



*This manual is to be given
to the end user*

UNIDRIVE Synchronisation Solution

Installation and Commissioning Manual

UNIDRIVE SP

Universal speed drive

The LEROY-SOMER offer

Operation 4 quadrants

- Brake resistor

RFI filters - Line choke

UNIDRIVE SP



Control

- Additional input/output module
- Decentralised input/output
- RTU Modbus serial link in standard version
- Field bus module :
 - DP Profibus,
 - S Interbus,
 - Devicenet,
 - CANopen,
 - CTNet

Operator interfaces

- LED display
- LCD display
- LS Soft parameter-setting software
- Man-Machine interfaces

Application Solutions

- Positioning
- Lifting
- Synchronisation
- Winding-Unwinding
- Length cut
- Programmable PLC module

Other integrable modules

- Encoder second input
- Resolver

Gearboxes standard or reduced play

- Axial output
 - Helical gears



- Orthogonal output
 - Helical gears and helical torque,
 - Worm



Output choke - Ferrite Power cables and encoder

Motors

- Asynchronous
 - LS
 - FLS



- Asynchronous adapted to the variable speed
 - LSMV
 - FLSMV



- Servo



Options

- Forced ventilation
- Parking brake or dynamic brake

Motor transducer

- Encoders : incremental, 'EnDat' or SSI absolute, sincos ...
- Resolvers

Other motor options

- Forced ventilation
- Parking brake or dynamic brake

Options

- Forced ventilation
- Parking brake

UNIDRIVE SP

Safety instructions

NOTE

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

CAUTION

For the user's safety, this speed drive must be connected to a proper earthing. (terminal $\frac{1}{\text{E}}$).

If the accidental starting of the installation is likely to cause a risk to the personnel or to the machines being driven, it is necessary to supply with power the equipment by means of an isolating switch and of a circuit-breaking device (power contactor) controlled by an external safety chain (emergency stop, detection of anomalies on installation).

The speed drive is fitted with safety devices which in case of fault may control its stopping and consequently the motor stopping. This motor itself can be also subject to stopping as result of the mechanical blocking. Finally, the voltage fluctuations, in particular power cuts, may also cause the motor to stop.

The elimination of the shutdown causes can lead to a restart which may be dangerous for certain machines or installations, especially for those which must comply with appendix 1 of decree 92.767 of 29th July, 1992 on safety. In such cases, it is important for the user to take the appropriate precautions against the motor restarting in case of an unscheduled motor stop.

The variable speed drive is designed to be able to supply with power a motor and the driven machine above its rated speed. If the motor or the machine are not mechanically designed to withstand such speeds, the user may be exposed to a serious risk due to their mechanical deterioration. It is important for the user to check, before setting a high speed, if the installation can withstand it.

The speed drive making the object of this manual is a component designed to be integrated into an installation or an electrical machine and it can under no circumstances be considered to be a safety device. It is therefore the responsibility of the machine manufacturer, the installation designer or the user to take the necessary precautions in order to ensure that the installation complies with the standards in force and to provide any devices required to ensure the safety of the equipment and personnel.

Use of the drive for lifting: the implementation of this application imposes the observance of the particular instructions given in a specific manual, on demand. The user is the one who must require it from its usual interlocutor LEROY-SOMER.

LEROY-SOMER declines all responsibility in case the above-mentioned recommendations are not observed.


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Manual corresponding to the software versions higher or equal to 1.07.01

UNIDRIVE SP

Safety instructions

SAFETY AND OPERATING INSTRUCTIONS RELATED TO SPEED DRIVES (According to the low voltage directive 73/23/CEE amended by 93/68/CEE)

 • Throughout this manual this symbol warns of the consequences arising from the misuse of the variable speed drive, since the electrical risks may lead to material damages or to bodily injuries, as well as to fire hazards.

1 - General

According to their degree of protection, the variable speed drives may contain live parts which are powered up, which may be moving or rotating, as well as hot surfaces, during their operation.

The improper removal of the protection devices, an inadequate use, a faulty installation or an inappropriate handling could represent a serious risk to the personnel and equipment.

For further information, read this documentation.

All the works related to the transportation, installation, commissioning and maintenance must be performed by a qualified and authorised personnel (see IEC 364 or CENELEC HD 384, or DIN VDE 0100, as well as the national provisions regarding installation and accident prevention).

Within the scope of these basic safety instructions, qualified personnel means persons having competence as regards the installation, the assembling, the commissioning and the product exploitation, and having the relevant qualifications.

2 - Use

The variable speed drives are components designed for integration into installations or electrical machines.

In case of incorporation into a machine, their commissioning is forbidden if the compliance of the machine with the provisions of the Directive 89/392/CEE (machine directive) has not been checked. It is also necessary to observe the EN 60204 standard stipulating mainly that the electrical actuators (which include the variable speed drives) cannot be considered as circuit-breaking devices and certainly not as isolating switches.

Their commissioning is not allowed if the provisions of the Electromagnetic Compatibility Directive (89/336/CEE, amended by 92/31/CEE) are not observed.

The variable speed drives meet the requirements of the Low Voltage Directive 73/23/CEE, amended by 93/68/CEE. The harmonised standards of the DIN VDE 0160 series along with the VDE 0660 standard, part 500 and EN 60146/VDE 0558 are applicable to them.

The technical characteristics and the instructions concerning the connection conditions specified on the nameplate and in the documentation provided, must be observed.

3 - Transportation, storing

All the instructions concerning the correct transportation, storing and handling must be observed.

The climatic conditions specified in the technical manual must be observed.

4 - Installation

The equipment installation and cooling must comply with the provisions of the documentation supplied with the product. The variable speed drives must be protected against any excessive stress. In particular, the parts must not be damaged and/or the clearances between components must not be changed during the transportation and the handling. Do not touch the electronic components and the contact parts.

The variable speed drives contain parts which are sensitive to electrostatic stress and may be easily damaged in case of inadequate handling. Electric components must not be exposed to mechanical damage or destruction (otherwise, your health is at risk!).

5 - Electric connection

When works are performed on variable speed drives which are powered up, the national provisions related to the prevention of accidents must be observed.

The electric installation must be executed according to the applicable provisions (for example, conductor section, protection by fused short-circuit, connection of the protection conductor). More detailed information is given in the manual. The documentation accompanying the variable speed drives contains the instructions for an installation which meets the electromagnetic compatibility requirements, such as screening, earthing, presence of filters and adequate insertion of cables and conductors. These instructions must be observed in all cases, even if the variable speed drive carries the CE mark. The observation of the limit values imposed by the legislation on CEM is the responsibility of the manufacturer of the installation or the machine.

6 - Operation

The installations with built-in speed drives must be fitted with additional protection and monitoring devices as laid down in the safety provisions in force, such as the law on technical equipment, the provisions on accident prevention, etc. The modification of the variable speed drives by means of the control software are permitted.

The active parts of the device and the live power connections must not be touched immediately after the the variable speed drive in powered down, as the capacitors may still be loaded. The warnings attached to the variable speed drives must be observed.

During operation, all doors and protective devices must be kept closed.

7 - Servicing and maintenance

Refer to the manufacturer's documentation

This manual is to be given to the end user.

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UNIDRIVE SP

General information



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A1 - Main principle

The SM-SYN module (Synchronisation programmable application module) built in a UNIDRIVE SP drive, with option at SM-Universal-Encoder module is used to synchronise two axes (a "master" axis and a "slave" axis). The system can operate in closed or open loop and it must be used with an auto-driven asynchronous or synchronous motor (brushless).


The ratio between the master and the slave is fixed by the settings. If several ratios are necessary, an additional SM-I/O input / output module is added in order to manage up to 32 ratios.

Manual for use with the synchro software versions higher or equal to 42000338



A2 - Operating conditions

The UNIDRIVE SP permanent output current and the maximum transient current depend on the operating conditions.

Maximum overload: In order to obtain the maximum available overload, the permanent output current (I_{sp}) is limited. In this case, the maximum transient drive current (transient I_{max}) is 150% I_{sp} in open loop or 175% I_{sp} in closed loop or servo.

I_{sp} is available on the entire speed range . Maximum transient overload

$$= \frac{I_{sp}}{I_{N \text{ motor}}} \times 1.5 \times 100.$$

Maximum transient overload  and 

$$= \frac{I_{sp}}{I_{N \text{ motor}}} \times 1.75 \times 100.$$

Example :

- LS MV 132 SM motor - 4 poles - 5.5 kW - 400V Y

$I_{N \text{ motor}} = 10.4A.$

- Application with constant torque - open loop vector control - maximum overload.

- Drive selection --> UNIDRIVE SP 8T, I_{sp} with maximum overload: 13A.

$$\text{Maximum transient overload} = \left(\frac{13}{10.4}\right) \times 1.5 \times 100 = 187.5\%.$$

Reduced overload: If the operating conditions are not severe, the output current may be increased and may allow a high power motor. On the other hand, the maximum transient current is limited to 110% I_{sp} .

Below 15% of the rated speed, the permanent output current is reduced as indicated in the graph below.

$$\text{Maximum transient overload} = \frac{I_{sp}}{I_{N \text{ motor}}} \times 1.1 \times 100.$$

Example :

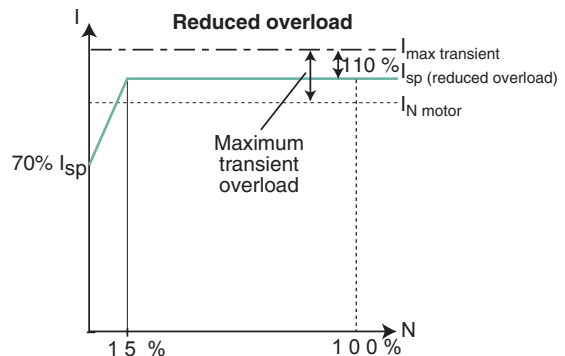
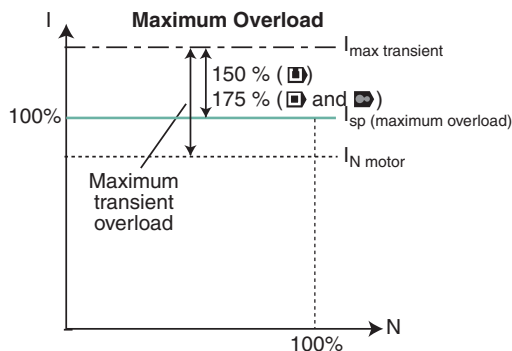
- LS MV 132 SM motor - 4 poles - 5.5 kW - 400V Y

$I_{N \text{ motor}} = 10.4 A.$

- Application to constant torque - open loop vector control - reduced overload and minimum speed > 15% rated speed.

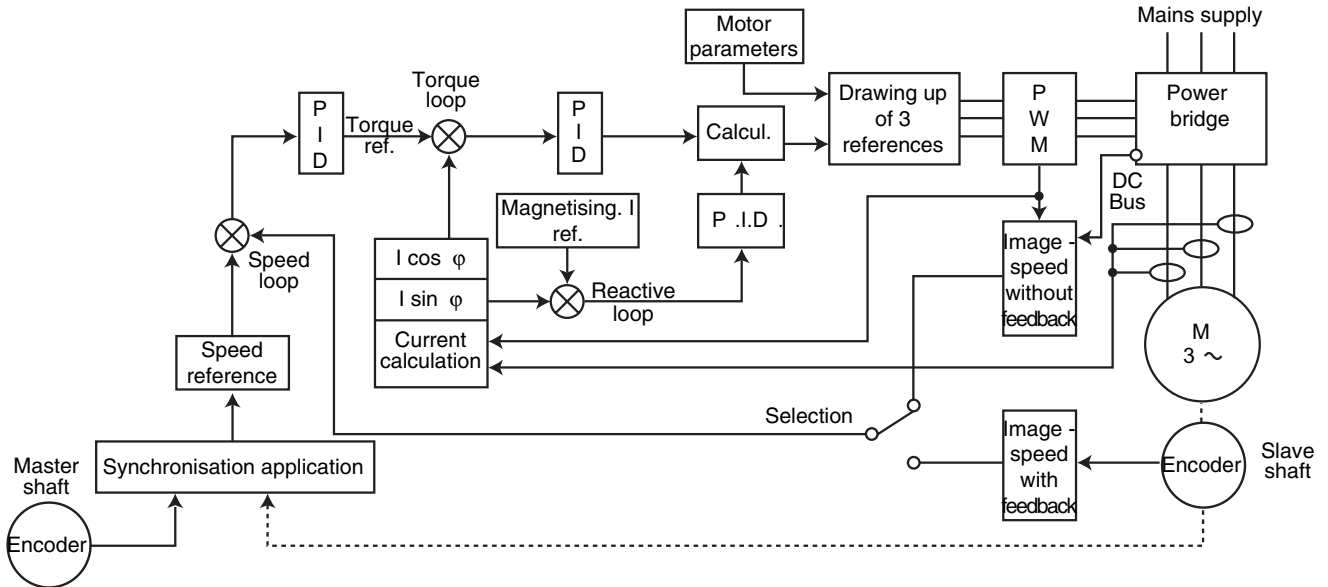
- Drive selection --> UNIDRIVE SP 5,5T, I_{sp} with reduced overload: 11A

$$\text{Maximum transient overload} = \left(\frac{11}{10.4}\right) \times 1.1 \times 100 = 116\%.$$



UNIDRIVE SP General information

A3 - Control principle



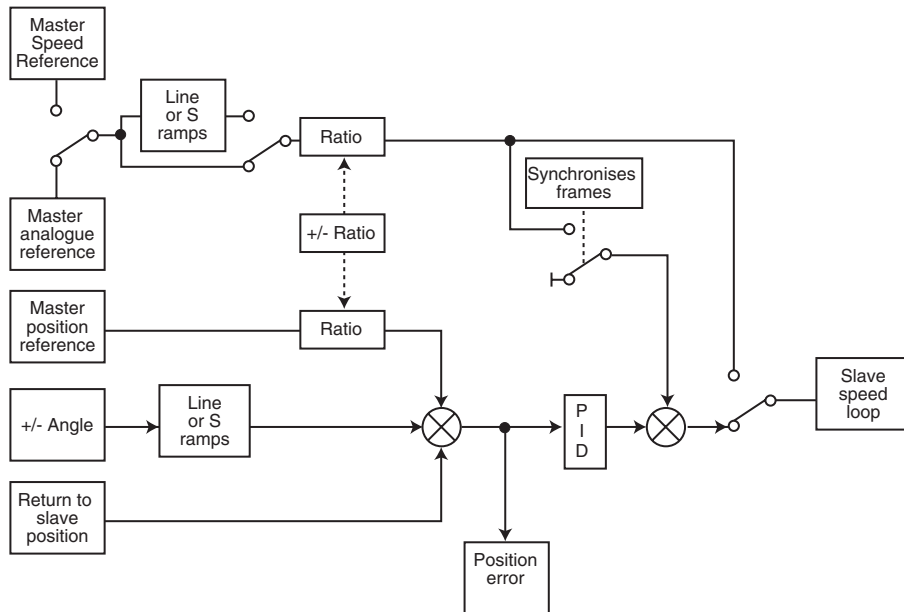
UNIDRIVE SP General information

A4 - Operation principle

The SM-SYN module is used for speed or position synchronisation. The position can be rigid or non rigid (recovering or not from the position change of the slave before the synchronisation order).

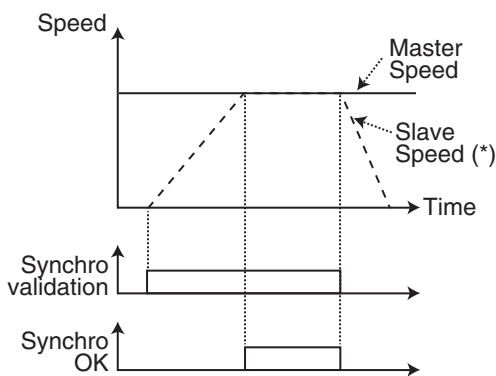
The use of the master speed reference or feedback anticipates the synchronisation. In certain cases, it allows the slave to be synchronised during transient phases.

According to the application type, it is possible to use external sensors to check and correct the distance between the axes to be synchronised.



A4.1 - Speed Synchronisation

It keeps the slave speed proportional to the master speed via the kinematics ratio and the desired electric ratio.

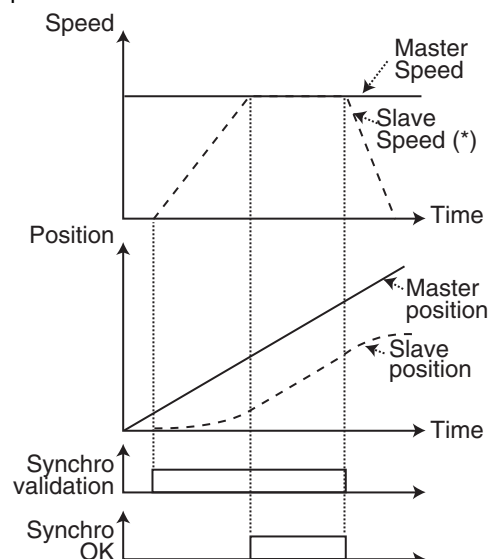


(*) Slave speed = master speed x kinematic relation x electrical ratio.

A4.2 - Position Synchronisation

A4.2.1 - Non Rigid Mode

The non rigid servo-control principle is to synchronise in position the slave axis and the master axis via the kinematics ratio and the desired electric ratio without recovering the lost position between the master and the slave during the transient phase.



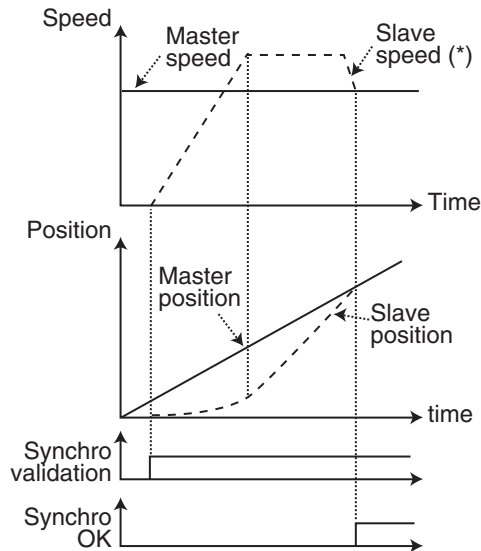
(*) Slave speed = master speed x kinematics ratio x electric ratio.

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A4.2.2 - Rigid Mode

The regulation principle in rigid position is to synchronise in position the slave axis according to the master axis via the kinematics ratio and the desired electric ratio, by correcting the lost position between the master and the slave during the transient phase.



(*) Slave speed = master speed x kinematics ratio x electric ratio.

A4.2.3 - Position shift

• Shift by Digital Input

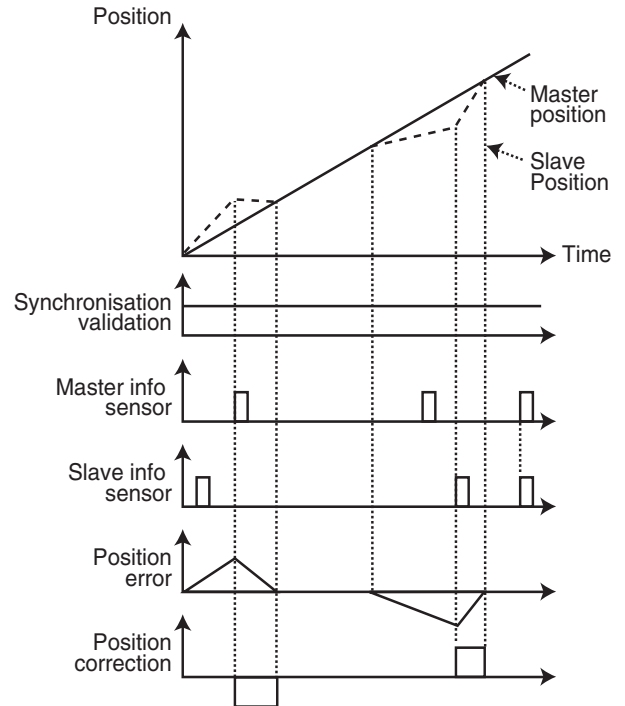
A pulse on the digital inputs brings forward by a step the slave axis position by comparison with the master axis, in the two directions of rotation.

• Shift on Top 0 encoder

The synchronisation mode is used to position the two motor axes after having performed at least one encoder turn in order to read Top 0. It is possible to set a position offset in order to correctly index slow shafts (according to the machine kinematics).

• Interval by external sensors

Two digital inputs can be assigned to manage external sensor information, to synchronise in position the two axes. The correction can be performed on each front of the slave sensor or according to a number of fronts defined by the setting. It is possible to change the interval between the two sensors, generally for mechanical setting reasons.



• Interval on run command

By setting, it is possible to manage a fixed shift on the run command.

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A4.3 - Setting

In order to synchronise two axes, it is necessary to introduce the ratio specific to the axes kinematics.

In order to limit the errors introduced by an infinite ratio, it is possible to define the reduction, referred to as ratio 0, as a fraction with a value ranging between 1.10^{-8} and 15.99999999.

In certain cases it may necessary to change the ratio between the master and slave axes. Adding an SM-I/O module helps the management of up to 32 ratios. For additional information refer to section "Module SM-I/O Plus".

A4.4 - Position shift

Two logic inputs, I+ and I- (positive or negative shift) are used to change the selected ratio or the position angle between the axes, according to an internal presetting.

A4.5 - Report

• Validated Synchro

The "validated synchro" information is given by a logic output when the drive has received a Run command and the program operates correctly.

• Synchro OK

The "synchro OK" information is given by a logic output when the position or speed error (according to the synchronisation mode) is in a preset "window". It is used to give information to the machine on the axes synchronisation status.

• Synchro Error

The analogue output +/- 10V of the drive is used to have an image of the error in position between the axes.

A4.6 - Mechanical Brake

A safety brake shall be installed on the motor or on the machine, if necessary.

If necessary, dynamic braking shall be provided by the drive via a braking resistor.

If the motor is designed for this use (forced ventilation), the drive can be used to keep the torque stopped. According to the set mode, the brake shall be used either after all movements or on emergency stops and supply cut.

CAUTION:

The SM-SYN module is not used to directly manage the brake.



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General characteristics

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General characteristics


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General characteristics

B1 - Environment characteristics

-  • Drives shall be installed on a control panel in order to protect them from conductive dust and condensation. The access of non authorised persons is denied.

Characteristics	Level
Protection	IP20 with installed cable run and glands.
Storage temperature	-40°C to +50°C, maximum 12 months (after this period, follow the maintenance instructions described in section M).
Operation temperature	0°C to +50°C. The drive characteristics are given at +40°C. Beyond 40°C, the permanent output current may be degraded. Refer to section B3.3 characteristics.
Relative humidity	≤ 95 % without condensation.
Altitude	≤ 1000 m without degrading. The maximum authorised altitude is 3000 m, but beyond 1000m, the permanent output current must be degraded by 1% for each additional 100m. (ex.: for a 3000m altitude, degrade by 20%).
Vibrations	Compliant with IEC 68-2-64 and IEC 60068-2-6.
Shocks	Compliant with IEC 60068-2-29.

B2 - Product Name

Unidrive SP = Range.

2.5 = kVA rating at maximum overload.

TL = 200 to 240V ±10% three-phase supply ,

or

T = 380 to 480V ±10% three-phase supply,

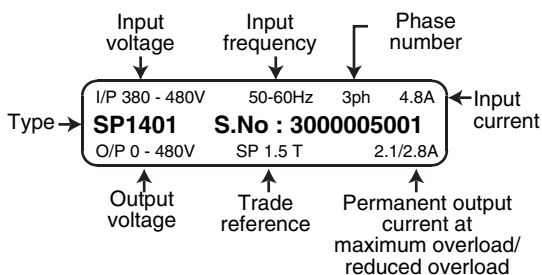
or

TM = 500 to 575V ±10% three-phase supply,

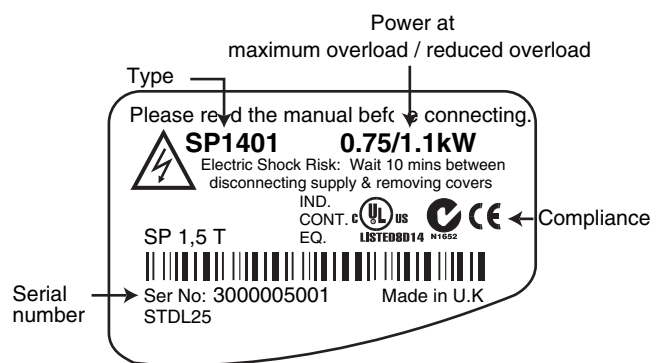
or




TH = 500 to 690V ±10% three-phase supply.

Front label:



- Display label (on the upper cover side):



Logo	Compliance	
	CE	Europe
	C Tick	Australia
	UL / cUL	USA & Canada

UNIDRIVE SP

General characteristics

B3 - Electric characteristics

B3.1 - General detail

Characteristics	Level
Voltage variation between phases	< 3 %
Maximum number of power ups per hour	≤ 20
Input frequency	48 to 65 Hz
Maximum short-circuit current	5 kA except 50T to 60T, 50TH and 60TH: 10 kA and size 6 : 15 kA
Inrush current limitation during power up	Rating TL : T1 = 18A, T2 = 12A, T3= 8A, T4 = 73A, Rating T : T1 = 35A, T2 = 24A, T3= 14A, T4 (40T) = 37A, T4 (50T and 60T) = 73A, T5 = 110A Rating TM : T3 = 18A Ratings TH : T4 = 35A, T5 = 70A
Interval between power up and " rdy " (drive ready)	4s
Frequency range / output speed	: 0 to 3000 Hz and : 0 to 40000 min ⁻¹

B3.2 - Electric characteristics at 40°C and 3 kHz cutout frequency

Caution:

• With the factory settings, the drive operates with a 3 kHz cutout frequency at a 40°C ambient temperature. In case of higher cutout frequency or temperature, it is necessary to degrade the output current (see section B3.3).

• In servo mode, in order to obtain optimum functions, chose a 12 kHz cutout frequency.

I_{sp} : Permanent output current.

P_{mot} : Motor power.

