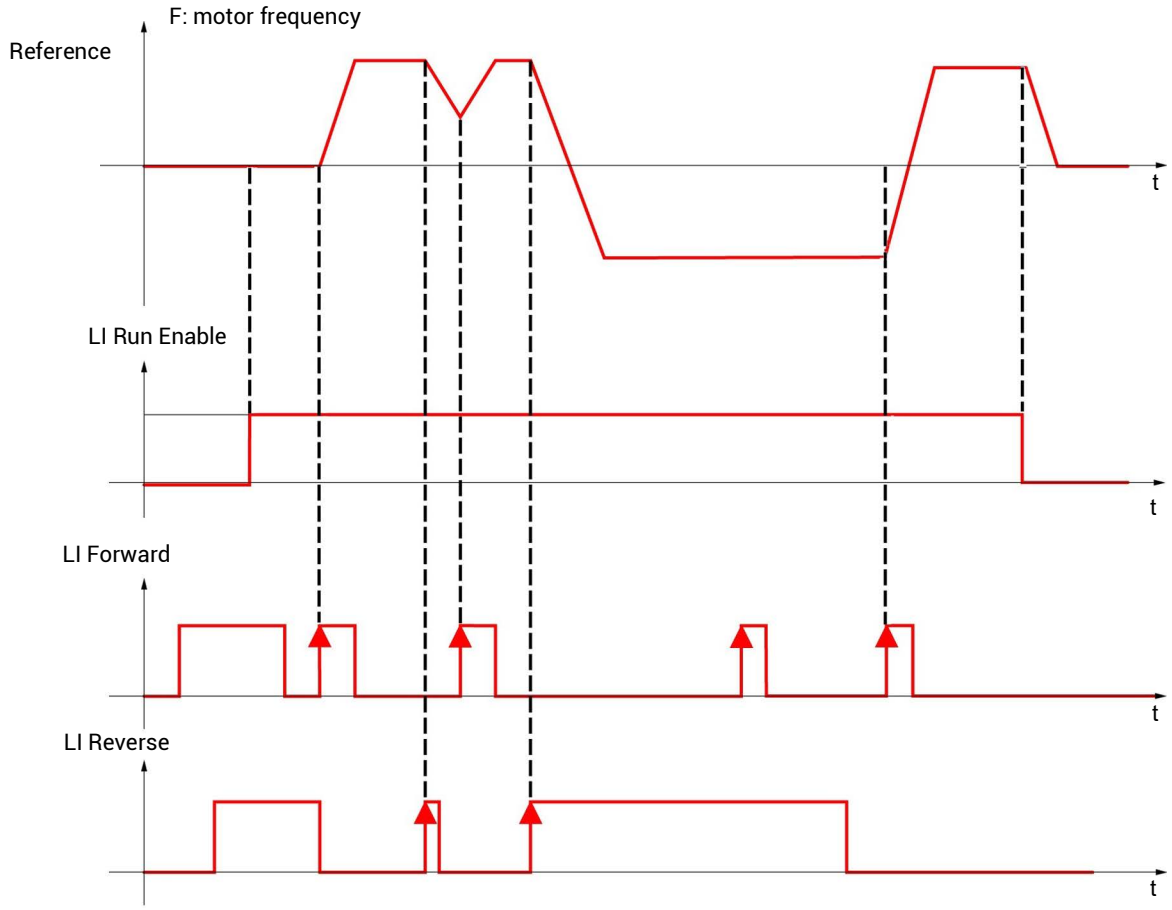
Level detection diagram with forward priority



Transition detection diagram



3-wire control diagrams page 59



Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CON>FULL>200

Code	Name/Description	Adjustment Range	Factory Setting
CONF-	**[Configuration mode]**		
FULL-	**[Complete menu]**		
200-	**[I/O MENU]**		
202	**[2-wire type control]**		01

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

Verify that the parameter setting is compatible with the type of wiring used.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

2-wire type control parameter can only be accessed if Type of control 201 page 55 is set to 2C.

- 00 Level 0/1: Run or stop determined by level state 0 or 1.
- 01 Transition: A change of state (transition or edge) is necessary to initiate operation, to help prevent accidental restarts after a power supply interruption.
- 02 Priority FW: Run or stop determined by state 0 or 1, but "forward" input takes priority over the "reverse" input.

203	**[Logic inputs type]**		00

- 00 Positive: the inputs are active (state 1) at a voltage equal to or higher than 11 V (for example +24 V terminal). They are inactive (state 0) when the drive is disconnected or at a voltage lower than 5 V.
- 01 Negative using internal supply: the inputs are active (state 1) at a voltage lower than 10 V (for example COM terminal). They are inactive (state 0) at a voltage equal to or higher than 16 V or when the drive is disconnected.
- 02 Negative using external supply: the inputs are active (state 1) at a voltage lower than 10 V (for example COM terminal). They are inactive (state 0) at a voltage equal to or higher than 16 V.

NOTE: The modification will be taken into account only at the next control power-on.

See Control connection diagrams on page 31.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CON>FULL>200

Code	Name/Description	Adjustment range	Factory setting
ConF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
200 -	**[I/O MENU]**		
204 -	**[AI1 CONFIGURATION MENU]**		
204. 0	**[AI1 type]**		5U
	This function establishes an interface between the analog input signal and drive internal value. 5U Voltage: 0-5 Vdc 10U Voltage: 0-10 Vdc 0A Current: x-y mA. Range determined by the AI1 current scaling parameter of 0% 204. 1 and AI1 current scaling parameter of 100% 204. 2 settings below. See page 60. LIU Logic input. AI1 must be wired the same way as a logic input LIx in source mode.		
204. 1	**[AI1 current scaling parameter of 0%]**	0 - 20 mA	4 mA
	Visible only if AI1 type 204. 0 is set to 0A.		
204. 2	**[AI1 current scaling parameter of 100%]**	0 - 20 mA	20 mA
	Visible only if AI1 type 204. 0 is set to 0A.		
204. 3	**[AI1 filter time]**	0 - 10 s	0 s
	Interference filtering cut-off time of the low filter.		
205 -	**[R1 CONFIGURATION MENU]**		
205. 0	**[R1 assignment]**		01
	00 Not assigned 01 No fault 02 Drive run 04 Frequency threshold reached 05 Motor frequency when max. reference value reached 512. 2 06 I threshold reached 07 Frequency reference reached 08 Motor thermal threshold reached 21 Process underload fault 22 Process overload fault 123 4-20 mA signal loss visible only if 204. 0 is set to 0A (see above). **NOTE:** Relay R1 can be assigned to upstream protection to avoid overvoltage in the drive: • Connect fault relay R1 to the contactor, see schematic page 24. • Use Relay R1 (R1 assignment 205. 0) with protection. NOTE: When R1 is assigned to Process overload or Process underload fault, the relay will active and last time duration setting by 209 or 212.		
205. 1	**[R1 status (output active level)]**		00
	00 Positive logic: active high 01 Negative logic: active low		

⚠ WARNING

LOSS OF CONTROL

Depending on the assignments and settings of the logic outputs, signal output functions may not be effective if the wiring is incorrect or inoperative.

- Do not set this parameter to 01 unless you can ensure that the signal will be available under all circumstances.
- Verify correct settings for all parameters used to set signal output functions.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>200

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
200 -	**[I/O MENU]**		
206 -	**[LO1 Configuration menu]**		
206. 0	**[LO1 assignment]**		00

This parameter is used for a remote indication of the drive status.

- 00 Not assigned
- 01 No fault
- 02 Drive run
- 04 Frequency threshold reached
- 05 Motor frequency when max. reference value reached 512.2
- 06 I threshold reached
- 07 Frequency reference reached
- 08 Motor thermal threshold reached
- 21 Process underload fault
- 22 Process overload fault
- 123 4-20 mA signal loss visible only if 204.0 is set to 0A (see above).
- 126 Auxiliary pump

NOTE: When LO1 is assigned to Process overload or Process underload fault, the logic output will active and last the time duration setting by 209 or 212.

206. 1	**[LO1 status (output active level)]**		00

- 00 Positive logic: active high
- 01 Negative logic: active low

⚠ WARNING

LOSS OF CONTROL

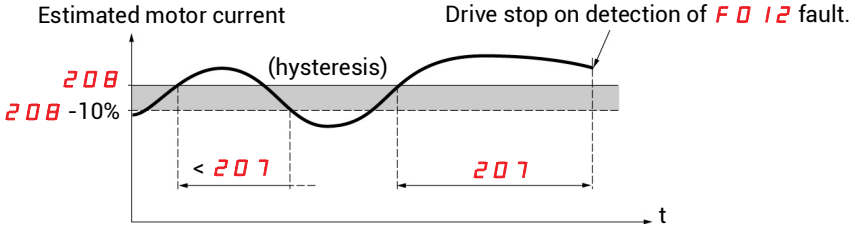
Depending on the assignments and settings of the logic outputs, signal output functions may not be effective if the wiring is incorrect or inoperative.

- Do not set this parameter to 01 unless you can ensure that the signal will be available under all circumstances.
- Verify correct settings for all parameters used to set signal output functions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

207 -	**[Process overload time delay]**	0 to 100 s	0 s

This function can be used to stop the motor in the event of an process overload. This is not a motor or drive thermal overload. If the motor current exceeds the Process overload threshold 208, a Process overload time delay 207 is activated. Once this time delay 207 has elapsed, if the current is still greater than the overload threshold 208 -10%, the drive will stop running and display Process overload.
Overload detection is only active when the system is in steady state (Actual speed reference reached).
A value of 0 will disable application overload detection.

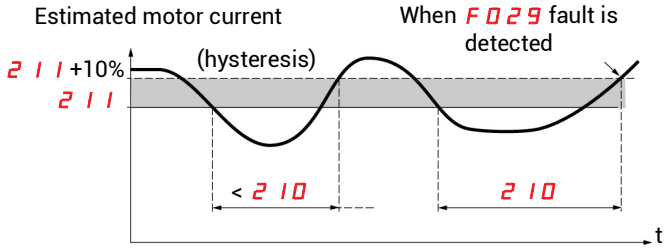


208 -	**[Process overload threshold]**	70% - 150% of 305 parameter value	90% of 305 parameter value

Visible only if Process overload time delay 207 above is not 0.
This parameter is used to detect an "application overload". 208 can be adjusted between 70 and 150% of the rated drive current. This is not the same as a motor or drive thermal overload.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>200

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
200 -	**[I/O MENU]**		
209	**[Process overload fault duration]**	0-6 min.	0 min.
	If 602.0 = 01, the drive will automatically restart after this time delay following the overload fault F012. Minimum time permitted between an overload being detected and any automatic restart. In order for an automatic restart to be possible, the maximum restart time 602.1 page 104) must exceed that of this parameter by at least one minute. Visible only if the "Overload time delay 207" above is not set to 0.		
210	**[Process underload time delay]**	0 to 100 s	0 s
	210 can be adjust between 0 to 100 s. If the motor current undershoots the underload threshold 211 for longer than the adjustable time delay 210 the drive will stop running and display F029 (Underload fault), see page 117.  Underload detection is only active when the system is in steady state (Actual speed reference reached). A value of 0 will disable application underload detection.		
211	**[Process underload threshold]**	20% to 100% of 305 parameter	60%
	Visible only if Process underload time delay 210 is not set to 0. This parameter is used to detect an application underload condition on the motor. Process underload threshold 211 can be adjusted between 20 and 100% of the rated drive current.		
212	**[Process underload fault duration]**	0-6 min.	0 min.
	If 602.0 = 01, the drive will automatically restart after this time delay following the Process under load fault F029. Minimum time permitted between an underload being detected and any automatic restart. In order for an automatic restart to be possible, the maximum restart time 602.1 page 104 must exceed that of this parameter by at least one minute. Visible only if the "Process underload time delay 210" above is not set to 0.		
213	**[Motor frequency threshold]**	0 to 400 Hz	50 or 60 Hz, Determined by drive rating
	Visible only if R1 assignment 205 page 60 or LO1 assignment 206.0 page 61 is set to 04.		
214	**[Motor current threshold]**	0 to 1.5 In (1)	In
	Visible only if R1 assignment 205 page 60 or LO1 assignment 206.0 page 61 is set to 06.		
215	**[Motor thermal state threshold]**	0 to 118% of 808	100%
	Visible only if R1 assignment 205 page 60 is set to 08. Trip threshold for motor thermal alarm (logic output or relay)		

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>200

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
200 -	**[I/O MENU]**		
216 -	**[AO1 Configuration menu]**		
216.0	**[AO1 assignment]**		00
	This parameter is used to set the value of an analog output. 00 Not assigned 129 Estimated motor current, between 0 and 2xDrive nominal current 130 Estimated motor frequency, between 0 and Maximum Frequency 131 Ramp output, between 0 and Maximum Frequency 135 PID reference value(1) , between 0% and 100% 136 PID feedback(1) , between 0% and 100% 137 PID error(1), between -5% and +5% 139 Output power, between 0 and 2xMotor nominal power 140 Motor thermal state, between 0% and 200% 141 Drive thermal state, between 0% and 200% (1) Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
216.1	**[AO1 type]**		0 A
	This parameter provides type selection for the drive analog output signal. 10U Voltage: 0-10 Vdc 0A Current: 0-20 mA 4A Current: 4-20 mA		

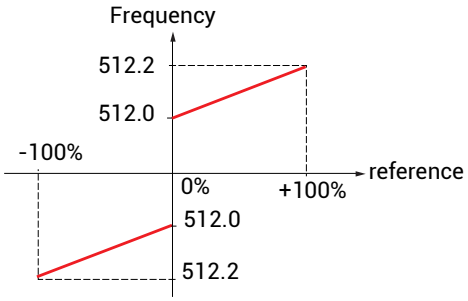
Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: **CONF>FULL>200**

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
200 -	**[I/O MENU]**		
217	**[Reference Template]**		bSd

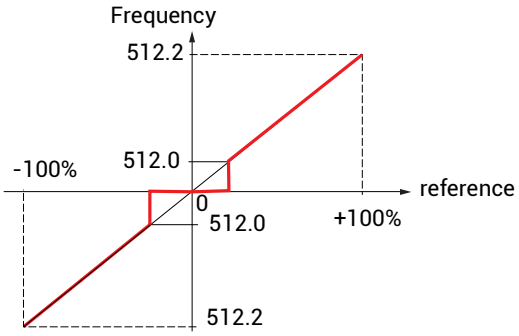
This parameter defines how the speed reference is taken into account for analog inputs only.
In the case of the PID controller, bnS and bnS0 are not applied. The limits are set by the Low Speed SI2.0 and High Speed SI2.2 parameters.

bSd Standard



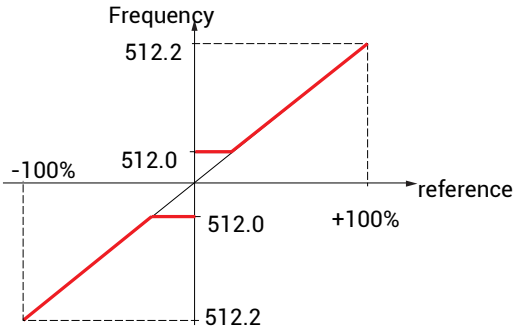
At zero reference the frequency = 512.0

bnS Deadband



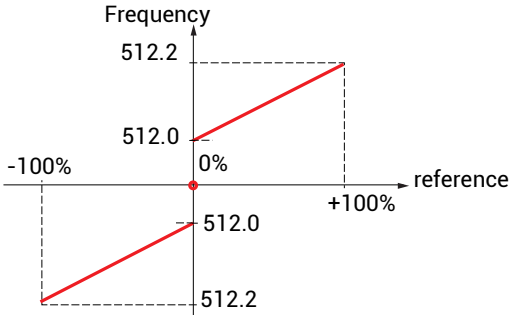
At reference = 0 to 512.0 the frequency = 0

bLS Pedestral



At zero reference to 512.0, the frequency = 512.0

bnS0 Deadband at 0%



This operation is the same as bSd Standard, except that in the following cases at zero reference, the frequency = 0: the signal is less than the minimum value, which is greater than 0 (example: 2 mA on a 4–20 mA input). The signal is greater than minimum value, which is greater than the maximum value (example: 21 mA on a 20–4 mA input)

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		

⚠ WARNING

LOSS OF CONTROL
- Fully read and understand the manual of the connected motor.
- Verify that all motor parameters are correctly set by referring to the nameplate and the manual of the connected motor.
- If you modify the value of one or more motor parameters after having performed auto-tuning, the value of Auto-tuning is reset to 00 and you must re-perform auto-tuning.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

301	**[Standard motor frequency]**		00

This parameter modifies the presets of the following parameters: Rated motor voltage 304 below, High speed 5 12.2 page 102, Motor frequency threshold 213 page 62 and Rated motor frequency 306.

00 50 Hz
01 60 Hz

NOTE:
1. This parameter must be set before performing an autotuning.
2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.

302	**[Rated motor power]**	Drive power -5 to drive power +2 according to dual rating	Determined by drive rating and dual rating

Rated motor power given on the nameplate, in kW if Standard motor frequency 301 is set to 50 Hz, in HP if Standard motor frequency 301 is set to 60 Hz.

NOTE:
1. This parameter must be set before performing an autotuning.
2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.

303	**[Rated motor cos phi]**	0.5 to 1	Determined by drive rating and dual rating

This parameter is visible only if Motor parameter choice 319 page 69 is set to [00].
If Rated motor cos phi 303 is available, Rated Motor Power 302 disappears.
Power factor (pf) is given on the motor rating plate.

NOTE:
1. This parameter must be set before performing an autotuning.
2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.

NOTE: Do not confuse this with motor "Service Factor". Setting 303 to 1 or very near to 1 may result in unsatisfactory motor operation. If the motor power factor is not indicated on the nameplate, leave this parameter at the factory default (approximately 0.80).

304	**[Rated motor voltage]**	360 to 460 V	380 V

Nominal motor voltage is given on the nameplate. If the line voltage is less than the nominal motor voltage, Rated motor voltage 304 should be set to the value of the line voltage applied to the drive terminals.

NOTE:
1. This parameter must be set before performing an autotuning.
2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.

(1) In = rated drive current

Configuration Mode - Complete menu (FULL)

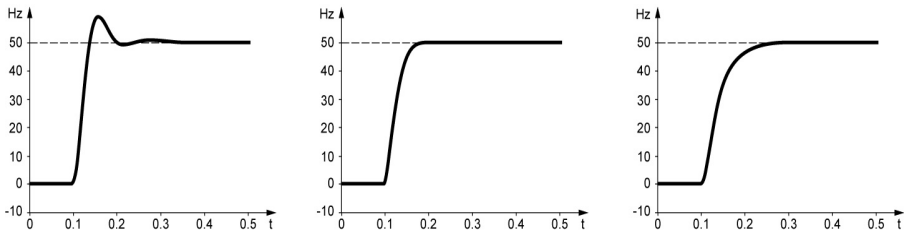
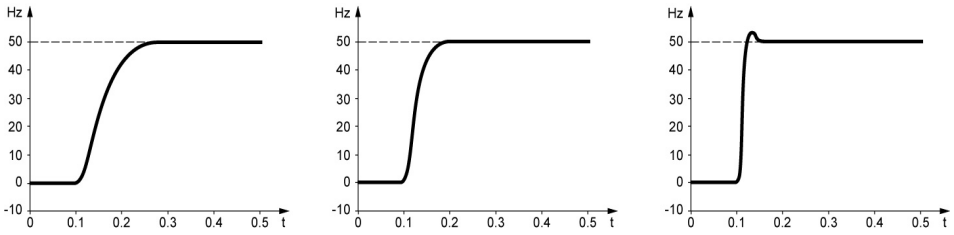
Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		
305	**[Rated motor current]**	0.25 In to 1.5 In (1)	Determined by drive rating and dual rating
	Nominal motor current is given on the nameplate. Motor thermal current 604.0 page 106 varies according to the nominal motor current 305. **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.		
306	**[Rated motor frequency]**	10 to 400 Hz	50 Hz
	Nominal motor frequency is given on the nameplate. The factory setting is 50 Hz, or preset to 60 Hz [if Standard motor frequency 301 page 65 is set to 60 Hz]. **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.		
307	**[Rated motor speed]**	0 to 24000 RPM	Determined by drive rating and dual rating
	Nominal motor speed is given on the nameplate. **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.		
308	**[Maximum frequency]**	10 to 400 Hz	50 Hz
	Maximum frequency 308 gives the upper value possible for High speed 512.2 page 102. The factory setting is 60 Hz, or preset to 72 Hz [if Standard motor frequency 301 page 65 is set to 60 Hz]. **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.		
309	**[Motor control type]**		03
	Permits selection of motor control types suitable for application and performance requirements. 00 Performance: Sensorless vector control with internal speed loop based on a voltage feedback calculation. For applications requiring high performance during starting or operation. 03 Standard: 2 point V/F control without internal speed loop. For simple applications that do not require high performance. Simple motor control law maintaining a constant Voltage Frequency ratio, permits adjustment of curve start point. This law is generally used for motors connected in parallel. Some applications using motors in parallel or with high performance requirements may require use of the "high performance" (00) control type. 06 Pump: U2/F; for dedicated use with variable torque fan and pump applications not requiring high starting torque **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.		

(1) In = rated drive current

Configuration Mode - Complete menu (FULL)

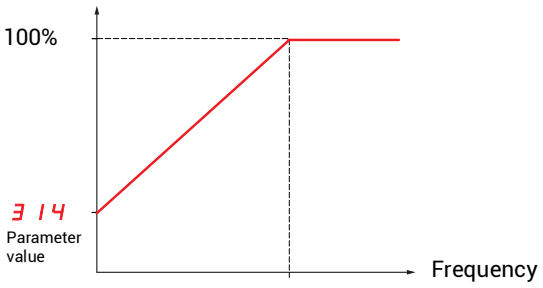
Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		
310	**[IR compensation]**	25 to 200%	100%
	Used to optimize torque at very low speed, or to adapt to special cases (for example, for motors connected in parallel, decrease IR compensation 310). If there is insufficient torque at low speed, increase IR compensation 310. Too high a value can cause the motor not to start (locking) or to change to current limiting mode.		
311	**[Slip compensation]**	0 to 150%	100%
	Visible only if Motor control type 309 page 66 is not set to 06. Used to adjust the slip compensation around the value set by the nominal motor slip, or to adjust to special circumstances (for example, for motors connected in parallel, decrease Slip compensation 311). If the set slip compensation is lower than the actual slip compensation, the motor will not run at nominal speed in a steady state but at a speed lower than the reference. If the set slip compensation is greater than the actual slip compensation, the motor speed becomes unstable.		
312	**[Frequency loop stability]**	0 to 100%	20%
	The 312 parameter can be used to reduce overshoots and oscillations at the end of acceleration. After a period of acceleration or deceleration, 312 adjusts the return value of the steady state to the dynamic value of the equipment; Too high a value can cause an extended response time. Too low a value can cause overspeed, or even instability. Low 312 parameter value Correct 312parameter value High 312 parameter value In this case, increase 312 In this case, reduce 312  Visible only if Motor control type 309 page 66 is set to 00		
313	**[Frequency loop gain]**	0 to 100%	20%
	The 313 parameter adjusts the slope of the speed increase according to the inertia of the machine being driven. Too high a value can cause overspeed, or even instability. Too low a value can cause an extended response time. Low 313 parameter value Correct 313 parameter value High 313 parameter value In this case, increase 313 In this case, reduce 313  Visible only if Motor control type 309 page 66 is set to 00.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
ConF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		
314	**[Flux Profile]**	0 to 100%	20%
	This function defines the magnetizing current at zero frequency as a % of the rated magnetizing current. Adjustment curve for PUMP law.  Visible only if Motor control type 309 page 66 is set to 06.		
315	**[Switching frequency]**	2 to 12 kHz	4 kHz
	Switching frequency range setting. In the event of overheating, the drive automatically decreases the Switching frequency range. Returns to its original value once the temperature has returned to normal.		
317	**[Motor noise reduction]**		00
	Noise refers to audible noise. Means of adjusting motor noise must be provided to satisfy environmental requirements. andom frequency modulation avoids possible noise resonance that can occur at fixed frequency. 00 No 01 Yes		

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		
318	**[Auto-tuning]**		00

⚠ WARNING

UNEXPECTED MOVEMENT
Autotuning moves the motor in order to tune the control loops.
• Only start the system if there are no persons or obstructions in the zone of operation.
Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

LOSS OF CONTROL
If you modify the value of one or more motor parameters after having performed auto-tuning, the value of Auto-tuning is reset to 00 and you must re-perform auto-tuning.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

00 No: use factory paramameters of standard motors.
01 Yes: request auto-tuning.
02 Done: auto-tuning has already been performed.