200V to 240V ± 10% three-phase mains supply

UNIDRIVE SP			Maximum overload		Reduced overload	
Size	LS	CT	P_{mot} at 220V (kW)	I_{sp} (A)	P_{mot} at 220V (kW)	I_{sp} (A)
1	1.5TL	1201	0.75	4.3	1.1	5.2
	2TL	1202	1.1	5.8	1.5	6.8
	2.5TL	1203	1.5	7.5	2.2	9.6
	3.5TL	1204	2.2	10.6	3	11
2	4.5TL	2201	3	12.6	4	15.5
	5.5TL	2202	4	17	5.5	22
	8TL	2203	5.5	25	7.5	28
3	11TL	3201	7.5	31	11	42
	16TL	3202	11	42	15	54
4	22TL	4201	15	56	18.5	68
	27TL	4202	18.5	68	22	80
	33TL	4203	22	80	30	104

500V to 575V ± 10% three-phase mains supply

UNIDRIVE SP			Maximum overload		Reduced overload	
Size	LS	CT	P_{mot} at 575V (kW)	I_{sp} (A)	P_{mot} at 575V (kW)	I_{sp} (A)
3	3.5TM	3501	2.2	4.1	3	5.4
	4.5TM	3502	3	5.4	4	6.1
	5.5TM	3503	4	6.1	5.5	8.4
	8TM	3504	5.5	9.5	7.5	11
	11TM	3505	7.5	12	11	16
	16TM	3506	11	18	15	22
	22TM	3507	15	22	18.5	27
4	33TH	4603	18.5	27	22	36
	40TH	4604	22	36	30	43
	50TH	4605	30	43	37	52
	60TH	4606	37	52	45	62
5	75TH	5601	45	62	55	84
	100TH	5602	55	84	75	99
6	120TH	6601	75	100	90	125
	150TH	6602	90	125	110	144

380V to 480V ± 10% three-phase mains supply

UNIDRIVE SP			Maximum overload		Reduced overload	
Size	LS	CT	P_{mot} at 400V (kW)	I_{sp} (A)	P_{mot} at 400V (kW)	I_{sp} (A)
1	1.5T	1401	0.75	2.1	1.1	2.8
	2T	1402	1.1	3	1.5	3.8
	2.5T	1403	1.5	4.2	2.2	5
	3.5T	1404	2.2	5.8	3	6.9
	4.5T	1405	3	7.6	4	8.8
2	5.5T	1406	4	9.5	5.5	11
	8T	2401	5.5	13	7.5	15.3
	11T	2402	7.5	16.5	11	21
3	16T	2403	11	25	15	29
	22T	3401	15	32	18.5	35
	27T	3402	18.5	40	22	43
4	33T	3403	22	46	30	56
	40T	4401	30	60	37	68
	50T	4402	37	74	45	83
5	60T	4403	45	96	55	104
	75T	5401	55	124	75	138
6	100T	5402	75	156	90	168
	120T	6401	90	180	110	202
	150T	6402	110	210	132	236

500V to 690V ± 10% three-phase mains supply

UNIDRIVE SP			Maximum overload		Reduced overload	
Size	LS	CT	P_{mot} at 690V (kW)	I_{sp} (A)	P_{mot} at 690V (kW)	I_{sp} (A)
4	22TH	4601	15	19	18.5	22
	27TH	4602	18.5	22	22	27
	33TH	4603	22	27	30	36
	40TH	4604	30	36	37	43
	50TH	4605	37	43	45	52
5	60TH	4606	45	52	55	62
	75TH	5601	55	62	75	84
6	100TH	5602	75	84	90	99
	120TH	6601	90	100	110	125
	150TH	6602	110	125	132	144

UNIDRIVE SP

General characteristics

B3.3 - Degrading according to the temperature and the cutout frequency

UNIDRIVE SP			Temp.	Three-phase permanent output current below 220V at a cutout frequency ≥ 3 kHz																				
Size	LS	CT		Maximum overload						Reduced overload														
				3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz									
1	1.5TL	1201	40°C	4.3						5.2														
			50°C	4.3						5.2														
	2TL	1202	40°C	5.8						6.8														
			50°C	5.8						6.8														
	2.5TL	1203	40°C	7.5						9.6														
			50°C	7.5						9.6				9										
3.5TL	1204	40°C	10.6						11															
		50°C	10.6			9.5		8.3		11		10.9		9.5		8.3								
2	4.5TL	2201	40°C	12.6						15.5														
			50°C	12.6				11.4		15.5				13.5		11.5								
	5.5TL	2202	40°C	17						22														
			50°C	17		15.7		13.4		11.4		19.7		18.9		17.3		15.9		13.5		11.5		
	8TL	2203	40°C	25		24.2		22.5		19.6		17.2		28		27.9		24.8		21.8				
			50°C	19.2		18.4		17		15.7		13.3		11.4		19.5		18.6		17.2		15.8		13.4
3	11TL	3201	40°C	31				x		42				x										
			50°C	31				x		42				38.2		x								
	16TL	3202	40°C	42				41.3		x		54				48.5		x						
			50°C	42				37.2		x		54		52.8		47		38.2		x				
4	22TL	4201	40°C	56				x		x		68				x		x						
			50°C	56				x		x		68				x		x						
	27TL	4202	40°C	68				x		x		80				x		x						
			50°C	68				x		x		80				x		x						
	33TL	4203	40°C	80				x		x		104				x		x						
			50°C	80				x		x		87				x		x						

UNIDRIVE SP			Temp.	Three-phase permanent output current below 400V at a cutout frequency ≥ 3 kHz																									
Size	LS	CT		Maximum overload						Reduced overload																			
				3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz														
1	1.5T	1401	40°C	2.1						2.8																			
			50°C	2.1						2.8																			
	2T	1402	40°C	3						3.8																			
			50°C	3						3.8																			
	2.5T	1403	40°C	4.2						5																			
			50°C	4.2				3.8		5				3.9															
	3.5T	1404	40°C	5.8				5.4		4.3		6.9				5.9													
			50°C	5.8				4.8		3.7		6.9				5.1		3.9											
	4.5T	1405	40°C	7.6						8.8																			
			50°C	7.6		7.2		6		4.2		3.1		8.8		7.3		6		4.2		3.1							
5.5T	1406	40°C	9.5				9.2		7.7		5.6		4.4		11														
		50°C	9.5		9		7.2		6		4.2		3.1		10.1		9		7.3		6		4.2		3.1				
2	8T	2401	40°C	13				12.6		9.6		7.6		15.3				12.7		10.1									
			50°C	13				11.7		9.9		7.3		5.5		15.3		14.2		11.8		10		7.3		5.5			
	11T	2402	40°C	16.5				14.9		12.6		9.6		7.6		21				19.5		16.7		12.7		10			
			50°C	15.5		14.1		11.7		9.9		7.3		5.5		15.7		14.2		11.8		10		7.3		5.5			
	16T	2403	40°C	25		23.7		19.9		16.9		12.8		10.1		29		27.2		23.2		20		15		11.8			
			50°C	16.7		15		12.2		10.1		7.1		5.1		16.8		15		12.2		10.1		7.1		x			
3	22T	3401	40°C	32				28.9		22		17.5		35				34.5		26.3		21							
			50°C	32				30.7		26.1		19.7		15.4		35				33.5		28.5		21.5		16.9			
	27T	3402	40°C	40				38.3		32.5		24.5		19.2		43				37.9		28.6		22.5					
			50°C	40				34.1		28.4		20.7		16		43		41.5		34.2		28.7		21		16			
	33T	3403	40°C	46		45.9		38.5		32.5		24.4		x		56		53.4		44.6		37.9		28.6		x			
			50°C	46		41.5		33.6		28.3		20.8		x		46		41.5		34.2		28.7		21		x			
4	40T	4401	40°C	60				52		42		x		x		68				62		x		x					
			50°C	60				47		38		x		x		68				67		55		x		x			
	50T	4402	40°C	74		65		51		42		x		x		83				74		61		x		x			
			50°C	68		59		46		38		x		x		83		82		67		52		x		x			
	60T	4403	40°C	96		84		67		55		x		x		104				95		79		x		x			
			50°C	86		75		60		50		x		x		87		86		71		60		x		x			
5	75T	5401	40°C	124				107		82		67		x		x		138				118		97		x		x	
			50°C	113				96		75		60		x		x		138				106		87		x		x	
	100T	5402	40°C	156		137		109		91		x		x		168		158		129		107		x		x			
			50°C	140		123		99		82		x		x		141		140		112		92		x		x			
6	120T	6401	40°C	180				174		134		x		x		202				164		x		x		x			
			50°C	180		158		121		x		x		x		191		190		148		x		x		x			
	150T	6402	40°C	210		175		130		x		x		x		236		210		158		x		x		x			
			50°C	190		158		116		x		x		x		198		181		138		x		x		x			

UNIDRIVE SP

General characteristics

B

UNIDRIVE SP			Three-phase permanent output current below 575V at a cutout frequency ≥ 3 kHz																
Size	LS	CT	Temp.	Maximum overload						Reduced overload									
				3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz				
3	3.5TM	3501	40°C	4.1						5.4									
			50°C	4.1						5.4									
	4.5TM	3502	40°C	5.4						6.1									
			50°C	5.4						6.1									
	5.5TM	3503	40°C	6.1						8.4									
			50°C	6.1						8.4									
	8TM	3504	40°C	9.5						11									
			50°C	9.5						11									
	11TM	3505	40°C	12						16									
			50°C	12						16			14.7			x			
	16TM	3506	40°C	18			15.5			22		21.6		18.2		x			
			50°C	18		16.8		13.9		22		17.8		14.7		x			
	22TM	3507	40°C	22		18.4		15.5		27		26		21.6		18.1		x	
			50°C	22		20.4		16.7		24.6		22		17.8		14.7		x	

UNIDRIVE SP			Three-phase permanent output current below 575V/690V at a cutout frequency ≥ 3 kHz															
Size	LS	CT	Temp.	Maximum overload						Reduced overload								
				3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz			
4	22TH	4601	40°C	19						22								
			50°C	19						22								
	27TH	4602	40°C	22						27								
			50°C	22						27			25			x		
	33TH	4603	40°C	27						36								
			50°C	27						36		31		34		x		
	40TH	4604	40°C	36			34			43		41		34		x		
			50°C	36		31		25		43		40		31		25		
	50TH	4605	40°C	43			41			52								
			50°C	46		40		31		25		x		x		x		
	60TH	4606	40°C	52			45			36			x			x		
			50°C	52		45		35		28		x		x		x		x
5	75TH	5601	40°C	62						84								
			50°C	62						84								
100TH	5602	40°C	84						99									
		50°C	84						99									
6	120TH	6601	40°C	100						125								
			50°C	100						125								
	150TH	6602	40°C	125						144								
			50°C	125						144								

UNIDRIVE SP

General characteristics

B4 - Electromagnetic compatibility (CEM)

B4.1 - Compatibility label

CAUTION :

The drive is compliant only when the mechanical and electric installation instructions described in this manual are observed.

Immunity						
Standard	Description	Application	Compliance			
IEC 61000-4-2 EN 61000-4-2	Electrostatic discharges	Product casing	Level 3 (industrial)			
IEC 61000-4-3 EN 61000-4-3	Radiated radio-frequencies immunity standards	Product casing	Level 3 (industrial)			
IEC 61000-4-4 EN 61000-4-4	Fast transient burst	Control cable	Level 4 (heavy industry)			
		Power cables	Niveau 3 (industry)			
IEC 61000-4-5 EN 61000-4-5	Surges	Supply cables between phase and earth	Level 4			
		Supply cables between phases	Level 3			
		Earth signal port	Level 2			
IEC 61000-4-6 EN 61000-4-6	Generic standards for conducted radio-frequencies immunity	Control and power cables	Level 3 (industry)			
EN 50082-1 IEC 61000-6-1 EN 61000-6-1	Generic standards for residential, commercial and light industry environments	-	Compliant			
EN 50082-2 IEC 61000-6-2 EN 61000-6-2	General immunity standards for the industrial environment	-	Compliant			
EN 61800-3 IEC 61800-3 EN 61000-3	Speed drive standards	Compliant with the first and second environment				

Emission										
Standard	Description	Scope of application	Drive / motor cable length	Compliance conditions						
				RFI Filter						
				Size 1	Size 2	Size 3	Size 4	Size 5	Size 6	
EN 61800-3	Speed drive standard	2 nd env. with non restricted distrib. (E2U)	≤ 4 m	int. filter, fd=3 kHz	int. filter and ferrite*, fd≤6 kHz	int. filter and ferrite*, fd=3 kHz				
			≤ 10 m	int. filter and ferrite*, fd≤6 kHz	int. filter and ferrite*, fd=3 kHz					
			≤ 100 m	ext. filter	ext. filter	ext. filter				
		2 nd env. with restricted distrib. (E2R)	≤ 4 m	int. filter, fd≤16kHz	int. filter, fd≤12kHz					
			≤ 10 m	int. filter and ferrite*, fd≤16 kHz		int. filter, fd≤16 kHz				
			≤ 100 m							
		1 st env. with non restricted distrib. (R)	≤ 20 m	ext. filter, fd≤6kHz	ext. filter, fd=3 kHz					
			≤ 20 m	ext. filter, fd≤16kHz	ext. filter, fd≤12 kHz					
		1 st env. with restricted distrib. (I)	≤ 75 m	ext. filter, fd≤8kHz	ext. filter, fd=8 kHz					
			≤ 100 m	ext. filter, fd≤4 kHz	ext. filter, fd=3 kHz					
EN 50081-1 EN61000-6-3	Generic emission standards for residential, commercial and light industry environment	Alternative mains supply (EN50081-1)	≤ 20 m	ext. filter, fd≤6kHz	ext. filter, fd=3 kHz					
EN 50081-2 (I) EN 61000-6-4	Generic emission standards for industrial environment	Alternative mains supply (EN50081-2)	≤ 100 m	ext. filter, fd≤4 kHz	ext. filter, fd=3 kHz					

* For information on ferrite, refer to section L4. For sizes 2 and 3, the ferrite is delivered as standard (accessories). Put the ferrite at the drive output and run U, V, W cables through the ferrite (without shielding).

UNIDRIVE SP

General characteristics

! • The second environment comprises with industrial networks supplied in low voltage but it does not supply households. The operation of a drive without RFI filter in such an environment may lead to interference in certain electronic devices placed near the drive whose immunity level is not compatible with the industrial environment. If it is not possible to filter the disrupted element, the drive must be added an external RFI filter.

B4.2 - Internal RFI filter

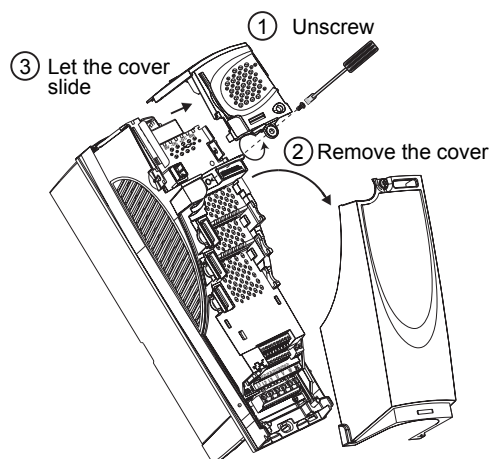
This filter is connected to the drive in standard mode. It reduces the radio-frequency emission in the mains supply.

CAUTION:

Remove the filter:

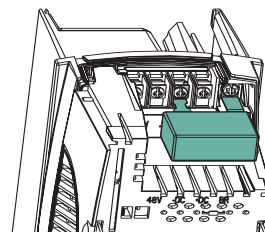
- when the leakage current must be below 28mA AC at 400V - 50 Hz or 30µA DC (10 MΩ) (without the internal filter, the drive leakage current is below 1mA),
 - from a 3 to 6 size drive connected to a mains supply.
- If an external RFI filter or an additional motor earth is used, it is not necessary to remove the internal RFI filter.

• Terminal access

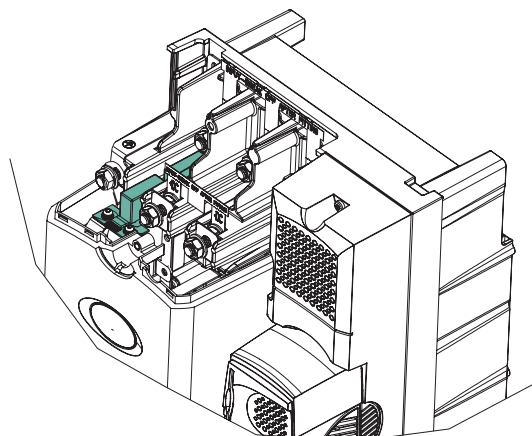


• Installation

- Installation on 1 to 3 sizes:



- Installation on 4 to 6 sizes:



B5 - UL compliance

• For UL compliance, the operation temperature must not exceed 50°C.

• Motor overload protection

The drive is fitted with a motor overload protection. The overload level is 150% of the current at full drive load in open loop (□), and 175 % on closed loop vector mode (▣) or servo (◀▶).

It is thus necessary to set correctly the current at parameter 0.46 in order that the protection be effective (the protection level can be adjusted below 150% if necessary).

• Motor thermal protection

The drive has a built-in motor thermal protection.

• Overspeed protection

The drive has a built-in overspeed protection. Nevertheless, this protection cannot provide a level equivalent to an independent high integrity overspeed protection circuit.

UNIDRIVE SP Mechanical Installation

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UNIDRIVE SP Mechanical Installation

Notes



UNIDRIVE SP Mechanical Installation

C1 - Warning

! • It is the responsibility of the owner or of the user to check that the installation, the use and the maintenance of the variable speed drive and its options are made in compliance with the legislation relating to the safety of the equipment and of the personnel and with the regulations in force in the country of use.

• The UNIDRIVE SP must be installed in an environment clean of conductive dust, steam, gas and corrosive fluids, and condensation (for example class 2 according to UL 840 and IEC 664.1). The drive must not be installed in hazardous areas, except in adapted enclosures. In this case, the installation must be certified.

• In environments subject to condensation, install a reheating system to be connected when the drive is not used and to be disconnected when the drive is used. It is recommended to automatically order the reheating system.

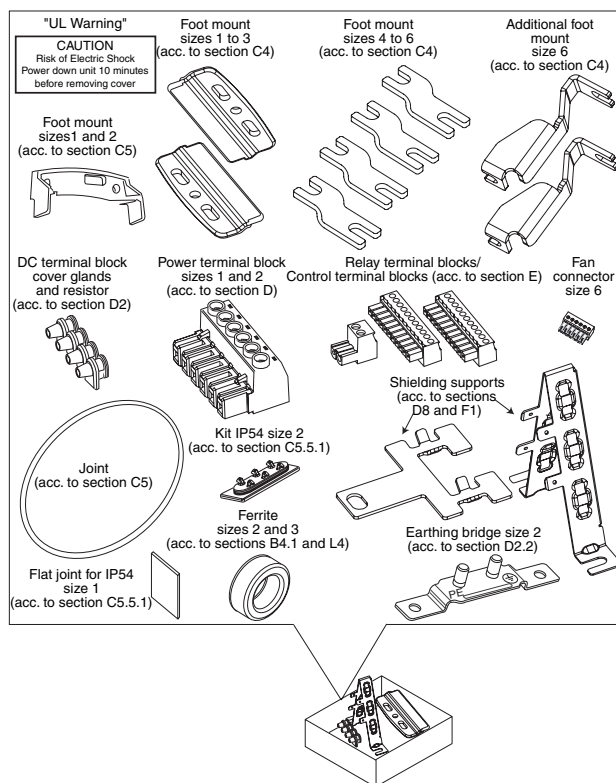
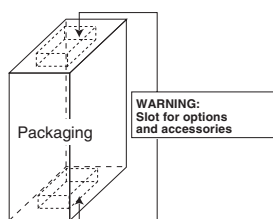
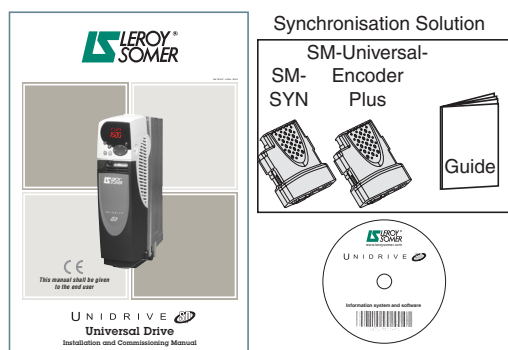
• The UNIDRIVE SP casing is not non-flammable; if necessary, use a fire-protection cabinet.

• In order to observe the UL compliance, the drive must be installed in a 1 type cabinet, at least, as defined by standard UL50.

C2 - Reception Check

Before starting the installation of the drive, check that :

- the drive has not been damaged during transportation,
- the accessories, the general detail and the CD Rom are included in the drive package,
- the name plate corresponds to the mains supply.



C3 - Installation Types

The drive can be installed by 2 means ...

- Heater inside the cabinet:

In this configuration, it is necessary to take into account the drive losses for cabinet size.

- Heater outside the cabinet:

Installing the heater outside the cabinet allows the outside exhaust of loss. Consequently, the cabinet sizes can be considerably reduced.

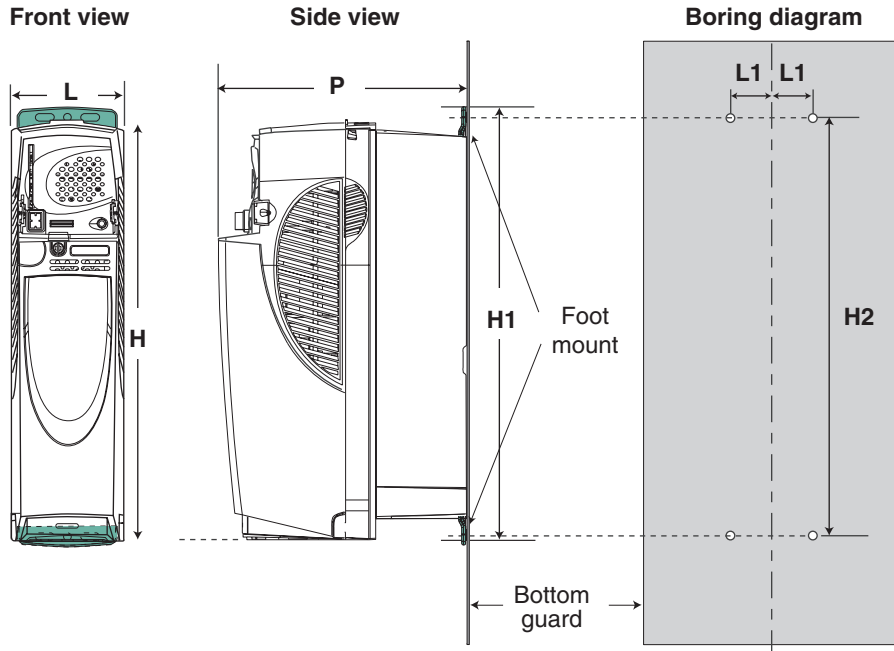
If necessary, the drive can be modified in order to preserve the IP54 protection on the outside of the cabinet (see section C5.5).

UNIDRIVE SP Mechanical Installation

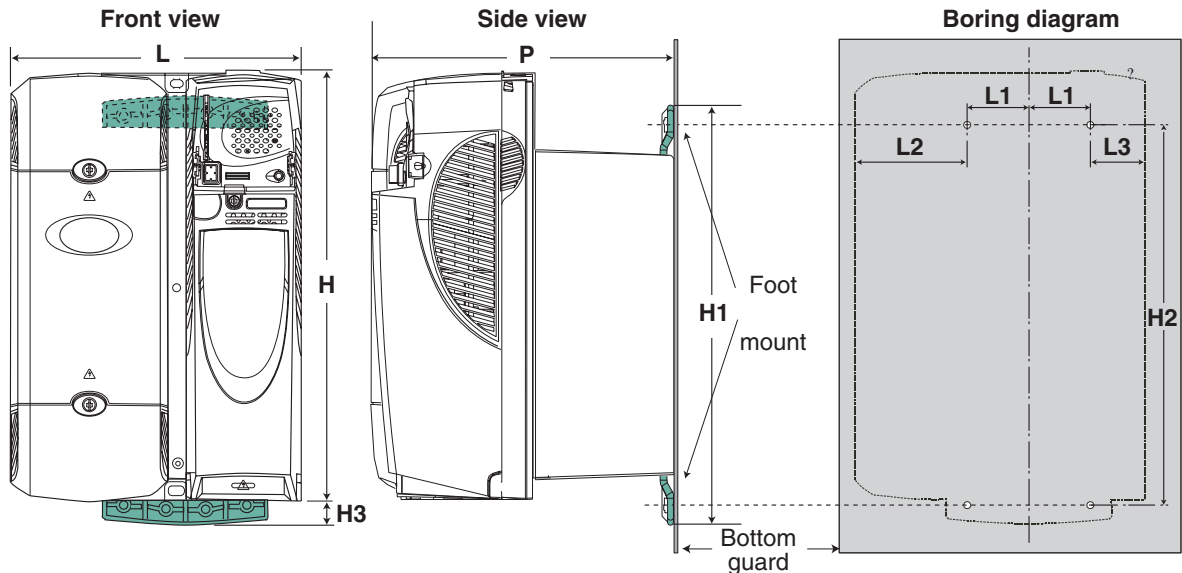
C4 - Heater Installation in the Cabinet


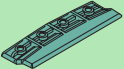
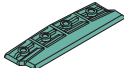
C4.1 - Sizes and weights

- Ratings 1.5TL to 3.5 TL / 1.5T to 5.5T (Size 1)



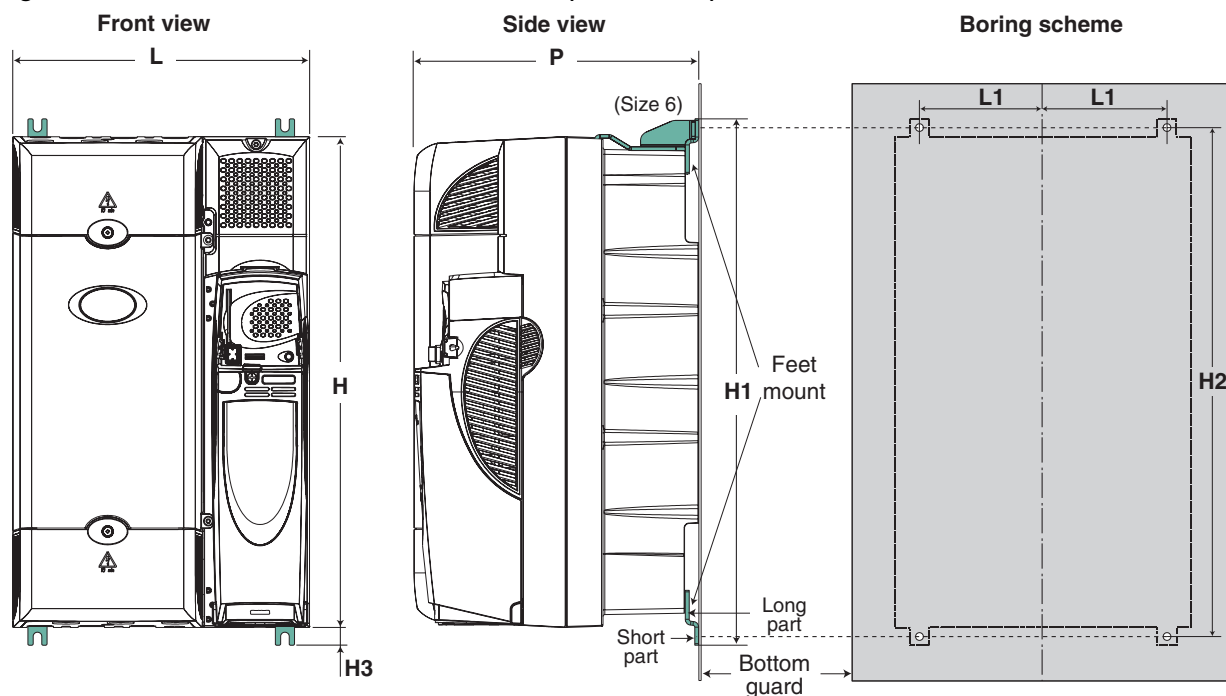
- Ratings 4.5TL to 16TL / 8T to 33T / 3.5TM to 22TM (Sizes 2 and 3)



UNIDRIVE SP		Dimensions (mm)									Vis (mm)	Weight (kg)	Mount
Size	Type	L	L1	L2	L3	H	H1	H2	H3	P			
1	1.5TL to 3.5TL 1.5T to 5.5T	100	20 ± 2.5	-	-	368	386	370 ± 1	-	219	4 x Ø6.5	5 (4.5T & 5.5T : 5.8)	 x 2
2	4.5TL to 8TL 8T to 16T	155	53 ± 0.5	24.5	24.5	368	371.6	337.5 ± 1	21	219	4 x Ø6.5	7	 x 2
3	11TL and 16TL 22T to 33T 3.5TM to 22TM	250	53 ± 0.5	97	47	368	361	327 ± 1	21	260	4 x Ø6.5	15	 x 2

UNIDRIVE SP Mechanical Installation

- Ratings 22TL to 33TL / 40T to 150T / 22TH to 150TH (Sizes 4 to 6)



UNIDRIVE SP		Dimensions (mm)							Screw (mm)	Weight (kg)	Mount
Size	Type	L	L1	H	H1	H2	H3	P			
4	22TL to 33TL 40T to 60T 22TH to 60TH	310	129.3 ± 0.25	510	546.8	528.8 ± 0.5	18.4	298	4 x ØM8	30	 x 4 + x 2 (size 6)
5	75T and 100T 75TH and 100TH	310	129.3 ± 0.25	820	857.3	839.3 ± 0.5	18.4	298	4 x ØM8	55	
6	120T and 150T 120TH and 150TH	310	129.3 ± 0.25	1131	1168.8	1150.8 ± 0.5	18.9	298	4 x ØM8	75	

C4.2 - Losses inside the cabinet

The table below indicates the maximum value of drive losses at rated current, according to the carrier frequency. The values correspond to normal operation at ambient temperatures of 40°C and 50°C.

UNIDRIVE SP		Temp.	Losses (W)												
Size	Type		Maximum overload						Reduced overload						
			3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	
1	1.5TL	40°C	27	29	32	35	41	47	33	35	38	42	49	56	
		50°C	27	29	32	35	41	47	33	35	38	42	49	56	
	2TL	40°C	38	40	43	47	55	62	45	47	51	56	64	73	
		50°C	38	40	43	47	55	62	45	47	51	56	64	73	
	2.5TL	40°C	51	53	58	62	71	81	67	70	76	81	92	104	
		50°C	51	53	58	62	71	81	67	70	76	81	92	97	
3.5TL	40°C	75	78	86	94	109	124	78	82	89	97	113	129		
	50°C	75	78	86	94	97	97	78	82	89	97	113	129		
2	4.5TL	40°C	133	139	150	160	182	203	155	161	173	186	210	235	
		50°C	133	139	150	160	182	190	155	161	173	186	190	190	
	5.5TL	40°C	170	176	190	203	229	256	210	218	234	250	282	314	
		50°C	170	176	190	190	190	190	210	218	234	250	282	314	
	8TL	40°C	245	254	263	261	259	258	272	282	302	320	320	315	
		50°C	245	254	263	261	259	258	272	282	302	320	320	315	
3	11TL	40°C	260	272	297	321	370	x	331	347	380	412	477	x	
		50°C	260	272	297	289	273	x	331	347	380	412	436	x	
	16TL	40°C	349	365	398	430	486	x	431	451	492	532	551	x	
		50°C	306	315	300	289	273	x	431	451	480	463	439	x	
	4	22TL	40°C	428	448	488	528	x	x	517	541	589	637	x	x
			50°C	428	448	488	528	x	x	517	541	589	637	x	x
27TL		40°C	517	541	589	637	x	x	611	639	694	750	x	x	
		50°C	517	541	589	637	x	x	611	639	694	750	x	x	
33TL		40°C	611	639	694	750	x	x	810	845	916	987	x	x	
		50°C	611	639	694	750	x	x	671	701	761	821	x	x	

UNIDRIVE SP Mechanical Installation

UNIDRIVE SP		Temp.	Losses (W)											
Size	Type		Maximum overload					Reduced overload						
			3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz
1	1.5T	40°C	20	24	30	37	51	64	26	29	37	45	61	76
		50°C	20	24	30	37	51	64	26	29	37	45	61	76
	2T	40°C	27	31	39	48	64	80	34	38	48	57	76	95
		50°C	27	31	39	48	64	80	34	38	48	57	76	95
	2.5T	40°C	37	42	52	62	82	102	44	50	61	72	95	117
		50°C	37	42	52	62	82	95	44	50	61	72	95	97
	3.5T	40°C	52	58	70	83	101	104	62	69	83	97	126	134
		50°C	52	58	70	83	92	104	62	69	83	97	126	134
	4.5T	40°C	72	82	101	121	123	125	83	94	117	139	156	157
		50°C	72	82	97	123	125	125	83	94	117	139	156	157
	5.5T	40°C	91	103	123	125	125	125	106	120	147	158	156	157
		50°C	91	103	97	123	125	125	106	120	147	158	156	157
2	8T	40°C	164	178	206	229	231	231	186	202	234	266	283	282
		50°C	164	178	190	229	231	231	186	202	234	266	283	282
	11T	40°C	201	218	230	229	231	231	248	269	291	286	283	281
		50°C	201	218	190	229	231	231	248	269	291	286	283	281
	16T	40°C	272	282	279	278	279	282	313	320	315	315	316	316
		50°C	272	282	190	278	279	282	313	320	190	315	316	x
3	22T	40°C	337	363	415	424	408	401	364	392	449	499	477	465
		50°C	337	363	399	387	373	364	364	392	430	417	399	389
	27T	40°C	411	443	485	469	452	444	437	471	540	538	514	501
		50°C	411	443	435	417	396	388	437	455	435	418	399	388
	33T	40°C	474	509	485	469	452	x	567	580	552	533	510	x
		50°C	474	459	429	415	397	x	474	459	429	415	397	x
4	40T	40°C	629	689	704	674	x	x	714	781	914	956	x	x
		50°C	629	689	638	617	x	x	714	781	898	852	x	x
	50T	40°C	780	745	690	663	x	x	882	961	995	941	x	x
		50°C	716	673	629	607	x	x	882	944	894	814	x	x
	60T	40°C	976	920	854	821	x	x	1070	1158	1217	1144	x	x
		50°C	876	820	775	750	x	x	877	949	912	875	x	x
5	75T	40°C	1311	1236	1150	1112	x	x	1471	1618	1640	1560	x	x
		50°C	1186	1118	1047	1009	x	x	1471	1616	1462	1411	x	x
	100T	40°C	1681	1600	1508	1464	x	x	1830	1881	1781	1717	x	x
		50°C	1500	1434	1366	1333	x	x	1500	1644	1543	1480	x	x
6	120T	40°C	1817	1935	1772	x	x	x	2058	2259	2153	x	x	x
		50°C	1817	1747	1610	x	x	x	1942	2118	1939	x	x	x
	150T	40°C	2192	2042	1888	x	x	x	2477	2455	2255	x	x	x
		50°C	1979	1851	1715	x	x	x	2068	2108	1997	x	x	x

UNIDRIVE SP		Temp.	Losses (W)											
Size	Type		Maximum overload					Reduced overload						
			3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz
3	3.5TM	40°C	112	124	148	172	x	x	127	141	168	196	x	x
		50°C	112	124	148	172	x	x	127	141	168	196	x	x
	4.5TM	40°C	127	141	168	196	x	x	135	150	180	209	x	x
		50°C	127	141	168	196	x	x	135	150	180	209	x	x
	5.5TM	40°C	135	150	180	209	x	x	163	181	218	254	x	x
		50°C	135	150	180	209	x	x	163	181	218	254	x	x
	8TM	40°C	178	198	237	276	x	x	197	219	263	306	x	x
		50°C	178	198	237	242	x	x	197	219	263	306	x	x
	11TM	40°C	212	235	281	328	x	x	267	296	354	412	x	x
		50°C	212	235	246	242	x	x	267	296	354	383	x	x
	16TM	40°C	300	332	396	405	x	x	362	399	475	471	x	x
		50°C	257	253	246	242	x	x	362	399	390	384	x	x
	22TM	40°C	365	403	406	405	x	x	448	486	477	471	x	x
		50°C	257	253	246	242	x	x	405	399	390	384	x	x

UNIDRIVE SP		Temp.	Losses (W)											
Size	Type		Maximum overload					Reduced overload						
			3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz
4	22TH	40°C	360	413	519	625	x	x	409	470	590	711	x	x
		50°C	360	413	619	625	x	x	409	470	590	711	x	x
	27TH	40°C	409	470	590	711	x	x	496	568	712	857	x	x
		50°C	409	470	590	711	x	x	496	568	712	789	x	x
	33TH	40°C	496	568	712	857	x	x	660	754	941	1063	x	x
		50°C	496	568	712	789	x	x	660	754	805	789	x	x
	40TH	40°C	660	754	941	1063	x	x	798	908	1083	1058	x	x
		50°C	660	754	805	789	x	x	798	831	805	789	x	x
	50TH	40°C	798	908	1083	1058	x	x	985	1115	1080	1058	x	x
		50°C	798	831	805	789	x	x	850	831	805	789	x	x
	60TH	40°C	873	987	1042	1023	x	x	1060	1179	1130	1105	x	x
		50°C	871	848	816	797	x	x	871	848	816	797	x	x
5	75TH	40°C					x	x					x	x
		50°C					x	x					x	x
	100TH	40°C					x	x					x	x
6	120TH	40°C				x	x	x				x	x	x
		50°C				x	x	x				x	x	x
	150TH	40°C				x	x	x				x	x	x
		50°C				x	x	x				x	x	x

UNIDRIVE SP Mechanical Installation

C4.3 - Ventilation

• The driver is ventilated by internally mounted 2-speed forced ventilation (low speed / high speed). UNIDRIVE SP controls speed change.

• High speed air flow:

UNIDRIVE SP	Flow (m³/h)
Size 1	75
Size 2	85
Size 3	200
Size 4	200
Size 5	Contact LEROY-SOMER
Size 6	

• Noise levels:

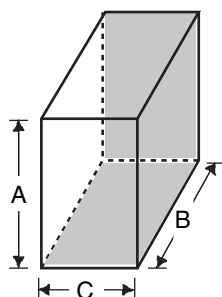
UNIDRIVE SP	High speed (DBA)	Low speed (DBA)
Size 1	48	28
Size 2	54	35
Size 3	56	43
Size 4	Contact LEROY-SOMER	
Size 5		
Size 6		

C4.4 - Cabinet Volume Calculation

The installation of a cabinet drive requires special precautions concerning the inside volume. You must check that thermal dissipation is adequate.

Taking the most restricting example:

IP54 cabinet (without forced ventilation), the rear and the underside in contact with other surfaces.



The minimum surface required for heat exchange is:

$$S = \frac{P_i}{k(T_j - T_{amb})}$$

where:

P_i = loss of all heat generating elements (ex.: 400 W).

T_j = operation maximum internal ambient temperature (ex.: 40°C).

T_{amb} = max. external ambient temperature (ex.: 25°C).

k = thermal transmission coefficient (ex.: 5.5).

$S = 4.85 \text{ m}^2$.

The exchange surfaces are: $2(AB) + AC + BC = S$.

Taking the A and B values:

A = 2.2 m (height),

B = 0.6 m (depth).

==> C = 0.8 m.

In case of a ventilated cabinet, the volume can be reduced.

Taking the same example, the F.V. flow is calculated according to the following formula:

$$V = \frac{3kp}{T_j - T_{amb}} = 83 \text{ m}^3/\text{h}$$

where:

$$k_p = \frac{P_0}{P_1}$$

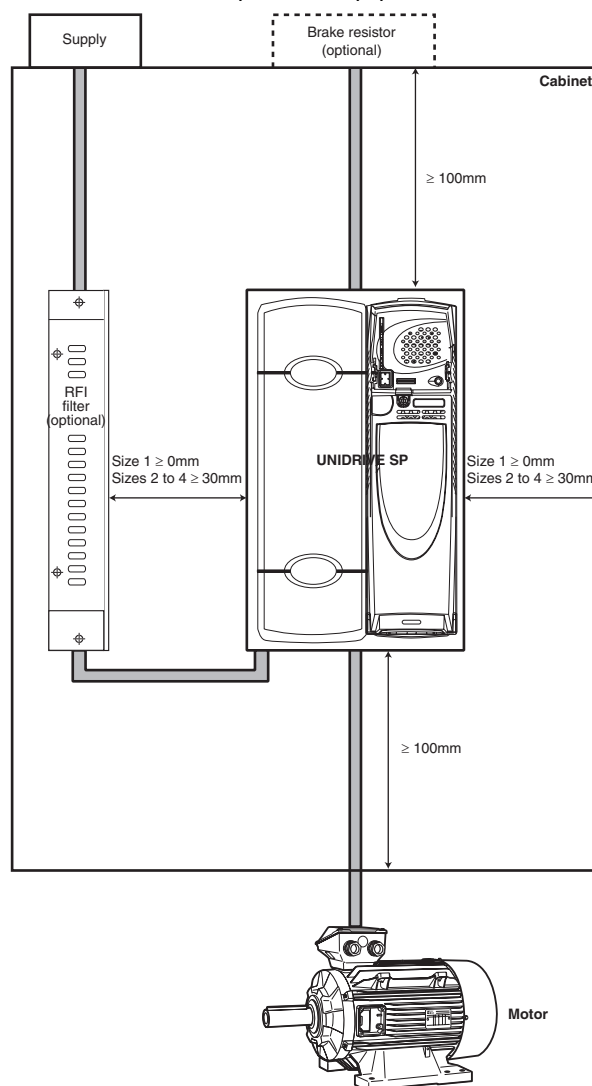
P_0 : Sea level atmospheric pressure.

P_1 : Installation atmospheric pressure.

(Generally, $\frac{P_0}{P_1}$ corresponds to a coefficient ranging from 1.2 to 1.3).

C4.5 - Cabinet Installation Notice

Install the drive vertically, observing the distances between the drive and the other options or equipment described below.



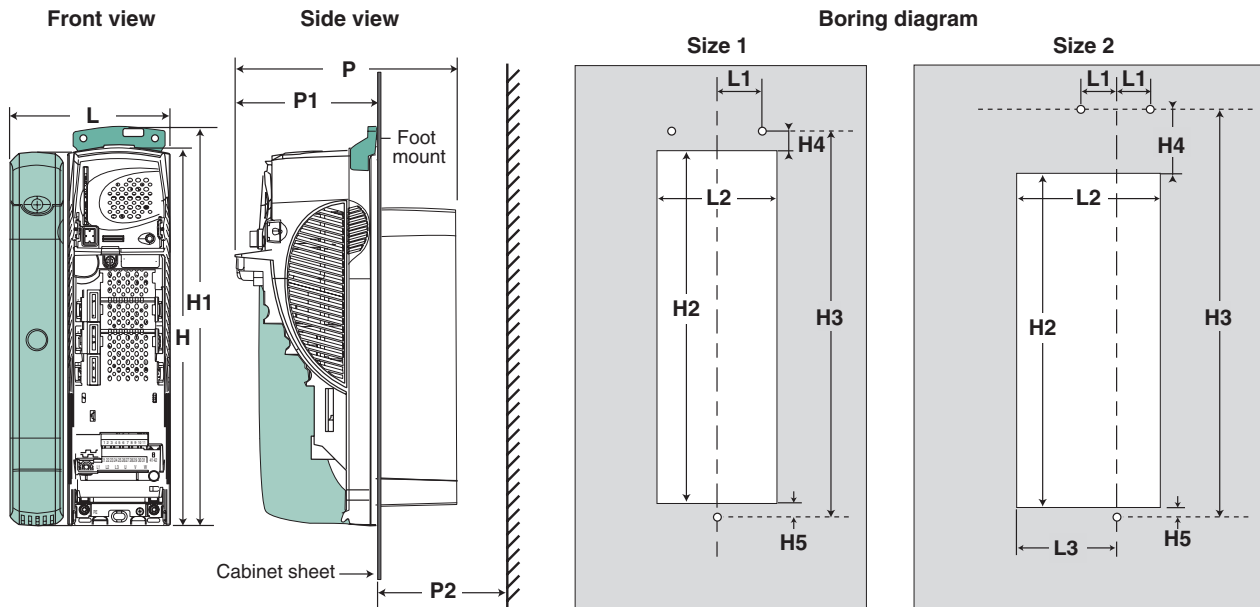
- Check that the air flow necessary to the drive and the optional external RFI filter circulates normally.
- The optional external RFI filter must be placed as close to the drive as possible according to the minimum established spacing (on the side or below the drive).
- The optional external brake resistor must be mounted outside the cabinet, as close as possible or above the cabinet.
- Do not mount above a heat source or another drive.
- Do not obstruct the drive ventilation holes.

UNIDRIVE SP Mechanical Installation

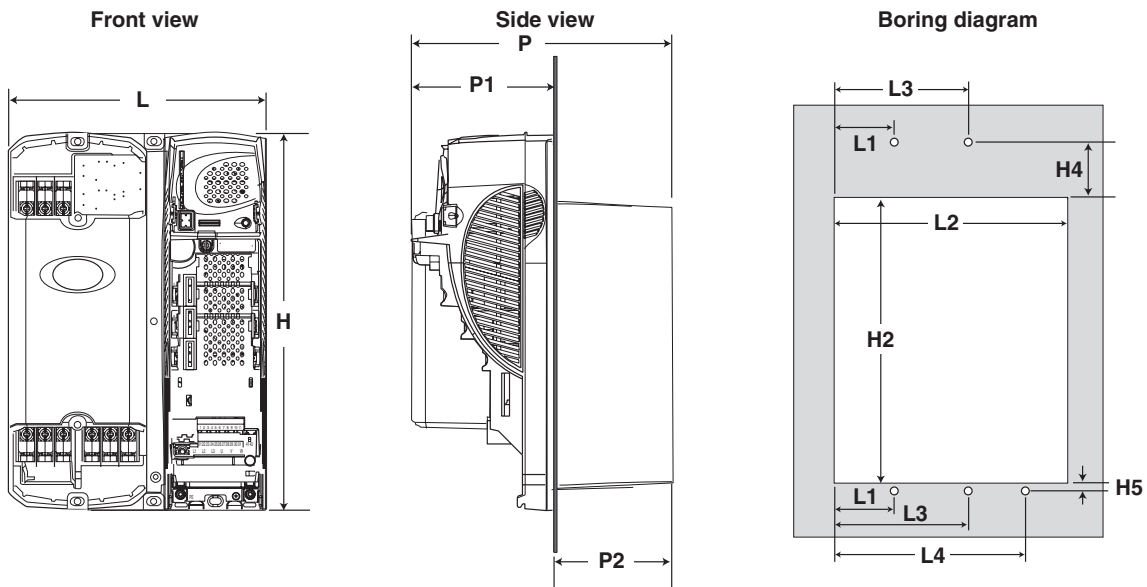
C5 - Heater Mounting outside the Cabinet



C5.1 - Sizes and Weights

- Rating 1.5TL to 8TL / 1.5T to 16T (Sizes 1 and 2)



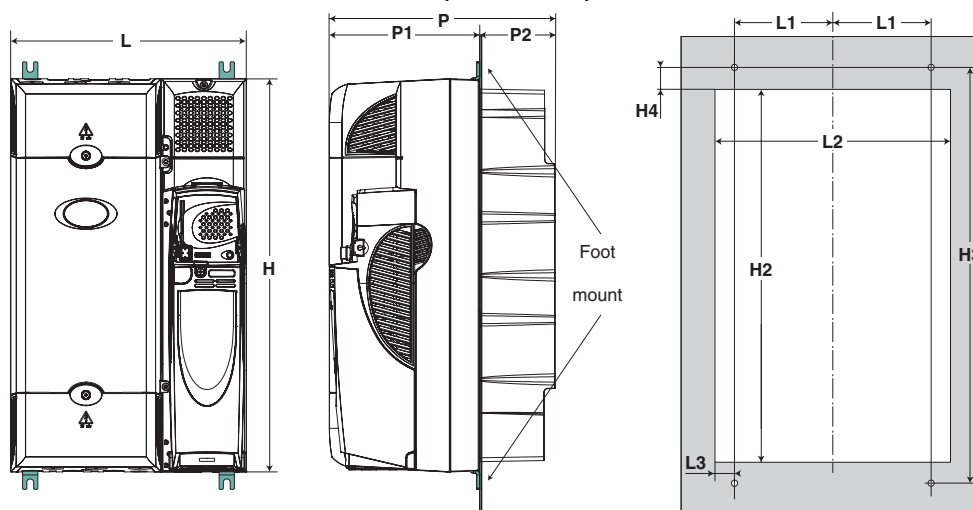
- Ratings 11TL and 16TL / 22T to 33T / 3.5TM to 22TM (Size)




UNIDRIVE SP		Dimensions (mm)											Screw	Weight	Mount			
Size	Type	L	L1	L2	L3	L4	H	H1	H2	H3	H4	H5	P	P1	P2	(mm)	(kg)	
1	1.5TL to 3.5TL 1.5T to 5.5T	100	35 ±0.15	93 ±0.5	-	-	368	391	343 ±0.5	368 ±1	15.6 ±0.5	9.4 ±0.75	219	139	80	3 x Ø6.5	5 (4.5T & 5.5T : 5.8)	 x 1
2	4.5TL to 8TL 8T to 16T	155	35 ±0.15	148 ±0.5	101.5 ±0.5	-	368	391	294 ±0.5	368 ±1	64.6 ±0.5	9.3 ±0.5	219	139	80	3 x Ø6.5	7	 x 1
3	11TL and 16TL 22T to 33T 3.5TM to 22TM	250	60.5 ±0.5	236 ±0.5	135.5 ±0.5	193 ±0.5	368	-	287 ±0.5	-	56 ±0.5	8 ±0.3	260	140	120	5 x Ø6.5	15	internal

UNIDRIVE SP Mechanical Installation

- Ratings 22TL to 33TL / 40T to 150T / 22TH to 150TH (Sizes 4 to 6)



UNIDRIVE SP		Dimensions (mm)											Screw (mm)	Weight (kg)	Mount	
Size	Type	L	L1	L2	L3	H	H1	H2	H3	H4	P	P1				P2
4	22TL to 33TL 40T to 60T 22TH to 60TH	310	129.3 ±0.25	286 ±0.5	14.2 ±0.5	510	-	487 ±0.5	540.3 ±0.5	26.65 ±0.5	298	200	98	4 x ØM8	30	 x 4
5	75T and 100T 75TH and 100TH	310	129.3 ±0.25	286 ±0.5	14.2 ±0.5	820	-	797.5 ±0.5	852.6 ±0.5	26.7 ±0.5	298	200	98	4 x ØM8	55	
6	120T and 150T 120TH and 150TH	310	129.3 ±0.25	286 ±0.5	13.7 ±0.5	1131	-	1107 ±0.5	1161.2 ±0.5	27.1 ±0.5	298	200	98	4 x ØM8	75	

C5.2 - Mounting Instructions

- Perform the cut and the boring of the rear cabinet side. If an optional resistor is integrated to the drive heater (refer to section L8), take into account the cuts presented at section C5.4, which are necessary for the cable run.
- Release the front screw of the drive to remove the control terminal cover. For size 3 drives, release as well the upper and lower covers of the power side (if necessary, refer to section D2.3) in order to have access to the mounting holes.
- Place the seal supplied with the drive on the flange.

Note: For sizes 4 to 6, mount the feet as follows:

- insert the long part of the left upper and lower feet, then screw,
- insert the long part of the right upper and lower feet. Do not screw, the feet are fixed by compression (internal to the drive).

- Place the drive in the rear cut and mount it by the upper and lower feet.
- Replace the drive cover.

CAUTION:

Check if there is enough air flow behind the cabinet.

C5.3 - Losses inside the Cabinet

As the main power-related losses are evacuated outside the cabinet, you must take into account only the control card or the optional integrable module losses..

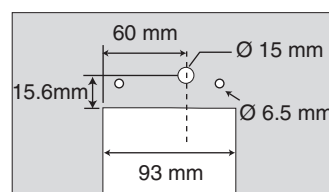
UNIDRIVE SP	Losses (without heater losses)
Size 1	≤ 50 W
Size 2	≤ 75 W
Size 3	≤ 100 W
Size 4	≤ 204 W
Size 5	≤ 347 W
Size 6	

C5.4 - Cutout for integrable resistors

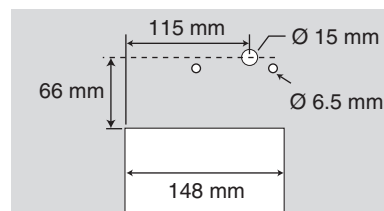
For 1 and 2 size ratings, the optional brake resistors may be integrated directly into the drive heater.

In order to mount the heater outside the cabinet, you must perform an additional cut for resistor cable run. (For detailed information on this type of resistor, refer to section L8).

Size 1



Size 2



UNIDRIVE SP Mechanical Installation

C5.5 - IP54 protection of the heater

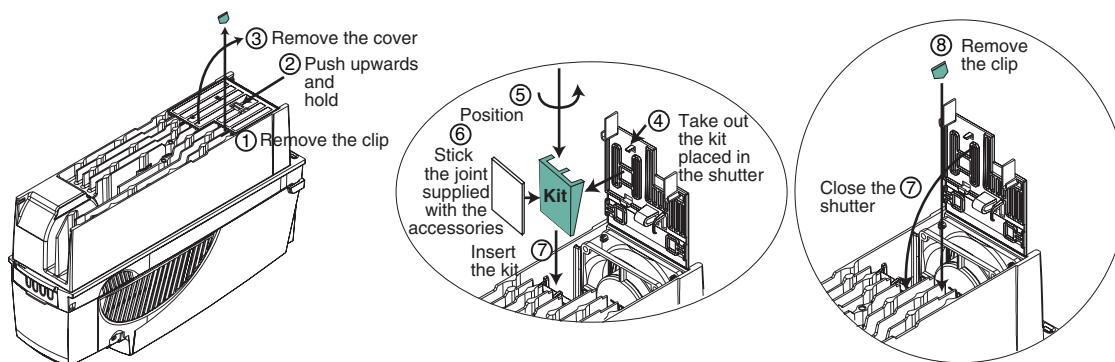
The drive is mounted in a IP54 cabinet and the heater is mounted outside with an IP20 protection. For 1 and 2 size drives, the heater protection index may be increased to IP54.