Attention:
• Auto-tuning must be performed with the motor connected and cold.
• The parameters Rated motor power 302 page 65 and Rated motor current 305 page 66 must be consistent.
• Auto-tuning is performed only if no stop command has been activated. If a freewheel stop or fast stop function has been assigned to a logic input, this input must be set to 1 (active at 0).
• Auto-tuning takes priority over any run or prefluxing commands, which will take effect after the auto-tuning sequence.
• Auto-tuning may last for 1 to 10 seconds. Do not interrupt. Wait for the display to change to 02 or 00.
• Re-perform auto-tuning after motor cables are replaced to ensure effectiveness of motor control.

NOTE: During auto-tuning, the motor operates at rated current.

319	**[Motor parameter choice]**		00

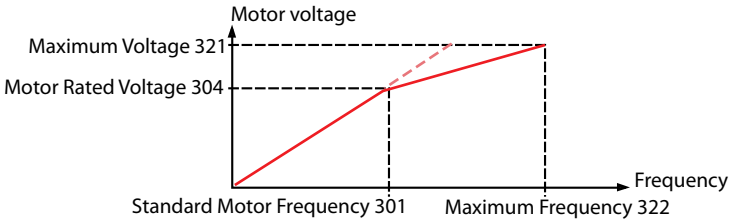
This parameter allows to choose which motor parameter will be configured (power or power factor).

00 Rated motor power page 65
01 Rated motor cos phi page 65

NOTE:
1. This parameter must be set before performing an autotuning.
2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again.

Configuration Mode - Complete menu (FULL)

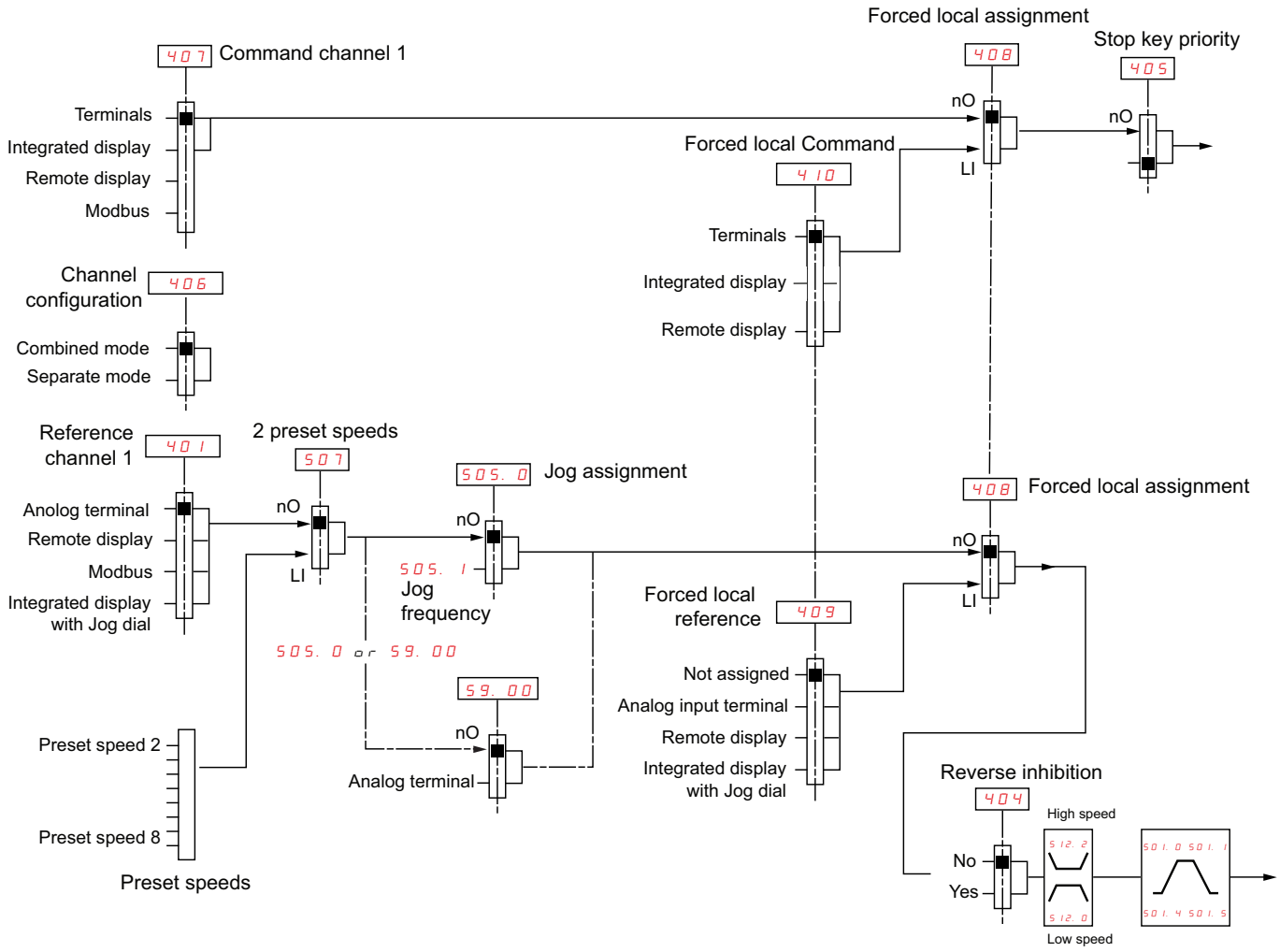
Parameters described in this page can be accessed by: CONF>FULL>300

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
300 -	**[Motor control menu]**		
320	**[Vector control 2 points]**		00
	00 [00] No 01 [00] Yes For use in the following application contexts: when the rated speed and rated frequency of the motor must be exceeded for optimization of operation performance at constant power, or when the maximum voltage of the motor must be limited to a certain value below the main voltage. The U/F diagram must therefore be modified according to the motor's work ability at maximum voltage and Top frequency.  		
321	**[Max voltage of constant power]** Visible if 320 = YES	314 parameter value ~ 460 V	380 V
322	**[Max frequency of constant power]** Visible if 320 = YES	306 parameter value ~ 400Hz	50 Hz
323	**[Dual Rating]**		01
	This parameter is used to select the default value of rated drive current and motor nameplate. This parameter cannot be modified on drive with power equal to or lower than 2.2 kW. A modification of its setting resets several parameters of the drive: - motor nameplate parameters (302, 303, 304, 305, 306, 307) - status of tune results current parameters: In (drive rating current), motor thermal current (6074.0), current limitation (5111.1 and 5111.2), motor current threshold (214) and current injections (5025, 5027, 5041). 00 Normal duty: Normal rating, dedicated mode for applications requiring slight overload (up to 1.1 In for 60 s) 01 Heavy duty: High rating, dedicated mode for applications requiring significant overload (up to 1.5 In for 60s). **NOTE:** 1. This parameter must be set before performing an autotuning. 2. Modifying this parameter resets the motor tune parameters. Auto-tuning will need to be performed again. **NOTE:** Both modes use the same hardware, the overload in normal duty is lower than the one in normal duty, consequently, the rated drive current (In) in normal duty mode is adapted to be slightly higher than the one in heavy duty mode. The default motor nameplate and other current limitation are adapted accordingly.		

Configuration Mode - Complete menu (FULL)

Control menu

Control channel diagram



Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>400

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
400 -	**[Control menu]**		
401	**[Reference channel 1]**		01
	01 Anolog terminal 163 Remote display 164 Modbus 183 Integrated display with Jog dial		
402	**[External reference value]**	-400 Hz to 400 Hz	-
403	**[Integrated display jog dial reference]**	0% to 100% of 512.2 parameter value	
	Embedded display terminal active or local force mode configured. Forced local reference 409 set to 183 and Forced local assignment 408 is not set to 00. Displays the Actual speed reference coming from the jog dial. This value is not visible in the factory settings.		
404	**[Reverse inhibition]**		00
	Inhibition of movement in the reverse direction. Does not apply to direction requests sent by logic inputs. - Reverse direction requests sent by logic inputs are taken into account. - Reverse direction requests sent by the display are not taken into account. - Reverse direction requests sent by the communication line are not taken into account. - Any reverse Actual speed reference originating from the PID, summing input etc., is interpreted as a zero reference (0 Hz). 00 No 01 Yes		
405	**[Stop key priority]**		01
2 s	This parameter can enable or disable the stop button located on the drive and remote display. Disabling the stop button is effective if the active command channel is not the drive display terminal or the remote display.		
	⚠ WARNING **LOSS OF CONTROL** The function Stop key priority 405 parameter disables the Stop keys of the drive and of the Remote Display Terminal if the setting of the parameter is 00. Only set this parameter to 00 if you have implemented appropriate alternative stop functions. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**		
	00 No: Stop inactive 01 Yes: Stop active It is advised in case this function is set to 01 to use the front door cover or the optional display cover on the "run" and "stop" keys.		
406	**[Channel configuration]**		01
	Channel configuration 406 allows the selection of: - Combined mode (command and reference come from the same channel) - Separate mode (command and reference come from different channels) 01 Combined mode 02 Separate mode		

2 s To change the assignment of this parameter, press the ENT key for 2sec.

Parameter that can be modified during operation or when stopped.

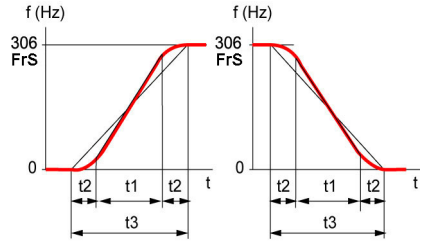
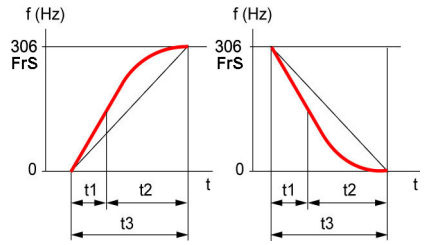
Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>400

Code	Name/Description	Adjustment range	Factory setting
CONF-	**[Configuration mode]**		
FULL-	**[Complete menu]**		
400-	**[Control menu]**		
407	**[Command channel 1]**		01
	This parameter permits selection of the command channel. 01 Terminals 02 Integrated display 03 Remote display 10 Modbus Visible only if Channel configuration 406 page 72 is set to Seperate		
408	**[Forced local assignment]**		00
	00 Not assigned LI1H LI1 active high LI2H LI2 active high LI3H LI3 active high LI4H LI4 active high LIUH LIU active high		
409	**[Forced local reference]**		00
	Visible only if Forced local assignment 408 is not set to 00 00 Not assigned 01 Analog terminal 163 Remote display 183 Integrated display with Jog dial		
410	**[Forced local Command]**		02
	Visible only if Forced local assignment 408 is not set to 00 00 Terminal 01 Integrated display 03 Remote display		

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>400

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
501 -	**[Ramp menu]**		
501.0	**[Acceleration]**	0.0 s to 999.9 s	3.0 s
	Acceleration time between 0 Hz and the Rated motor frequency 306 page 66. Make sure this value is compatible with the inertia being driven.		
501.1	**[Deceleration]**	0.0 s to 999.9 s	3.0 s
	Time to decelerate from the Rated motor frequency 306 page 66 to 0 Hz. Make sure this value is compatible with the inertia being driven.		
501.2	**[Ramp shape assignment]**		00
	00 Linear 01 S Shape 02 U Shape		
	S Shape  The rounding coefficient is fixed, wherein t1 = 0.6 x set ramp time (linear) t2 = 0.4 x set ramp time (round) t3 = 1.4 x ramp time		
	U Shape  The rounding coefficient is fixed, wherein t1 = 0.5 x set ramp time (linear) t2 = set ramp time (round) t3 = 1.5 x ramp time		
501.3	**[Ramp switching commutation]**		00
	00 Not assigned L1H LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LuH LIU active high L1L LI1 active low L2L LI2 active low L3L LI3 active low L4L LI4 active low LuL LIU active low See LI assignment information on page 53.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>501

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
501 -	**[Ramp menu]**		
501.4	**[Acceleration 2]**	0.0 to 999.9 s	5.0 s
	Visible only if Ramp switching commutation 501.3 page 74 is not set to 00. Second acceleration ramp time, adjustable from 0.0 to 999.9 s This ramp becomes the active ramp only when PID is used to perform start and wake-up phases. See PID: wake up level page 88.		
501.5	**[Deceleration 2]**	0.0 to 999.9 s	5.0 s
	Visible only if Ramp switching commutation 501.3 page 74 is not set to 00. Second deceleration ramp time, adjustable from 0.0 to 999.9 s		
501.6	**[Decel Ramp Adaptation assignment]**		01
	00 Function inactive. The drive will decelerate based on normal deceleration time settings. This setting is compatible with optional dynamic braking (if used). 01 This function automatically increases deceleration time when stopping or reducing the speed of high inertia loads to help prevent DC bus overvoltage or overbraking. 02 Motor Braking: This mode allows the drive to attempt the most rapid stop possible without the use of a dynamic brake resistor. It uses motor losses to dissipate energy generated by braking. This function may be incompatible with positioning. This function should not be used when an optional braking resistor and module are being used. Attention: When using a braking resistor set 501.6 to 00.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>502

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
502 -	**[Stop configuration menu]**		
502. 0	**[Type of stop]**		00
	Stop mode on disappearance of the run command or appearance of a stop command. 00 Ramp stop 03 DC injection stop 08 Fast stop 13 Freewheel stop		
502. 1	**[Freewheel stop assignment]**		00
	his stop type is activated when the input or corresponding register bit changes to 0. If the input returns to state 1 and the run command is still active, the motor will only restart if Type of control 201 page 55 = 2C and 2-wire type control 202 page 59 = 00 or 02. If not, a new run command must be sent. 00 Not assigned LIL LI1 active Low to stop L2L LI2 active Low to stop L3L LI3 active Low to stop L4L LI4 active Low to stop LuL LIU active Low to stop		
502. 2	**[Fast stop assignment]**		00
	00 Not assigned LIL LI1 active Low to stop L2L LI2 active Low to stop L3L LI3 active Low to stop L4L LI4 active Low to stop LuL LIU active Low to stop		
502. 3	**[Fast stop Ramp divider]**	1 to 10	4
	Visible only if Fast stop assignment 502.2 page 78 is not set to 00 or 502.0 is set to 08 Fast stop page 76. When stop requests are sent the active ramp time [Deceleration 501.1 page 74 or Deceleration 2 501.5 page 75] is divided by this coefficient.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>502

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
502 -	**[Stop configuration menu]**		
502.4	**[DC injection assignment]**		00

⚠ WARNING

UNINTENDED MOVEMENT
- Do not use DC injection to generate holding torque when the motor is at a standstill.
- Use a holding brake to keep the motor in the standstill position.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

DC injection is activated when the input switches to 0. If the input returns to state 1 and the run command is still active, the motor will only restart if Type of control 201 page 55 = 00 and 2-wire type control 202 page 202 = 00 or 02. If not, a new run command must be sent.

This parameter is forced to 00 if Type of stop 502.0 is set to 08 page 76

00	Not assigned
LIH	LI1 active high
L2H	LI2 active high
L3H	LI3 active high
L4H	LI4 active high
LUH	LIU active high (AI1 used as logic input: AI1 type 204.0 sets to LIU)

502.5	**[DC injection level]**	0.1*In to 1.41*In (1)	0.64*In (in A)

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time.

Failure to follow these instructions can result in equipment damage.

Level of DC injection braking current activated via digital input or selected as stop mode. This parameter can be accessed if DC injection assignment 502.4 is set to a value different from 00 or if Type of stop 502.0 is set to DC injection stop 03.

NOTE: this setting is independent from the AUTO DC INJECTION MENU 504 - function.

502.6	**[IDC injection time for DCLI]**	0.1 s to 30 s	0.5 s

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time.

Failure to follow these instructions can result in equipment damage.

Maximum current injection time DC injection level 502.5 After this time, the injection current becomes DC injection level 2 502.7

This parameter can be accessed if DC injection assignment 502.4 is set to a value different from 00 or if Type of stop 502.0 is set to DC injection stop 03.

NOTE: this setting is independent from the AUTO DC INJECTION MENU 504 - function.

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>502

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
502 -	**[Stop configuration menu]**		
502.1	**[DC injection level 2]**	0.1*In to DC injection level 502.5 (1)	0.5*In (in A)

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time.
Failure to follow these instructions can result in equipment damage.

Injection current activated by digital input or selected as stop mode once period IDC injection time for DCLI 502.6 has elapsed.
This parameter can be accessed if DC injection assignment 502.4 is set to a value different from 00 or if Type of stop 502.0 is set to DC injection stop 03.
NOTE: this setting is independent from the AUTO DC INJECTION MENU 504 - function.

502.8	**[Injection standstill braking time]**	0.1 s to 30 s	0.5 s

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time.
Failure to follow these instructions can result in equipment damage.

Maximum injection time for DC injection level 2 502.1, selected as stop mode only.
This parameter can be accessed if Type of stop 502.0 is set to DC injection stop 03.
NOTE: this setting is independent from the AUTO DC INJECTION MENU 504 - function.

503	**[Reverse direction]**	00

LI1 - LI4: choice of the input assigned to the reverse command.
- 00 Function inactive
- LI1H LI1 active high
- LI2H LI2 active high
- LI3H LI3 active high
- LI4H LI4 active high
- LIUH LIU active high

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>504

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
504 -	**[Auto DC injection menu]**		
504.0	**[Automatic DC injection]**		01

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
If the parameter 504.0 Automatic DC injection is set to 02, DC injection is always active, even if the motor does not run.
Verify that using this setting does not result in unsafe conditions.
Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNINTENDED MOVEMENT
- Do not use DC injection to generate holding torque when the motor is at a standstill.
- Use a holding brake to keep the motor in the standstill position.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

00	No DC injected current
01	Time limited DC injection
02	Continuous DC injection

504.1	**[Automatic DC injection current]**	0 to 120% of Rated motor current 305	70% of Rated motor current 305 (in A)

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time in order to avoid overheating and damage to the motor.
Failure to follow these instructions can result in equipment damage.

Visible only if Automatic DC injection 504.0 is not set to 00.
Injection current on stopping and continuous DC injection.

504.2	**[Automatic DC injection time]**	0.1 to 30 s	0.5 s

NOTICE

OVERHEATING
Verify that the connected motor is properly rated for the DC injection current to be applied in terms of amount and time in order to avoid overheating and damage to the motor.
Failure to follow these instructions can result in equipment damage.

Visible only if Automatic DC injection 5504.0 is not set to 00.
Injection time on stopping.

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

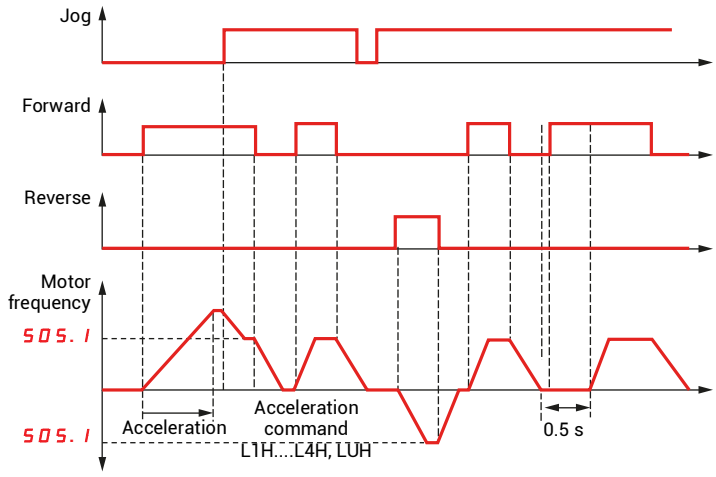
Parameters described in this page can be accessed by: CONF>FULL>500

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
505.0	**[Jog assignment]**		00

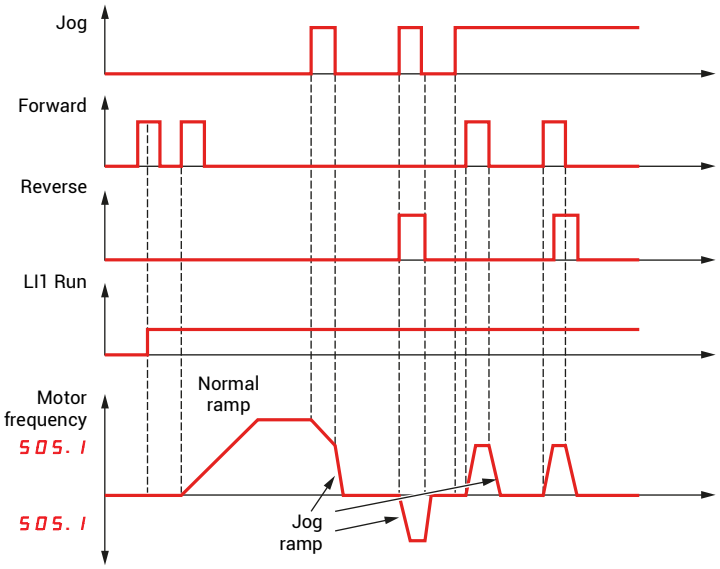
This parameter employs a 2 or 3-wire control related logic input, providing step by step control of motor running. Acceleration and deceleration ramps taken into account in the Jog function are 0.1 s.