CAUTION:

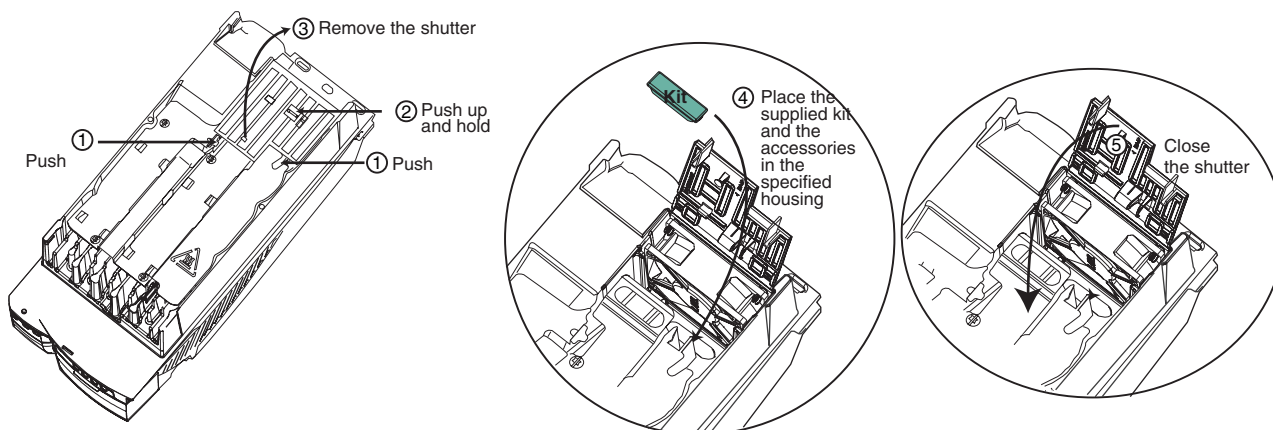
- A periodical cleaning of the heater and of the fan is necessary.
- In an environment requiring an IP54 protection, the standard ventilation can be preserved, but its life span shall be reduced in comparison to a standard use. In order to enhance the reliability of ventilation, replace it by an equivalent IP54 ventilation (for mounting references and instructions, contact your usual LEROY-SOMER representative).

C5.5.1 - Mounting instructions

• Size 1



• Size 2



Note: In order to remove the heater IP54 protection, follow the above instructions in the reverse order.

C5.5.2 - Permanent Output Current Degrading

- ⚠ • The IP54 kit installation must be accompanied by a rated current degrading.

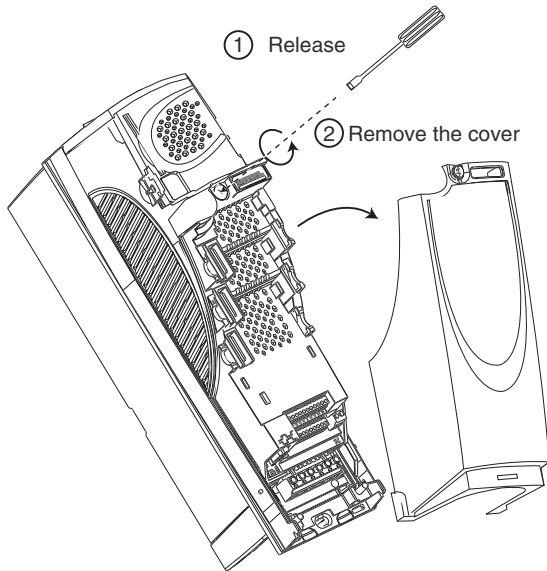
UNIDRIVE SP	Permanent output current with IP54 kit (standard ventilation) at 40 °C												
	Maximum overload						Reduced overload						
	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	
1.5TL	4.3						5.2						
2TL	5.8						6.8						
2.5TL	7.5						7.3						
3.5TL	10.6	10.5	9.7	9	7.7	6.6	11	9.6	10.6	9.7	9	8.2	7.3
4.5TL	12.6						15.5						
5.5TL	17						15.5						
8TL	24.2	23.4	21.8	20.3	17.7	15.5	24.5	23.7	22	20.5	17.9	15.6	
1.5T	2.1						2.8						
2T	3						2.9						
2.5T	4.2						3.8						
3.5T	5.8						5						
4.5T	7.6	7.3	5.8	5.4	3.9	2.9	6.9	6.5	5.4	3.9	2.9		
5.5T	8.2	7.3	5.8	4.7	3.2	2.3	8.3	7.3	5.8	4.7	3.2	2.3	
8T	13						15.3						
11T	16.5						13.3						
16T	21.6	19.6	16.4	12.3	9.3	7.2	20.1	18.4	15.6	13.4	10.1	7.9	
				13.8	10.2	7.7	21.7	19.7	16.4	13.9	10.2	7.7	

UNIDRIVE SP Mechanical Installation

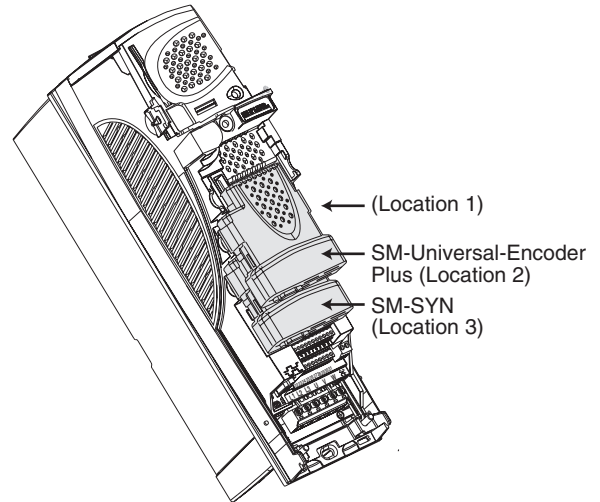
C6 - SM Module Installation

C6.1 - Access to locations

- In order to insert a module, power down the drive (including the +24V and +48V supplies), and wait 10 min, otherwise the option can be damaged.
- Check the good status of the option: a damaged module should not be inserted in the drive.



Do the same to insert the SM-Universal-Encoder Plus in the middle location.
Replace the cover.

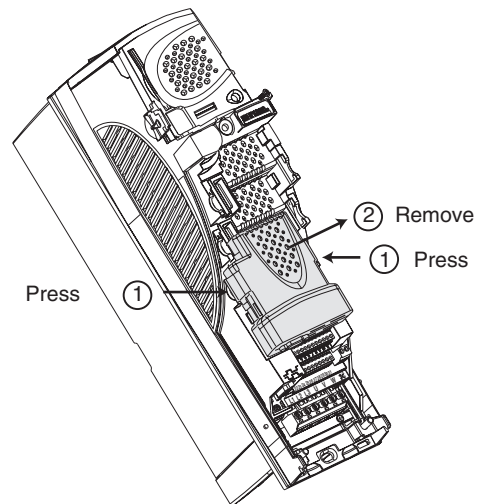
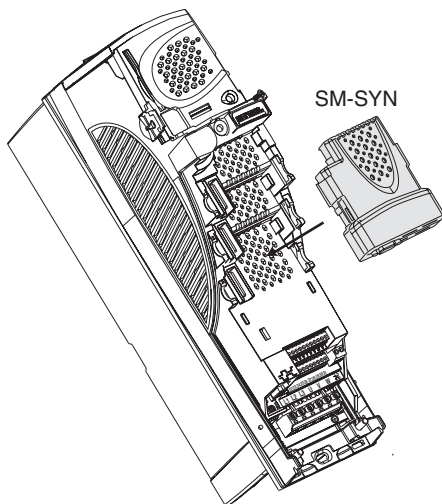


Nota : If the application requires an additional module (ex. : SM-I/O Plus module), install it last.

If it is necessary to remove a module, follow the instructions below.

C6.2 - Drive Module Installation

Install the SM-EDL SYN module in the lowest point and press gently on the module until you hear a click.



UNIDRIVE SP Mechanical Installation

Notes



UNIDRIVE SP

Power connection

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UNIDRIVE SP Power connection

Notes



UNIDRIVE SP Power connection

D1 - Warning

⚠ • All connection works must be performed according to the laws in force in the country of installation. It also includes the earthing or the grounding so that no accessible drive part be connected to the mains supply voltage or any other dangerous voltages.

- The voltage in the cables or the supply, motor, brake resistor or filter connections may cause fatal electric shocks. Avoid all contact.
- The drive must be supplied by means of a contactor in order to power it down for security reasons.
- The drive supply must be protected against overcharges and short-circuits.
- The drive stop command does not prevent from high voltages on the terminal.
- The drive contains the capacitors loaded with a fatal voltage after supply cut-out.
- Power down the drive 10 min before removing the cover. For UL compliance, stick the label «CAUTION Risk of electric shock power down unit 10 minutes before removing cover» (supplied with the accessories), so that the maintenance personnel see it.

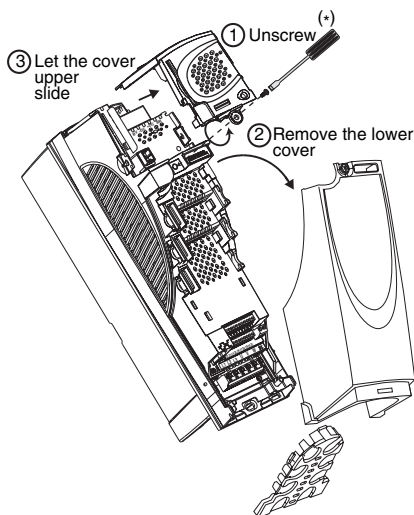
- Check that the continuous bus voltage is below 40V before intervention.
- Check the drive, motor and mains supply voltage and current compatibility.
- After operation, the drive can be heated, do not touch it.
- Give special attention to a drive installed in an equipment connected to the mains supply by rapid connectors. The supply drive terminals are connected to internal capacitors by a diode bridge, which in this case does not provide enough insulation. It is thus necessary to add an automatic isolation system for the connectors as long as they are not among them.
- For UL compliance and in order to avoid any fire risks, the grip torque specified in this section must be observed.

For option connection refer to section L.

D2 - Terminal position

D2.1 - Size 1 drives

• Access to terminals



(*) To rescrew, observe the 1 N.m grip torque.

• Installation of terminals

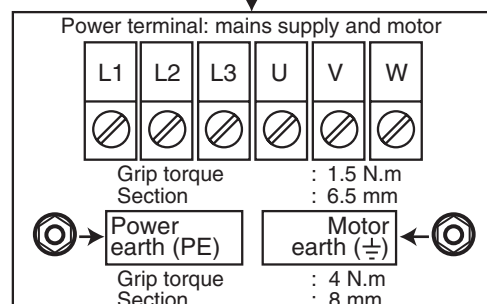
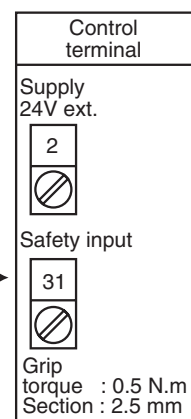
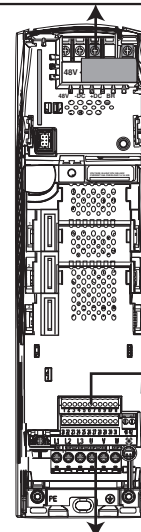
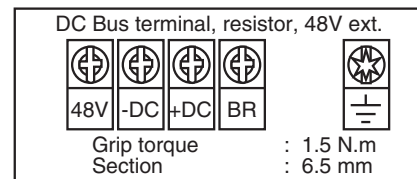
Insert the quick release terminals supplied with the drive:

- 1 power terminal (L1, L2, L3, U, V, W),
- 1 control terminal (terminals 1 to 11),
- 1 control terminal (terminals 21 to 31),
- 1 relay terminal (terminals 41 and 42).

• Installation of cables runs and glands

- Remove the pre-cut washer of the cable run plate for power and control cable run (lower terminals).
- If necessary, break the upper cover miters and install the glands for the brake resistor or 48V supply cable runs.

• Position

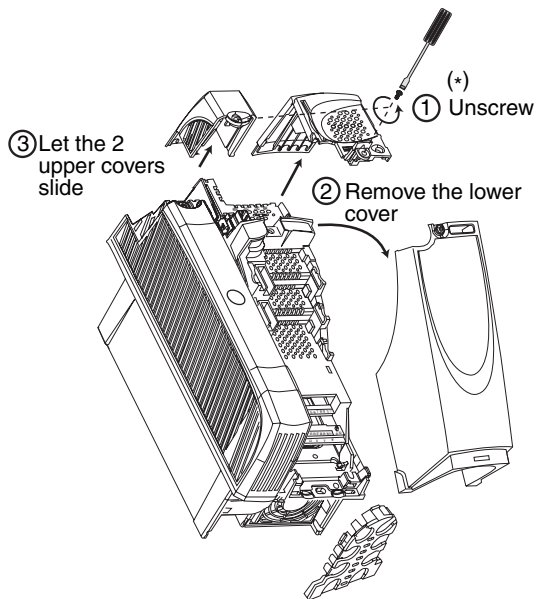


UNIDRIVE SP

Power connection

D2.2 - Size 2 drive

• Access to terminals



(*) To rescrew, observe the 1 N.m grip torque.

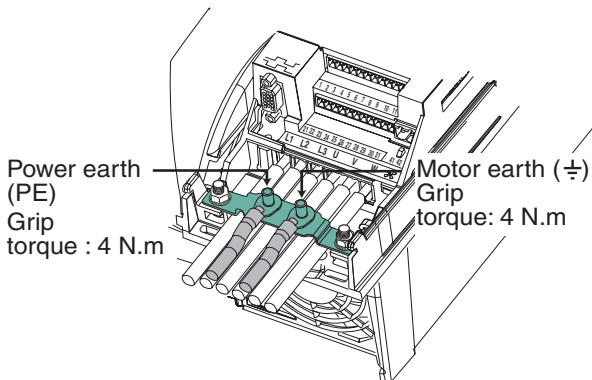
• Installment of terminals

Insert the quick release terminals supplied with the drive:

- 1 power terminal (L1, L2, L3, U, V, W),
- 1 control terminal (terminals 1 to 11),
- 1 control terminal (terminals 21 to 31),
- 1 relay terminal (terminals 41 and 42).

• Earthing

An earthing bridge is supplied with the drive. It is used to facilitate the run of earth cables in the cable run plate holes. Screw the earthing bridge supplied with the drive.



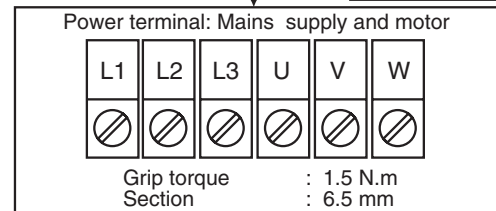
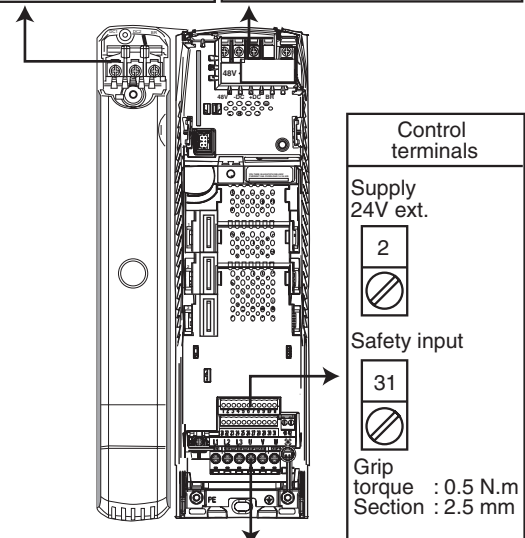
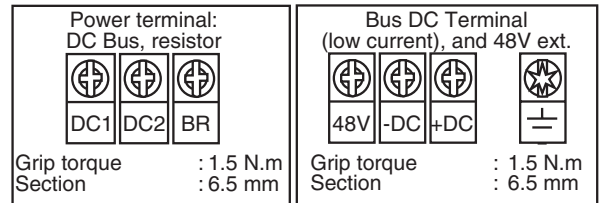
Note:

- In order to avoid additional handling, place the shielding support (described in sections E3 and F), then the bridge on the two drive earth terminal.
- According to the used earth cables section, it can be possible to make the connection directly to the drive terminals.

• Installation of cables runs and glands

- Remove the pre-cut washer of the cable run plate for power and control cable run (lower terminals).
- If necessary, break the upper cover miters and install the glands for the brake resistor or 48V supply cable runs.

• Terminal position



ATTENTION :

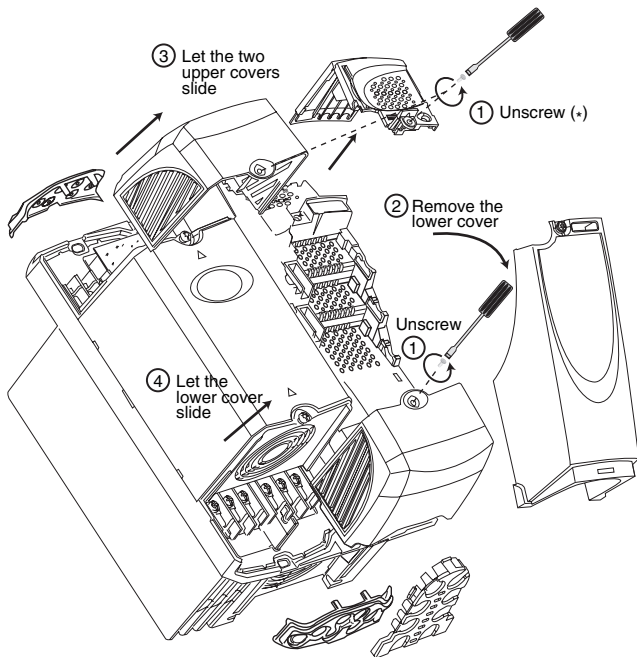
Use the DC Bus power cable to connect the brake resistor (DC2 and BR), the drive supply by DC, or the connection in parallel of DC buses of several drives (DC1, DC2).

Use the low current DC bus terminal (terminals 48V, -DC, +DC) only for the connection of the integrable RFI filter (supplied with the drive) or for the 48V safety supply.

UNIDRIVE SP Power connection

D2.3 - Size 3 drives

• Access to terminals



(*) To rescrew, observe the 1 N.m grip torque.

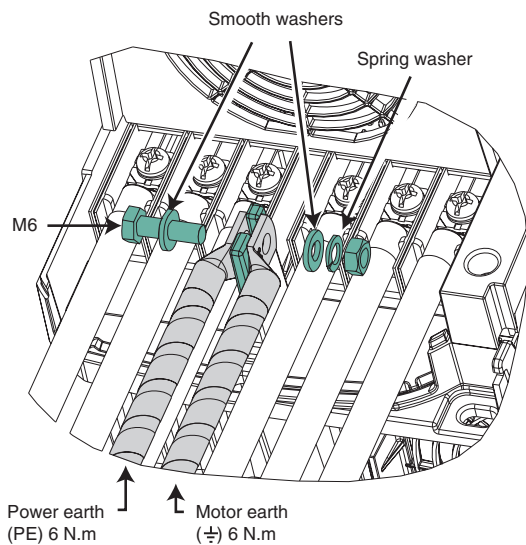
• Installment of terminals

Insert the quick release terminals supplied with the drive:

- 1 control terminal (terminals 1 to 11),
- 1 control terminal (terminals 21 to 31),
- 1 relay terminal (terminals 41 and 42).

• Earthing

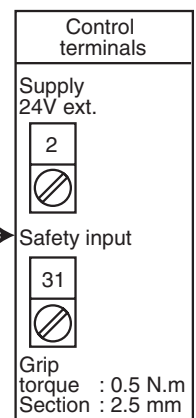
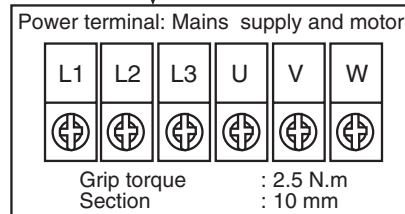
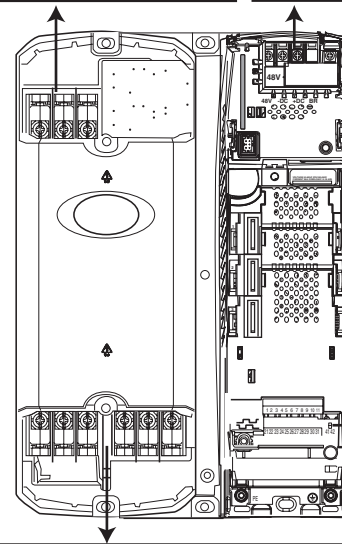
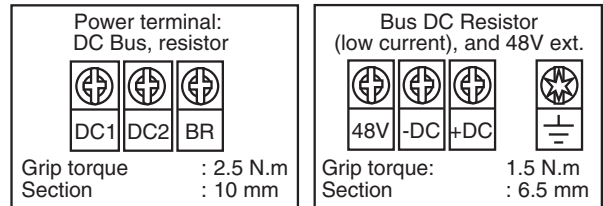
Connect the mains supply (PE) and motor earth cables (\perp) to the heater as specified.



• Installment of cables runs and glands

- Remove the pre-cut washer of the cable run plate for power and control cable run (lower terminals).
- If necessary, break the upper cover miters and install the glands for the brake resistor or 48V supply cable runs.

• Position



ATTENTION :

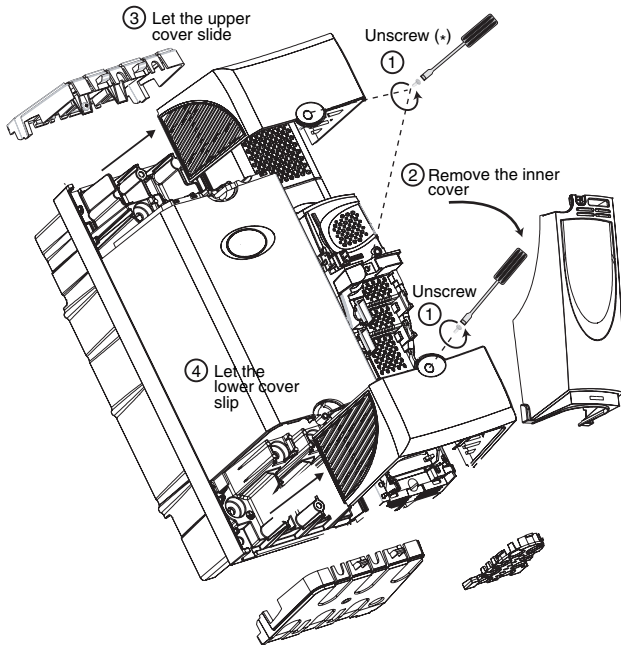
Use the DC Bus power cable to connect the brake resistor (DC2 and BR), the drive supply by DC, or the connection in parallel of DC buses of several drives (DC1, DC2).

Use the low current DC bus terminal (terminals 48V, -DC, +DC) only for the connection of the integrable RFI filter (supplied with the drive) or for the 48V safety supply.

UNIDRIVE SP Power connection

D2.4 - Size 4 to 6 drives

• Access to drives



(*) To rescrew, observe the 1 N.m grip torque.

• Installation of terminals

Insert the quick release terminals supplied with the drive:

- 1 control terminal (terminals 1 to 11),
- 1 control terminal (terminals 21 to 31),
- 1 relay terminal (terminals 41 and 42).

• Earthing

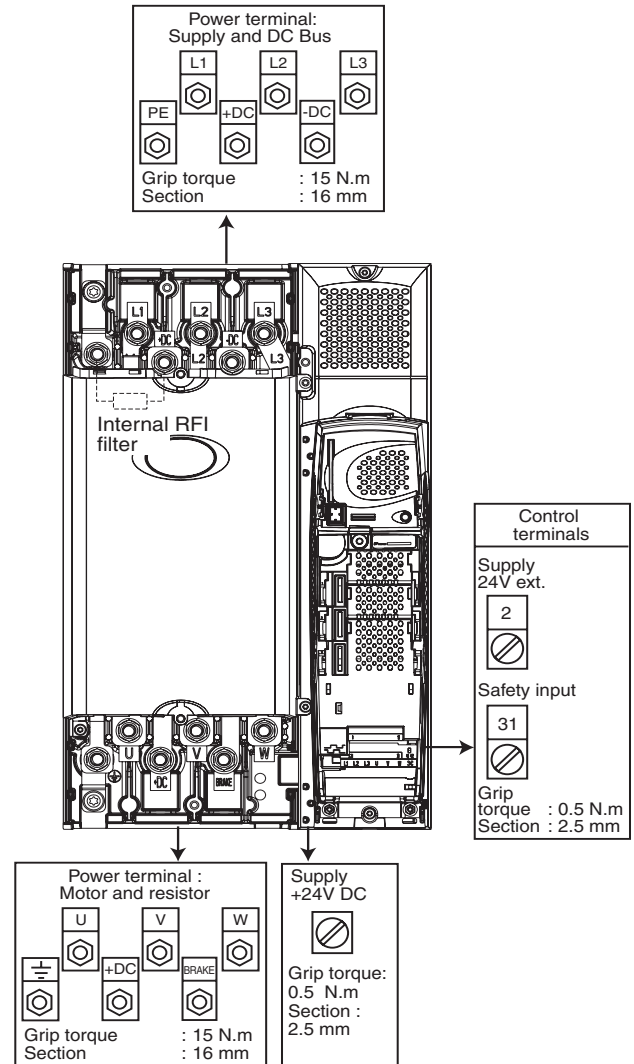
The power earth (PE) and the motor earth (\perp) are internally linked by a copper conductor (section 19.2 mm²).

This internal link is sufficient if the phase power supply cables has a section below or equal to 38.4 mm² (according to standard 60204-1 / EN60204-1) and when the power protection systems is calculated to less than or 200A (standard NFPA 79). In addition, it is necessary to perform an additional connection between the power earth and the motor.

• Installation of cables runs and glands

Remove the pre-cut washer of the cable run plate for brake resistor, power and control cable run (lower and upper left terminals)

• Position



UNIDRIVE SP

Power connection

D3 - Power diagrams


D3.1 - Safety input

This input, when open, leads to the drive enabling. Independent of the microprocessor, it activates several power bridge control levels. It is conceived so as the absence of torque on the motor shaft have a very high level of integrity even in case of failure of one or more circuit components.

Certified by the independent European bodies, this input has been recognised as compliant with the EN 954-1 safety standard category 3 specified in the Machine Directive.

As a consequence, it can be used as a safety element and it can replace an electromechanical contactor or a safety relay.

According to the safety category with which the installation must comply, it is recommended to observe the power connection diagrams described in the following paragraphs.

 • **The safety input is a safety element to be built in the complete machine safety system. As any other installation, the entire machine shall form the object of a risk analysis performed by the integrator in order to determine the safety category with which the installation must comply.**

• **The safety input, when open, disables the drive and prevents the dynamic braking function. If a brake function is required before the drive safety disabling, a timing safety relay must be installed in order to automatically control the disabling after brake.**

If the brake is a machine safety function, it must be provided by an electromechanical solution as the dynamic drive brake function is not intended for safety purposes.