- 00 Function inactive
- L1H LI1 active high
- L2H LI2 active high
- L3H LI3 active high
- L4H LI4 active high
- LUH LIU active high

2 wire type control



3-wire control



505.1	**[Jog Frequency]**	0 to 10 Hz	5 Hz

Reference in jog function

Configuration Mode - Complete menu (FULL)

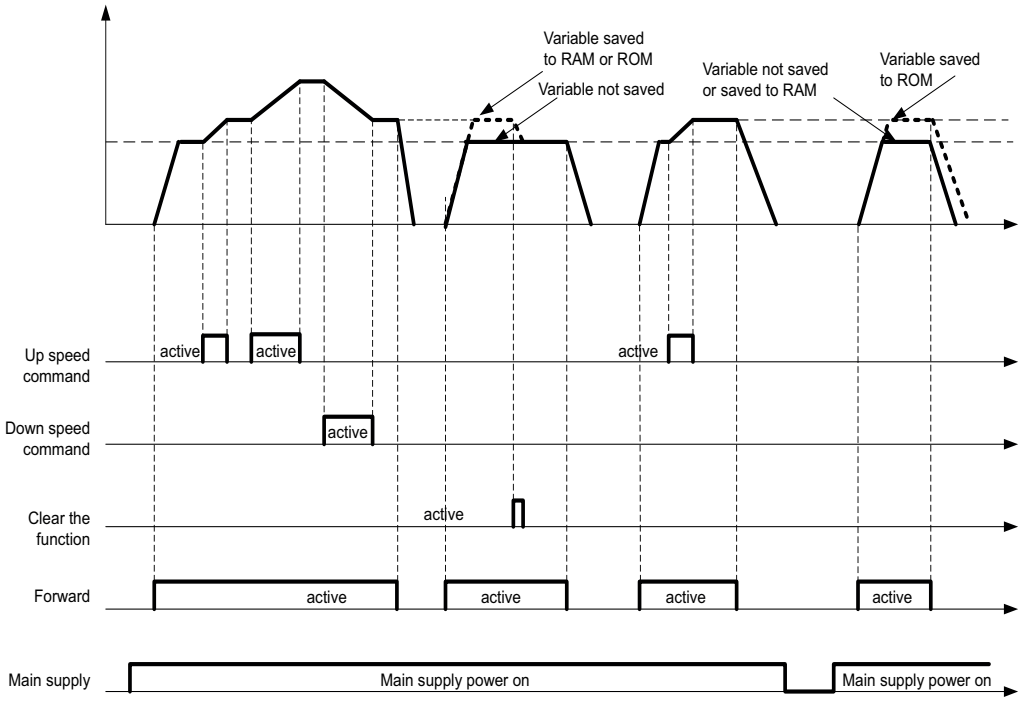
Parameters described in this page can be accessed by: CONF>FULL>500>506

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
506 -	**[Speed up and down]**		
506.0	**[Up speed command]**		00

00 Function inactive
LI1H LI1 active high
LI2H LI2 active high
LI3H LI3 active high
LI4H LI4 active high
LIUH LIU active high

506.1	**[Down speed command]**		00

00 Function inactive
LI1H LI1 active high
LI2H LI2 active high
LI3H LI3 active high
LI4H LI4 active high
LIUH LIU active high



506.2	**[Store]**		00

Up speed/down speed command will change the initial speed reference. Eventually it produces an overall "speed increment". This speed increment accumulates over time depending on the actions of Lix and Liy.
It is therefore necessary to keep a record of speed incrementation when changing speed reference.
Visible only if parameter 506.0 and 506.1 are configured.

00 Do not save. Variables not saved after the RUN command has disappeared.
01 Save to RAM. Variables saved to RAM after STOP command ends and disappear when power off.
02 Save to ROM. Variables saved to ROM when power off.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>506

Code	Name/Description	Adjustment range	Factory setting
CONF	**[Configuration mode]**		
FULL	**[Complete menu]**		
500	**[Function menu]**		
506	**[Speed up and down]**		
506.3	**[Clear the function]**		00

When the CLEAR command is activated, acceleration and deceleration commands are deactivated. All speed increments are reset when the CLEAR command is activated, regardless of the save method used.
Visible only if parameter 506.0 and 506.1 are configured.

00	Function inactive
LI1H	LI1 active high
LI2H	LI2 active high
LI3H	LI3 active high
LI4H	LI4 active high
LIUH	LIU active high
159	The function is cleared when 159 acceleration and deceleration commands activate simultaneously.

506.4	**[Reactivity of +/- speed around ref.]**	0 - 100%	0%

An experience value between 0 to 100% is used to change the rapidity of response for acceleration and deceleration command inputs.
Visible only if parameters 506.0 and 506.1 are configured.

Preset speeds

2, 4, or 8 speeds can be preset, requiring 1, 2 or 3 logic inputs respectively.

Combination table for preset speed inputs

8 speeds LI (507.2)	4 speeds LI (507.1)	2 speeds LI (507.0)	Speed reference
0	0	0	Preset speed 1
0	0	1	Preset speed 2
0	1	0	Preset speed 3
0	1	1	Preset speed 4
1	0	0	Preset speed 5
1	0	1	Preset speed 6
1	1	0	Preset speed 7
1	1	1	Preset speed 8

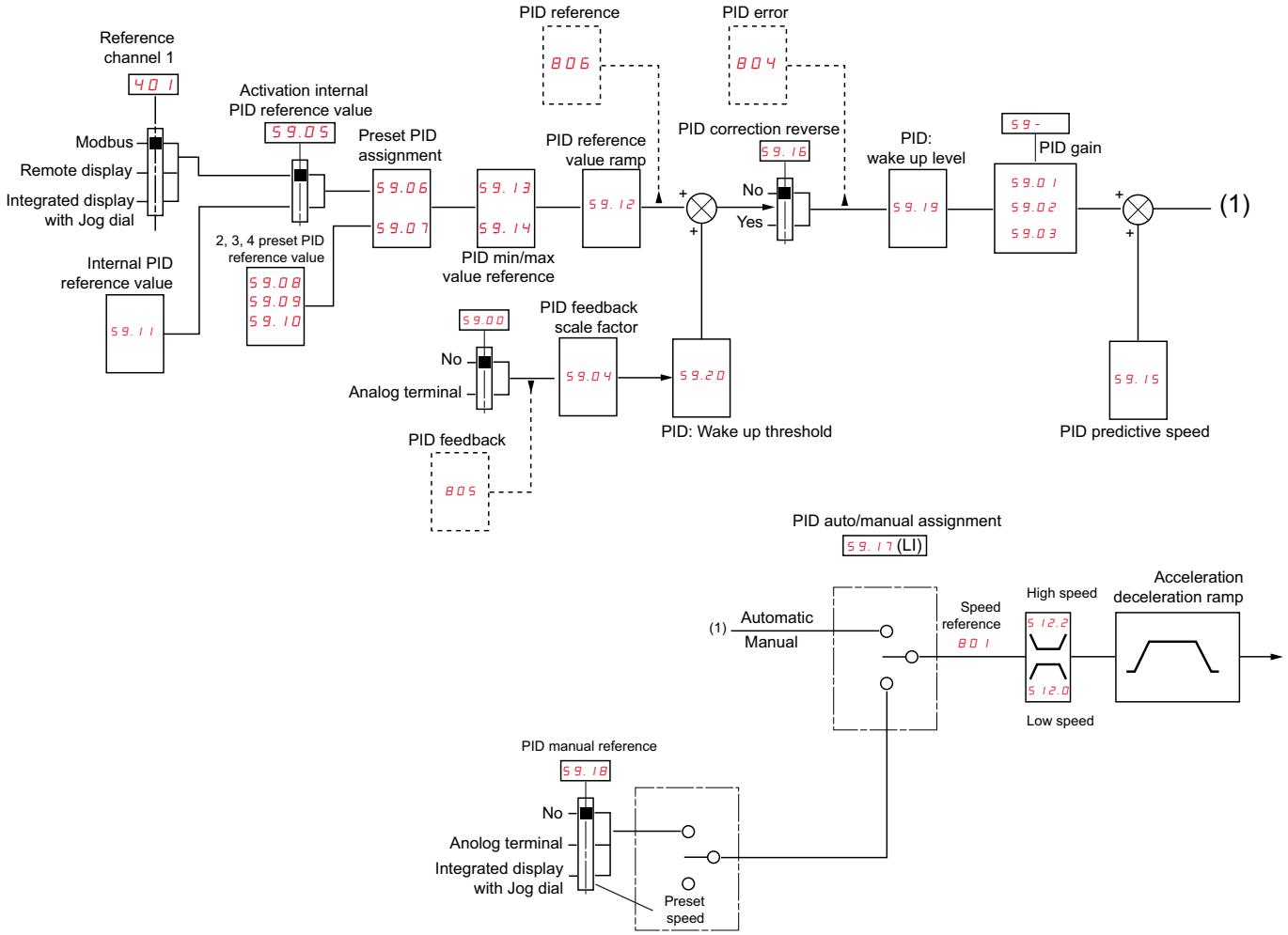
Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>507

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
507 -	**[Preset speed menu]**		
507.0	**[2 preset speeds]** 00 Function inactive LI1H LI1 high activation level LI2H LI2 active high LI3H LI3 active high LI4H LI4 active high LIUH LIU active high		00
507.1	**[4 preset speeds]** As 507.0		00
507.2	**[8 preset speeds]** As 507.0		00
507.3 ↻	**[Preset speed 2]** Visible only if 2 preset speeds 507.0 is not set to 00.	0 to 400 Hz	10 Hz
507.4 ↻	**[Preset speed 3]** Visible only if 4 preset speeds 507.1 is not set to 00.	0 to 400 Hz	15 Hz
507.5 ↻	**[Preset speed 4]** Visible only if 2 preset speeds 507.0 and 4 preset speeds 507.1 are not set to 00.	0 to 400 Hz	20 Hz
507.6 ↻	**[Preset speed 5]** Visible only if 8 preset speeds 507.2 is not set to 00.	0 to 400 Hz	25 Hz
507.7 ↻	**[Preset speed 6]** Visible only if 2 preset speeds 507.0 and 8 preset speeds 507.2 are not set to .00	0 to 400 Hz	30 Hz
507.8 ↻	**[Preset speed 7]** Visible only if 4 preset speeds 507.1 and 8 preset speeds 507.2 are not set to 00.	0 to 400 Hz	35 Hz
507.9 ↻	**[Preset speed 8]** Visible only if 2 preset speeds 507.0, 4 preset speeds 507.1 and 8 preset speeds 507.2 are not set to 00.	0 to 400 Hz	40 Hz
508 ↻	**[Skip frequency]** This parameter prevents prolonged operation within an adjustable range around 508 frequency of ±1 Hz. This function can be used to prevent a critical speed which would cause resonance being reached. Setting the function to 0 renders it inactive.	0 to 400 Hz	0 Hz

↻ Parameter that can be modified during operation or when stopped.

PID diagram


PID reference
PID error
Reference channel 1
401
806
804
Activation internal PID reference value
59.05
Preset PID assignment
PID reference value ramp
PID correction reverse
59.16
PID: wake up level
59.19
59.-
PID gain
59.01
59.02
59.03
Modbus
Remote display
Integrated display with Jog dial
59.06
59.07
59.13
59.14
59.12
No
Yes
(1)
2, 3, 4 preset PID reference value
59.08
59.09
59.10
Internal PID reference value
59.11
PID min/max value reference
59.00
PID feedback scale factor
No
Analog terminal
59.04
59.20
PID: Wake up threshold
59.15
PID predictive speed
PID feedback
805
PID auto/manual assignment
59.17 (LI)
(1)
Automatic
Manual
Speed reference
801
High speed
512.2
512.0
Low speed
Acceleration deceleration ramp
PID manual reference
59.18
No
Anolog terminal
Integrated display with Jog dial
Preset speed

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>59

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
59 -	**[PID menu]**		
59.00	**[PID feedback assignment]** 00 Not assigned 01 Analog terminal. Choice not possible if 401 is set to 01.		00
59.01	**[PID proportional gain]** Visible only if PID feedback assignment 59.00 is not set to 00.	0.01 to 100	1
59.02	**[PID integral gain]** Visible only if PID feedback assignment 59.00 is not set to 00.	0.01 to 100	1
59.03	**[PID derivative gain]** Visible only if PID feedback assignment 59.00 is not set to 00.	0.00 to 100.00	0.00
59.04	**[PID feedback scale factor]** This parameter gives the relation between process range and feedback range. Visible only if PID feedback assignment 59.00 is not set to 00.	0.1 to 100.0	1.0
59.05	**[Activation internal PID reference value]** Visible only if PID feedback assignment 59.00 is not set to 00. 00 No 01 Yes		00
59.06	**[2 preset PID assignment]** Visible only if PID feedback assignment 59.00 is not set to 00. 00 Not assigned LIH LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LuH LIU active high		00

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>59

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
59 -	**[PID menu]**		
59.07	**[4 preset PID assignment]**		00
	Visible only if PID feedback assignment 59.00 page 85 is not set to 00. 00 None LIH LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LUH LIU active high Before assigning 4 preset PID assignment 59. 07, 2 preset PID assignment 59. 06 page 85 must be assigned.		
59.08	**[2 Preset PID reference value]**	0 to 100%	25%
	Visible only if PID feedback assignment 59.00 page 85 and 2 preset PID assignment 59.06 page 85 are not set to 00.		
59.09	**[3 Preset PID reference value]**	0 to 100%	50%
	Visible only if PID feedback assignment 59.00 page 85 and 4 preset PID assignment 59.07 page 86 are not set to 00.		
59.10	**[4 Preset PID reference value]**	0 to 100%	75%
	Visible only if PID feedback assignment 59.00 page 85, 2 preset PID assignment 59.06 and 4 preset PID assignment 59.07 page 86 are not set to 00.		
59.11	**[Internal PID reference value]**	0 to 100%	0%
	Visible only if PID feedback assignment 59.00 page 85 is not set to 00 and Activation internal PID reference value 59.05 page 86 is set to 01 or Reference channel 1 401 page 72 is set to 163.		
59.12	**[PID reference value ramp]**	0 to 99.9 s	0 s
	Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
59.13	**[PID min value reference]**	0 to 100%	0%
	Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
59.14	**[PID max value reference]**	0 to 100%	100%
	Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
59.15	**[PID predictive speed]**	0.1 to 400 Hz	no
	This parameter allows direct attainment of a set speed reference. Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>59

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
59 -	**[PID menu]**		
501.4	**[Acceleration 2]**	0.0 to 999.9 s	5.0 s
	This parameter only can be activated when the system is starting. Second acceleration ramp time, adjustable from 0.1 to 999.9 s. The time required to accelerate from 0 to Rated motor frequency 306 page 66. Make sure that this value is compatible with the inertia being driven Visible only if PID feedback assignment 59.00 page 85 and PID predictive speed 59. 15 page 86 are not set to 00.		
59.16	**[PID correction reverse]**		00
	This parameter will reverse the internal error value of PID system. 00 No, negative speed 01 Yes, no negative speed 02 No, allow negative speed 03 Yes, allow negative speed Visible only if PID feedback assignment 59.00 page 85 is not set to 00 Negative speed possible only if: Low speed 512.0 is set to 00 Reverse inhibition 404 is set to 00		
59.17	**[PID auto/manual assignment]**		00
	At state 0 of input, PID is active. At state 1 of input, manual run is active. 00 No LI1H LI1 active high LI2H LI2 active high LI3H LI3 active high LI4H LI4 active high LIUH LIU active high Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
59.18	**[PID manual reference]**		00
	This parameter can disable the PID and enable the standard manual reference. 00 No 01 Analog terminal 183 Integrated display with Jog dial Visible only if PID feedback assignment 59.00 page 85, and PID auto/manual assignment 59. 17 page 87 are not set to 00.		

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>59

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
59 -	**[PID menu]**		
512.1	**[Low speed operating time]**	0.1 to 999.9 s	00
	A motor stop is requested automatically following a defined period of operation at Low speed 512.0 page 101. The motor restarts if the frequency reference is greater than Low speed 512.0 and if a run command is still present. **NOTE:** 00 value corresponds to an unlimited period. Visible only if PID feedback assignment 59.00 page 85 is not set to 00.		
59.19	**[PID: wake up level]**	0 to 100%	0%
	If PID functions and Low speed operating time 512.1 are set at the same time, the PID regulator may try to set a speed lower than Low speed 512.0. This will result in unwanted operations consisting of starting, running at Low speed 512.0, stopping and so on. Parameter PID: wake up level 59.19 can be used to set a minimum PID error threshold to restart after a prolonged stop below Low speed 512.0. Visible only if PID feedback assignment 59.00 page 85 and Low speed operating time 512.1 page 101 are not set to 00.		
59.20	**[PID: Wake up threshold]**	0 to 100%	0%
	If PID correction reverse 59.16 page 87 is set to no, this parameter can be used to set the PID feedback threshold. Following a stop caused by exceeding the maximum time at low speed 512.1, the PID regulator is reactivated (wake-up) when this threshold is exceeded. If 59.16 is set to 01, the PID regulator is reactivated (wake-up) when this threshold is exceeded, following a stop caused by exceeding the maximum time at low speed 512.1. Visible only if PID feedback assignment 59.00 page 85 and Low speed operating time 512.1 page 101 is not set 00.		
59.21	**[Sleep offset threshold]**	0 to 512.2	0 Hz
	0 ~ 512.2		
59.22	**[PID feedback supervision threshold]**	0 - 100%	0
	0 - 100%		
59.23	**[PID supervision function time delay]**	0 - 600s	0 s
	0 - 600s		
59.24	**[Maximum frequency detection Hysteresis]**	0 to 512.2	0 Hz
	0 ~ 512.2		
59.25	**[PID feedback supervision]**		01
	00 Fault and freewheel stop 04 Fall back speed		
59.26	**[Fall back speed]**	0 to 512.2	0 Hz
	0~ high speed frequency (*0).		

Parameter that can be modified during operation or when stopped.

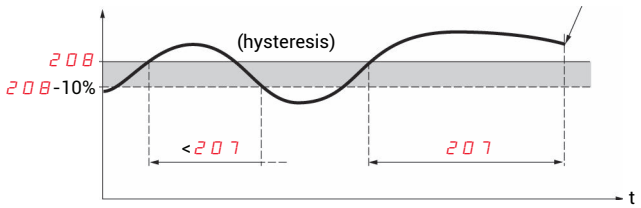
Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>510

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
510 -	**[Pump sub menu]**		
207	**[Process overload time delay]**	0-100 s	5 s

This function can be used to stop the motor in the event of an process overload. This is not a motor or drive thermal overload. If the motor current exceeds the Process overload threshold 208, a Process overload time delay 207 is activated. Once this time delay 207 has elapsed, if the current is still greater than the overload threshold 208 -10%, the drive will stop running and display Process overload.
Overload detection is only active when the system is in steady state (Actual speed reference reached).
A value of 0 will disable application overload detection

Estimated motor current — Drive stop on detection of F012 fault



208	**[Process overload threshold]**	70% - 150% of 305 parameter value 70% - 150%	90% of 305 parameter value

Visible only if Process overload time delay 207 above is not 0.
This parameter is used to detect an "application overload". 208 can be adjusted between 70 and 150% of the rated drive current. This is not the same as a motor or drive thermal overload.

209	**[Process overload fault duration]**	0 - 6 min	0 min

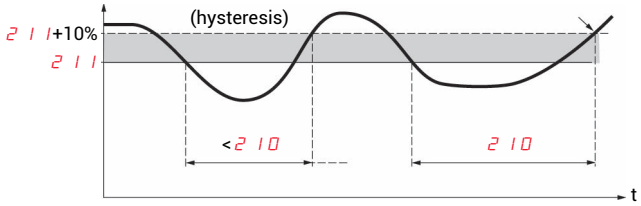
If 602. 0=01, the drive will automatically restart after this time delay following the overload fault F012.
Minimum time permitted between an overload being detected and any automatic restart.
In order for an automatic restart to be possible, the maximum restart time 602. 1 page 104 must exceed that of this parameter by at least one minute.

Visible only if the "Overload time delay 207" above is not set to 0.

210	**[Process underload time delay]**	0 to 100 s	0 s

210 can be adjust between 0 to 100 s
If the motor current undershoots the underload threshold 211 for longer than the adjustable time delay
210, the drive will stop running and display F029 (Underload fault), page 117.

Estimated motor current — When F029 fault is detected



Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>510

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
510 -	**[Pump sub menu]**		
211	**[Process Underload threshold]**	20%-100%	60%
	Visible only if Process underload time delay 210 is not set to 0. This parameter is used to detect an application underload condition on the motor. Process underload threshold 211 can be adjusted between 20 and 100% of the rated drive current.		
212	**[Process underload fault duration]**	0 - 6 min	0 min
	If 602. 0=01, the drive will automatically restart after this time delay following the Process underload fault F029. Minimum time permitted between an underload being detected and any automatic restart. In order for an automatic restart to be possible, the maximum restart time 602. 1 page 104 must exceed that of this parameter by at least one minute. Visible only if the "Process underload time delay 210" above is not set to 0.		
510.0	**[Selecting operating mode]**		
	00 No: single frequency conversion mode 01 Yes: single frequency conversion combined with auxiliary pump mode If 510.0 = [01], digital output Lo will automatically assign value pump switching.		
510.1	**[Starting frequency of the auxiliary pump]**	0 - 308 parameter value	512.2 parameter value
	The auxiliary pump will start if this frequency is exceeded and after the pump start time delay (value of 510.2).		
510.2	**[Time delay before starting auxiliary pump]**	0-999.9s	2 s
	This time avoids the effects of transient pressure fluctuations and so avoids vibrations generated during pump starting and stopping.		
510.3	**[Auxiliary pump ramp reaching]**	0-999.9s	2 s
510.4	**[Auxiliary pump stop frequency]**	0- 308 parameter value	0 Hz
	The auxiliary pump will stop below this frequency after the auxiliary pump stop delay (value of 510.5).		

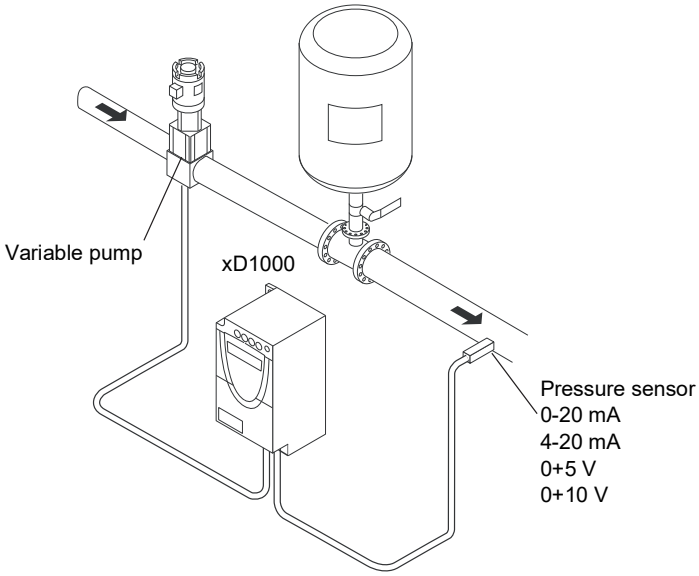
Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by:	CONF>FULL>500>510

Code	Name/Description	Adjustment range	Factory setting
CONF -	[Configuration mode]		
FULL -	[Complete menu]		
500 -	[Function menu]		
510 -	[Pump sub menu]		
510.5	[Auxiliary pump stop time delay]	0-999.9 s	2 s
	This time avoids the effects of transient pressure fluctuations and so avoids vibrations generated during pump starting and stopping.		
510.6	[Auxiliary pump stop ramp]	0-999.9 s	2 s
510.7	[Zero flow detection period]	0 - 20 min	0 min
	Function inactive if value is 0.		
510.8	[Zero flow detection activation threshold]	0 to 400 Hz	0 Hz
	Below this threshold function activated if 510.7 value >0 and the auxiliary pump is stopped.		
510.9	[Zero flow detection offset]	0 to 400 Hz	0 Hz

Architecture of the pumping installation

Single variable mode - 1 single variable speed pump



Enter the values given on the motor rating plate in the Motor control menu 300-

First level adjustment parameters

50 1.0 Acceleration: 0.7 s
50 1.1 Deceleration: 0.7 s
5 12.0 Low speed: 30 Hz
5 12.2 High speed: 60 Hz

Analog input menu AIt

204.0 Scale of analog input AI1: 0-20 mA

Motor control menu drC

311 Slip compensation: 0%
313 Frequency loop gain: 70%
310 IR compensation: 0%

Application functions menu FUn

202 2-wire type control: LEL

PI sub-menu

59.00 Assignment of the PI function feedback: AI1
59.01 PI regulator proportional gain: 5.00
59.02 PI regulator integral gain: 8.00
59.11 Internal PI regulator reference: 39%
59.19 Restart error threshold: 40%
59.25 Supervision of the PI regulator function: LFF
59.22 PI feedback supervision threshold: 17%
59.23 PI feedback supervision function time delay: 1 s
59.26 Fallback speed: 50 Hz

Pump sub-menu PMP

5 10.7 Zero flow detection: 1 min
5 10.7 Zero flow detection activation threshold: 50 Hz
5 10.9 Zero flow detection offset: 5 Hz
5 12.11 Sleep threshold operating time: 3 s
59.15 Quick start threshold: 25 Hz
59.21 Sleep threshold offset: 10 Hz

Automatic DC injection sub-menu AdC

504.0 Automatic DC injection assignment: nO

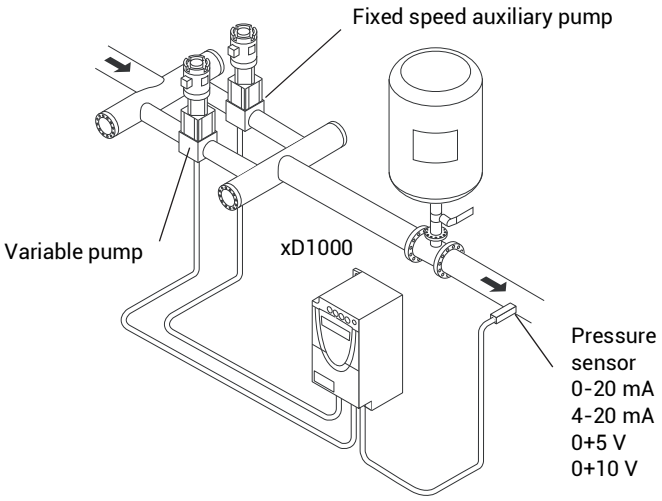
Automatic restart function Atr

602.0 Automatic restart: YES

Fault menu 600-

208 Process Overload threshold: 11%
209 Process overload fault duration: 1
59.24 Frequency hysteresis reached: 2 Hz

Single variable with auxiliary pump mode - 1 variable speed pump (variable pump) and one fixed speed pump (auxiliary pump)

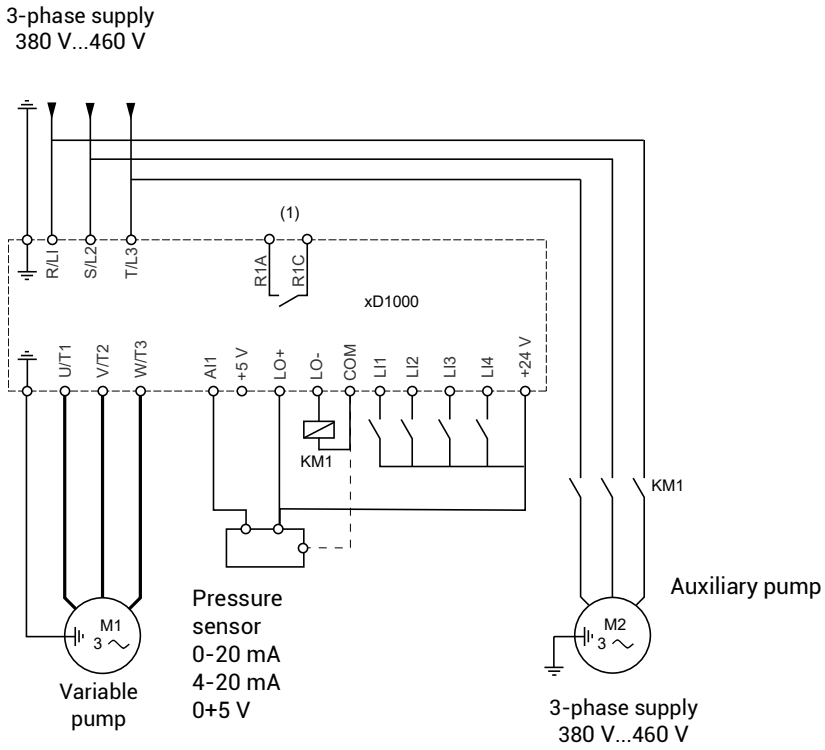


The auxiliary pump is controlled by the xD1000 via logic output LO.

Enter the values given on the motor rating plate in the Motor control menu 300-

First level adjustment parameters
50 1.0 Acceleration: 0.1 s
50 1.1 Deceleration: 0.1 s
512.0 Low speed: 35 Hz
Analog input menu 204-
204.0 Scale of analog input AI1: 0-20 mA
Motor control menu 300-
311 Slip compensation: 0%
313 Frequency loop gain: 70%
310 IR compensation: 0%
Application functions menu FUn
202 2-wire type control: 00
PI sub-menu
59.00 Assignment of the PI function feedback: 01
59.01 PI regulator proportional gain: 5.00
59.02 PI regulator integral gain: 8.00
59.11 Internal PI regulator reference: 51%
59.19 Restart error threshold: 42%
Pump sub-menu PMP
510.0 Selecting the operating mode: 01 (Yes)
510.1 Starting frequency of the auxiliary pump: 49 Hz
510.2 Time delay before starting the auxiliary pump: 1 s
510.3 Ramp for reaching the nominal speed of the auxiliary pump: 1 s
510.4 Stopping frequency of the auxiliary pump: 39.6 Hz
510.5 Time delay before the auxiliary pump stop command: 1 s
510.6 Ramp for stopping the auxiliary pump: 1 s
510.7 Zero flow detection: 1 min
510.8 Zero flow detection activation threshold: 42 Hz
510.9 Zero flow detection offset: 2 Hz
512.1 Sleep threshold operating time: 5 s
59.21 Sleep threshold offset: 3 Hz
206.1 Assignment as logic/analog output PMP
Automatic DC injection sub-menu 504-
504.0 Automatic DC injection assignment: 00
Automatic restart function 602-
602.0 Automatic restart: 01 (active)
Fault menu 600-
210 Process underload function time delay 5 s
211 Process underload threshold: 59%
212 Time delay before automatic restart for the underload fault: 1

Connection diagram



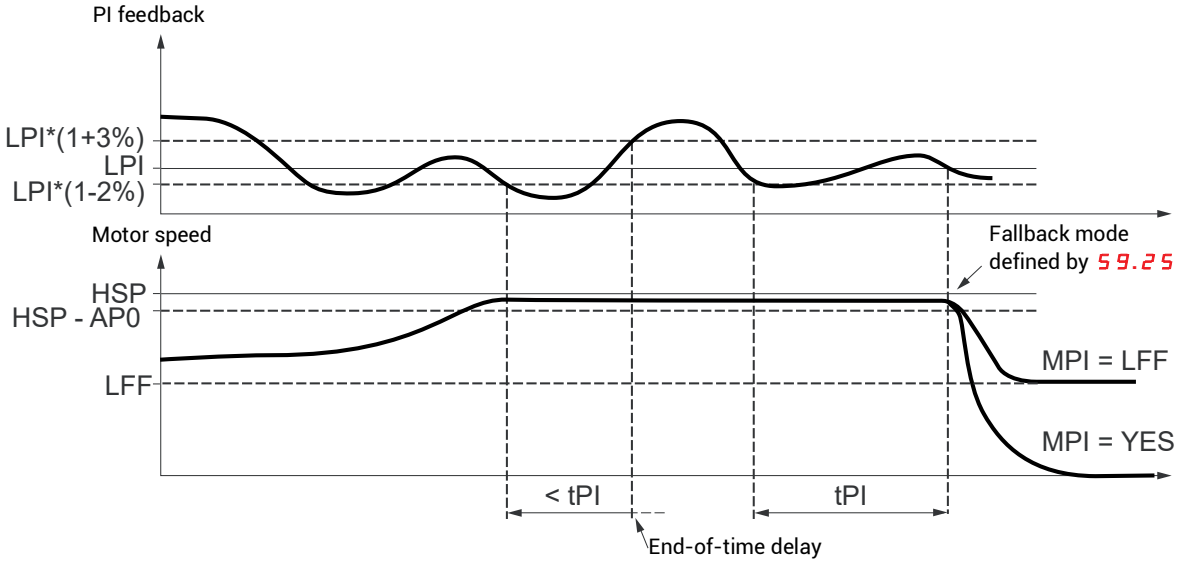
(1) Fault relay contacts, for remote indication of the drive status.

NOTE: Fit interference suppressors to all inductive circuits near the drive or connected to the same circuit (relays, contactors, solenoid valves, etc.).

NOTE: This wiring example is in source using internal supply.

PI feedback supervision (59.25)

Used to define the operating mode in the event of detection of a PI feedback lower than the limit set.



Once the variable pump is running at maximum speed (higher than 512.2 – 59.24) and at the same time the PI feedback is lower than the supervision threshold 59.22*(1-2%), a time delay tPI is launched. If at the end of this time delay the value of the PI feedback is still lower than the supervision threshold 59.22*(1+3%), the drive switches to fallback mode as defined by parameter 59.25.
- 59.25 = 01:
The drive will perform a freewheel stop.

- 59.25 = 04:
The drive will run at a fixed frequency 59.26 and will display fault code --12.
In both cases the drive reverts to PI regulation mode as soon as the PI feedback is higher than the supervision threshold 59.22*(1+3%).
In single variable with auxiliary pump mode (510.0 = 01), the PI feedback supervision function is only active when both pumps are operating.

Pump submenu PMP

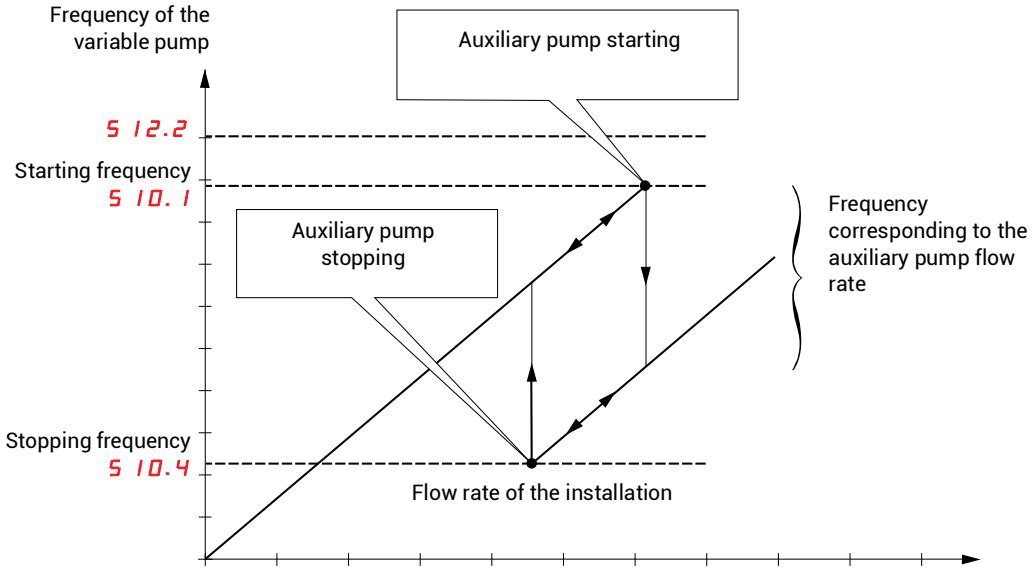
The principal objective is to control a complete pumping installation using a single drive by providing constant pressure whatever the flow rate.
The system is operated using an auxiliary fixed speed pump, and one variable speed pump, which is unable to provide the full flow range required on its own. A PI regulator is used for drive control. The pressure sensor provides system feedback.
The variable speed pump is called a variable pump.
The fixed speed pump is called an auxiliary pump.

Selecting the operating mode

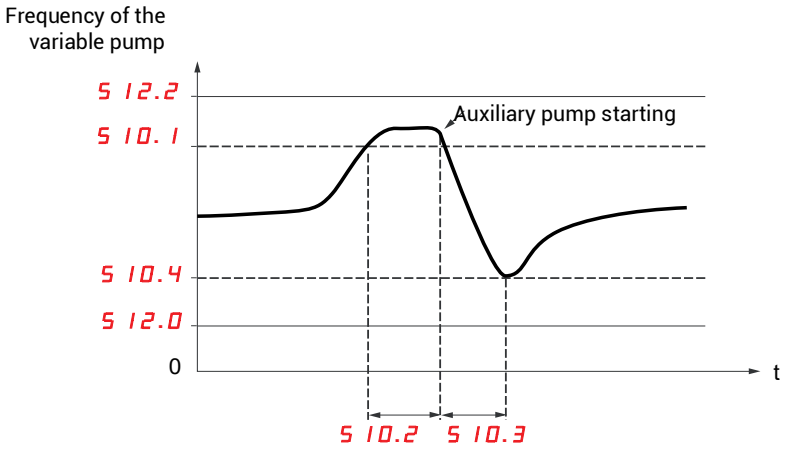
The xD1000 offers 2 operating modes:
- Single variable mode: 1 single variable speed pump (variable pump).
- Single variable with auxiliary pump mode: 1 variable speed pump (variable pump) and one fixed speed pump (auxiliary pump).

Control of the auxiliary pump

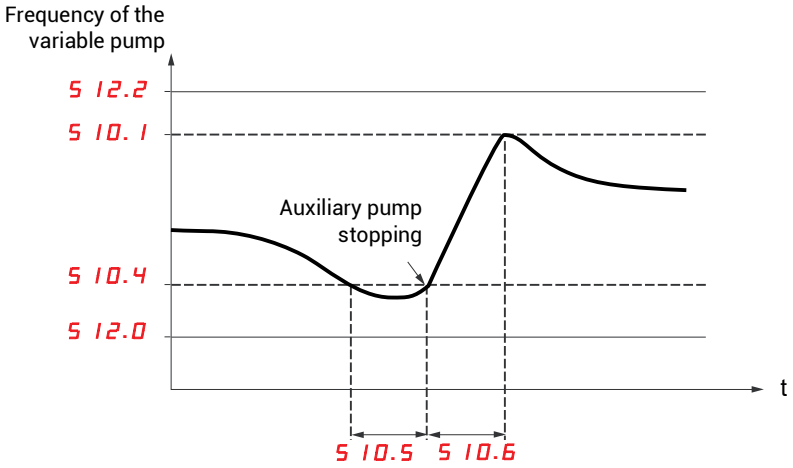
The PI regulator output (frequency reference of the variable pump) is used to control starting or stopping of the auxiliary pump with hysteresis, as shown in the figure below:



When the frequency exceeds the starting threshold (S 10. 1), a time delay (S 10.2) is launched to avoid the effects of transient flow fluctuations. If after this time delay, the frequency remains higher than the starting threshold, the auxiliary pump is started. When the start command is sent, the variable pump will go from its current speed reference to the auxiliary pump stopping frequency (S 10.4) following a ramp (S 10.3) that equals the time taken for the auxiliary pump to reach its nominal speed. Parameter rOn is used to minimize the booster effect on starting the auxiliary pump.

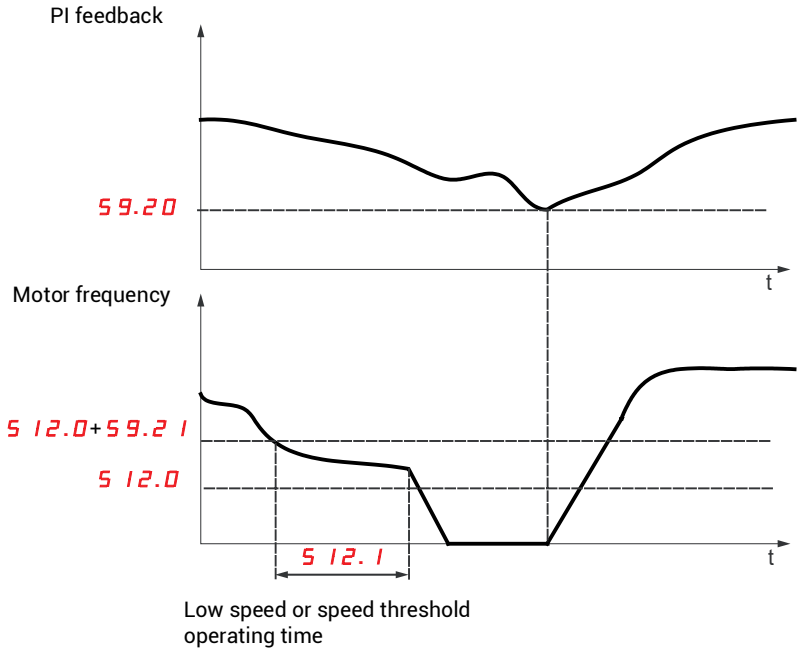


When the frequency is lower than the stopping threshold (S 10.4), a time delay is launched (S 10.5) to avoid the effects of transient flow fluctuations. If after this time delay, the frequency remains lower than the stopping threshold, the auxiliary pump is stopped. When the stop command is sent, the variable pump will go from its current speed reference to the auxiliary pump starting frequency (S 10.1) following a ramp (S 10.6) that equals the auxiliary pump stopping time. Parameter (S 10.6) is used to minimize the booster effect on stopping the auxiliary pump.



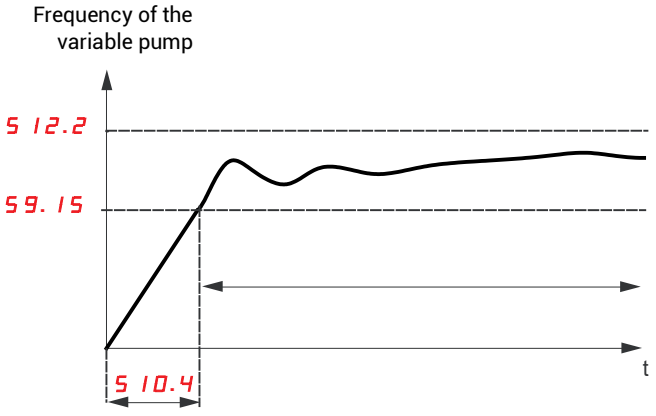
"Sleep" function/"Wake-up" function

This function is used to stop the variable pump when there is zero flow (auxiliary pump stopped). In this case, if the frequency of the variable pump is lower than the "sleep" threshold (S 12.0 + S9.21), a time delay (S 12.1) is launched. If, after this time delay, the frequency remains lower than threshold S 12.0 + S9.21, the variable pump then stops. The installation is in "sleep" mode.
To switch to "wake-up" mode, the pressure feedback must drop to below the "wake-up" threshold S9.20. The variable pump is then started.



Quick start function

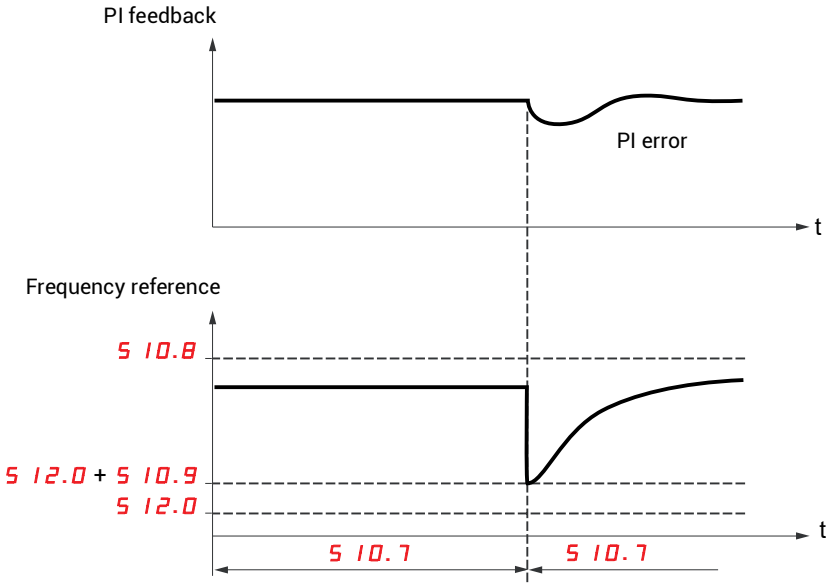
The quick start function can be used to overcome problems linked to high S9.01 and S9.02 gains (instability on starting). The drive accelerates until it reaches the quick start threshold S9.15 following a ramp S 10.4. Once the threshold has been reached, the PI regulator is activated.