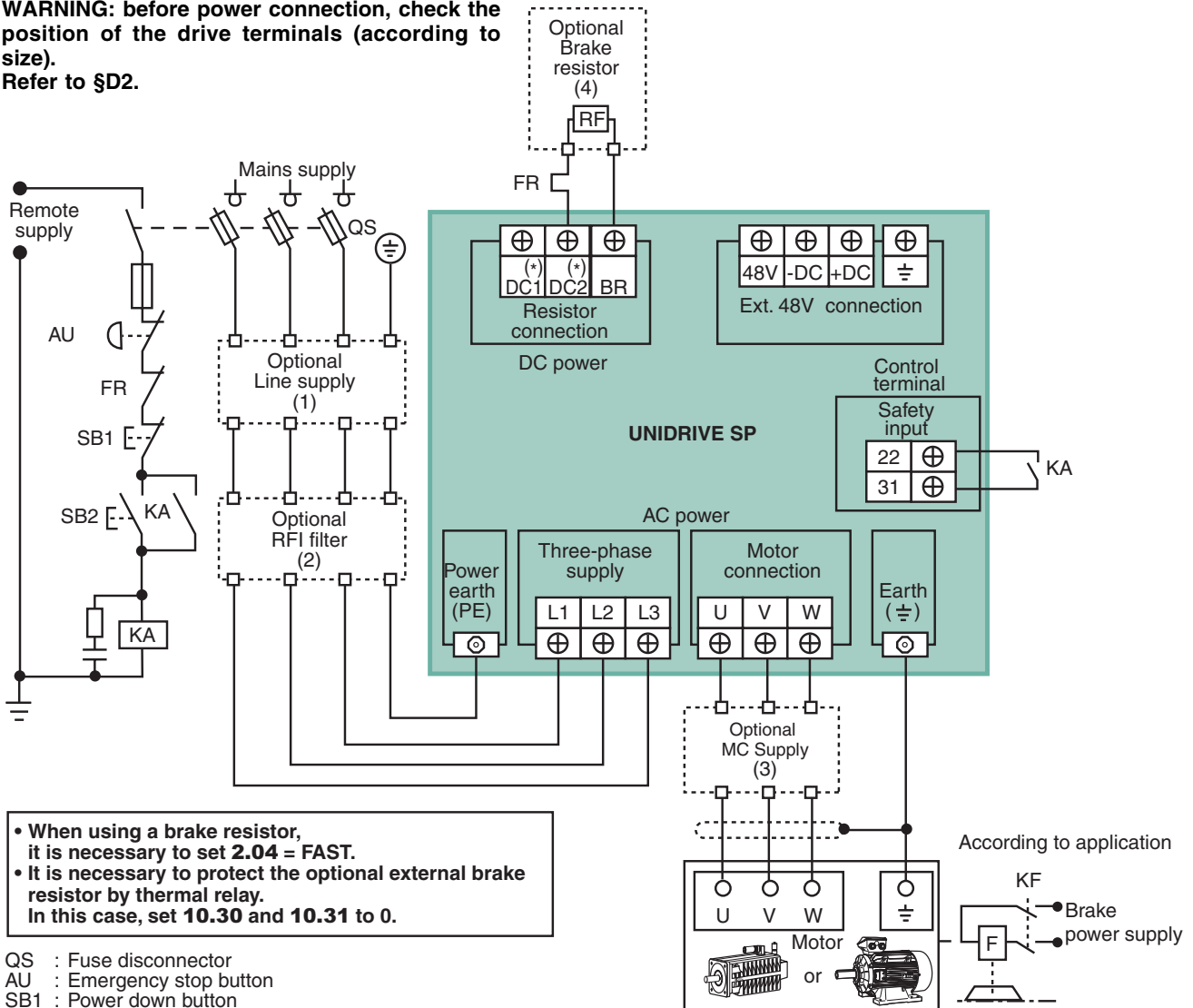
• **The safety input does not provide the electric insulation function. Before any intervention, the power cut must be provided by a certified disconnection body (disconnecter, switch ...).**



UNIDRIVE SP Power connection

D3.2 - Three-phase AC power supply according to the EN 954-1 safety standard - Category B or 1

WARNING: before power connection, check the position of the drive terminals (according to size). Refer to §D2.



- When using a brake resistor, it is necessary to set **2.04 = FAST**.
- It is necessary to protect the optional external brake resistor by thermal relay. In this case, set **10.30** and **10.31** to 0.

QS : Fuse disconnector
 AU : Emergency stop button
 SB1 : Power down button
 SB2 : Power up button
 KA : Remote relay
 FR : External brake resistor thermal relay (not necessary for heater built-in resistors)
 KF : Brake relay (refer to section H3.21 for brake management)

- (1) Line mains supply:
Option used to reduce the supply current harmonic amplitude and the transient interferences of the mains supply with the drive. Refer to section L7
- (2) " RFI " filter:
Option used to reduce the drive electromagnetic emissions and to comply with the EN 61800-3 standard in certain cases. Refer to section L3.
- (3) " MC " mains supply:
Option used to reduce the leakage currents as well as the drive interferences. Refer to section L5.
- (4) Brake resistor
Option used to disperse the active power returned by the motor on the drive continuous bus in case of a driving machine. Refer to section L8.

(*) For drives size 1, the DC1 terminal is replaced by -DC, and the DC2 terminal is replaced by + DC (there is no risk of confusion taking into account that there is only one continuous bus terminal for size 1).

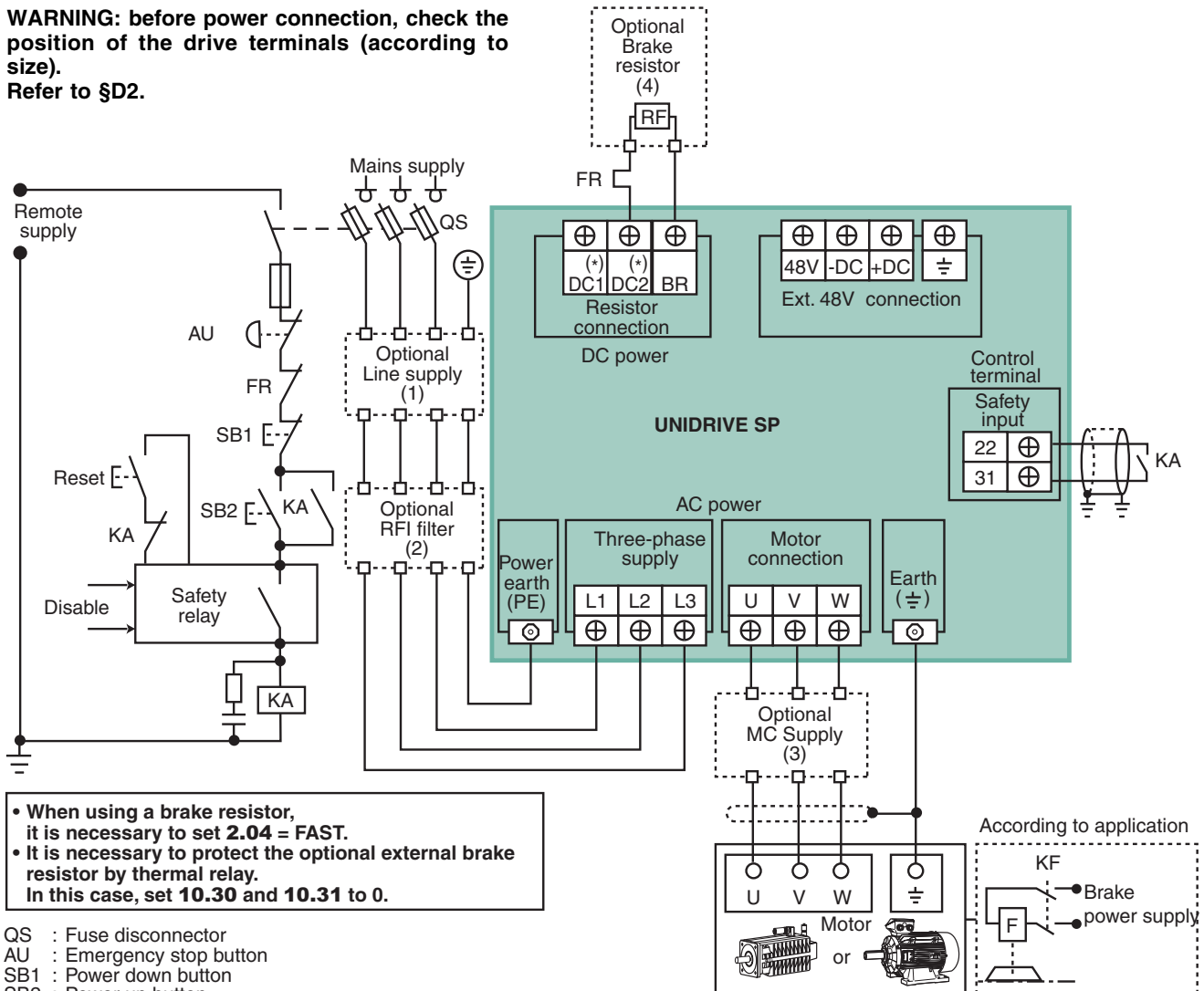
UNIDRIVE SP

Power connection

D3.3 - Three-phase AC power supply according to the EN 954-1 safety standard - Category 2 or 3

D3.3.1 - Use of a special cable on the safety input

WARNING: before power connection, check the position of the drive terminals (according to size).
Refer to §D2.



- When using a brake resistor, it is necessary to set 2.04 = FAST.
- It is necessary to protect the optional external brake resistor by thermal relay. In this case, set 10.30 and 10.31 to 0.

- QS : Fuse disconnector
 AU : Emergency stop button
 SB1 : Power down button
 SB2 : Power up button
 KA : Remote relay
 FR : External brake resistor thermal relay (not necessary for heater built-in resistors)
 KF : Brake relay

- (1) Line mains supply:
Option used to reduce the supply current harmonic amplitude and the transient interferences of the mains supply with the drive. Refer to section L7.
- (2) " RFI " filter:
Option used to reduce the drive electromagnetic emissions and to comply with the EN 61800-3 standard in certain cases. Refer to section L3.
- (3) " MC " mains supply:
Option used to reduce the leakage currents as well as the drive interferences. Refer to section L5.
- (4) Brake resistor
Option used to disperse the active power returned by the motor on the drive continuous bus in case of a driving machine. Refer to section L8.

WARNING: In this case, the cable used for the safety input connection must be isolated from other cables, either by introducing it into a metal or a separate pipe, or by using a special shielded cable.

(*) For drives size 1, the DC1 terminal is replaced by -DC, and the DC2 terminal is replaced by + DC (there is no risk of confusion taking into account that there is only one continuous bus terminal for sizes 1).

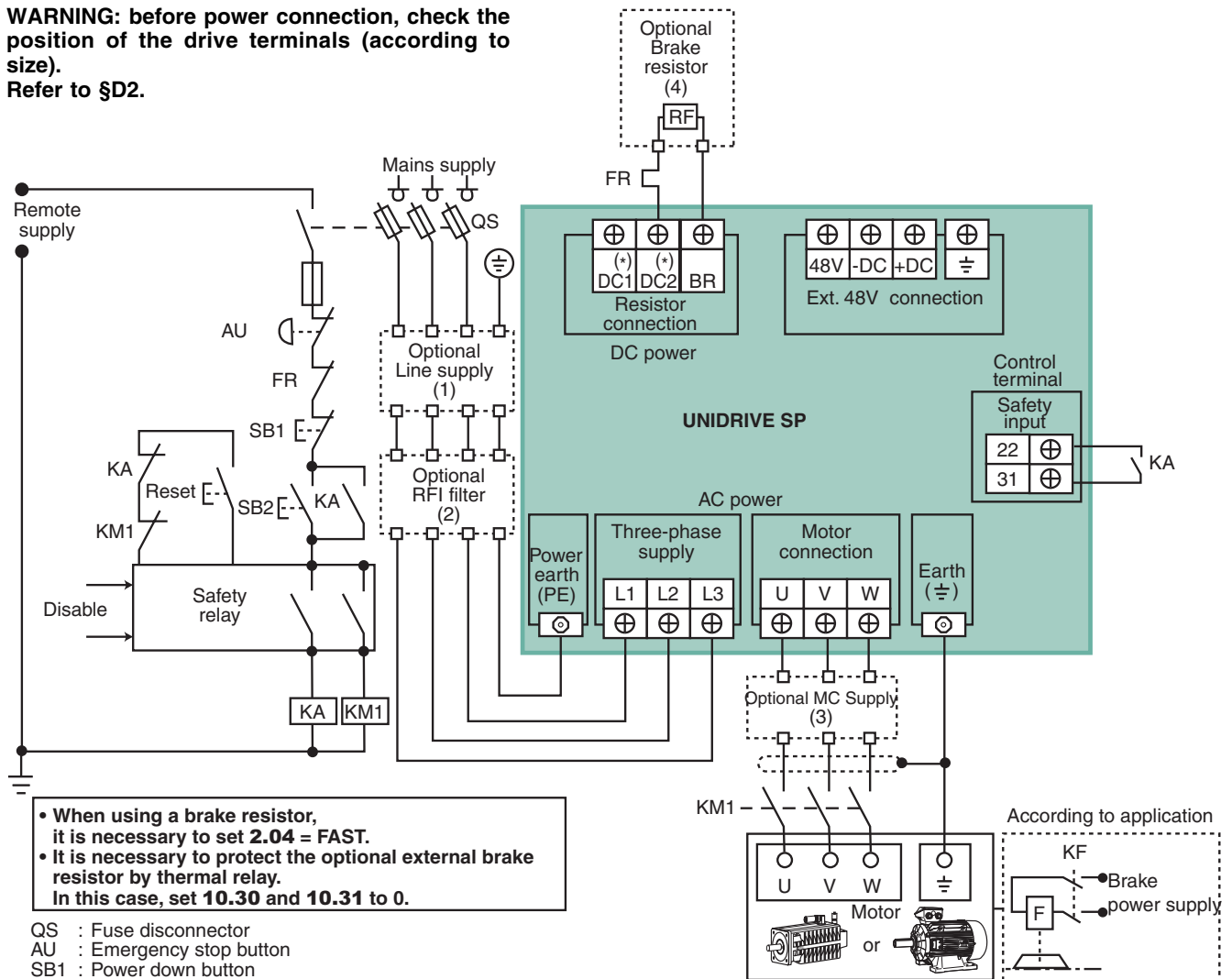
UNIDRIVE SP Power connection

D3.3.2 - Contactor use

In case a safety input cable cannot be used, add a contactor.

WARNING: before power connection, check the position of the drive terminals (according to size).

Refer to §D2.



- When using a brake resistor, it is necessary to set **2.04 = FAST**.
- It is necessary to protect the optional external brake resistor by thermal relay. In this case, set **10.30** and **10.31** to 0.

- QS : Fuse disconnecter
 AU : Emergency stop button
 SB1 : Power down button
 SB2 : Power up button
 KA : Remote relay
 FR : External brake resistor thermal relay (not necessary for heater built-in resistors)
 KF : Brake relay

- (1) Line mains supply:
Option used to reduce the supply current harmonic amplitude and the transient interferences of the mains supply with the drive. Refer to section L7
- (2) " RFI " filter:
Option used to reduce the drive electromagnetic emissions and to comply with the EN 61800-3 standard in certain cases. Refer to section L3.
- (3) " MC " mains supply:
Option used to reduce the leakage currents as well as the drive interferences. Refer to section L5.
- (4) Brake resistor
Option used to disperse the active power returned by the motor on the drive continuous bus in case of a driving machine. Refer to section L8.

! If a contactor is connected between the drive and the motor (recommended type: AC3), check that the drive is disabled when the contactor is activated or deactivated.

(*) For drives size 1, the DC1 terminal is replaced by -DC, and the DC2 terminal is replaced by + DC (there is no risk of confusion taking into account that there is only one continuous bus terminal for sizes 1).

UNIDRIVE SP Power connection

D4 - Cables and fuses

⚠ It is the responsibility of the user to perform the UNIDRIVE SP connection and protection according to the legislation and the rules in force in the country of use. It is especially important for the size of cables, the fuse type and diameter, the earthing and grounding, the power down, the repairing, the insulation and protection against overcurrent.

• These tables are given for information only and they do not replace the existing standards.

• The diameters and characteristics correspond to a maximum overload. For reduced overload, refer to the corresponding motor current.

• Sizes 1 to 3

UNIDRIVE SP	Power supply						Motor										
	I _{rated} (Reduced overload) (A)	I _{max} (A)	Fuses		Cable section* & **		I _{sp} * (A)	Cable section* & **		Max. motor cable length (m)							
			IEC (gG) (A)	USA (A)	EN60204 (mm ²)	UL508C (AWG)		EN60204 (mm ²)	UL508C (AWG)	3kHz	4kHz	6kHz	8kHz	12kHz	16kHz		
1.5TL	7.1	9.5	10		1.5	14	4.3	1	18	65						50	37
2TL	9.2	11.3	12	15	1.5	14	5.8	1	16	100		75	50	37			
2.5TL	12.5	16.4	20		4	12	7.5	1	14	130		100	75	50	37		
3.5TL	15.4	19.1	20		4	12	10.6	1.5	14	200	150	100	75	50	37		
4.5TL	13.4	18.1	20		4	12	12.6	2.5	14	200	150	100	75	50	37		
5.5TL	18.2	22.6	25		4	10	17	4	10	200	150	100	75	50	37		
8TL	24.2	28.3	32	30	6	8	25	6	8	200	150	100	75	50	37		
11TL	35.4	43.1	50	45	16	6	31	16	6	200	150	100	75	50	x		
16TL	46.8	54.3	63	60	25	4	42	25	4	200	150	100	75	50	x		
1.5T	4.1	4.8	6		1	18	2.1	1	22	65						50	37
2T	5.1	5.8	6		1	16	3	1	20	100		75	50	37			
2.5T	6.8	7.4	8	10	1	16	4.2	1	18	130		100	75	50	37		
3.5T	9.3	10.6	12	15	1.5	14	5.8	1	16	200	150	100	75	50	37		
4.5T	10	11	12	15	1.5	14	7.6	1	14	200	150	100	75	50	37		
5.5T	12.6	13.4	16	15	2.5	14	9.5	1.5	14	200	150	100	75	50	37		
8T	15.7	17	20		4	12	13	2.5	14	200	150	100	75	50	37		
11T	20.2	21.4	25		4	10	16.5	4	10	200	150	100	75	50	37		
16T	26.6	27.6	32	30	6	8	25	6	8	200	150	100	75	50	37		
22T	34.2	36.2	40		10	6	32	10	6	200	150	100	75	50	37		
27T	40.2	42.7	50	45	16	6	40	16	6	200	150	100	75	50	37		
33T	51.3	53.5	63	60	25	4	46	25	4	200	150	100	75	50	x		
3.5TM	5	6.7	8	10	1	16	4.1	1	18	200	150	100	75	50	x		
4.5TM	6	8.2	10		1	16	5.4	1	16	200	150	100	75	50	x		
5.5TM	7.8	11.1	12	15	1.5	14	6.1	1	14	200	150	100	75	50	x		
8TM	9.9	14.4	16	15	2.5	14	9.5	1.5	14	200	150	100	75	50	x		
11TM	13.8	18.1	20		4	12	12	2.5	14	200	150	100	75	50	x		
16TM	18.2	22.2	25		4	10	18	4	10	200	150	100	75	50	x		
22TM	22.2	26	32	30	6	8	22	6	8	200	150	100	75	50	x		

• Sizes 4 to 6

UNIDRIVE SP	Mains supply						Motor									
	I _{rated} (Reduced overload) (A)	I _{max} (A)	Option 1: fuse IEC (gR) (A)	Option 2 : series semiconductor with HRC fuse or circuit breaker		Cable section * & **		I _{sp} * (A)	Cable section * & **		Max. motor cable length (m)					
				HRC UL (clas. J) IEC (gG) (A)	Semi- conductor IEC (aR) (A)	EN60204 (mm ²)	UL508C (AWG)		EN60204 (mm ²)	UL508C (AWG)	3kHz	4kHz	6kHz	8kHz	12kHz	16kHz
22TL	62.1	68.9	90	90	160	25	3	56	25	3	250	185	125	90	x	x
27TL	72.1	78.1	100	100	160	35	3	68	35	3						
33TL	94.5	99.9	125	125	200	50	1	80	70	1						
40T	61.2	62.3	80	80	160	25	3	60	25	3	250	185	125	90	x	x
50T	76.3	79.6	110	100	200	35	2	74	35	2						
60T	94.1	97.2	125	125	200	50	1	96	70	1						
75T	125	131	175	160	200	95	2/0	124	95	2/0						
100T	150	156	225	200	250	120	4/0	139	120	4/0						
120T	205.8	214.9	250			2 x 70	2 x 2/0	180	2 x 70	2 x 2/0	250	185	125	x	x	x
150T	247.2	257.9	315			2 x 120	2 x 4/0	210	2 x 120	2 x 4/0	250	185	125	x	x	x
22TH	23	26.5	63	32	125	4	10	18	4	10	250	185	125	90	x	x
27TH	26.1	28.8	63	35	125	6	8	22	6	8						
33TH	32.9	35.1	63	50	125	10	8	27	10	8						
40TH	39	41	63	50	125	16	6	36	16	6						
50TH	46.2	47.9	63	63	125	16	6	43	16	6						
60TH	55.2	56.9	80	80	125	25	4	52	25	4						
75TH	76	83	100	90	160	35	2	62	35	2						
100TH	89	95	110	125	160	50	1	84	50	1						
120TH	119	123.1	200			2 x 50	2 x 1	100	2 x 50	2 x 1	250	185	125	x	x	x
150TH	140	146.3	200			2 x 50	2 x 1	125	2 x 50	2 x 1	250	185	125	x	x	x

* and **: see the following page.

UNIDRIVE SP

Power connection

* The permanent output current value and the motor cable sections are given for information only. Knowing that the motor rated current used by the drive varies according to the cutout frequency, the temperature and the overload, refer to section B3.3 for more details.

** The pre-established sections are given for single-wire cable with a max. length of 10m, and for all other lengths take into consideration the line drops due to length.

Note:

- The supply current value is a typical value depending on the source impedance. The higher the impedance, the lower the current.
- In factory setting, the cutout frequency is 3 kHz (except for the Servo operating mode: 6 kHz).
- In order to determine the earth cable section (according to the EN 60204 standard):
 - phase cable section $\leq 16 \text{ mm}^2$: use an earth cable of the same section,
 - $16 \text{ mm}^2 < \text{phase cable section} \leq 35 \text{ mm}^2$: the earth cable section is 16 mm^2 ,
 - phase cable section $> 35 \text{ mm}^2$: the earth cable section must

be half of the phase cable section (choose the equal or higher existing section).

- Circuit breakers can replace the class gG fuses. They must be of the same C type and size as the fuses (for sizes 4 to 6, they must be serially connected to class aR fuses).

WARNING:

- In order to limit the leakage current it is recommended to use cables with a capacity lower than 260pF/m. If cables of higher capacity are required, reduce to half the maximum length of motor cables specified on the above page.

D5 - Special applications

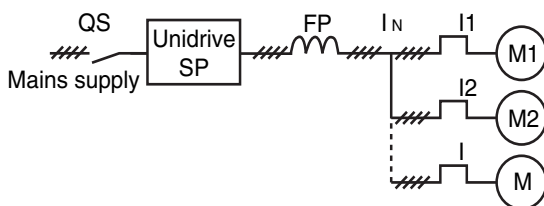
D5.1 - Motor Insulation

When one of the following cases:

- the power voltage is higher than 500 Vac or 670Vdc,
 - the 400V drive is used with highly frequent brake applications,
- is associated to a motor cable length exceeding 10m, it is recommended to use a motor adapted to frequency variation (LSMV). These motors insulation may resist to repeated voltage peaks.

With a standard motor, it is recommended to install an output mains supply (FP mains supply type) with an approximately 2% reactance.

D5.2 - Motor parallel operation in U/F mode



The drive control mode must be the open loop mode (**0.48** = Open.LP(1)) U/F control (**0.07** = Fd(2) or SrE(5)).

The total length of motor cables (M1 cable length + M2 cable length + ...) must be shorter than the maximum length specified in D4 section according to the drive caliber and the used cutout frequency.

It is possible to supply several motors of different powers with a single drive. Each motor must be protected by a thermal relay.

Determination of the drive caliber:

$$I_N \text{ drive} > I_1 + I_2 + \dots + I$$

In order to avoid accidental starting of thermal relays, a specific supply of the Low Loss type may be proposed as an option (see

section L). The determination of this supply depends on the drive caliber and the cable length between the drive and the motor. Contact LEROY-SOMER.

D5.3 - Parallel operation of drives by continuous bus

• General detail

The parallel coupling of several drives by continuous bus is used to limit the number and power of brake resistors. You can even remove the brake resistors if the amount of energy to restore is lower than the motion energy.

This mounting is also useful in case the mains supply is missing if you want to stop several synchronised motors loaded by different inertias.

If the drives have the same calibers or close calibers, they can be powered up simultaneously.

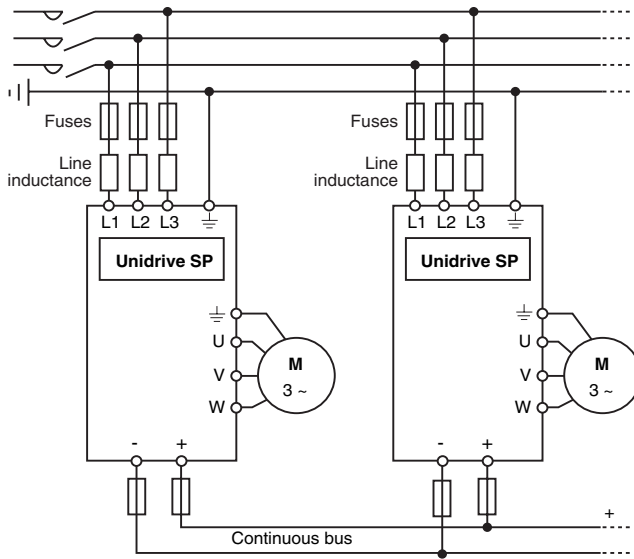
If the calibers are highly different, in order to avoid that the lowest caliber drive load the entire bus, you must either delay its power up (1 second), or delay the bus coupling by a bus contactor which switches off 1 second after power up.

In order to provide a good distribution of supply currents at the drive input, it is recommended to serially install with each drive power supply a line inductance adapted to the drive caliber (refer to section L7 for details).

In addition, each modulator continuous bus shall be fitted with fuses (see section D4).

UNIDRIVE SP Power connection

• Example of connection diagram



D6 - 48V safety supply

The Unidrive SP gives the possibility to connect the power to a 48V DC safety supply.

This operation mode can be used only at the end of the motion following a power supply loss. In this case, the available voltage being much lower than the rated operation voltage, the system performances are limited to the following values.

- Asynchronous motor: constant torque up to 4 Hz and defluxed motor afterwards.

- Servo motor: the maximum motor speed depends on its Ke factor.

Example:

for a 3000 min⁻¹ motor with 98V/kmin⁻¹ Ke, the maximum speed shall be 347 min⁻¹.

Note: the safety supply voltage level must be set at *. The start level in overvoltage default corresponds to 1.45 x **6.46** (V), and the brake transistor driving voltage corresponds to 1.325 x **6.46** (V).

⚠ • The operation below 48V DC implies strict observance of cabling and sequencing rules. For additional information, contact the LEROY-SOMER assistant.

• Characteristics

Characteristics	Level
Minimum operating continuous voltage	36 V
Operating rated voltage	Size 1 : 48 V Sizes 2 to 6 : 48 to 72V
Minimum start supply voltage	40 V
Maximum brake transistor driving voltage	63.6 V
Maximum overvoltage default threshold	69.6 V
Current	2 x I _{sp} with maximum overload

D7 - UL compliance

D7.1 - Mains supply

The drive can be built in an installation which can supply maximum 5000A rms for sizes 1 to 3, 10000A rms for sizes 4 and 5 and 15000A rms for size 6, under maximum 264V AC rms for 200V (TL) drives and maximum 528V AC rms for 400V (T) drives, or maximum 632V AC for 575V (TM) and 690V (TH) drives.

D7.2 - Cables

Use only class 1 copper cables 60/75°C (140/167° F).

D7.3 - Fuses

The UL compliance is observed if the fuses are rapid and UL listed (class DC up to 30A, and class J below) and the symmetric short-circuit current does not exceed 5 kA up to calibers 16TL, 33T and 22TM.

Example of rapid fuses:

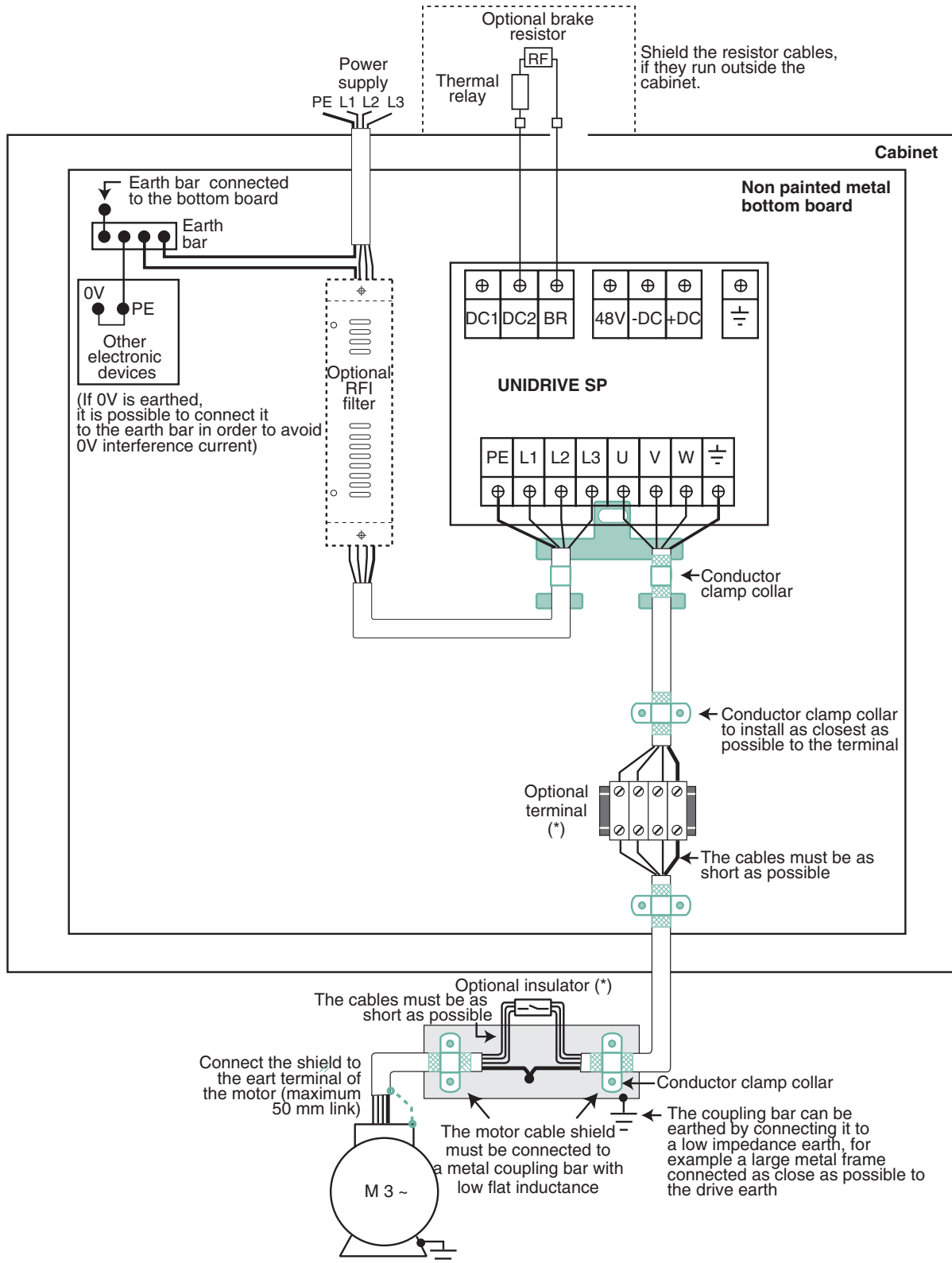
- Bussman Limitron KTK,
- Gould Amp - trap ATM.

Note: in case of a circuit breaker in stead of fuses, the UL compliance is no longer observed.

UNIDRIVE SP Power connection

D8 - Recommendations for CEM compliance

D8.1 - Diagram



(*) It is recommended to use an uninterrupted shielded motor cable. Nevertheless, if a motor cable must be connected to a drive cabinet built-in terminal or when a motor insulator must be installed, check that the shields are continuous as specified above.

UNIDRIVE SP Power connection

D8.2 - Recommendations



- The earth loop must comply with the recommendations of the local security regulation.
- The earth connections must be tested and inspected periodically.

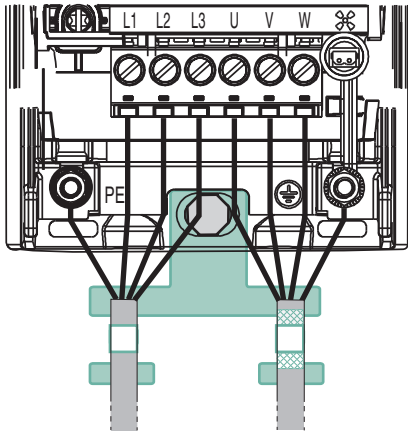
WARNING:

- Bare the wires at grip level so as the shielding be in contact.
- Threaded screws must be used to fix the drive on the bottom sheet in order to obtain a direct electric connection to the earth.
- Do not place sensitive circuits (not shielded) at less than 300 mm around the drive, the motor cables, the RFI filter cable (optional) and the brake resistor cables (optional).
- Put the supply cables and the earth cables at least 100 mm away from the drive power module and the motor cable (except for the RFI filter connection cables of the drive).

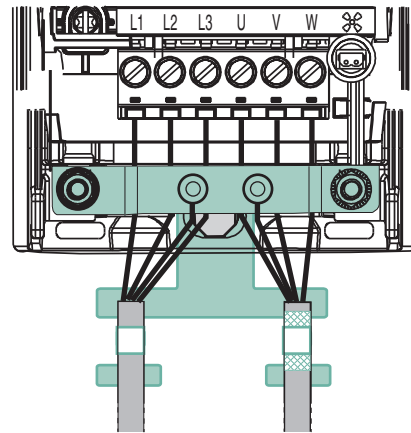
The power earth (PE) must be connected to an earth bar (or a low impedance earth terminal) in the cabinet. This bar must correspond to a common bar of all the cabinet components. In addition, if the power earth (PE) connection is made by separated cable, it must run in parallel with the other mains cables in the cabinet (reduces the risk of emissions).

D8.3 - Details on the shield supports (power)

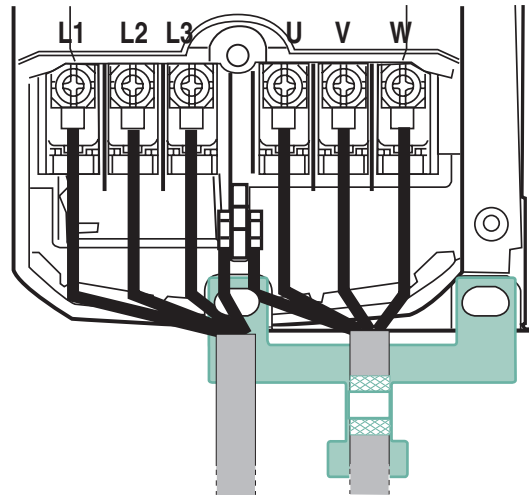
- Size 1



- Size 2



- Size 3



D9 - Supply types

The drives can be used in all neuter regime, such as TN-S, TN-C-S, TT, IT.

The drives have been conceived to be used with category III supplies or less, according to the IEC 60664-1 standard. In case of a higher category supply, provide adapted overvoltage devices before the drive.



For size 3 and higher, when the drive is used with an IT supply, the internal RFI filter must be disconnected, except if an additional external filter or a motor earth protection is used.

UNIDRIVE SP Power connection

Notes



UNIDRIVE SP Control Connections

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UNIDRIVE SP Control connections

Notes

E

UNIDRIVE SP Control connections

E1 - Warning

! • For the factory settings, UNIDRIVE SP is set in positive logic. Setting a drive with a different control logic, can cause inadvertant starting of the motor.

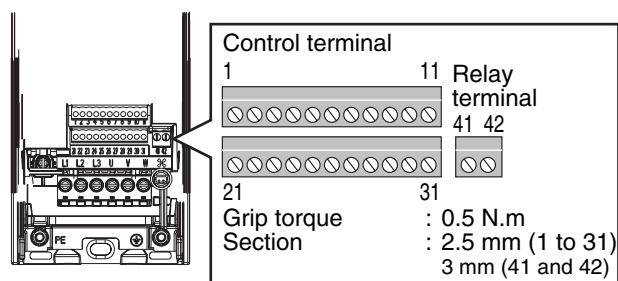
• In the drive, the control circuits are isolated from the power circuits by simple insulation (CEI 664-1). The fitter must check if the external control circuits are isolated against any human contact.

• If the control circuits must be connected to circuits complying with the SELV safety requirements, an additional insulation must be inserted to observe the SELV classification.

• The software integrated to the SM-EDL CEL module automatically configures the drive and the modules according to "Synchronisation" application requirements.

E2 - Location and characteristics

E2.1 - Location



E2.2 - Terminal characteristics

1	Common 0V
2	+24V for external supply of the drive control circuit
Rated voltage	+24 Vdc
Minimum operating voltage	+19.2 Vdc
Maximum operating voltage	+30 Vdc
Minimum starting supply voltage	+21.6 Vdc
Recommended supply	60 W, rated 24Vdc nominal
Recommended Fuse	4A Gg, 50Vdc
<p>• This 24V power supply may be used as a fail safe supply which protects against overload, for example in case of simultaneous use of several SM modules (SM-Universal-Encoder Plus module, SM-Encoder Plus module and SM-I/O Plus module). If the internal 24V is overloaded, the drive defaults with "PS.24V".</p> <p>• It may be used as a fail safe supply of the control card, in case of power drop, which allows the operation of programmable modules (with or without field bus) or of an encoder module.</p> <p>For UL compliance, the external supply must be class 2 UL.</p>	
3	Common 0V
4	internal analogue +10V source
Voltage tolerance	± 1 %
Rated output current	10 mA
Protection	Overload and thermal (stop state at 30mA)

5	Precision 1 (+) analogue input	Master speed reference
6	Precision 1 (-) analogue input	
Characteristics	powered up 2-pole differential inputs (operation in common mode: connect terminals 6 and 3)	
Resolution	16 bits plus sign	
Maximum offset	70 µV	
Sampling	250 µs for a closed loop speed reference, 4ms for other functions	
Full scale voltage range	±9.8 V ± 1 %	
Maximum voltage in common mode	±13 V/0V	
Absolute maximum voltage	±36 V/0V	
Input impedance	100 kΩ, ± 1 %	

7	Analogue input 2 (allocatable)	
Characteristics	2-pole analogue voltage (common mode) or single pole current	
Resolution	10 bits + sign	
Sampling	250µs for a voltage speed reference, or a closed loop torque reference, 4ms for other functions	
Voltage input		
Full scale voltage range	± 9.8V ± 3 %	
Maximum offset	± 30 mV	
Maximum absolute voltage	± 36Vdc/0V	
Input impedance	>100 kΩ	
Current input		
Current range	0-20mA ± 5 % 20-0mA ± 5 % 4-20mA ± 5 % 20-4mA ± 5 %	
Maximum offset	250 µA	
Maximum absolute voltage	- 36 Vmax	
Maximum absolute current	70 mA	
Input impedance	≤ 200 Ω to 20 mA	

UNIDRIVE SP

Control connection

8	Analogue input 3	Motor thermal probe
Characteristics	2-pole analogue voltage (common mode), single pole current or motor probe input	
Resolution	10 bits + sign	
Sampling	250µs for a voltage speed reference, 4ms for another function	
Voltage input		
Full scale voltage range	± 9.8V ±3 %	
Maximum offset	± 30 mV	
Maximum absolute voltage	± 36 Vdc/0V	
Input impedance	>100 kΩ	
Current input		
Current range	0-20mA ±5 % 20-0mA ±5 % 4-20mA ±5 % 20-4mA ±5 %	
Maximum offset	250 µA	
Absolute maximum voltage	- 36 Vmax	
Absolute maximum current	70 mA	
Input impedance	≤ 200 Ω to 20 mA	
Motor probe input		
Internal voltage	< 5V	
Trip state start threshold	3.3kΩ ± 10 %	
Trip state end threshold	1.8kΩ ± 10 %	
Short-circuit detection	50Ω ± 30 %	
WARNING: Terminal 8 is internally connected to pin 15 of HD-15 connector. When the motor probe is connected to pin 15, terminal 8 is not available.		

9	Analogue output 1	Synchro error
10	Analogue output 2	Slave speed image
Characteristics	Tension analogique bipolaire (common mode) or single pole current	
Resolution	10 bits (+ sign under voltage)	
Cooling	4ms	
Sampling	250 µs if the output has 4.02 or 4.17 or 3.02 or 5.02 sources in closed loop 4 ms in the other cases	
Voltage output		
Voltage range	± 9.6Vdc ±5 %, ±10mA max.	
Maximum offset	100 mV	
Load resistor	1 kΩ minimum	
Protection	Short-circuit (35mA max.)	
Current output		
Current range	0-20mA ±10 % 4-20mA ±10 %	
Maximum offset	600 µA	
Maximum open circuit voltage	+15V	
Maximum load resistor	500Ω	

11	Common 0V
21	Common 0V

22	+24V internal source
Output current	200mA (including all digital inputs / outputs)
Overload current	240mA (including all digital inputs / outputs)
Protection	Current limitation and stop

23	Common 0V
-----------	-----------

24	Digital inputs or outputs	Validated Synchro
25		Synchro OK
26		I ₊
Characteristics	Digital inputs in positive or negative logic or outputs in negative logic with open commutator or push-pull	
Thresholds	Positive logic: 0 : < 5V 1 : >15V Negative logic: 1 : < 5V 0 : > 15V	
Voltage range	0 to +24V	
Sampling / Cooling	200µs if the output has a 6.35 or 6.36 source, 4ms in the other cases	
Digital input		
Maximum absolute voltage	±30V	
Load	> 2mA to 15Vdc	
Input threshold	10.0V ± 0.8V	
Digital output		
Maximum output current	200mA (in whole, all the digital outputs + terminal 22)	
Overload current	240mA (in whole, all the digital outputs + terminal 22)	

27	Digital inputs	I ₋
28		R/S Synchro
29		RTZ interval
Characteristics	Positive or negative digital inputs	
Threshold	Positive logic: 0 : < 5V 1 : >15V Negative logic: 1 : < 5V 0 : > 15V	
Sampling / Cooling	200µs if the output has a 6.35 or 6.36 source, 4ms in the other cases	
Voltage range	0 to +24V	
Maximum absolute voltage	±30V	
Load	> 2mA to 15V DC	
Input threshold	10.0V ± 0.8V	

30	Common 0V
-----------	-----------

UNIDRIVE SP Control connections

31	Safety input / drive enable (refer to section D3)
Characteristics	Positive logic input
Sampling period	Drive disable (Hardware) : < 100 µs Drive enable (software) : 4 ms
Voltage range	0 to +24V
Maximum absolute voltage	±30V
Thresholds	18.5V ± 0.5V

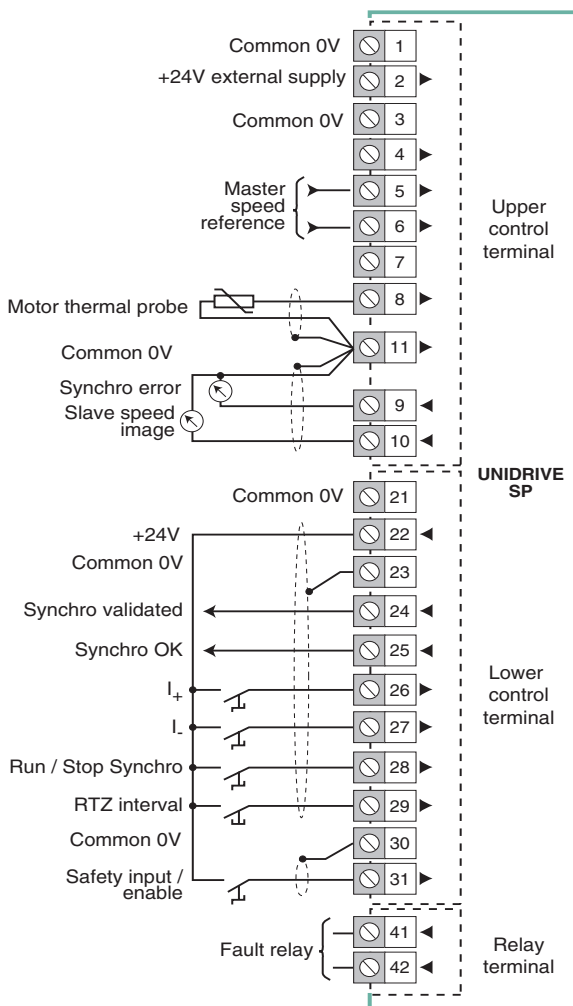
Note:

- According to the EN954-1 safety standard for category 2 or 3, the safety input must be isolated from the other cables, either by a metal duct or a shielded cable.
- The digital circuit cables are shielded or not, according to the drive environment and the used communication interfaces (refer to section E3).

41	Relay output	Default relay
Characteristics	240Vac	
Cooling period	4ms	
Maximum contact current	<ul style="list-style-type: none"> • 2A AC 240V • 4A DC 30V resistive load • 0.5A DC 30V inductive load (L/R = 40ms) 	
Minimum recommended contact	12V/100mA	
Configuration	Closed contact: drive powered up and running Open contact: powered down or stopped drive	

E3 - Cabling diagrams

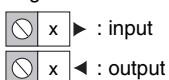
E3.1 - Drive Connection



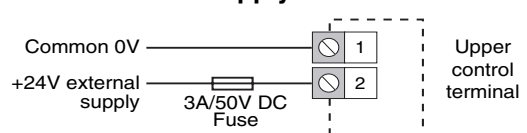
WARNING:

If the motor probe is connected to pin 15 of the HD-15 connector (see encoder connection section F), pin 8 of the drive is not available.

Legend:



E3.2 - +24V External supply connection



E3.3 - Negative logic connection

For negative logic, connect the commons to 0V (except the safety input).

Note: In order to configure the drive in negative logic, change the parameter (refer to section H, menu 8).

⚠ • For the factory setting, the UNIDRIVE SP is configured in positive logic. Setting a drive with a different control logic may cause inadvertant motor starting.

E3.4 - Use of a field bus

If an SM-Field bus module is used (SM-PROFIBUS DP, SM-DeviceNet, SM-INTERBUS or SM-CANopen), refer to section I for the connection specific to the field bus, available on the CD Rom supplied with the drive (documentation).

UNIDRIVE SP Control connections

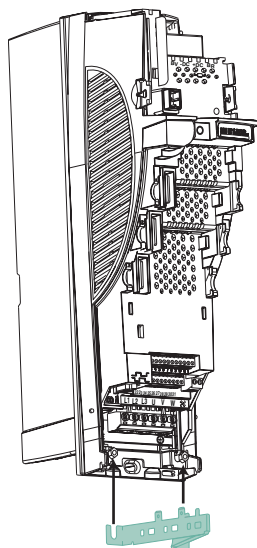
E4 - CEM Electromagnetic compatibility

E4.1 - Precautions concerning control cables outside the cabinet

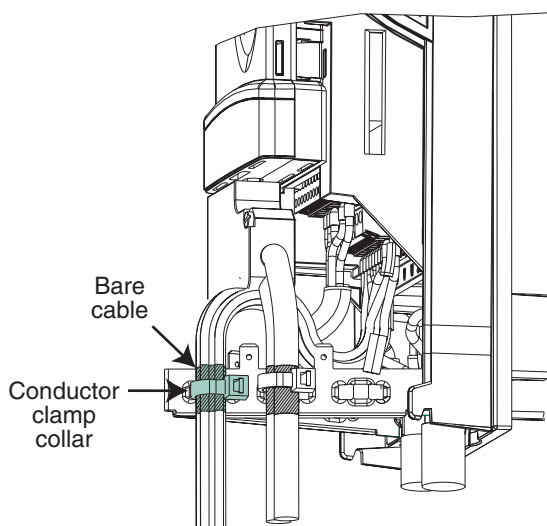
If the control cables must run outside the cabinet, use shielded cables and connect the shield to the drive shielding support.

• Installation of the shielding support (control)

Screw the support on the 2 earth terminals.



• Shield connection



E4.2 - Immunity to overvoltages

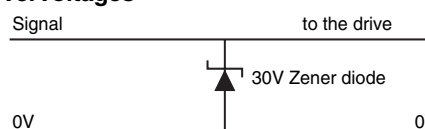
Immunity to control circuits overvoltages or long cable length and connection outside a building.

The different drive input and output circuits are compliant with the EN61000-6-2 standard on overvoltages (1kV).

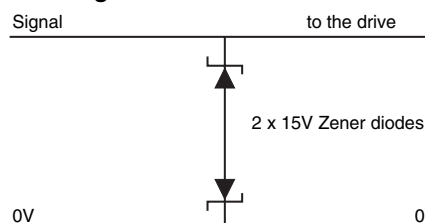
There are exceptional cases when the overvoltage peaks exceed the levels fixed by the standard. It can be the case of thunder or earth trips accompanied by long cable lengths (>30 m). In order to limit the drive damaging risks, the following precautions must be taken:

- galvanic insulation of inputs / outputs. In this case, check that the 0V is not earthed and avoid loops,
- Double the cable shielding and use an earth wire of 10mm² minimum. The cable shielding and the earth wire must be linked at both ends and connected to earth by the shortest possible connection. This method enables the high current to pass through the earth wire rather than into the shield,
- Increase the logic and analogue input / output protection by adding a zener diode or a peak limiter.

Elimination of uni-directional logic and analogue Input / Output overvoltages



Elimination of two-pole digital and analogue Input / Output overvoltages



These circuits are available in modules (rail mounting), for ex. Phoenix Contact (uni-directional: TT UKK5 D/24 DC, bi-directional: TT UKK5 D/24 AC).

These circuits are not suitable for encoder signals or for fast digital data networks, because the diodes can affect the signal. Most encoders have galvanic isolation between the motor casing and the encoder circuit, and in this case no precautions are necessary. For data networks follow the specific network recommendations.

If a digital output is subjected to high overvoltage, the variable speed drive defaults to "O.Ld1" .

UNIDRIVE SP Encoder connections

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UNIDRIVE SP

Encoder connections

Notes

F

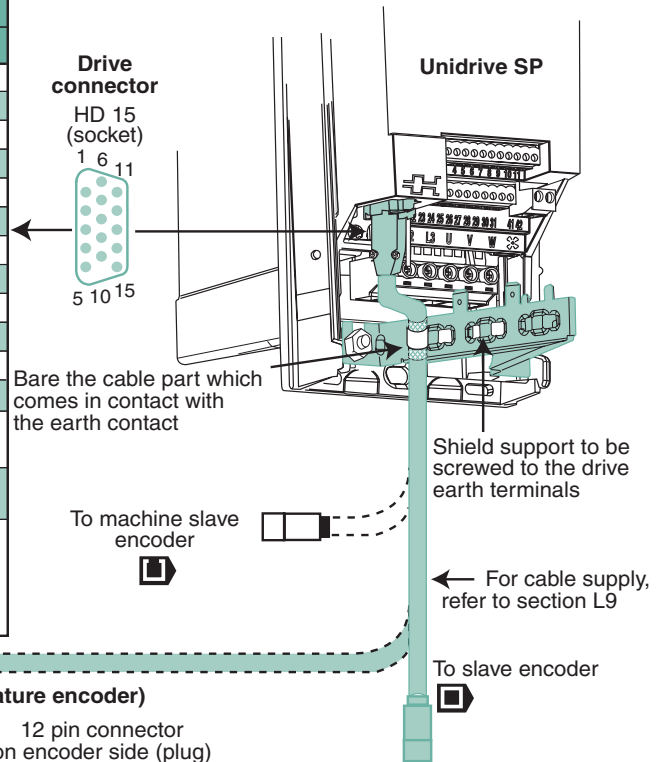
UNIDRIVE SP Encoder connections

F1 - Drive connections

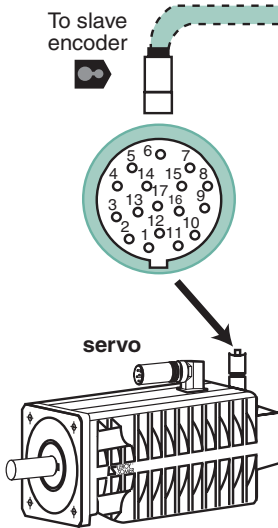
F1.1 - Incremental encoders

• Drive side

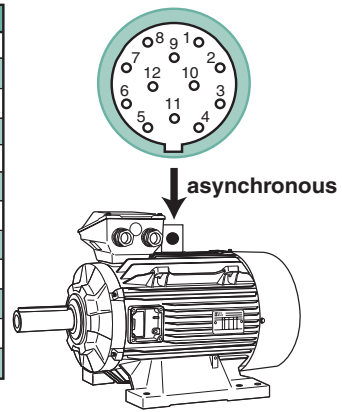
HD-15 Ref.	Mode		
	□	□ (1)	⊞
1	-	B or F	A or F
2	-	B\ or F\	A\ or F\
3	-	A or D or R	B or D or R
4	-	A\ or D\ or R	B\ or D\ or R\
5	-	C or O or Z	
6	-	C\ or O\ or Z\	
7	A _{out} or F _{out}	-	U
8	A _{out} \ or F _{out} \	-	U\
9	B _{out} or D _{out}	-	V
10	B _{out} \ or D _{out} \	-	V\
11	-	-	W
12	-	-	W\
13	-	+5V or +8V or +15V	
14	-	0V	
15	-	Motor thermal probe (3) WARNING: Pin 15 is internally connected to terminal 8 of the control terminal	



• Motor side (ex.: quadrature encoder)



17 pin connector on encoder side (plug)		12 pin connector on encoder side (plug)	
Ref.	Designation	Ref.	Designation
1	Motor thermal probe (2)	1	0V
2	-	2	+5V or +8V or +12V
3	U	3	A
4	U\	4	B
5	V	5	C or O or Z
6	V\	6	A\
7	W	7	B\
8	W\	8	C\ or O\ or Z\
9	A	9	-
10	C or O or Z	10	-
11	C\ or O\ or Z\	11	Shield (3)
12	A\	12	-
13	B		
14	B\		
15	+5V or +8V or +15V		
16	0V		
17	Shield (3)		



Note: in order to facilitate the encoder connection, a INTERCOD 15 interface is proposed as option (see section L10).