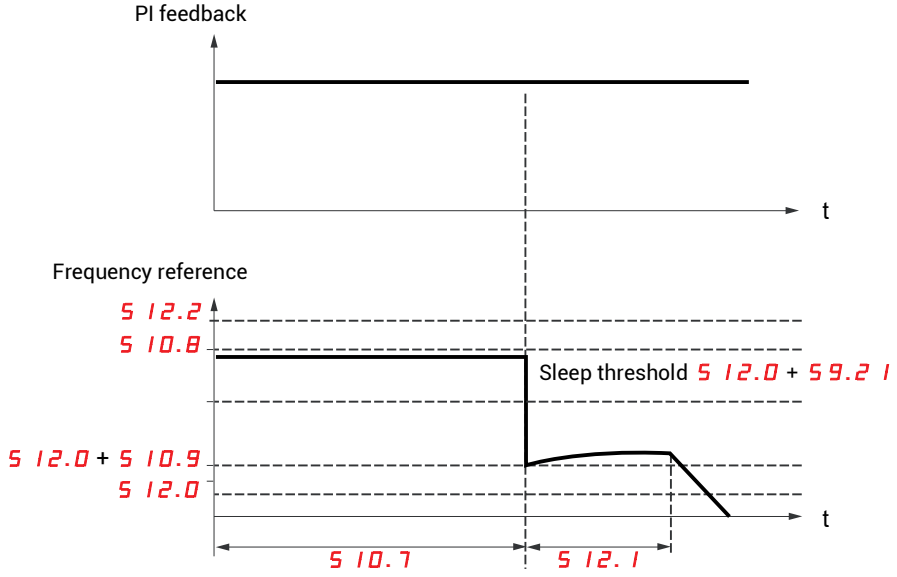
Zero flow detection

This function is only active when the auxiliary pump is stopped and the motor frequency is below threshold S 10.8.
This function is used in applications where zero flow cannot be detected by the sleep function alone. It forces the drive frequency reference to S 12.0 + S 10.9 periodically (at each time interval S 10.7) in order to test for zero flow.

- If the request is still present, the PI error increases, causing the drive to restart.



- If the request is no longer present (zero flow), the PI error will not increase.



- Set the sleep function so that the drive switches to sleep mode when zero flow is detected (S 10.9 ≤ S 9.2 1).

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>511

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
511 -	**[Current limitation menu]**		
511.0	**[2nd current limitation commutation]**		00
	Assignment 00 Function inactive L1H LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LuH LIU active high L1L LI1 active low L2L LI2 active low L3L LI3 active low L4L LI4 active low LuL LIU active low If the assigned input is at 0, the first current limitation is active. If the assigned input is at 1, the second current limitation is active. See LI assignment information page 53.		
511.1	**[Current limitation]**	0.25 to 1.5 In (1)	Determined by drive rating and dual rating
	First current limitation.		
	NOTICE **OVERHEATING AND DAMAGE TO THE MOTOR** Depending on the settings of this parameter, the error response to detected errors is disabled or the transition to the operating state Fault is suppressed if an error is detected. • Verify that the settings of this parameter do not result in equipment damage. • Implement alternative monitoring functions for disabled monitoring functions. **Failure to follow these instructions can result in equipment damage.**		
511.2	**[Current limitation 2]**	0.25 to 1.5 In (1)	Determined by drive rating and dual rating
	Second current limitation. This function allows reduction of the drive current limit. Visible only if 2nd current limitation commutation 511.0 page 100 is not set to 00.		
	NOTICE **OVERHEATING AND DAMAGE TO THE MOTOR** Depending on the settings of this parameter, the error response to detected errors is disabled or the transition to the operating state Fault is suppressed if an error is detected. • Verify that the settings of this parameter do not result in equipment damage. • Implement alternative monitoring functions for disabled monitoring functions. **Failure to follow these instructions can result in equipment damage.**		

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>500>512

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
512 -	**[Speed limit menu]**		
512.0	**[Low speed]**	0 Hz to 512.2 parameter value	0 Hz
	Motor frequency at minimum reference.		
512.1	**[Low speed operating time]**	0.1 to 999.9 s	00
	Following operation at Low speed 512.0 for a defined period, a motor stop is requested automatically. The motor restarts if the reference value is greater than Low speed 512.0 and if a run command is still present. **NOTE:** 00 corresponds to an unlimited period.		

Parameter that can be modified during operation or when stopped.

High speed configuration

The logic inputs enable selection of the desired high speed

Desired High speed	Setting	
	Parameter	State
S 12.2	S 12.3	00
	S 12.4	00
S 12.5	S 12.3	assigned
	S 12.4	00

Desired High speed	Setting	
	Parameter	State
S 12.6	S 12.3	00
	S 12.4	assigned
S 12.7	S 12.3	assigned
	S 12.4	assigned

Parameters described in this page can be accessed by: CONF>FULL>500>512

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
500 -	**[Function menu]**		
S 12 -	**[Speed Limit Menu]**		
S 12.2	**[High speed]**	S 12.0 to 308 parameter value	50 or 60 Hz determined by 301 parameter value, maximum 308 parameter value
	Motor frequency at maximum reference can be set in the range Low speed S 12.0 to Motor control type 308 page 66). If 308 falls below the value defined for S 12.2, S 12.2 automatically drops to the new value of 308.		
S 12.3	**[2 High speed assignment]**		00
	00 None L1H LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LUH LIU active high		
S 12.4	**[4 High speed assignment]**		00
	00 None L1H LI1 active high L2H LI2 active high L3H LI3 active high L4H LI4 active high LUH LIU active high		
S 12.5 ↻	**[High speed 2]**	S 12.0 to 308	As S 12.2 parameter value
	Visible only if 2 High speed assignment S 12.3 is not set to 00.		
S 12.6 ↻	**[High speed 3]**	S 12.0 to 308	As S 12.2 parameter value
	Visible only if 4 High speed assignment S 12.4 is not set to 00.		
S 12.7 ↻	**[High speed 4]**	S 12.0 to 308	As with S 12.2 parameter value
	Visible only if 2 High speed assignment S 12.3 and 4 High speed assignment S 12.4 are not set to 00.		
S 13	**[Cooling fan control]**		01
	00 Fan runs while drive is running. 01 Temperature control mode, fan starting and stopping controlled on basis of IGBT temperature.		

↻ Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>600

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
601	**[Detected fault reset assignment]**		00

Manual fault reset.

00	Function inactive
LI1H	LI1 active high
LI2H	LI2 active high
LI3H	LI3 active high
LI4H	LI4 active high
LIUH	LIU active high

Faults are reset when the assigned input or bit changes to 1, if the cause of the fault has disappeared.
The STOP/RESET button on the graphic display terminal performs the same function.
See also Diagnostics and Troubleshooting page 114.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>600>602

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
602 -	**[Automatic restart menu]**		
602.0	**[Automatic restart]**		00

This function can be used to automatically perform individual or multiple Fault Resets. If the cause of the error that has triggered the transition to the operating state Fault disappears within while this function is active, the drive resumes normal operation. While the Fault Reset attempts are performed automatically, the output signal "Operating state Fault" is not available. If the attempts to perform the Fault Reset are not successful, the drive remains in the operating state Fault and the output signal "Operating state Fault" becomes active.

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

- Verify that activating this function does not result in unsafe conditions.
- Verify that the fact that the output signal "Operating state Fault" is not available while this function is active does not result in unsafe conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

00	Function inactive.
01	Automatic restart after locking on a detected fault, if the cause has disappeared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 minute for subsequent attempts. The drive status relay remains activated if this function is active. The speed reference and the operating direction must be maintained. Use 2 wire type control (Type of control 201 page 55 = 00 and 2-wire type control 202 page 59 = 00). If the restart has not taken place once the Max. automatic restart 602.1 has elapsed, the procedure is aborted and the drive remains locked until it is turned off and then on again. The detected faults which permit use of this function are listed on page 116.

602.1	**[Max. automatic restart]**		00

00	5 min
01	10 min
02	30 min
03	1 hr
04	2 hr
05	3 hr
06	infinite

Visible only if Automatic restart 602.0 is not set to 00. This parameter can be used to limit the number of consecutive restarts on a recurrent fault.

603	**[Catch on the fly]**		00

This function is used to enable a smooth restart if the run command is maintained after the following events:
Loss of line supply or disconnection
Reset of current fault or automatic restart
Freewheel stop
The speed given by the drive resumes from the estimated speed of the motor at the time of the restart, then follows the ramp to the reference speed.
This function requires 2-wire level control.

00	Function inactive
01	Function active

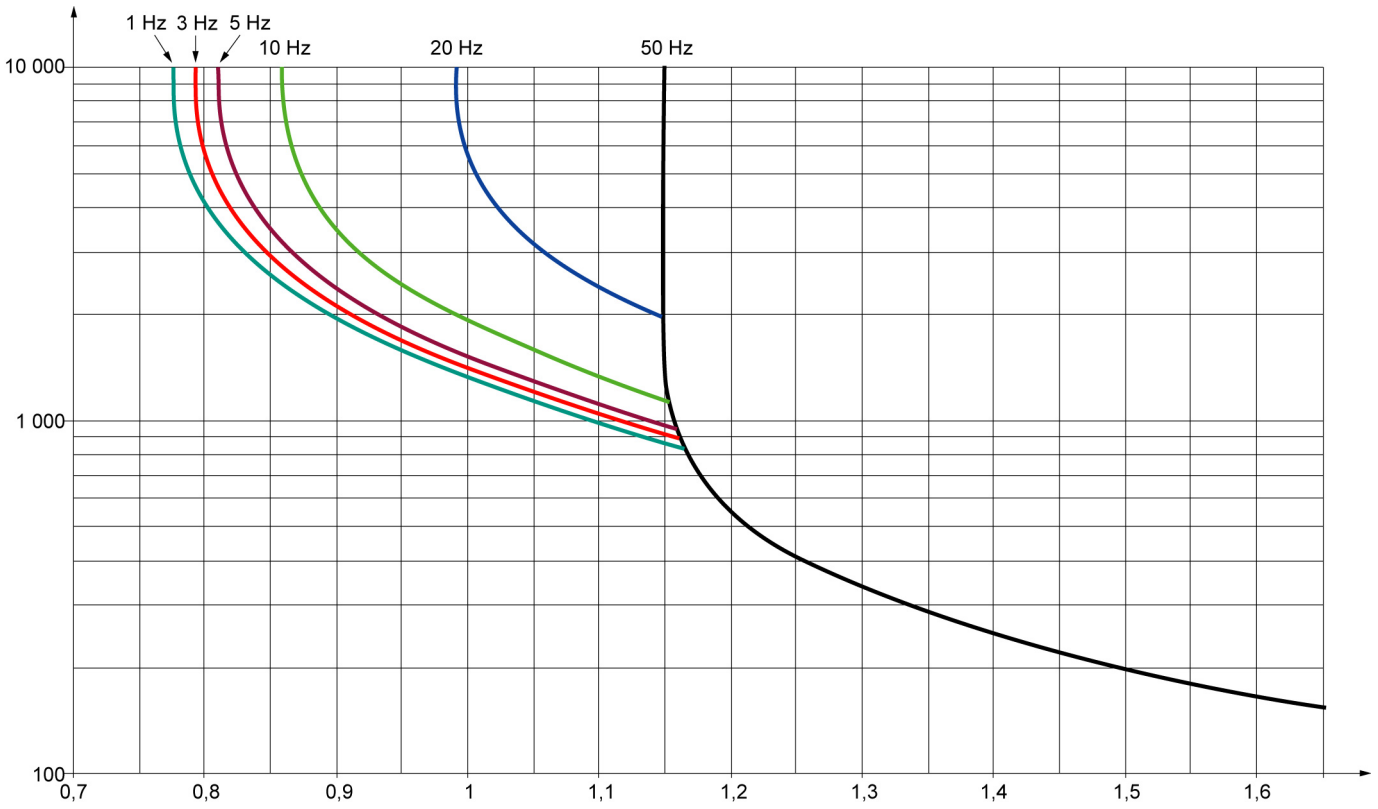
Motor thermal protection

Function:

Thermal protection by calculating the I^2t.

- Naturally-cooled motors:
  The tripping curves depend on the motor frequency.
- Force-cooled motors:
  Only the 50 Hz tripping curve need be considered, regardless of the motor frequency.

Trip time in seconds



Motor current/6 0 4.0 parameter value

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>600

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
604 -	**[Motor thermal protection menu]**		
604.0	**[Motor thermal current]**	0.2 to 1.5 In (1)	Determined by drive rating
	Current used for motor thermal detection. Set ItH to the nominal current on the motor rating plate.		
604.1	**[Motor protection type]**		01
	01 Self-ventilated 02 Motor-ventilated		
604.2	**[Overload fault management]**		01
	Type of stop in the event of a motor thermal fault. 00 Fault ignored 01 Freewheel stop 08 DC injection Overload fault management Setting 604.2 to 00 inhibits the Motor overload fault FO 13 page 116.		
	NOTICE **OVERHEATING AND DAMAGE TO THE MOTOR** If this parameter is set to 00, the error response to detected errors is disabled and the transition to the operating state Fault is suppressed. Verify that the settings of this parameter do not result in equipment damage. Implement alternative monitoring functions for disabled monitoring functions. **Failure to follow these instructions can result in equipment damage.**		
604.3	**[Motor thermal state memo]**		00
	00 Motor thermal state not stored at power off 01 Motor thermal state is stored at power off		
605 -	**[Output Phase loss]**		01
	⚠⚠ DANGER **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH** If output phase monitoring is disabled, phase loss and, by implication, accidental disconnection of cables, are not detected. Verify that using this setting does not result in unsafe conditions. **Failure to follow these instructions can result in death, serious injury or equipment damage.**		
	00 Function inactive 01 Tripping on FO 14 (1 phase loss) or FO 15 (3 phase loss) fault with freewheel stop.		
606 -	**[Input Phase loss]**		01
	This parameter is only accessible in this menu on 3-phases drives. 00 Fault ignored 01 Fault with freewheel stop If one phase disappears, the drive switches to fault mode, but if 2 or 3 phases disappear, the drive continues to operate until it trips on an undervoltage fault. 08 DC injection		

(1) In = rated drive current

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>600

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
607 -	**[Undervoltage menu]**		
607.0	**[Undervoltage detected fault management]**		00
	Behaviour of the drive in the event of an undervoltage 00 Detected fault and R1 relay set to 0 01 Detected fault and R1 relay set to 1		
607.1	**[Undervoltage prevention]**		00
	Behaviour in the event of the undervoltage fault prevention level being reached 00 No action (freewheel) 02 Stop following an adjustable ramp Undervoltage ramp deceleration time 607.2.		
607.2	**[Undervoltage ramp deceleration time]**	0.0 to 10.0 s	1.0 s
	Undervoltage prevention 607.1 = 02 gives this ramp time.		
608	**[IGBT Test]**		00
	00 No test 01 The IGBTs are tested on power up and every time a run command is sent. These tests cause a slight delay (a few ms). In the event of a fault, the drive will lock. The following faults can be detected: • Drive output short-circuit (terminals U-V-W): F018, F019, F021 display • IGBT faulty: F020 display, where x indicates the number of the IGBT concerned IGBT short-circuited: x2F, where x indicates the number of the IGBT concerned		
609	**[4-20mA loss Behaviour]**		00
	00 Fault ignored. This configuration is only possible if: AI1 current scaling parameter of 0% 204.1 page 60 is not greater than 3 mA or AI1 type 204.0 = 0 A. 01 Freewheel stop 08 DC injection		

2 s To change the assignment of this parameter, press the ENT key for 2sec.

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: **CONF>FULL>600**

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
610	**[Detected fault inhibition assignment]**		00

2 s

In rare cases, the monitoring functions of the drive may be unwanted because they impede the purpose of the application. A typical example is a smoke extractor fan operating as a part of a fire protection system. If a fire occurs, the smoke extractor fan should operate as long as possible, even if, for example, the permissible ambient temperature of the drive is exceeded. In such applications, damage to or destruction of the device may be acceptable as collateral damage, for example, to keep other damage from occurring whose hazard potential is assessed to be more severe.

A parameter is provided to disable certain monitoring functions in such applications so that automatic error detection and automatic error responses of the device are no longer active. You must implement alternative monitoring functions for disabled monitoring functions that allow operators and/or master control systems to adequately respond to conditions which correspond to detected errors. For example, if overtemperature monitoring of the drive is disabled, the drive of a smoke extractor fan may itself cause a fire if errors go undetected. An overtemperature condition can be, for example, signaled in a control room without the drive being stopped immediately and automatically by its internal monitoring functions.

⚠⚠ DANGER

MONITORING FUNCTIONS DISABLED, NO ERROR DETECTION

- Only use this parameter after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.
- Implement alternative monitoring functions for disabled monitoring functions that do not trigger automatic error responses of the drive, but allow for adequate, equivalent responses by other means in compliance with all applicable regulations and standards as well as the risk assessment.
- Commission and test the system with the monitoring functions enabled.
- During commissioning, verify that the drive and the system operate as intended by performing tests and simulations in a controlled environment under controlled conditions.

Failure to follow these instructions can result in death, serious injury or equipment damage.

To assign fault inhibit, press and hold down the ENT key for 2sec.

00	Function inactive
LIH	LI1 active high
L2H	LI2 active high
L3H	LI3 active high
L4H	LI4 active high
LuH	LIU active high

Following detected faults can be inhibited:
F008, F025, F028, F011, F013, F014, F015, F016, F022, F024, F027, and F030.

2 s To change the assignment of this parameter, press the ENT key for 2sec.

Parameter that can be modified during operation or when stopped.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>600

Code	Name/Description	Adjustment range	Factory setting
CONF -	**[Configuration mode]**		
FULL -	**[Complete menu]**		
600 -	**[Fault Detection Management Menu]**		
611	**[Modbus detected fault management]**		01

Behaviour of the drive in the event of a communication fault with integrated Modbus.
- 00 Fault ignored
- 01 Freewheel stop
- 08 DC injection

⚠ WARNING

LOSS OF CONTROL
If this parameter is set to 00, Modbus communication monitoring is disabled.
- Only use this setting after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.
- Only use this setting for tests during commissioning.
- Verify that communication monitoring has been re-enabled before completing the commissioning procedure and performing the final commissioning test.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

612	**[Degraded line supply operation]**		00

Lowers the tripping threshold of the F030 fault to operate on a line supply down to 50% of nominal line voltage. In this case, a line choke must be used and the performance of the drive controller cannot be guaranteed.
- 00 No
- 01 Yes

NOTICE

RISK OF DAMAGE TO THE DRIVE
A line choke must be used when the parameter 612 is set to 01.
Failure to follow these instructions can result in equipment damage.

613	**[Reset power run]**		00

This function will initialize the settings in the Monitor (800-) section, menu 900- page 48.
- 00 No
- 07 Reset fan time display

614 2 s	**[Reset all previous detected faults via Run key of HMI]**		00

If this function is active and the RUN key on the equipment panel is pressed for at least 2sec, some detected faults (1) can be reset.
This function is only effective for 2-wire or 3-wire control.
If type of control 201 page 55 = 00 and 2 wire type control 202 page 59 = 00 and the RUN command is still valid, the drive will run the motor after the fault is reset.
To change the assignment of this parameter, press the ENT key for 2sec.
(1) These errors include: F001, F002, F006, F008, F010, F014, F015, F017, F018, F019, F020, F021, F025, F027 and F028.
- 00 Inactive
- 01 Active

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION
If parameter 614 is set to 1, pressing the RUN key for 2 s with clear and some detected errors (1).
- Verify that activating this function does not result in unsafe conditions.
- Only use this parameter after a thorough risk assessment in compliance with all regulations and standards that apply to the device and to the application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>700

Code	Name/Description	Adjustment range	Factory setting
CONF-	**[Configuration mode]**		
FULL-	**[Complete menu]**		
700-	**[Communication Menu]** **NOTE:** For following parameters, the modifications will be taken into account only at the next control power on.		
701	**[Modbus address]**	OFF to 247	OFF
	Modbus address is adjustable in the range OFF to 247 When OFF, communication is not active.		
702	**[Modbus baud rate]**		32
	24 4.8 kbps 28 9.6 kbps 32 19.2 kbps 36 38.4 kbps		
703	**[Modbus format]**		03
	02 8O1: Data:- 8 bit, Parity:- Odd, Stop Bit:- 1 03 8E1: Data:- 8 bit, Parity:- Even, Stop Bit:- 1 04 8N1: Data:- 8 bit, Parity:- None, Stop Bit:- 1 05 8N2: Data:- 8 bit, Parity:- None, Stop Bit:- 2		
704	**[Modbus time out]**	0.1 to 30 s	10 s
	The drive detects a Modbus fault if the drive does not receive a Modbus request within a predefined time period (time out).		
705-	**[Input scanner menu]** (values are expressed in hexadecimal)		
705. 0	**[Com scanner read address parameter 1]**		0C81
	Address of the 1st input word.		
705. 1	**[Com scanner read address parameter 2]**		219C
	Address of the 2nd input word.		
705. 2	**[Com scanner read address parameter 3]**		0000
	Address of the 3rd input word.		
705. 3	**[Com scanner read address parameter 4]**		0000
	Address of the 4th input word.		
706-	**[Output scanner menu]** (values are expressed in hexadecimal)		
706. 0	**[Com scanner write address parameter 1]**		2135
	Address of the 1st input word.		
706. 1	**[Com scanner write address parameter 2]**		219A
	Address of the 2nd input word.		
706. 2	**[Com scanner write address parameter 3]**		0000
	Address of the 3rd input word.		
706. 3	**[Com scanner write address parameter 4]**		0000
	Address of the 4th input word.		

Configuration Mode - Complete menu (FULL)

Parameters described in this page can be accessed by: CONF>FULL>700

Code	Name/Description	Adjustment range	Factory setting
CONF-	**[Configuration mode]**		
FULL-	**[Complete menu]**		
700-	**[Communication Menu]** **NOTE:** For following parameters, the modifications will be taken into account only at the next control power on.		
707-	**[Input scanner access menu]** (values are expressed in hexadecimal)		
707.0	**[Com scanner read address value 1]** Value of the 1st input word.		ETA value
707.1	**[Com scanner read address value 2]** Value of the 2nd input word.		rFrd value
707.2	**[Com scanner read address value 3]** Value of the 3rd input word.		8000
707.3	**[Com scanner read address value 4]** Value of the 4th input word.		8000
708-	**[Output scanner access menu]** (values are expressed in hexadecimal)		
708. 0 ↻	**[Com scanner write address value 1]** Value of the 1st output word.		CMd value
708. 1 ↻	**[Com scanner write address value 2]** Value of the 2nd output word.		LFrd value
708. 2 ↻	**[Com scanner write address value 3]** Value of the 3rd output word.		8000 value
708. 3 ↻	**[Com scanner write address value 4]** Value of the 4th output word.		8000 value

↻ Parameter that can be modified during operation or when stopped.

Maintenance

Servicing

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Read and understand the instructions in **"Before your begin"** chapter before performing any procedure in this chapter.

Failure to follow these instructions will result in death or serious injury.

The xD1000 does not require any preventive maintenance. However, it is advisable to perform the following checks regularly:

- Check environment and tightness of connections
- Remove any dust from the drive
- Ensure proper fan operation

Physical damage to covers

Services

NOTICE

RISK OF DAMAGE TO DRIVE

Perform the following activities.

Failure to follow these instructions can result in equipment damage.

Environment	Related parts	Actions	Periodicity
Product impact	Enclosure - Control panel (LED display)	Check drive display part	Once per month
Corrosion	Terminals - connectors - screws	Check and clean	
Dust	Terminals - fans - vents		
Temperature	Product setting	Check and optimize	
Cooling	Fan	Check fan operation	
		Replace fan	As required
Vibration	Terminal connections	Check connection torque	Once per month

Prolonged storage

For products that have been stored for more than 2 years, voltage should be gradually increased in product capacitors.

NOTICE

RISK OF DERATED PERFORMANCE DUE TO CAPACITOR AGING

The product capacitor performances after a long time storage above 2 years can be degraded. In that case, before using the product, apply the following procedure:

- Use a variable AC voltage supply, connected between L1 and L2 (even for XD1000-XXXX-4XXXXX catalog numbers).
- Increase AC supply voltage to have:
  - 80% of rated voltage for 30 min
  - 100% of rated voltage for 30 min

Failure to follow these instructions can result in equipment damage.

Maintenance

Display menu

Use the status of the drive and its current values shown on the display menu as an aid for finding the causes of detected faults.

Assistance with maintenance, detected fault display

If a problem arises during setup or operation, ensure that the recommendations relating to the environment, mounting and connections have been observed.
The first fault detected is stored and displayed, flashing, on the screen. The drive locks and the status relay R1 contact opens.

Clearing the detected fault

Disconnect the drive power supply in the event of a non-resettable fault.
Wait for the display to go off completely.
Find the cause of the detected fault and correct it.
Restore power to the drive.
The detected fault will no longer be present if its cause has been corrected.
In the event of a non resettable detected fault:

- Remove/cut the power to the drive.
- WAIT 15 MINUTES to allow the DC bus capacitors to discharge, then follow the "Bus Voltage Measurement Procedure" page 5 to verify that the DC voltage is less than 42 V. The drive LED is not an accurate indicator of the absence of DC bus voltage.
- Find and correct the detected fault.
- Restore power to the drive to confirm the detected fault has been rectified.
- **Certain detected faults can be programmed for automatic restart after the cause has disappeared.**

These detected faults can also be reset by cycling power to the drive or by means of a logic input or control bit.

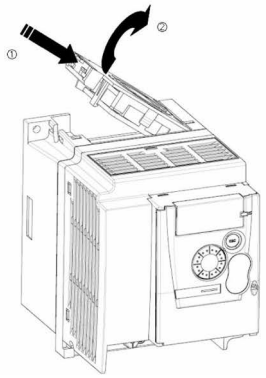
Spares and repairs:

Serviceable product. Refer to spares replacement catalogue.

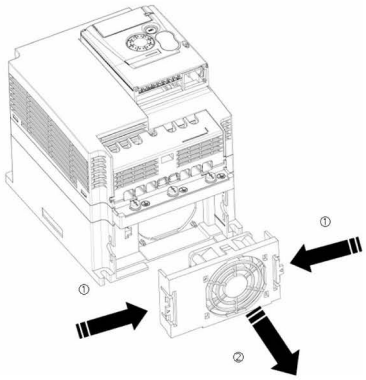
Fan replacement

Fan spares can be ordered for the xD1000. Contact the Lauritz Knudsen Electrical & Automation Customer Care Center for details.

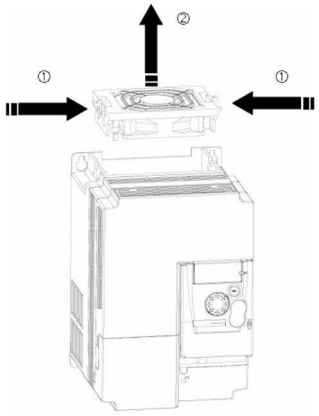
① Remove screw of fan support and pull out the fan support
② Uncoupled the connected parts and remove the fan



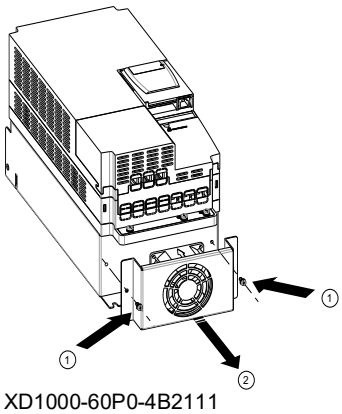
XD1000-04P1-4B2111
XD1000-05P5-4B2111



XD1000-08P9-4B2111 XD1000-12P1-4B2111
XD1000-16P0-4B2111 XD1000-36P0-4B2111
XD1000-43P0-4B2111



XD1000-22P8-4B2111
XD1000-30P0-4B2111



XD1000-60P0-4B2111

① Grasp the protruding part of fan bayonet mount
② Uncouple the connected parts and remove the fan

Drive does not start, no error code displayed

- If the display does not light up, check the power supply to the drive (ground and input phase connections, see page 26.
- The assignment of the "Fast stop" or "Freewheel" functions will prevent the drive starting if the corresponding logic inputs are not powered up. The xD1000 then displays 502.1 in freewheel stop mode and --01 in fast stop mode. --00 is displayed at freewheel stop end. This is normal, since these functions are active at zero so drive can safely stop in case of wire break. Assignment of LI to be checked in the ConF/FULL/500-/502- menu.
- Make sure that the run command input(s) is activated in accordance with the selected control mode (parameters in ConF/FULL/200- menu Type of control 201 page 55 2-wire type control 202 page 59.
- If the reference channel or command channel is assigned to Modbus, the drive displays "502.1" freewheel stop when the power supply is connected and remains in stop mode until the communication bus sends a command.
- "RUN" key is inactive in factory setting. Adjust parameters Reference channel 1 401 page 72 and Command channel 1 407 page 73 to control the drive locally (ConF/FULL/400- menu). See "How to control the drive locally" page 42.

Fault detection codes which cannot be cleared automatically

The cause of the detected fault must be removed before resetting by cycling power to the drive.

F025 and F028 faults can also be reset remotely by means of a logic input (in ConF/FULL/600- menu, parameter Detected fault reset assignment 601 page 104.

F007, F025 and F028 faults can be inhibited and cleared remotely by means of a logic input (parameter Detected fault inhibition assignment 610 page 108.

Code	Name	Possible causes	Remedy
----	Problem with application firmware	• Invalid application firmware update using the Multi-Loader tool	• Re-download application firmware.
F001	Precharge	• Charging relay control fault or charging resistor damaged	• Turn the drive off and then back on again. • Check the connections. • Check the stability of the main supply. • Contact local Lauritz Knudsen Electrical & Automation representative.
F002	Unknown drive rating	• Power card and stored card versions different	• Contact local Lauritz Knudsen Electrical & Automation representative.
F003	Unknown or incompatible power board	• The power card is incompatible with the control card	• Contact local Lauritz Knudsen Electrical & Automation representative.
F004	Internal serial link fault	• Communication interruption between the internal cards	• Contact local Lauritz Knudsen Electrical & Automation representative.
F005	Invalid industrialization zone	• Internal data inconsistent	• Contact local Lauritz Knudsen Electrical & Automation representative.
F006	Current measurement circuit	• Current measurement is not correct due to hardware circuit fault	• Contact local Lauritz Knudsen Electrical & Automation representative.
F007	Internal thermal sensor detected fault	• The drive temperature sensor is not operating correctly • The drive is in short circuit or open	• Contact local Lauritz Knudsen Electrical & Automation representative.
F008	Internal CPU	• Internal microprocessor fault	• Turn the drive off and then back on again. • Contact local Lauritz Knudsen Electrical & Automation representative.

Fault detection codes that cannot be cleared automatically (continued)

Code	Name	Possible causes	Remedy
F010	Overcurrent	• Parameters in the Motor control menu 300- page 65 are not correct • Inertia or load too high • Mechanical locking	• Check the parameters. • Check the size of the motor/drive/load. • Check the state of the mechanism. • Connect line motor chokes. • Reduce the Switching frequency range 315 page 68. • Check the ground connection of drive, motor cable and motor insolation.
F018	Motor short-circuit	• Short-circuit or grounding at the drive output • Ground fault while in run state • Motor switching while in run state • Significant current leakage to ground while several motors are connected in parallel	• Verify the cables connecting the drive to the motor and the motor insulation. • Adjust the switching frequency. • Connect chokes in series with the motor. • Verify the adjustment of speed loop.
F019	Ground short-circuit		
F020	IGBT short circuit	• Internal power component short circuit detected at power on	• Contact local Lauritz Knudsen Electrical & Automation representative.
F025	Overspeed	• Instability • Overspeed associated with the inertia of the application	• Check the motor. • If overspeed is 10% more than Top frequency 308 page 66 adjust this parameter if necessary. • Add a braking resistor. • Check the size of the motor/drive/load. • Check parameters of the speed loop (gain and stability).
F028	Autotuning fault	• Motor not connected to the drive • Motor phase loss • Special motor • Motor is rotating (being driven by the load, for example)	• Check that the motor/drive are compatible. • Check that the motor is present during autotuning. • If an output contactor is being used downstream, close it during auto-tuning. • Check that the motor is completely stopped.

Fault detection codes that can be cleared with the automatic restart function, after the cause has disappeared

These faults can also be cleared by turning on and off or by means of a logic input (parameter Detected fault reset assignment 601 page 103.
F011, F013, F014, F015, F016, F022, F024 and F027 faults can be inhibited and cleared by means of a logic input Detected fault inhibition assignment 610 page 103.

Code	Name	Possible causes	Remedy
F009	Overbraking	• Sudden braking or load inertia too high	• Increase the deceleration time. • Install a module unit with a braking resistor if necessary. • Check the main supply voltage to ensure it is under the maximum acceptable (20% over maximum main supply during run status).
F011	Drive overheat	• Drive temperature too high	• Check the motor load, the drive ventilation and the ambient temperature. Wait for the drive to cool down before restarting. See Mounting and temperature conditions on page 18.
F012	Process overload fault	• Process overload	• Check that drive parameters and application processes are compatible.
F013	Motor overload	• Triggered by excessive motor current	• Check configuration of motor thermal protection and motor load.
F014	1 Output phase loss	• Loss of one phase on drive output	• Check the connections from the drive to the motor. • If using a downstream contactor, make sure the connection, cable and contactor are right.
F015	3 Output phases loss	• Motor not connected • Motor power too low, below 6% of the rated drive current • Output contactor open • Transient instability in the motor current	• Check the connections from the drive to the motor. • Test on a low power motor or without a motor. In factory settings mode, motor phase loss detection is active Output Phase loss detection 605 page 106 = 01. To check the drive in a test or maintenance environment, without having to use a motor with the same rating as the drive, deactivate motor phase loss detection Output Phase loss detection 605 = 00. • Check and optimize IR compensation 310 page 67, Rated motor voltage 304 page 72 and Rated motor current 305 page 66 and then perform Auto-tuning 318 page 69.
F016	Main overvoltage	• Line voltage too high: - At drive power on, supply is 10% over the maximum acceptable voltage level - At power with no run command, 20% over maximal line supply • Disturbed mains supply	• Turn Off the Drive. Check and adjust the line voltage. After line come back to nominal voltage (within tolerance) do power On. If intermittent F016 code appear, set R1 assignment 205 to 01 and it can be connected to upstream protection to avoid overvoltage in the drive. In this case LO1 can be used for others drive status see page 60
F017	Input phase loss	• Drive incorrectly supplied or a fuse blown • Failure of one phase • 3-phase xD1000 used on a single-phase line supply • Unbalanced load • This protection only operates with the drive on load	• Check the power connection and the fuses. • Use a 3-phase line supply. • Disable reporting of this fault type by setting Input Phase loss detection detection 606 page 106 to 00.

Fault detection codes that can be cleared with the automatic restart function, after the cause has disappeared (continued)

Code	Name	Possible causes	Remedy
F021	Load short circuit	• Short-circuit at drive output • Short circuit detection at the run command or DC injection command if parameter IGBT Test 608 page 107 is set to 01	• Check the cables connecting the drive to the motor and the condition of motor insulation.
F022	Modbus interruption	• Interrupted communication on the Modbus network	• Check the connections of communication bus. • Check the time-out (parameter Modbus time out 704 page 110. • Refer to the Modbus user manual.
F024	HMI communication	• Communication interruption with the external display terminal	• Check the terminal connection.
F026	PI feedback fault	• PID feedback below lower limit	• Verify the PID function feedback. • Verify the PID feedback supervision (parameter PID feedback supervision 59. 25 page 89 and time delay setting (parameter PID supervision function time delay 59. 23 page 89.
F027	IGBT overheat	• Drive overheated • IGBT internal temperature is too high for the ambient temperature and load .	• Check the size of the load/motor/drive. • Reduce the Switching frequency 315 page 68. • Wait for the drive to cool down before restarting.
F029	Process underload fault	• Process underload • Time that motor current is below the Process underload threshold 211 page 62 exceeds the Process underload time delay 210 page 62 to protect the application	• Check that drive parameters and application processes are compatible.
F033	AI1 current loss	Detected if: • Analog input AI1 is configured as current • AI1 current scaling parameter of 0% 204. 1 page 60 is greater than 3 mA • Analog input current is lower than 2 mA	• Check the terminal connection.

Fault detection codes that will be cleared as soon as their causes disappear

USF faults can be inhibited and cleared remotely by means of a logic input parameter Detected fault inhibition assignment 6 10 page 113.

Code	Name	Possible causes	Remedy
F030	Undervoltage	• Line supply too low • Transient voltage dip	• Check the voltage and parameters on the Undervoltage phase loss menu 60 7- page 107.
F031	Incorrect configuration	• HMI block replaced by an HMI block configured on a drive with a different rating • The current configuration of customer parameters is inconsistent	• Return to factory settings or retrieve the backup configuration, if it is valid. • If the fault remains after reverting to the factory settings, contact your local Lauritz Knudsen Electrical & Automation representative.
F032 (1)	Invalid configuration	• Invalid configuration The configuration loaded in the drive via the bus or communication network is inconsistent. The configuration upload has been interrupted or is not fully finished	• Check the configuration loaded previously. • Load a compatible configuration.
F034	Download invaild configuration	When save parameter setting or restore to factory setting, the drive detect invalid configuration.	• Power cycle drive. • Restore to factory setting. • If the fault remains after reverting to the factory settings, contact your local Lauritz Knudsen Electrical & Automation representative.

(1) When the CFI is present in the previous fault menu, it means the configuration has been interrupted or is not fully finished.

Some detected faults that are reset by pressing the RUN key

See Reset all previous detected faults via Run key of HMI 6 14 parameter page 109.

HMI block changed

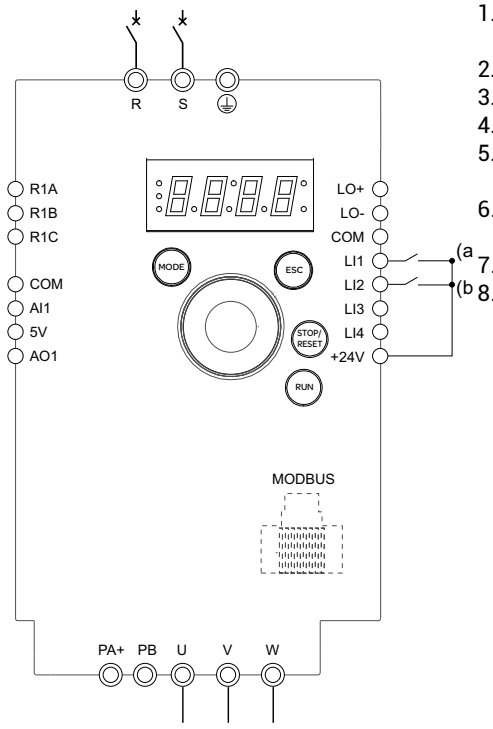
When an HMI block is replaced by an HMI block configured on a drive with a different rating, the drive locks in Incorrect configuration F031 fault mode on power-up. If the card has been deliberately changed, the fault can be cleared by returning to factory setting.

Fault detection codes displayed on the remote display terminal

Code	Name	Description
In It:	Auto-initialization on start	• Macro controller initialization • Searching communication configuration
CoM.E (1)	Communication error	• 50 ms time out error • This message appears after 220 retry attempts
A - 17 (1)	Key alarm	• Key pressed down for longer than 10 seconds • Membrane switch disconnected • Display terminal woken up while a key is being pressed
clr (1)	Confirm fault reset	• This message appears if the STOP key is pressed while the display terminal is displaying a fault
dEv.E (1)	Drive mismatch	• Drive type (brand) does not match display terminal type (brand)
roM.E (1)	ROM abnormality	• ROM abnormality detected by checksum calculation
rAM.E (1)	RAM abnormality	• Display terminal RAM abnormality detected
CPu.E (1)	Other fault	• The other detected fault

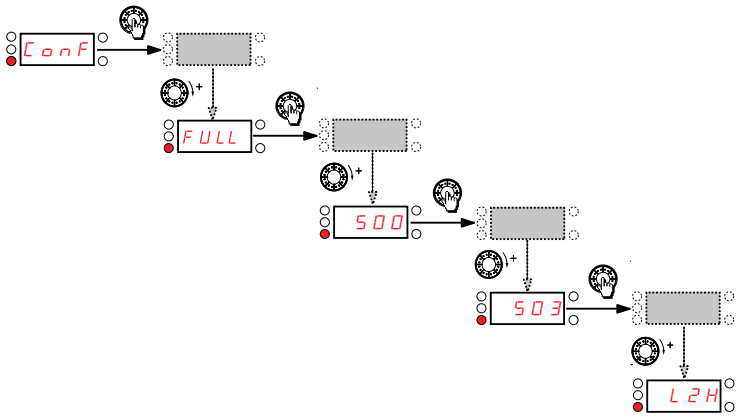
(1) Flashing

2-wire type control (source)



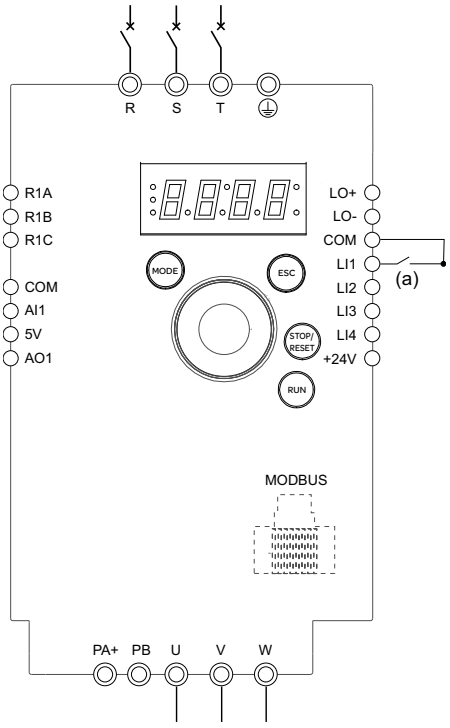
(a): Run Forward (b): Run Reverse

1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic inputs.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. Factory / recall customer parameter set `102` page 53 = `64`.
6. Set the motor parameters (in `CONF` mode) only if the factory configuration of the drive is not suitable.
7. Perform an auto-tuning.
8. Set parameter Reverse direction `503` page 79 to `L2H`.



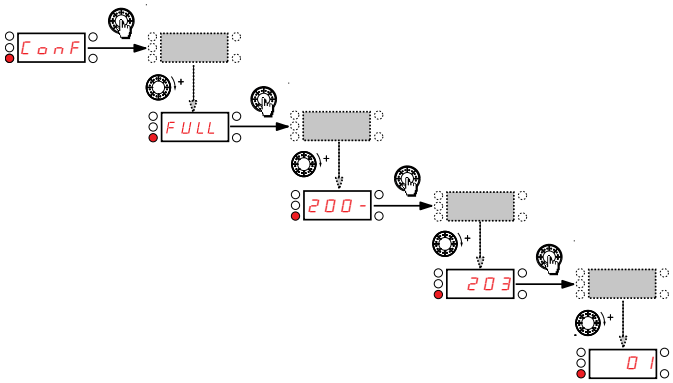
9. Start

2-wire control (sink)



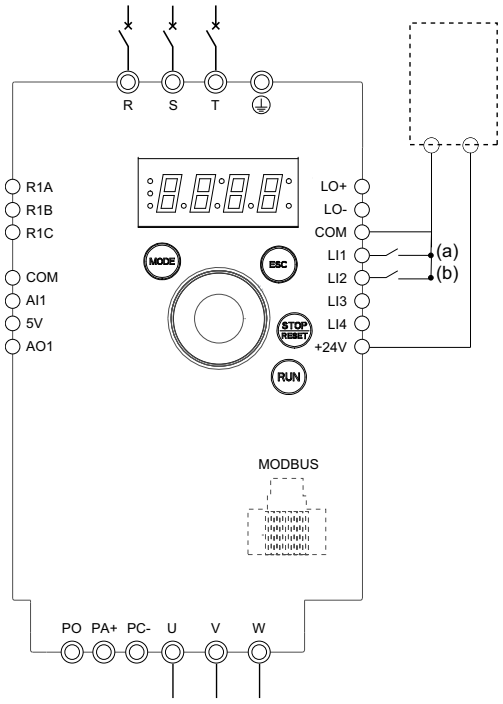
(a): Run Forward

1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic inputs.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. Factory / recall customer parameter set `102` page 53 = `64`.
6. Set the motor parameters (in `CONF` mode) only if the factory configuration of the drive is not suitable.
7. Perform an auto-tuning.
8. Set parameter Logic inputs type `203` page 59 to `01`



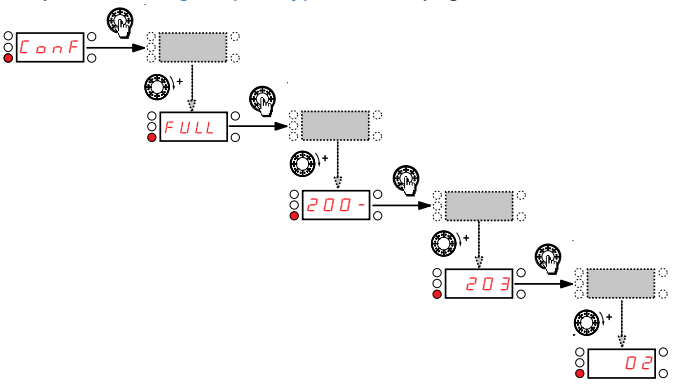
9. Start

3-wire control (sink)



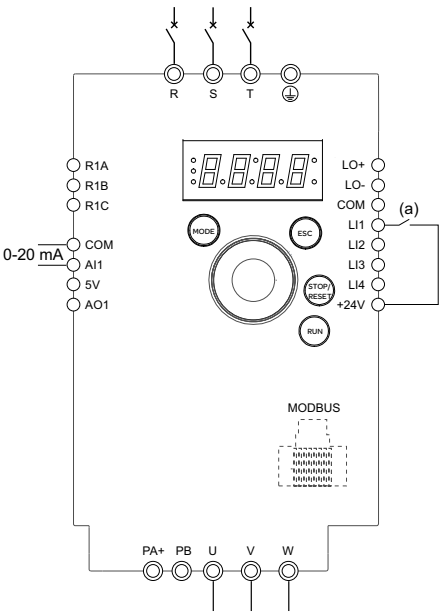
(a): Run Forward (b): Run Reverse

1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic inputs.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. Factory / recall customer parameter set `102` page 53 = `64`.
6. Set `201` to `01` page 55
7. Set the motor parameters (in `CONF` mode) only if the factory configuration of the drive is not suitable.
8. Perform an auto-tuning.
9. Set parameter Logic inputs type `203` page 59 to `02`.