⚠ Connect and disconnect the powered down drive encoder plug.

WARNING: Supplying an encoder with overvoltage can damage it. Use the quick putting into service or refer to menu 3 section H.

- (1) Certain types of auto-ventilated asynchronous motors with quadrature encoder of the LEROY-SOMER range (LS or LSMV motors) have a slightly different connection. Starting with the 160M, L or LU and 180MT types, you must connect the B path to terminal 2, and B\ path to terminal 1 of HD-15 drive connector, OR cross the 2 motor phases.
- (2) In order to validate the probe control, change parameter **7.15**. Refer to section H, menu 7. When the motor thermal probe is not connected to the coder connector but to the motor terminal box, connect the probe to terminal 8 of the drive control terminal block.
- (3) Depending on the encoder supplier, the shielding may not be as indicated in the table. If a shielding terminal is not available, connect the shield at 360 at connector level.

UNIDRIVE SP

Encoder connections

F1.2 - Other encoders

• Drive connections

HD-15 pins	All encoders	Encoders				
		SinCos	SinCos with U, V, W path	SinCos with Hiperface link (*)	SinCos with EnDat or SSI link	EnDat or SSI
			and	and	and	and
1	-	Cos		Cos	Cos	-
2	-	CosRef		CosRef	CosRef	-
3	-	Sin		Sin	Sin	-
4	-	SinRef		SinRef	SinRef	-
5	-	-	C or O or Z	Data	Data	Data
6	-	-	C\ or O\ or Z\	Data\	Data\	Data\
7	A _{out} , F _{out}	-	U	-	-	-
8	A _{out} \, F _{out} \	-	U\	-	-	-
9	B _{out} , D _{out}	-	V	-	-	-
10	B _{out} \, D _{out} \	-	V\	-	-	-
11	-	-	W	-	Clock _{out}	Clock _{out}
12	-	-	W\	-	Clock _{out} \	Clock _{out} \
13	+5V or +8V or +15V					
14	0V					
15	Motor thermal probe (in order to validate probe control, refer to section H)					
	WARNING: Pin 15 is internally connected to terminal 8 of the control terminal					

Note: in order to facilitate the encoder connection, an INTERCOD 15 interface is proposed as option (see section L10).



Connect or disconnect the encoder plug of the powered down drive.

WARNING: supplying the encoder with overvoltage may damage it. Follow the quick putting into service or refer to menu 3 section H.

(*) Types SCS/M60/70, SRS/M50/60, SHS170, LINCODER, SCS-KIT101, SKS/M36 are managed by the drive.

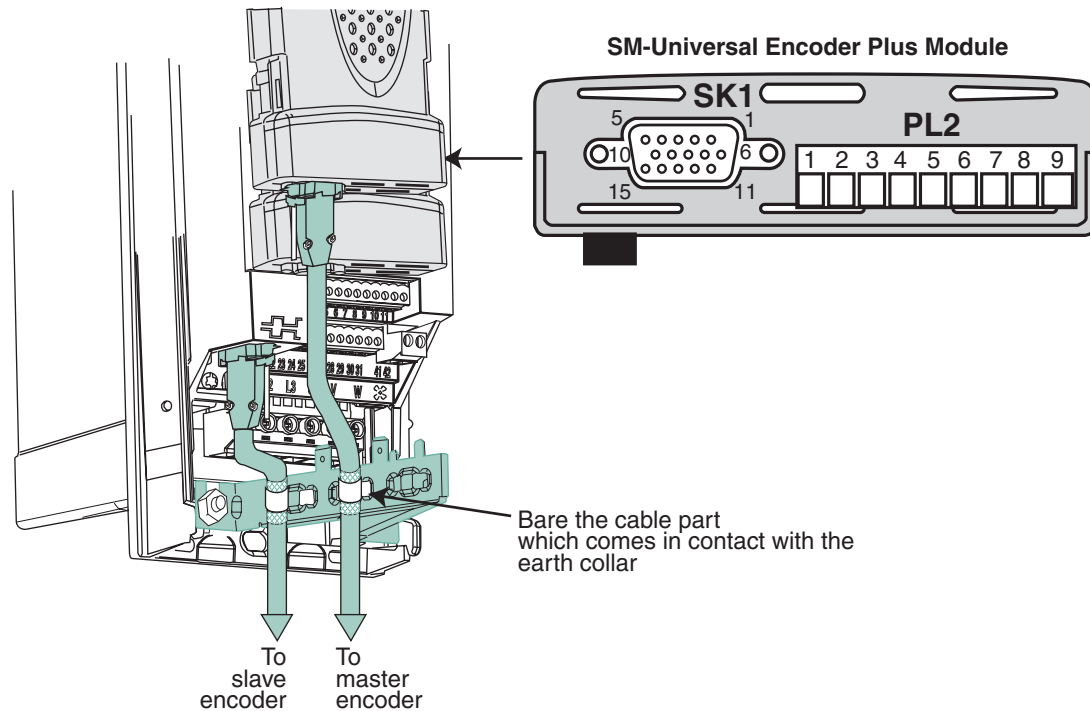
• Motor side connections (standard LEROY-SOMER)

Encoder connector pins	Sincos encoder with Hiperface link		Sincos encoder with Endat link ECN413/EQN425 ()
	SCM70 ()	SRS/M50/60 SKS/M36 ()	
1	CosRef	CosRef	-
2	Data	Data	-
3	-	Data\	-
4	-	Cos	-
5	Sin	Sin	-
6	SinRef	SinRef	-
7	Data\	CTP	+5V
8	Cos	CTP	Clock
9	-	Shielding	Clock\
10	0V	0V	0V
11	-	-	Shielding
12	+8V	+V	SinRef
13	-		Sin
14	-		Data
15	-		CosRef
16	-		Cos
17	-		Data\

Note: For any other type of encoder (motor side), contact the encoder supplier or your usual LEROY-SOMER representative.

UNIDRIVE SP Encoder connections

F2 - Connections to an SM module



SK1 pins	Encoders														
	Incremental (quadrature, frequency/direction, Forward / Reverse)			SinCos		SinCos with hyperface link		SinCos with EnDat or SSI link		EnDat		SSI		SinCos with U, V, W paths	
1	-	B or F	A or F	-	Cos	-	Cos	-	Cos	-	-	-	-	-	Cos
2	-	B\ or F\	A\ or F\	-	CosRef	-	CosRef	-	CosRef	-	-	-	-	-	CosRef
3	-	A or D or R	B or D or R	-	Sin	-	Sin	-	Sin	-	-	-	-	-	Sin
4	-	A\ or D\ or R\	B\ or D\ or R\	-	SinRef	-	SinRef	-	SinRef	-	-	-	-	-	SinRef
5	-	C or O or Z		-	-	-	Data	-	Data	-	Data	-	Data	-	Z
6	-	C\ or O\ or Z\		-	-	-	Data\	-	Data\	-	Data\	-	Data\	-	Z\
7	A _{out} or F _{out} or Data _{out}		U	A _{out} or F _{out} or Data _{out}							U				
8	A _{out} \ or F _{out} \ or Data _{out} \		U\	A _{out} \ or F _{out} \ or Data _{out} \							U\				
9	B _{out} or D _{out} or Clock _{in} (SSI)\		V	B _{out} or D _{out} or Clock _{in} (SSI)\							V				
10	B _{out} \ or D _{out} \ or Clock _{in} (SSI)		V\	B _{out} \ or D _{out} \ or Clock _{in} (SSI)							V\				
11	-	-	W	-	-	-	-	-	Clock _{out}	-	Clock _{out}	-	Clock _{out}	-	W
12	-	-	W\	-	-	-	-	-	Clock _{out} \	-	Clock _{out} \	-	Clock _{out} \	-	W\
13	+5V or +8V or +15V														
14	0V														
15	Motor thermal probe														

PL2 terminals	Functions
1	+24V quick input
2	0V
3	A _{out} (AB encoder) or F _{out} (FD encoder) or Data _{out} (SSI encoder) path output
4	A _{out} \ (AB encoder) or F _{out} \ (FD encoder) or Data _{out} \ (SSI encoder) path output
5	B _{out} (AB encoder) or D _{out} (FD encoder) or Clock _{in} (SSI encoder) path output
6	B _{out} \ (AB encoder) or D _{out} \ (FD encoder) or Clock _{in} (SSI encoder) path output
7	0V
8	RS 485 quick input or Top 0 _{out} or Z _{out} output
9	RS 485\ quick input or Top 0 _{out} \ or Z _{out} \ output

Sampling interval for inputs, outputs and relays (setting updating):

- 8 ms for 1 SM-Universal Encoder Plus module,
- 16 ms for 2 SM-Universal Encoder Plus modules,
- 24 ms for 3 SM-Universal Encoder Plus modules.

UNIDRIVE SP

Encoder connections

F3 - Characteristics

F3.1 - SK1 (SM module) and HD15 (drive) connector characteristics

Quadrature incremental encoders, Frequency/Direction, Forward / Reverse, SinCos (terminals 5 to 12 only)

1	Path B or F (□); path A or F (⊞)
2	Path B\ or F\ (□); path A\ or F\ (⊞)
3	Path A, D or R (□); path B, D or R (⊞)
4	Path A\, D\ or R\ (□); path B\, D\ or R\ (⊞)
5	Path Z or 0 or C (□, ⊞)
6	Path Z\ or 0\ or C\ (□, ⊞)
7	Path U (⊞)
8	Path U\ (⊞)
9	Path V (⊞)
10	Path V\ (⊞)
11	Path W (⊞)
12	Path W\ (⊞)
Characteristics	RS485 differential voltage
Maximum input frequency	• 600 kHz for an SM module • 410 kHz (1 to 4 terminals) or 512 kHz (5 to 12 terminals) the drive
Line load	< 2 drives for terminals 1 to 4 32 drives for terminals 5 and 6 1 drive for terminals 7 to 12
Input impedance	120 Ω
Operation range	-7 to +12V
Maximum absolute voltage	± 25V/0V for terminals 1 to 4 ± 14V/0V for terminals 5 to 12
Maximum absolute differential voltage	± 25V for terminals 1 to 4 ± 14V for terminals 5 to 12

SinCos, absolute SinCos encoders with Hiperface or EnDat or SSI link and SinCos encoder with paths U, V, W

1	Path Cos
2	Path Cosref
3	Path Sin
4	Path Sinref
Characteristics	Differential voltage
Maximum signal	1.25V peak to peak (Sin/Sin-Ref or Cos/Cos Ref) 115 KHZ
Maximum input frequency	± 1.5V for an SM module
Maximum differential	± 4V for the drive

Absolute SinCos encoders with Hiperface or EnDat or SSI links, EnDat and SSI encoders

5	Data
6	Data\
Characteristics	RS 485 differential voltage
Maximum input frequency	2 MHz
Line load	32 drives
Operation range	-7 to +12V
Maximum voltage	± 14V/0V
Maximum absolute differential voltage	± 14V

Absolute SinCos encoders with EnDat or SSI links, EnDat or SSI encoders

11	Clock _{out}
12	Clock _{out} \
Characteristics	RS 485 differential voltage
Maximum input frequency	2 MHz
Line load	1 drive
Operation range	-7 to +12V
Maximum voltage	± 14V/0V
Maximum absolute differential voltage	± 14V

Incremental or SSI encoder simulation

7	A _{out} or F _{out} path output (or Data _{out} only for SK1)
8	A _{out} \ or F _{out} \ path output (or Data _{out} \ only for SK1)
9	B _{out} or D _{out} path output (or Clock _{in} \ only for SK1)
10	B _{out} \ or D _{out} \ path output (or Clock _{in} only for SK1)
Characteristics	RS 485 differential voltage
Maximum output frequency	• 500 kHz for an SM module • 512 kHz for the drive
Line load	1 drive
Ending	120 Ω
Maximum voltage	± 14V / 0V
Maximum absolute differential voltage	± 14V

Note: the encoder simulation of SK1 terminal block (pins 7 to 10) is identical with the one for the PL2 terminal block (pins 3 to 6).

13	Encoder supply
Supply voltage	5.15V ± 2 %, 8V ± 5 %, or 15V ± 5 %
Maximum output current	300 mA for 5V and 8V 200 mA for 15V
WARNING: Supplying an encoder with overvoltage can damage it.	

14	Common 0V
----	-----------

15	Motor thermal probe input Management of the motor thermal probe
----	--

Note: On the HD15 drive connector, pin 15 is internally connected to pin 8 of the drive (control terminal block).

UNIDRIVE SP Encoder connections

F3.2 - PL2 terminal block characteristics (SM module)

• Quadrature incremental encoders, frequency / direction, Forward/Reverse and SinCos encoders without serial link or with hipurface serial link or U, V, W paths or EnDat or SSI

1	+24V quick input
8	RS 485 quick input
9	
Characteristics	RS485 differential voltage
Maximum input frequency	600 kHz
Line load	< 2 drives for terminal 1 1 drive for terminals 8 and 9
Input impedance	120 Ω
Operation range	-7 to +12V
Maximum absolute voltage	± 14V / 0V
Maximum absolute differential voltage	± 14V

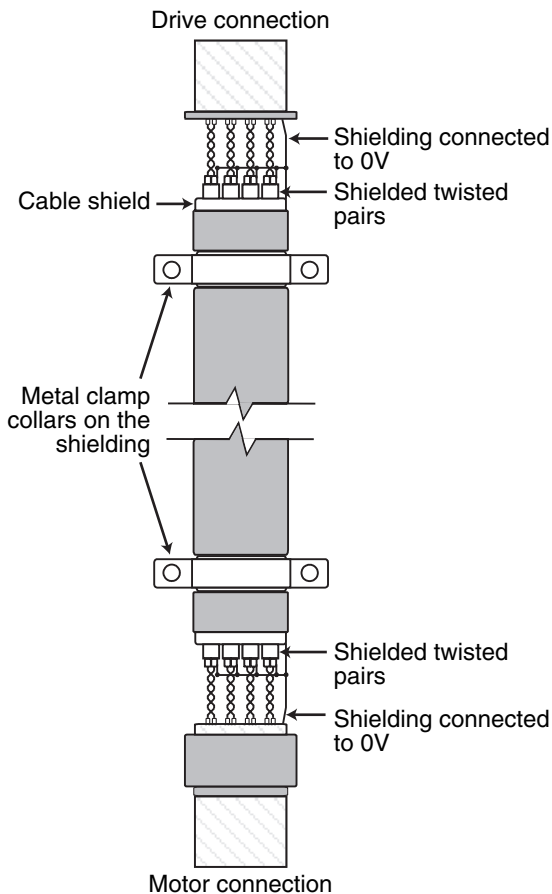
Note: Quick input is not active with EnDat or SSI encoders.


• Incremental encoder simulation

3	A_{out} or F_{out} or $Data_{out}$ (Data for SSI)
4	A_{out} or F_{out} or $Data_{out}$ path output (Data for SSI)
5	B_{out} or D_{out} or $Clock_{in}$ path output (Clock for SSI)
6	B_{out} or D_{out} or $Clock_{in}$ path output (Clock for SSI)
8	Z_{out} or Top 0_{out} path output
9	Z_{out} or Top 0_{out} path output
Characteristics	RS485 differential voltage
Maximum input frequency	500 kHz
Line load	< 2 drives for terminals 3 and 4 32 drives for terminals 5 and 6 1 drive for terminals 8 and 9
Input impedance	120 Ω
Operation range	-7 to +12V
Maximum absolute differential voltage	± 14V

F4 - CEM Recommendations for encoder cabling

The sensor cable shielding is important due to high voltages and currents at drive output. If the supplied LEROY-SOMER cables are not used, it is recommended to observe the following rules:



It is preferable not to make encoder cable extensions. If an extension is unavoidable, check that the shield connections are as short as possible (use preferably metal clamp collars directly on the shielding at the end of the cable ). Connect the shields directly to the encoder terminal block and the drive shielding support.

UNIDRIVE SP

Encoder connections

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F

UNIDRIVE SP Setting

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UNIDRIVE SP Setting

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UNIDRIVE SP Setting

G1 - Warning

! • The drives use a software which is adjusted by parameters. Unsuitable adjustments may have serious consequences on the personnel and the machine.

- The drive setting must be performed only by qualified and certified personnel.
- Before the drive power up check that the power connections (mains supply and motor) are correct and the moving parts are mechanically protected.
- The users must pay special attention in order to avoid accidental starting.

• If brake resistors are necessary, check that they are well connected to the DC2 (or +DC for size 1) and BR terminals, and protected by a correctly sized thermal relay in case of external resistors.

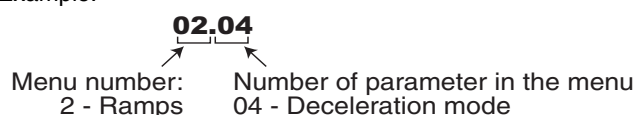
- The motor parameter values affect the motor protection and system security. The set values must be noted on the name plate of the used motor.
- For safety, in case of a brake, disconnect the brake coil during the setting phase.

G2 - General detail

• Structure

In order to configure the drive with a given application, you must change the parameters organised by menus, where each menu corresponds to a parameter group linked by a function.

Example:



• Parameter types

- The parameters are digital or binary and are accessible by reading or in writing.
- Certain parameters are accessible only by reading and give indications on the drive operating status.

• Commissioning in 3 levels

- Quick commissioning with the factory settings of the variable speed drive :

allows the operation of the variable speed drive with a minimum parameter-setting.

- Simplified commissioning starting with 0 menu (user menu):

group of parameters used to simply adapt the variable speed drive to the application, by modifying only the most current adjustments.

- Elaborated commissioning by using menus 1 to 22 (menu diagram) :

used to configure the variable speed drive according to the variable speed drive needs, by accessing all the variable speed drive functions.

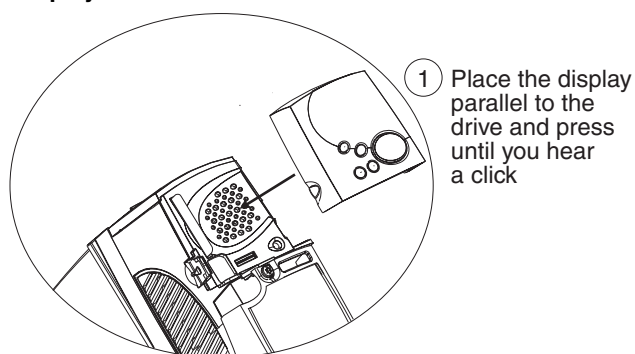
If necessary, the detailed explanations about each parameter are regrouped in the manual Explanation of parameters ref. 3655, available on the CD ROM supplied with the drive.

G3 - Installation of LED display

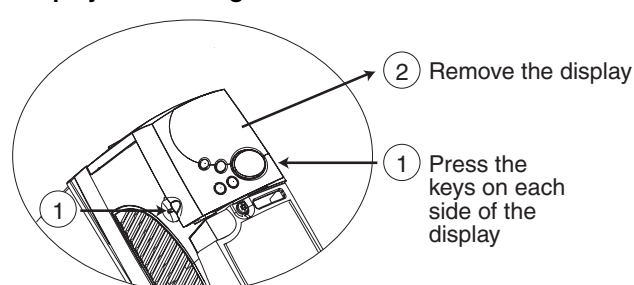
CAUTION :

The display can be mounted or dismantled when the variable speed drive is powered up, save when the Run and Stop commands are given from the keyboard.

- Display installation

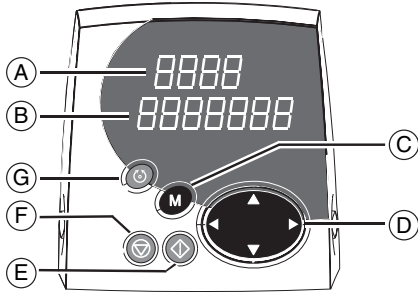


- Display dismantling



UNIDRIVE SP Setting

G4 - Use of LED display





Command	Ref.	Function
	(A)	Upper display made of 4 displays 7 segments allowing the display of: - the variable speed drive operating status, - the adjustment parameters, made of menu and of parameter
	(B)	Lower display made of 7 displays 7 segments used to display: - the operating mode, - the parameter content, - the default code.
	(C)	Touche Mode is used to pass from the normal mode to the setting mode.
	(D)	The 2 arrows are used to move on the displays 7 segments of the lower display in order to modify its value or to pass from one menu to another. The 2 arrows are used to scroll in increase or decrease order of the parameters or of their value.
 	(E) (F) (G)	In keyboard mode, these keys allow the foll. commands: - Run, - Stop, default deletion, - Inversion of the direction of rotation.

UNIDRIVE SP Setting


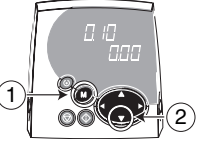


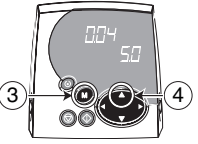


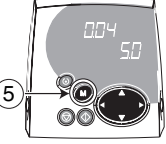


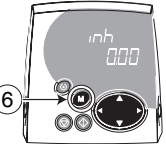
G5 - Selection and modification of a parameter

This procedure describes the use of the Unidrive SP LED display.

CAUTION :





- This procedure has been drawn up for initial commissioning.
- If the variable speed drive is already powered up, the first parameter displayed cannot be **0.10**. Simply select the parameter to be displayed or modified using the  or  keys.

Note : In setting mode, if there is no operator action for 4 minutes, the display stops flashing and returns automatically to the initial variable speed drive status.

Action	Comment
	Power-up Disabled variable speed drive (terminal 31 opened) (initial status)
	① : Access to the setting mode. Parameter 0.10 flashes on display. ② : The  and  keys are used to access the parameter to be modified. For instance, select parameter 0.04 .
	③ : Access to parameter modification. The parameter number stops flashing. Its value is indicated in the lower display (the lowest weight digit flashes). ④ : Press and hold down the key, to quickly scroll through the parameter value. The final setting is made by short presses on the same key. For more rapidity, you can move to modify the other digits by  or  .
	⑤ : The new 0.04 value is memorised Press the  or  key to select a new parameter to be modified.
	⑥ : Return to the initial variable speed drive status.

G6 - Control of the drive by means of the keyboard

Connect at least a contact maintained on the safety/enable input (terminal 31) and +24V (terminal 22) of the variable speed drive control terminal block (if necessary, see section E).

- Power up the variable speed drive, the display shows " inh ".
- Set the parameter **0.05** to Pad (4) (speed reference selection by keyboard).
- Display the parameter **0.10** to see the speed measure.
- Power down the contact of terminal 31, the display shows " rdy ".
- press the  key to start.
- Press the  key to increase the speed.
- Press the  key to decrease the motor speed.
- Press the  key to stop the motor, the display shows " rdy " or " stop " for servo mode.

UNIDRIVE SP Setting

G7 - Access level

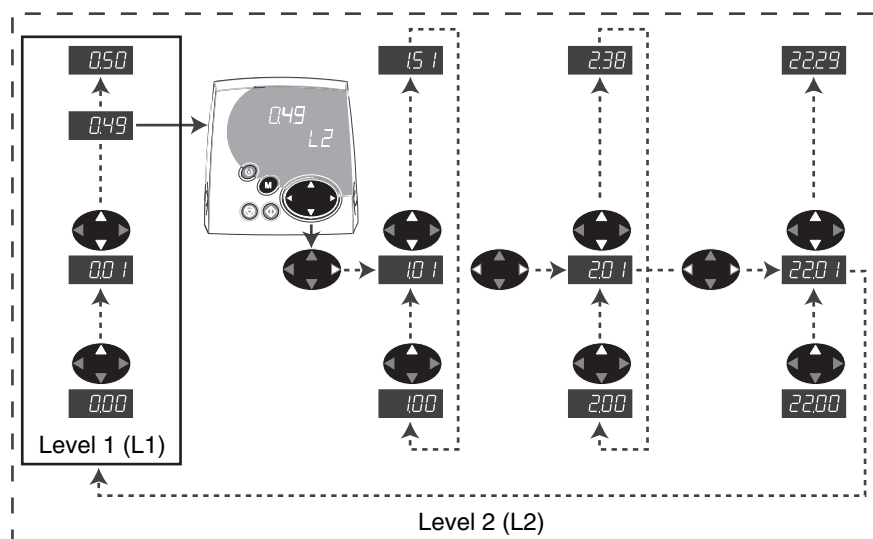
In factory settings, only 0 menu is accessible to the user.

To access other menus, you must:


- select the parameter **0.49** : its value is at " L1 "

- modify the value of **0.49** at " L2 "

The left and right arrows are now enabled and the menus 1 to 21 are accessible.



G8 - Storing


Parameter	Setting	Description	Validation
xx.00 (parameter 0 of any menu)	1000	Storing of the parameters modified in the menus 1 to 22	Press the Reset  key

- The modification of the 0 menu parameters are not stored automatically by the variable speed drive.

- The modification of the 1 to 22 menu parameters are not stored automatically, the opposite procedure must be followed.

Note : If the drive is " UU " powered up by default or if the variable speed drive operates by the 48V safety power supply, enter 1001 in **xx.00** to store the parameters.

G9 - Restore the factory settings

Parameter	Setting	Description	Validation
0.00	1233 or 1244	Europe factory setting configuration or USA factory setting configuration	Press the Reset  key




• Before following this procedure, check that the system safety is assured.

Note: This procedure is also valid if you use parameter 0 of another, for ex. **1.00** or **4.00**.

In addition, it does not change the operating mode (OPEn.LP, CLVEct, SErVO).