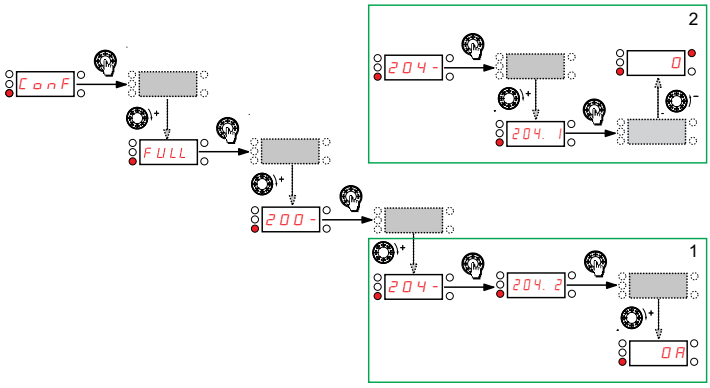
10. Start

Speed control 0-20 mA (source)



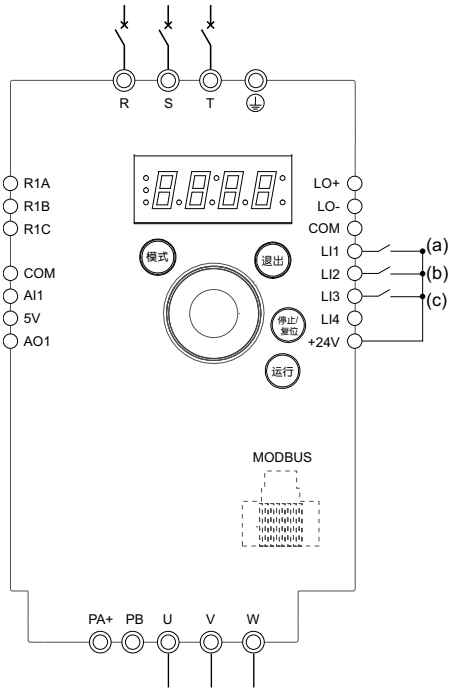
(a) Run Forward

1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic input LI1 and analog input AI1.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. Factory / recall customer parameter set `102` page 53 = `64`.
6. Set the motor parameters (in `CONF` mode) only if the factory configuration of the drive is not suitable.
7. Perform an auto-tuning.
8. Set AI1 type `204.0` page 60 to `0A`, AI1 current scaling parameter of 0% `204.1` page 60 to `0A`.
   Check that AI1 current scaling parameter of 100% `204.2` page 60 is set to 20 mA.



9. Start

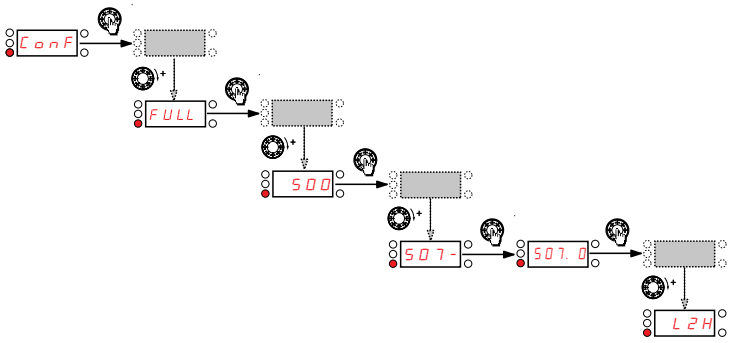
4 preset speeds (source)



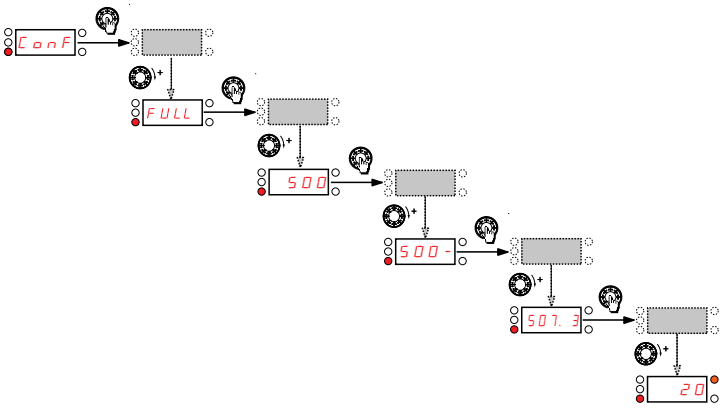
(a): Run Forward
(b): 2 preset speeds (c): 4 preset speeds

Important: Please refer to Function compatibility table page 43.

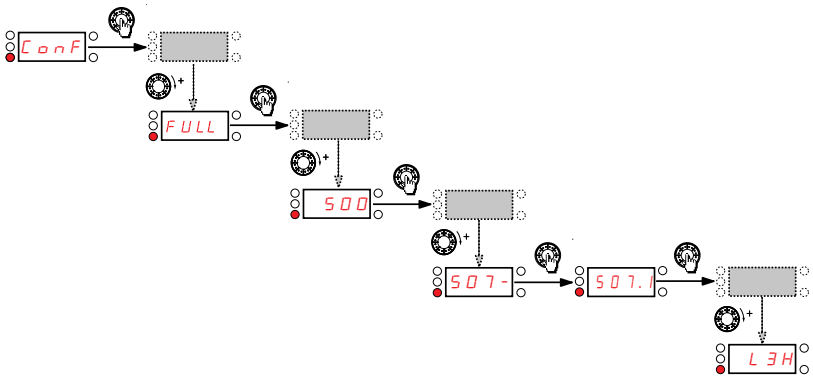
1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic inputs.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. Factory / recall customer parameter set `102` page 53 = `64`.
6. Set the motor parameters (in COnF mode) only if the factory configuration of the drive is not suitable.
7. Perform an auto-tuning.
8. Set 2 preset speeds `507.0` page 83 to `L2H`.



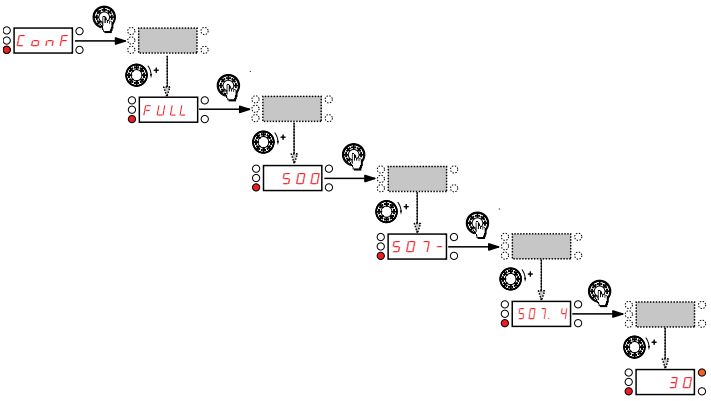
Set Preset speed 2 `507.3` page 83 to 20 Hz.



Set preset speed 4 `507.1` page 83 to `L3H`.

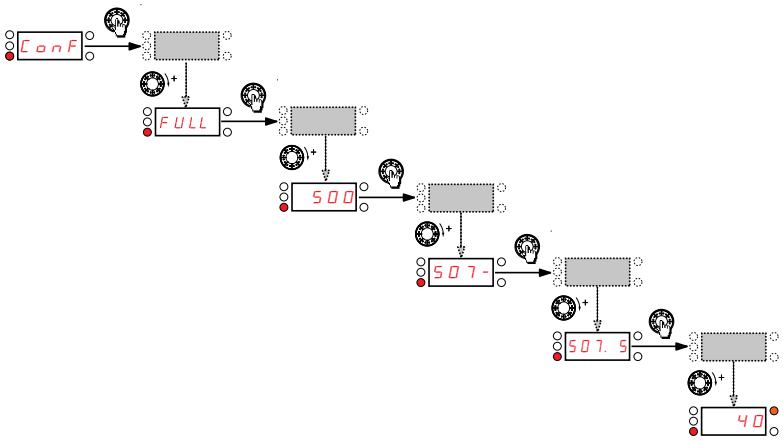


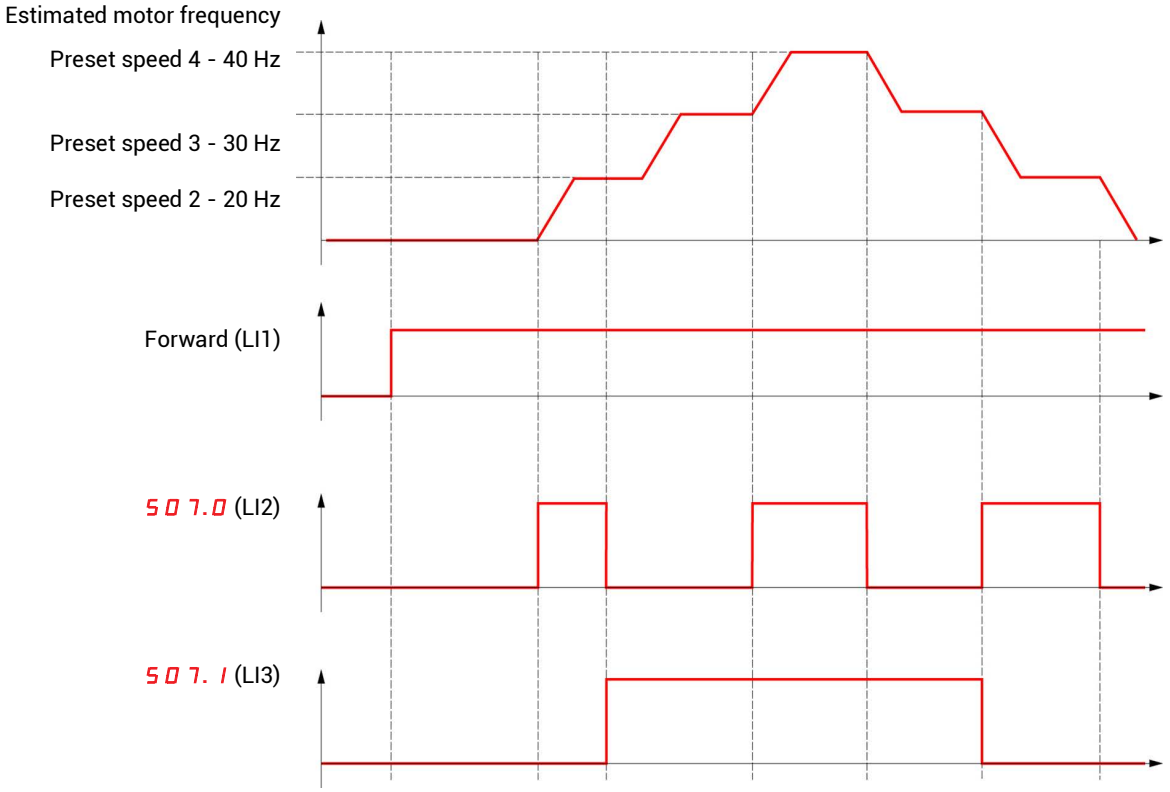
Set Preset speed 3 5 0 7.4 page 83 to 30 Hz.



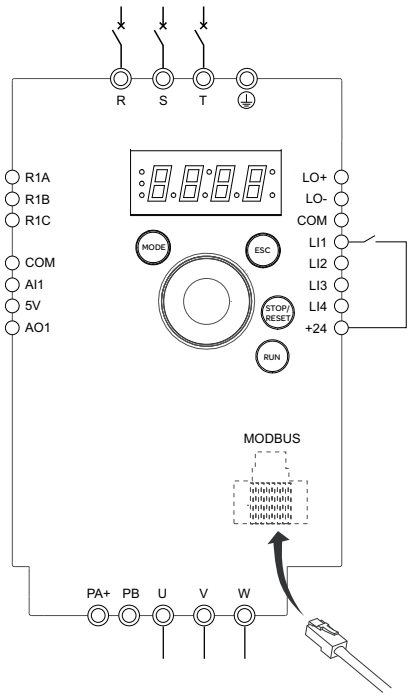
4 preset speeds (source) continued

Set Preset speed 4 5 0 7.5 page 83 to 40 Hz.





Terminal command channel and Modbus reference channel

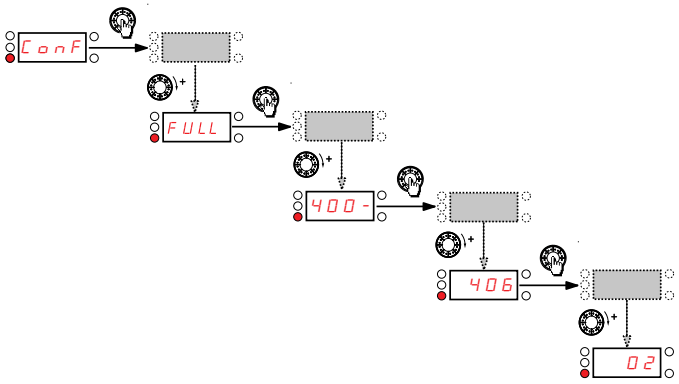


(a): Run Forward

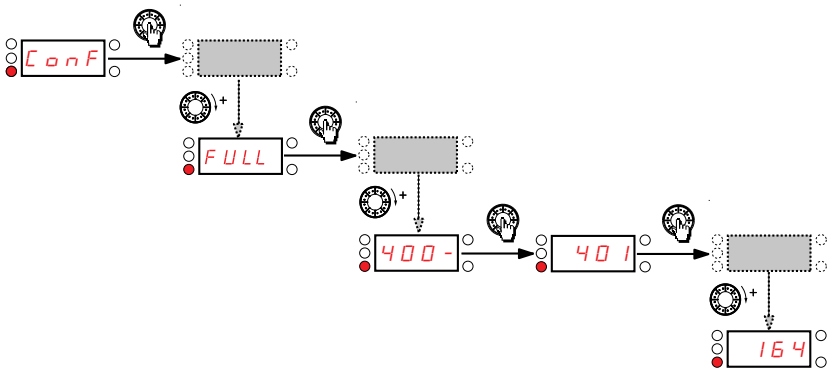
(a)

Important: Please refer to the Function compatibility table page 43.

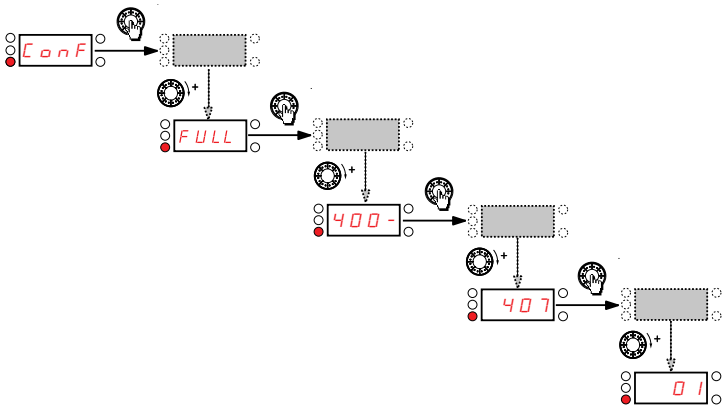
1. Connect the ground terminal to the grounding screws located below the output terminals.
2. Connect the power terminals.
3. Connect the logic input LI1 and plug RJ45 cable connector to the Modbus socket.
4. Turn on the drive without giving a run command.
5. Assign factory settings to the drive, i.e. set Factory / recall customer parameter set 102 page 53 to 64.
6. Set the motor parameters (in CONF mode) only if the factory configuration of the drive is not suitable.
7. Perform an auto-tuning.
8. Set Channel configuration 406 page 72 to 02.



Set Reference channel 1 401 page 72 to 164.



Check that Command channel 1 407 page 73 is set to 01.



9. Start

Upstream Protective Device

Introduction

Overview

⚠ ⚠ DANGER

INSUFFICIENT PROTECTION AGAINST OVERCURRENTS CAN CAUSE FIRE OR EXPLOSION

- Use properly rated overcurrent protection devices.
- Use the fuses/circuit breakers specified.
- Do not connect the product to a supply mains whose prospective short circuit current rating (current that flows during a short circuit) exceeds the specified maximum permissible value.
- When rating the upstream mains fuses and the cross sections as well as the lengths of the mains cables, take into account the minimum required prospective short-circuit current (Isc). Refer to the Upstream Protection Device section.
- If the minimum required prospective short-circuit current (Isc) is not available, apply the instructions given in the section below.

Failure to follow these instructions will result in death or serious injury.

The specified maximum permissible values and products for IEC compliance are specified in the present document (user manual).

General

- The Short Circuit Protective Device (SCPD) rated to the drive will help protect the upstream installation in case of a short-circuit internal to the drive and mitigate the damage to the drive and its surrounding area.
- The SCPD rated to the drive is mandatory to help ensuring the safety of the Power Drive System.
  It comes in addition to the upstream branch circuit protection which is in compliance with the local regulation for electrical installation.
- The SCPD shall mitigate the damage in case of detected error condition such as an internal short-circuit of the drive.
- The SCPD must take into account both following characteristics...
  - a maximum prospective short-circuit current
  - a minimum required prospective short-circuit current (Isc).

If the minimum required prospective short-circuit current (Isc) is not available, increase the power of the transformer or decrease the length of the cables

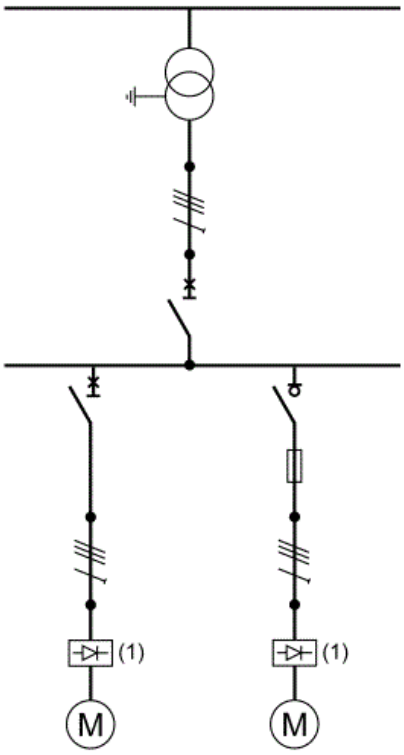
In other cases, contact your Lauritz Knudsen Electrical & Automation Customer Interaction Center (CIC) for specific selection of Short Circuit Protective Device (SCPD).

NOTE: The electronic power output short-circuit protection circuitry meets the requirements of IEC 60364-4-41:2005/AMD1 - Clause 411.

Upstream Protective Device

Wiring Diagram

This diagram shows an example of installation with both SCPD types, Circuit-breaker and Fuse link rated to the drive.



(1) Drive

Prospective Short-Circuit Current

Calculation

The prospective short-circuit current shall be computed at the drive connection points.

The following equations allow to estimate the value of the symmetrical three-phase prospective short-circuit current (Isc) at the drive connection points.

$$Xt = \frac{U^2}{Sn} \cdot usc$$

$$Zcc = \sqrt{\left(\rho \cdot \frac{l}{S} + Rf\right)^2 + \left(Xt + Xc.l + Xf\right)^2}$$

$$Isc = \frac{U}{\sqrt{3}} \cdot \frac{1}{Zcc}$$

Isc	Symmetrical three-phase prospective short-circuit current (kA)
Xt	Transformer reactance
U	No-load phase to phase voltage of the transformer (V)
Sn	Apparent transformer power (kVA)
usc	Short-circuit voltage, according to the transformer data sheet (%)
Zcc	Total short-circuit impedance (mΩ)
ρ	Conductor resistivity e.g. Cu: 0.01851 mΩ.mm
l	Conductor length (mm)
S	Conductor cross section (mm^2)
Xc	Conductor lineic reactance (0.0001 mΩ/mm)
Rf, Xf	Resistance and reactance of the line filter (mΩ)

Upstream Protective Device

Example of Calculation with Copper Cable (without line filter)

Transformer 50 Hz	U 400 Vac Usc	Cable Cross Section	Isc depending on cable length in m(ft)							
			10 (33)	20 (66)	40 (131)	80 (262)	100 (328)	160 (525)	200 (656)	320 (1050)
kVA	%	mm^2 (AWG)	kA	kA	kA	kA	kA	kA	kA	kA
100	4	2.5 (14)	2.3	1.4	0.8	0.4	0.3	0.2	0.2	0.1
		4 (12)	2.9	2.0	1.2	0.6	0.5	0.3	0.2	0.2
		6 (10)	3.2	2.6	1.6	0.9	0.7	0.5	0.4	0.2
		10 (8)	3.4	3.1	2.3	1.4	1.2	0.8	0.6	0.4
		25 (4)	3.5	3.4	3.1	2.5	2.2	1.6	1.4	0.9
		50 (0)	3.5	3.5	3.3	3.0	2.8	2.3	2.1	1.5
		70 (00)	3.5	3.5	3.4	3.1	2.9	2.6	2.3	1.8
		120 (250 MCM)	3.6	3.5	3.4	3.2	3.1	2.8	2.6	2.1
250	4	6 (10)	5.7	3.4	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	7.1	5.0	2.9	1.5	1.2	0.8	0.6	0.4
		25 (4)	8.4	7.4	5.5	3.4	2.8	1.8	1.5	0.9
		50 (0)	8.6	8.1	7.0	5.2	4.5	3.2	2.7	1.8
		70 (00)	8.6	8.2	7.3	5.8	5.2	3.9	3.3	2.3
		120 (250 MCM)	8.7	8.3	7.6	6.5	6.0	4.8	4.2	3.0
400	4	6 (10)	6.6	3.6	1.8	0.9	0.7	0.5	0.4	0.2
		10 (8)	9.2	5.6	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	12	9.9	6.5	3.6	2.9	1.9	1.5	1.0
		50 (0)	13	12	9.3	6.1	5.1	3.4	2.8	1.8
		70 (00)	13	12	10	7.2	6.2	4.4	3.6	2.4
		120 (250 MCM)	13	13	11	8.6	7.6	5.7	4.9	3.4
800	6	6 (10)	6.9	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	10	5.8	3.0	1.5	1.2	0.8	0.6	0.4
		25 (4)	15	11	6.9	3.7	3.0	1.9	1.5	1.0
		50 (0)	17	15	11	6.5	5.4	3.5	2.9	1.8
		70 (00)	17	15	12	7.9	6.7	4.6	3.7	2.4
		120 (250 MCM)	17	16	13	9.8	8.6	6.2	5.2	3.5
1,000	6	6 (10)	7.1	3.7	1.9	0.9	0.7	0.5	0.4	0.2
		10 (8)	11	6.0	3.1	1.5	1.2	0.8	0.6	0.4
		25 (4)	18	12	7.1	3.7	3.0	1.9	1.5	1.0
		50 (0)	21	17	12	6.7	5.5	3.6	2.9	1.8
		70 (00)	21	18	13	8.4	7.0	4.7	3.8	2.4
		120 (250 MCM)	22	19	16	11	9.3	6.5	5.4	3.6

Additional Line Filter Option

If a line input filter option is required for the installation such as a line reactor or a passive harmonic filter, the minimum prospective short-circuit current capability of the source is reduced at the drive connection point and shall be estimated (see Calculation, page 128) with the impedance values given in the table below.

Then, the SCPD type shall be selected according to the drive. If no selection is available, Lauritz Knudsen Electrical & Automation Customer Interaction Center (CIC) should be contacted.

EMC filter series have no significant effect on the minimum prospective shortcircuit current capability of the main source.
Through the line option, the Isc will be limited to a maximum value independent of the transformer and cable. Therefore the below **equations can be used to estimate the minimum prospective short-circuit current capability.**

$$10\,m\Omega \le Xf \le 400\,m\Omega \quad \Rightarrow \quad Isc_{maxi}(kA) = 4.7 - 0.7 \cdot Log\,(Xf)$$

$$400\,m\Omega \le Xf \le 2000\,m\Omega \quad \Rightarrow \quad Isc_{maxi}(kA) = 2.05 - 0.26 \cdot \mathrm{Log}(Xf)$$

Log: Natural logarithm

IEC Fuses

Introduction

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR FIRE

The opening of the branch-circuit protective device is able to be an indication that a fault current has been interrupted.

- Current-carrying parts and other components of the controller should be examined and replaced if damaged.
- If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

Failure to follow these instructions will result in death or serious injury.

NOTE: Only gR and gS fuses are mandatory in case of using braking ports, to comply with IEC 61800-5-1 Ed 2.1.

Short Circuit Current Ratings: Selection Table

The amp rating of the short circuit protection devices in the table are maximum values with Enclosure, in Normal Duty.
Smaller amp sizes may be used; particularly for Heavy Duty ratings.

NOTE:

- Integral solid state short circuit protection in the drive does not provide branch circuit protection. Branch circuit protection must be provided in accordance with any local codes.
- The drive has a 100 kA interrupt rating on the output of the drive. In addition to providing a rating based on shorting the output of the drive, these short circuit current ratings have been obtained by shorting components internal to the drive. These ratings allow proper coordination of short circuit protection.

NOTE: Verify that the minimum required prospective short-circuit current (Isc) value from the table above is lower than the value estimated in the Calculation section, page 128.

690 Vac Three phase (50/60Hz)

NOTE: Suitable for use on a circuit capable of delivering not more than __X__ rms symmetrical kiloAmperes, 690 Vac Volts maximum, when protected by __Z1__ with a maximum rating of __Z2__.

Current limiting fuses can be chosen as SCPD according to the following table for both Normal duty (ND) and Heavy duty (HD):

Reference	Fuse TYPE	Minimun Size	Nominal Voltage	Nominal current (Z1, Z2)	I^2t	SCCR (X)	
			(V)	(A)	(A^2s)	Min (A)	Max (kA)
XD1000-01P5-4B1111	gR	10x38	690	4	6.48	100	5
XD1000-02P3-4B1111	gR	10x38	690	6	22	100	5
XD1000-04P1-4B2111	gR	10x38	690	12.5	50	200	5
XD1000-05P5-4B2111	gR	10x38	690	16	78	200	5
XD1000-08P9-4B2111	gR	10x38	690	20	137	200	5
XD1000-12P1-4B2111	gR	10x38	690	25	238	300	5
XD1000-16P0-4B2111	gR	14x51	690	40	609	500	22
XD1000-22P8-4B2111	gR	14x51	690	40	609	500	22
XD1000-30P0-4B2111	gS	000	690	63	881	1000	22
XD1000-36P0-4B2111	gS	000	690	80	1741	1500	22
XD1000-43P0-4B2111	gS	1	690	100	2747	1500	22
XD1000-60P0-4B2111	gS	00	690	125	6185	1500	22

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
59.00	85	PID feedback assignment		00 01	None Terminal	00	
59.01	85	PID proportional gain		0.01 to 100	-	1	
59.02	85	PID integral gain		0.01 to 100	-	1	
59.03	85	PID derivative gain		0.00 to 100.00	-	0.00	
59.04	85	PID feedback scale factor		0.00 to 100.00	-	0.00	
59.05	85	Activation internal PID reference value		00 01	No Yes	00	
59.06	85	2 preset PID assignment	-	00 L1H L2H L3H L4H	None L1H L2H L3H L4H	00	
59.07	86	4 preset PID assignment		59.06	As 59.06	00	
59.08	86	2 preset PID reference value	%	0 to 100	-	25%	
59.09	86	3 preset PID reference value	%	0 to 100	-	50%	
59.10	86	4 preset PID reference value	%	0 to 100	-	75%	
59.11	86	Internal PID reference value	% PID	0 to 100	-	0%	
59.12	86	PID reference value ramp	s	0 to 99.9	-	0 s	
59.13	86	PID min value reference	% PID	0 to 100	-	0%	
59.14	86	PID max value reference	% PID	0 to 100	-	100%	
59.15	86	PID predictive speed	-	01 to 400	-	nO	
59.16	87	PID correction reverse	-	00 01	No Yes	00	
59.17	87	PID auto/manual assignment		00 L1H L2H L3H L4H	No L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high	00	
59.18	87	PID manual reference		00 01 02	No Terminal AIV	00	
59.19	88	PID: wake up level	%	0 to 100	-	0%	
59.20	88	PID: Wake up threshold	%	0 to 100	-	0%	
59.21	89	Sleep offset threshold	Hz	0 to 512.2	-	0 Hz	
59.22	89	PID feedback supervision threshold	%	0 to 100	-	0 (No)	
59.23	89	PID supervision function time delay	s	0 to 600	-	0 s	
59.24	89	Maximum frequency detection Hysteresis	Hz	0 to 512.2	-	0 Hz	
59.25	89	PID feedback supervision	-	01 04	Fault and freewheel stop Fall back speed	01	
59.26	89	Fall back speed	Hz	0 to 512.2	-	0 Hz	
100	54	Macro-configuration	-	00 04 09	Start/stop PID regulation Speed	00	-

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
101	53	Store customer parameter set	-	00 01	No Yes	00	
102	53	Factory / recall customer parameter set	-	00 02 64	No REC INI	00	
201	55	Type of control	-	00 01	2 wire type control 3-wire control	00	
202	59	2-wire type control	-	00 01 02	0/1 level Transition Priority FW	00	
203	59	Logic inputs type	-	00 01 02	Positive Negative internal supply Negative external supply	00	
204.0	60	AI1 type	-	5u 10u 0A Liu	Voltage: 0-5 Vdc Voltage: 0-10 Vdc Current: x-y mA Logic input	5U	
204.1	60	AI1 current scaling parameter of 0%	mA	0 to 20	-	4 mA	
204.2	60	AI1 current scaling parameter of 100%	mA	0 to 20	-	20 mA	
204.3	60	AI1 filter time	s	0 to 10	-	0 s	
205	60	R1 assignment	-	00 01 02 04 05 06 07 08 21 22 123	Not assigned No error detected Drive run Freq. threshold reached 512.2 reached I threshold reached Freq. reference reached Mot. therm. state reach. Process underload fault Process overload fault AI1 Al. 4-20	01	
206.0	61	LO1 assignment	-	00 01 02 04 05 06 07 08 21 22 123 126	Not assigned No error detected Drive run Freq. threshold reached 512.2 reached I threshold reached Freq. reference reached Mot. therm. state reach. Process underload fault Process overload fault 4-20 mA signal loss Auxiliary pump	00	
206.1	63	LO1 status (output active level)	-	00 01	Positive logic: active Negative logic: active	00	
207	61 90	Process overload time delay	s	0 to 100	-	5 s	
208	61 90	Process overload threshold	% of In	70 to 150	-	90%	
209	62 90	Process overload fault duration	min	0 to 6	-	0 min	
210	62 90	Process underload time delay	s	0 to 100	-	0 s	

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
211	62 90	Process underload threshold	% of 305	20 to 100	-	60%	
212	62 90	Process underload fault duration	min	0 to 6	-	0 min	
213	62	Motor frequency threshold	Hz	0 to 400	-	50 or 60 Hz	
214	62	Motor current threshold	A	0 to 1.5 of In	-	InV	
215	62	Motor thermal state threshold	% of tHr	0 to 118		100%	
216.0	63	AO1 assignment		00 129 130 131 135 136 137 139 140 141	None Estimated Motor current Estimated motor freq. Ramp output PID reference value PID feedback PID error Output power Motor thermal state Drive thermal state	00	
216.1	63	AO1 type		10U 0A 4A	Voltage Current Current	0 A	
217	64	Reference Template		850 8L5 8n5 8n50	Standard Pedestal Deadband Deadband at 0 %	00	
301	65	Standard motor frequency	Hz	00 01	50 Hz 60 Hz	00	
302	65	Rated Motor Power	kW or HP	-	-	Determined by drive rating and dual rating	
303	65	Rated motor cos phi	-	0.5 to 1	-	Determined by drive rating and dual rating	
304	65	Rated motor voltage	V	360 to 460	-	380 V	
305	66	Rated motor current	A (1)	0.25 to 1.5	-	Determined by drive rating and dual rating	
306	66	Rated motor frequency	Hz	10 to 400	-	50 or 60 Hz (301)	
307	66	Rated motor speed	rpm	0 to 32767	-	Determined by drive rating and dual rating	
308	66	Maximum frequency	Hz	10 to 400		60 or 72 Hz (to 301)	
309	66	Motor control type	-	00 03 06	SVC performance Standard U/F Pump	03	
310	67	IR compensation	%	25 to 200	-	100%	
311	67	Slip compensation	% of nSL	0 to 150	-	100%	
312	67	Frequency loop stability	%	0 to 100	-	20%	
313	67	Frequency loop gain	%	0 to 100	-	20%	
314	68	Flux Profile	%	0 to 100		20%	
315	68	Switching frequency	kHz	2 to 16	-	12	

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
317	68	Motor noise reduction		00 01	No Yes	00	
318	69	Auto-tuning	-	00 01 02	No Yes Complete	00	
319	69	Motor parameter choice	-	00 01	00 01	01	
320	70	Vector control 2 points	-	00 01	No Yes	00	
321	70	Max voltage of constant power	V	Value of parameter 314 to 460 V		380 V	
322	70	Max frequency of constant power	V	Value of parameter 306 to 460 Hz		50 Hz	
323	70	Dual Rating	-	00 01	Normal duty Heavy duty	01	
401	72	Reference channel 1		01 163 164 183	Terminal HMI Modbus Jog Dial	01	
402	72	External reference value	Hz	-400 to 400	-	-	
403	72	Integrated display jog dial reference	%	0 to 100	-	-	
404	72	Reverse inhibition		00 01	No Yes	00	
405	72	Stop key priority		00 01	No Yes	Yes	
406	72	Channel configuration		01 02	Combined mode Separate mode	01	
407	73	Command channel 1		01 02 03 10	Terminals Local Remote display Modbus		
408	73	Forced local assignment		00 L1H L2H L3H L4H	No L1H L2H L3H L4H	00	
409	73	Forced local reference		00 01 163 183	None Terminal HMI Jog Dial	00	
501.0	74	Acceleration	s	0.0 to 999.9	-	3.0 s	
501.1	74	Deceleration	s	0.0 to 999.9	-	3.0 s	
501.2	74	Ramp shape assignment		00 01 02	Linear S-shape U-shape	00	
501.3	74	Ramp switching commutation		00 L1H L2H L3H L4H L1L L2L L3L L4L	None L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high L1L: LI1 active low L2L: LI2 active low L3L: LI3 active low L4L: LI4 active low	00	

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
501.4	75	Acceleration 2	s	0.0 to 999.9	-	5 s	
501.5	75	Deceleration 2	s	0.0 to 999.9	-	5 s	
501.6	75	Decel Ramp Adaptation assignment		00 01 02	No Yes Motor braking	Yes	
502.0	76	Type of stop		00 03 08 13	Ramp stop DC injection Fast stop Freewheel stop	00	
502.1	76	Freewheel stop assignment		00 L1L L2L L3L L4L	No L1L: LI1 active low L2L: LI2 active low L3L: LI3 active low L4L: LI4 active low	00	
502.2	76	Fast stop assignment		00 L1L L2L L3L L4L	NONE L1L: LI1 active low L2L: LI2 active low L3L: LI3 active low L4L: LI4 active low	00	
502.3	76	Fast stop Ramp divider		1 to 10	-	4	
502.4	77	DC injection assignment		00 L1H L2H L3H L4H LUH	None / Not assigned L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high LUH: LIU active high	00	
502.5	77	DC injection level		0.1 to 1.41	-	0.64*In	
502.6	77	IDC injection time for DCLI		0.1 to 30	-	0.5 s	
502.7	78	DC injection level 2		0.1 to DC injection level value	-	0.5*In	
502.8	78	Injection standstill braking time		0.1 to 30	-	0.5 s	
503	74	Reverse direction	-	00 L1H L2H L3H L4H	Function inactive L1H active high L2H active high L3H active high L4H active high	00	
504.0	79	Automatic DC injection		00 01 02	No Yes Continuous	Yes	
504.1	79	Automatic DC injection current	A	0 to Rated motor current 305		70% of Rated motor current 305	
504.2	79	Automatic DC injection time	s	0.1 to 30		0.5 s	
505.0	80	Jog assignment	-	00 L1H L2H L3H L4H	Function inactive LI1 active high LI2 active high LI2 active high LI4 active high	00	
505.1	80	Jog Frequency	Hz	0 to 10	-	5 Hz	

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
506.0	81	Up speed command	-	00 L1H L2H L3H L4H LUH	Function inactive LI1 active high LI2 active high LI2 active high LI4 active high LIU active high	00	
506.1	81	Down speed command	-	00 L1H L2H L3H L4H LUH	Function inactive LI1 active high LI2 active high LI2 active high LI4 active high LIU active high	00	
506.2	81	Store	-	00 01 02	Do not save Save to RAM Save to ROM	00	
506.3	82	Clear the function	-	00 L1H L2H L3H L4H LUH 159	Function inactive LI1 active high LI2 active high LI2 active high LI4 active high LIU active high Function is cleared	00	
506.4	82	Reactivity of +/- speed around ref.	%	0 to 100	-	0%	
507.0	83	2 preset speeds	-	00 L1H L2H L3H L4H	Function inactive L1 high activation level LI2 active high LI2 active high LI4 active high	00	
507.1	83	4 preset speeds		As 507.0		00	
507.2	83	8 preset speeds		As 507.0		00	
507.3	83	Preset speed 2	Hz	0 to 400	-	10 Hz	
507.4	83	Preset speed 3	Hz	0 to 400	-	15 Hz	
507.5	83	Preset speed 4	-	0 to 400	-	20 Hz	
507.6	83	Preset speed 5	Hz	0 to 400	-	25 Hz	
507.7	83	Preset speed 6	Hz	0 to 400	-	30 Hz	
507.8	83	Preset speed 7	Hz	0 to 400	-	35 Hz	
507.9	83	Preset speed 8	Hz	0 to 400	-	40 Hz	
507.0	83	2 preset speeds	-	00 L1H L2H L3H L4H	Function inactive L1 high activation level LI2 active high LI2 active high LI4 active high	00	
508	83	Skip frequency	Hz	0 to 400	-	0 Hz	
510.0	90	Selecting operating mode	-	00 01	No Yes	-	
510.1	90	Starting frequency of the auxiliary pump	Hz	0 to parameter 308 value		parameter 512.2 value	
510.2	90	Time delay before starting auxiliary pump	s	0.0 to 999.9	-	2 s	
510.3	90	Auxiliary pump ramp reaching	s	0.0 to 999.9	-	2 s	
510.4	90	Auxiliary pump stop frequency	Hz	0 to parameter 308 value		0 Hz	
510.5	91	Auxiliary pump stop time delay	s	0.0 to 999.9	-	2 s	
510.6	91	Auxiliary pump stop ramp	s	0.0 to 999.9	-	2 s	

Parameter Index

Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
S10.7	91	Zero flow detection period	min	0.0 to 20	-	0 min	
S10.8	91	Zero flow detection activation threshold	Hz	0.0 to 400	-	0 Hz	
S10.9	91	Zero flow detection offset	Hz	0.0 to 400	-	0 Hz	
S11.0	100	2nd current limitation commutation		00 L1H L2H L3H L4H L1L L2L L3L L4L	NONE L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high L1L: LI1 active low L2L: LI2 active low L3L: LI3 active low L4L: LI4 active low	00	
S11.1	100	Current limitation	A	0.25 to 1.5 of In	-	Determined by drive rating and dual rating	
S11.2	100	2nd current limitation commutation	A	0.25 to 1.5 of In	-	Determined by drive rating and dual rating	
S12.0	101	Low speed	Hz	0 to S12.2	-	0 Hz	
S12.1	88 101	Low speed operating time	s	0.1 to 999.9	-	nO	
S12.2	102	High speed	Hz	S12.0 to 308	-	50 or 60Hz determined by 301 parameter value	
S12.3	102	2 High speed assignment	-	00 L1H L2H L3H L4H	None L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high	00	
S12.4	102	4 High speed assignment	-	As S12.3	As S12.3	00	
S12.5	102	High speed 2	Hz	S12.0 to 308	-	50 or 60 Hz determined by 301 and max. 308	
S12.6	102	High speed 3	Hz	As S12.5	As HS2	As S12.5	
S12.7	102	High speed 4	Hz	As S12.5	As HS2	As S12.5	
S13	102	Cooling fan control		00 01	Fan runs while drive is running Temperature control mode		
601	103	Detected fault reset assignment	-	00 L1H L2H L3H L4H	None L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high	00	
602.0	104	Automatic restart		00 01	No Yes	00	
602.1	104	Max. automatic restart		0 1 2 3 4 5 6	5 min. 10 min. 30 min. 1 hr 2 hr 3 hr Infinite	5 min.	
603	104	Catch on the fly		00 01	Function inactive Function active	00	

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Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
604	106	Motor thermal current	A	0.2 to 1.5 In	-	Determined by drive rating	
604.1	106	Motor protection type	-	01 02	Self-ventilated Motor-ventilated	01	
604.2	106	Overload fault management	-	00 01 08	Fault ignored Freewheel stop DC injection	01	
604.3	106	Motor thermal state memo	-	00 01	Not stored at power off Stored at power off	00	
605	106	Output Phase loss	-	00 01	Function inactive Function active	01	
606	106	Input Phase loss	-	00 01 08	Fault ignored Freewheel stop DC injection	01	
607.0	107	Undervoltage detected fault management	-	00 01	Detected fault and R1 relay set to 0 Detected fault and R1 relay set to 1	0	
607.1	107	Undervoltage prevention	-	00 02	Freewheel stop Ramp stop	00	
607.2	107	Undervoltage ramp deceleration time	s	0.0 to 10.0	-	1.0 s	
608	107	IGBT Test		00 01	No test Yes	00	
609	107	4-20mA loss Behaviour		00 01 08	00 01 DC injection	00	
610	108	Detected fault inhibition assignment		00 L1H L2H L3H L4H	NONE L1H: LI1 active high L2H: LI2 active high L3H: LI3 active high L4H: LI4 active high	00	
611	109	Modbus detected fault management		00 01 08	No Yes DC injection	Yes	
612	109	Degraded line supply operation		00 01	No Yes	00	
613	109	Reset power run		00 01	Function inactive Reset fan time display	00	
614	109	Reset all previous detected faults via Run key of HMI	-	00 01	Inactive Active	00	-
701	110	Modbus address		OFF to 247	-	Off	
702	110	Modbus baud rate		24 28 32 36	4.8 kbps 9.6 kbps 19.2 kbps 38.4 kbps	19.2 kbps	
703	110	Modbus format	-	00 01 02 03	8o1 8E1 8n1 8n2	8E1	
704	110	Modbus time out	-	0.1 to 30	-	10	
705.0	110	Com scanner read address parameter 1	-			0C81	
705.1	110	Com scanner read address parameter 2	-			219C	

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Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
705.2	110	Com scanner read address parameter 3	-			0	
705.3	110	Com scanner read address parameter 4	-			0	
706.0	110	Com scanner write address parameter 1				2135	
706.1	110	Com scanner write address parameter 1				219C	
706.2	110	Com scanner write address parameter 3				0	
706.3	110	Com scanner read address parameter 4				0	
707.0	111	Com scanner read address value 1				CMD value	
707.1	111	Com scanner read address value 2				LFRD value	
707.2	111	Com scanner read address value 3				8000	
707.3	111	Com scanner read address value 4				8000	
708.0	111	Com scanner write address value 1				ETA value	
708.1	111	Com scanner write address value 2				LFRD value	
708.2	111	Com scanner write address value 3				8000	
708.3	110	Com scanner write address value 4				8000	
801	46	Speed reference		01 63 164 183	Terminal HMI Modbus Jog Dial		
802	46	Output frequency	Hz	-	-	-	
803	46	Motor current	A	-	-	-	-
804	46	PID error	-	-	-	-	-
805	46	PID feedback	-	-	-	-	-
806	46	PID reference	-	-	-	-	-
807	46	Main voltage	V	-	-	-	-
808	46	Motor thermal state	%	-	-	-	-
809	46	Drive thermal state	-	-	-	-	-
810	46	Output power	%	-	-	-	-
811	47	Product status	-	-	-	-	-
901	48	State of logic inputs LI1 to LI4	-	-	-	-	-
902	48	State of the logic output LO1 and relay R1	-	-	-	-	-
903	48	Display of high speed value	Hz	-	-	-	-
904	48	Drive Power rating		-			
905	48	Drive voltage rating	-	-	-	-	-
906	48	Specific Product Number	-	-	-	-	-
907	48	Card 1 Software Version	-	-	-	-	-

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Code	Page	Name	Unit	Possible value / Function		Factory setting	User setting
908	49	Card 2 Software Version	-	-	-	-	-
909	49	Run elapsed time display	0.01h	0.01 to 999	-	-	-
910	49	Power On time display		0.01 to 999	-	-	-
911	49	Fan time display		0.01 to 999	-	-	-
912	49	Process elapsed time	0.01	-	-	-	-
913	49	Modbus communication status	-	rDt0 rDt1 rIt0 rIt1	-	-	
914	49	Last fault 1	-	See page 114		-	-
915	50	State of drive at fault 1	-	-	-	-	-
916	50	Last fault 2	-	See page 114		-	-
917	50	State of drive at fault 2	-	-	-	-	-
918	50	Last fault 3	-	See page 114		-	-
919	50	State of drive at fault 3	-	-	-	-	-
920	50	Last fault 4	-	See page 114		-	-
921	50	State of drive at fault 4	-	-	-	-	-
999	51	HMI Password	-	OFF On	Password disabled Password activated	OFF	

“This literature gives information to user about product installation, operation maintenance and disposal. This information is not exhaustive and should customer require further information, in specific cases, customer may contact customer interaction cell."

“The manufacturer assumes no responsibility for injuries, losses, damages to human beings and/or equipments due to inappropriate application of instructions, provided herein."

“Product development is a continuous process. The information given in this literature is Subject to change. For latest information the customer may contact customer interaction cell."

“Product images are indicative"

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