G10 - Modification of the operating mode

Parameter	Setting	Description	Validation
0.00	1253 or 1254	Europe configuration 50 Hz mains supply or USA configuration, 60 Hz mains supply	Press the Reset  key
0.48	OPEn LP (1) or CL VECt (2) or SErVO (3) or rEgEn (4)	Open loop (factory settings) or Vector control in closed loop or Servo mode with Brushless motor or Regenerative mode (not used)	



• This procedure of modification of the operating mode causes the restoring of the factory settings of the parameters corresponding to the new mode, including the motor parameters (it is necessary to set the motor parameters before starting). The modification of the operating mode must be made with the variable speed drive stopped or disabled.

• Before following this procedure, check that the system safety is assured.

UNIDRIVE SP Setting

G11 - List of modified parameters

Parameter	Setting	Description
xx.00 (parameter 0 of any menu)	12000	All the factory set parameters are no longer accessible, only the modified parameters are visible

During the setting, it is sometimes useful to know which are the drive parameters different from the factory setting. To display only these parameters, follow this procedure.
Note : to disable this function, enter the 0 value in a parameter **xx.00**.

G12 - List of destination parameters


Parameter	Setting	Description
xx.00 (parameter 0 of any menu)	12001	Only destination parameters are visible

If the setting of menus 1 to 22 has been modified, this procedure is used to present the destination parameters of the variable speed drive. This type of parameter is used to transfer a function output to another parameter. (See details at section H3.2).
To display only these parameters, follow this procedure.
Note : to disable this function, enter the 0 value in a parameter **xx.00**.

G13 - Safety code

In certain cases, it is necessary to block the modification of the variable speed drive parameters, maintaining the possibility to read them.

• Disabling of settings by the security code

Parameter	Setting	Description	Validation
0.34	Enter a value between 1 and 999	Selection of the security code	-
0.49	Loc (0)	Enabling of the security code	Press the Reset  key


Parameter **0.49** returns automatically to value "L1" : all the parameters of 0 menu are visible but they cannot be modified.


Only parameter **0.49** can be modified for reading the parameters of other menus.

The value **0.34** returns automatically to 0.

• Access to settings with security code


Select the parameter to be modified.

Press the  key, the display displays "CodE".

By means of the arrows, enter the security code, then press again .

- Correct code : the parameter is in parameter-setting mode, ready to be modified.


- Incorrect code: the parameter remains only in reading mode, as all the other parameters.


To return to the reading mode, select **0.49** and enter the value "Loc", then press the Reset  key.


The security code is enabled again.

• Suppression of a security code

Select a parameter.

Press the  key, the display shows "CodE".

By means of the arrows, enter the security code, then press again .

Select **0.34**, enter 0 value and press again .

• Research of a security code

If the user forgets the security code (variable speed drive blocked only for reading), contact your usual LEROY-SOMER interlocutor.

UNIDRIVE SP Setting

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UNIDRIVE SP Commissioning

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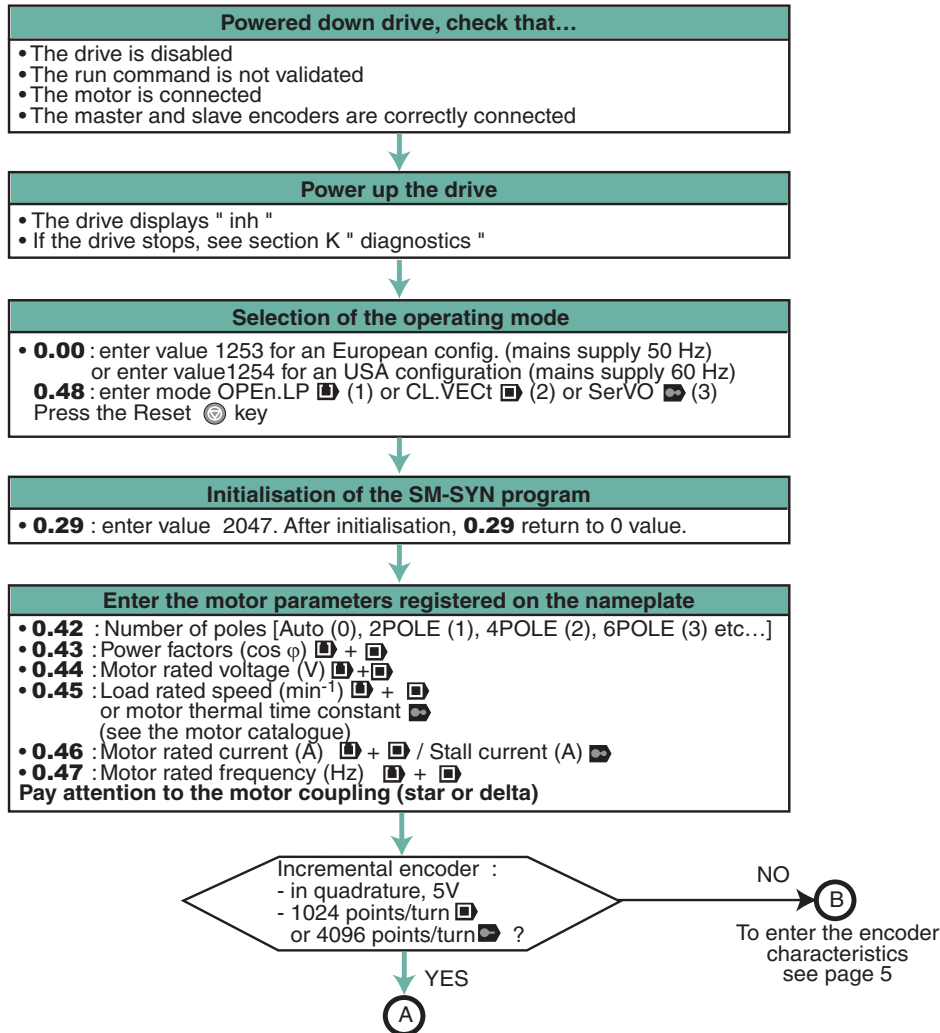
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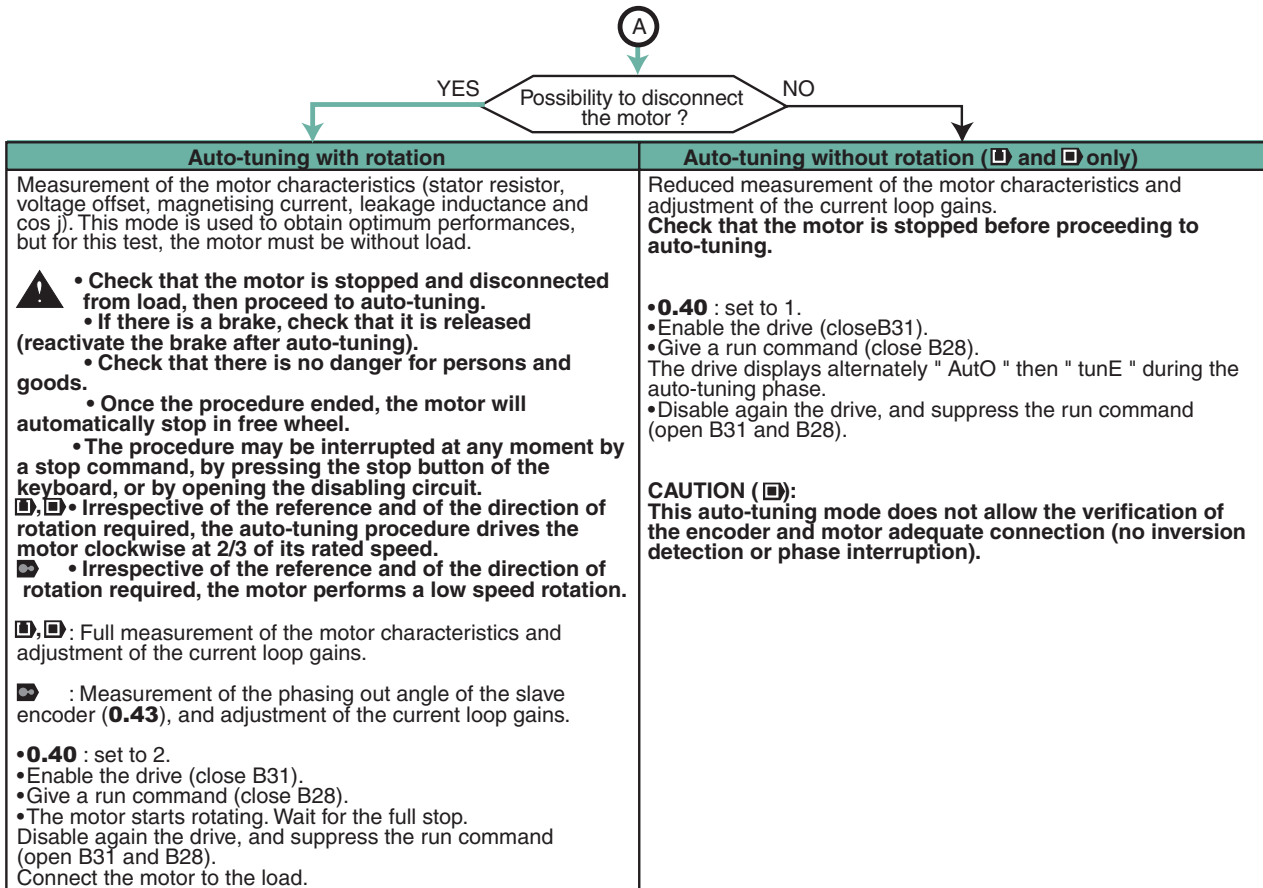
UNIDRIVE SP Commissioning

H1 - Quick start



Note: Factory settings, the variable speed drive is configured in positive logic. To change the variable speed drive to negative logic, set parameter **8.29** to On (1) for the drive logic, and, if necessary, **16.29** to On (1) for the logic of the SM-I/O Plus module, if used.

UNIDRIVE SP Commissioning




Enter the values of the essential parameters of the application

Electrical ratio :

- The 0 ratio (electrical ratio) is selected by default
- **0.24** : Ratio unit (enter the whole part of ratio 0)
- **0.23** : 4 first decimals of the ratio (enter the first 4 decimals of ratio 0)
- **0.22** : 4 last decimals of the ratio (enter the last 4 decimals of ratio 0)

Note : If the aix synchronisation depends only on the kinematics (ex. : reducer), the electrical ratio must not be modified (the latter is set to 1 in factory settings : **0.24** = 1, **0.23** = 0, **0.22** = 0)

- **20.23** : Reduction between slave encoder and slave motor (), when the encoder is set down.

Synchronisation mode:

- **0.26** : Enter 0 value for a speedy synchronisation, the value 1 for a synchronisation in non rigid position, the value 2 for a synchronisation in rigid position


Kinematic ratio:
The parameters **0.27** and **0.28** are used to define the distance covered by the slave axis for a motor (or encoder) turn depending on the master axle

Slave encoder	R_e	Slave axis	D_e	• R_e = Slave reduction
				• D_e = Movement of the slow slave shaft on 1 turn
Master encoder	R_M	Master axis	D_M	• R_M = Master reduction
				• D_M = Movement of the slow master shaft on 1 turn

Set **0.27** and **0.28** such as :

$$\mathbf{0.27} = \frac{\text{Driving}}{\text{Driven}} = \frac{D_M/R_M}{D_e/R_e} = \frac{D_M \times R_e}{D_e \times R_M}$$

Storing

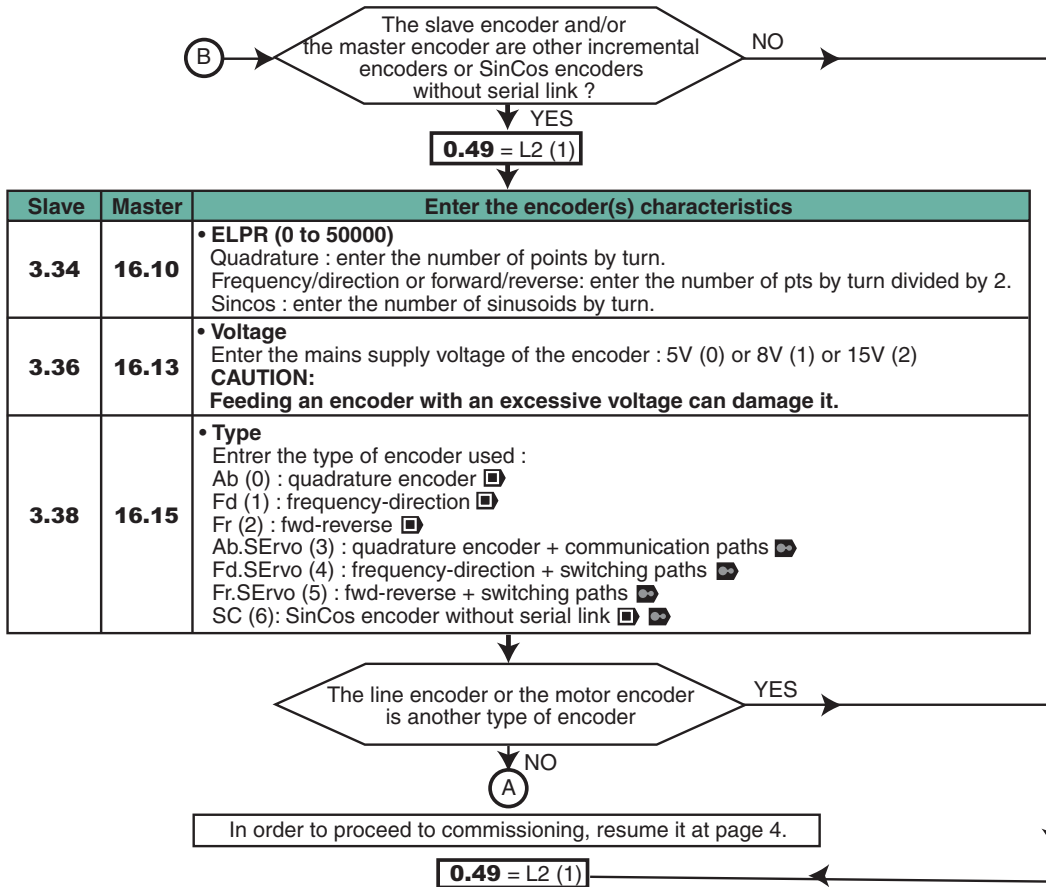
- **0.00** : Enter value 1000
- Pres the Reset () key

Commissioning

- Enable the drive
- For a manual run command (no synchronisation), use I_+ or I_-
- To give a synchronisation command, close terminal 28
- To stop the motor, cancel the run command, then disable the drive

UNIDRIVE SP Commissioning

If master and slave encoders are not standard LEROY-SOMER incremental encoders, follow the instructions below.



Enter the encoder(s) characteristics			
Slave	Master	SinCos encoder with serial link Hiperface or EndAt or EnDat encoder	SinCos encoder with serial link Hiperface or EndAt or EnDat encoder
3.41	16.18	<ul style="list-style-type: none"> • Auto-configuration Enter value On (1) for an auto-configuration of the encoder parameters when powering up (3.33, 3.34 and 3.35 or 16.09, 16.10 and 16.11) 	<ul style="list-style-type: none"> • Selection of SSI format Enter value OFF (0) to select the Gray SSI code format. Enter value On (1) to select the SSI binary format.
3.33	16.09	-	<ul style="list-style-type: none"> • Number of turns (number of bits) Enter the maximum number of encoder turns ex. : if 3.33 or 16.09 = 5, the maximum number of turns 2⁵
3.35	16.11	-	<ul style="list-style-type: none"> • Resolution (number of bits) Enter the resolution of the serial link (number of bits used to represent an encoder turn).
3.36	16.13	<ul style="list-style-type: none"> • Voltage Enter the mains supply voltage of the encoder : 5V (0) ou 8V (1) or 15V (2). CAUTION: Feeding an encoder with an excessive voltage can damage it. 	
3.37	16.14	<ul style="list-style-type: none"> • Transmission speed Enter the speed of the serial link (excepting the SinCos encoder with Hiperface link) : 100 kbauds (0), 200 kbauds (1), 300 kbauds (2), 400 kbauds (3), 500 kbauds (4), 1000 kbauds (5), 1500 kbauds (6), 2000 kbauds (7), 4000 kbauds (8). 	
3.38	16.15	<ul style="list-style-type: none"> • Type Enter the type of encoder used: SC.HIPeR (7) : SinCos with Hiperface link EndAt (8) : EndAt SC.EndAt (9) : SinCos with EndAt serial link SSI (10) : SSI encoder SC.SSI (11) : SinCos with SSI link 	

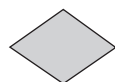


UNIDRIVE SP Commissioning

H2 - Menu 0 : User menu

H2.1 - List of parameters

Menu 0 is used to group together the most used parameters for a simplified commissioning. Each parameter of menu 0 is the image of a parameter contained in another menu (menu 1 to 22). The correspondance of the parameters of menu 0 is indicated in the "address" column of the table below.



: LS = Reading parameter

: Open loop vector control

: Closed loop vector control

: Servo

: L-E = Reading and writing parameter

EUR: 50 Hz mains supply

USA: 60 Hz mains supply

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.00	<ul style="list-style-type: none"> • Storing • Factory settings • Operating mode selection • List of parameters 	-	L-E		0 to 32767	0
0.01	Frequency limit or minimum speed	1.07	L-E		± 3000.0 Hz	0
					± LIM N MAX *	0
0.02	Frequency limit or maximum speed	1.06	L-E		0 to 3000.0 Hz	50.0 Hz (EUR) 60.0 Hz (USA)
					0 to LIM N MAX *	1500.0 min ⁻¹ (EUR) 1800.0 min ⁻¹ (USA)
						3000.0 min ⁻¹
0.03	Acceleration ramp	2.11	L-E		0 to 3200.0 s/100 Hz	5.0 s/100 Hz
					0 to 3200.000s/1000 min ⁻¹	2.000 s/1000 min ⁻¹
					0 to 3200.000s/1000 min ⁻¹	0.200 s/1000 min ⁻¹
0.04	Deceleration ramp	2.21	L-E		0 to 3200.0 s/100 Hz	10.0 s /100 Hz
					0 to 3200.000s/1000 min ⁻¹	2.000 s/1000 min ⁻¹
					0 to 3200.000s/1000 min ⁻¹	0.200 s/1000 min ⁻¹
0.05	Reference selection	1.14	L-E	 	A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), Pad (4), Prc (5)	A1.A2 (0)
0.06	Current limitation	4.07	L-E		0 to LIM IM1 MAX (%) *	165.0 %
					0 to LIM IM1 MAX (%) *	175.0 %
0.07	Control mode	5.14	L-E		Ur_S (0), Ur (1), Fd (2), Ur_Auto (3), Ur_I (4), SrE (5)	Ur_I (4)
	Proportional gain of the speed loop	3.10	L-E	 	0 to 6.5535 (1/rads ⁻¹)	0.0100 (1/rads ⁻¹)
0.08	Boost	5.15	L-E		0 to 25.0 % de U _N moteur	3.0 %
	Integral gain of the speed loop	3.11	L-E	 	0 to 655.35 (1/rad)	1.00 (1/rad)
0.09	Dynamic U/F selection	5.13	L-E		OFF (0) or On (1)	OFF (0)
	Speed loop derived gain	3.12	L-E	 	0 to 0.65336 (s)	0
0.10	Calculated motor speed	5.04	LS		± 180000 min ⁻¹	-
	Measured motor speed	3.02	LS	 	± N MAX (min ⁻¹) *	-
0.11	Product radius	19.02	LS	 	± 32767	-

* For parameter range explanations, see section H3.5.

UNIDRIVE SP Commissioning

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.12	Master position reference	16.05	LS		0 to 65535 points	-
0.13	Return to slave	3.29	LS		0 to 65535 points	-
0.14	Position total shift	19.06	LS		± 32767	-
0.15	Selected ratio	19.01	LS		0 to 32	-
0.16	Ratio unit	19.03	LS		0 to 15	-
0.17	First 4 ratio decimals	19.04	LS		0 to 9999	-
0.18	First 4 ratio decimals	19.05	LS		0 to 9999	-
0.19	Synchro window	20.27	L-E		0 to 2147483648 points	100
0.20	Maximum slave speed	20.21	L-E		0 to 32767 min ⁻¹	1500 min ⁻¹
0.21	Slave "manu" speed	20.22	L-E		0 to 20.21	150
0.22	First 4 ratio decimals to be adjusted	19.14	L-E		0 à 9999	0
0.23	First 4 ratio decimals to be adjusted	19.13	L-E		0 to 9999	0
0.24	Ratio unit adjusted	19.12	L-E		0 to 15	1
0.25	Selection of the ratio to be adjusted	19.11	L-E		0 to 32	0
0.26	Synchro mode	20.34	L-E		0 to 2	0
0.27	Numerator kinematics ratio	19.15	L-E		1 to 32767	1

* For parameter range explanation, see section H3.5.

UNIDRIVE SP Commissioning

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.28	Denominator kinematics report	19.16	L-E		1 to 32767	1
0.29	Return to synchro application factory settings	20.01	L-E		± 32767	0
0.30	Parameter cloning	11.42	L-E		nonE (0), rEAd (1), Prog (2), AutO (3), boot (4)	nonE (0)
0.31	Drive rated voltage	11.33	LS		200 (0), 400 (1), 575 (2), 690 (3) V	-
0.32	Drive rated current	11.32	LS		0 to 9999.99 A	-
0.33	Quick restart	6.09	L-E		0 to 3	0
	Auto-tuned rated speed	5.16	L-E		0 to 2	0
0.34	User security code	11.30	L-E		0 to 999	0
0.35	Communication type	11.24	L-E		AnSI (0), rtU (1), Lcd (2)	rtU (1)
0.36	Serial link transmission speed	11.25	L-E		300 (0), 600 (1), 1200 (2), 2400 (3), 4800 (4), 9600 (5), 19200 (6), 38400 (7), 57600 (8), 115200 (9)	19200 (6)
0.37	Serial link address	11.23	L-E		0 to 247	1
0.38	Proportional gain current loop	4.13	L-E		0 to 30000	20
					0 to 30000	Drive 200V(TL) : 75 Drive 400V(T) : 150 Drive 575V(TM) : 180 Drive 690V(TH) : 215
0.39	Integration gain current loop	4.14	L-E		0 to 30000	40
					0 to 30000	Drive 200V(TL) : 1000 Drive 400V(T) : 2000 Drive 575V(TM) : 2400 Drive 690V(TH) : 3000
0.40	Auto-tuning, measurements and calculations	5.12	L-E		0 to 2	0
					0 to 4	
					0 to 6	
0.41	Carrier frequency	5.18	L-E		3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz (16 kHz not available for sizes 3)	3 (0) kHz
					3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz (16 kHz not available for sizes 3)	6 (2) kHz

UNIDRIVE SP Commissioning

Parameter	Description	Address	Type	Mode	Variation range	Factory settings
0.42	Number of motor poles	5.11	L-E		Auto (0) to 120POLE (60)	Auto (0)
						6POLE (3)
0.43	Cos φ	5.10	L-E		0 to 1.000	0.850
	Phase angle	3.25	L-E		0 to 359.9°	0
0.44	Motor rated voltage	5.09	L-E	 	0 to U _{AC} MOT MAX (V) *	Drive 200V(TL) : 230V Drive 400V(T) : 400V (EUR), 460V (USA) Drive 575V(TM) : 575V Drive 690V(TH) :690V
0.45	Loaded motor rated speed	5.08	L-E		0 to 180000 min ⁻¹	1500 min ⁻¹ (EUR) 1800 min ⁻¹ (USA)
					0 to 40000.00 min ⁻¹	1450.00 min ⁻¹ (EUR) 1770.00 min ⁻¹ (USA)
	Motor thermal time constant	4.15	L-E		0 to 400.0	20.0
0.46	Motor rated current	5.07	L-E		0 to I _N MAX (A) *	I _{RATED} VAR (11.32)
	Stall current (STALL)					
0.47	Motor rated frequency	5.06	L-E		0 to 3000.0 Hz	50.0 Hz (EUR) 60.0 Hz (USA)
					0 to 1250.0 Hz	50.0 Hz (EUR) 60.0 Hz (USA)
0.48	Operating mode selection	11.31	L-E	 	OPEn LP (1), CL VECt (2), SErVO (3), rEgEn (4)	OPEn LP (1)
0.49	Access to level 2 and Security code storing	11.44	L-E	 	L1 (0), L2 (1), Loc (2)	L1 (0)
0.50	Software version	11.29	LS	 	1.00 to 99.99	-

* For parameter range explanations, see section H3.5.

UNIDRIVE SP Commissioning

H2.2 - Parameter explanation

0.00 Storing parameters, return to European and USA factory settings, modification of the operating mode, List of parameters

Variation range : 0 to 9999

Factory settings : 0

1000 : storing,

1001 : storing, even in safety power supply mode,

1070 : Option modules reset,

1233 : return to European factory settings,


1244 : return to USA factory settings,

1253 : selection of the operating mode with return to European factory settings,

1254 : selection of the operating mode with return to USA factory settings,

12000 : selection of all the parameters whose value is different from the factory settings.

12001 : selection of all the destination parameters.

Press the Reset  key to validate the settings.

0.01 : Frequency limit or minimum speed

It is the lowest operating speed or frequency (established for the 2 directions of rotation). With a minimum reference, it is the output frequency or speed.

Note: This parameter is not considered during pulse operation..

CAUTION :

0.01 is a rated value. The sliding compensation and the current limitation may generate a slightly different output frequency.

0.02 : Frequency limit or maximum speed

It is the highest operating speed or frequency (established for the 2 directions of rotation). With a maximum reference, it is the output frequency or speed.

Note: The drive has a built-in overspeed protection.



CAUTION :

0.02 is a rated value. The sliding compensation and the current limitation may generate a slightly different output frequency.

0.03 : Acceleration ramp

 :

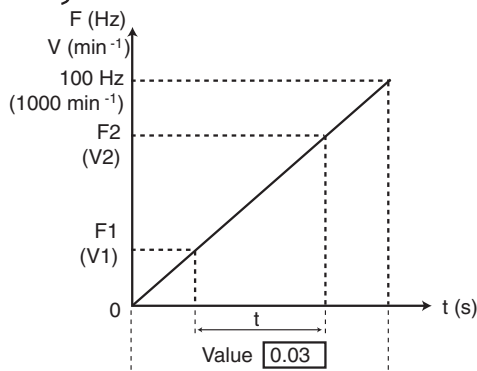
Time setting to accelerate from 0 to 100 Hz.

 and  :

Time setting to accelerate from 0 to 1000 min⁻¹.

Note: The **0.03** value applies to the 2 directions of rotation.

$$\begin{aligned} \text{Value of } \mathbf{0.03} \text{ (s)} &= \frac{t(\text{s}) \times 100 \text{ Hz}}{(F2-F1) \text{ Hz}} \\ \text{Value of } \mathbf{0.03} \text{ (s)} &= \frac{t(\text{s}) \times 1000 \text{ min}^{-1}}{(V2-V1) \text{ min}^{-1}} \end{aligned}$$





0.04 : Deceleration ramp

 :

Time setting to decelerate from 100 Hz to 0.

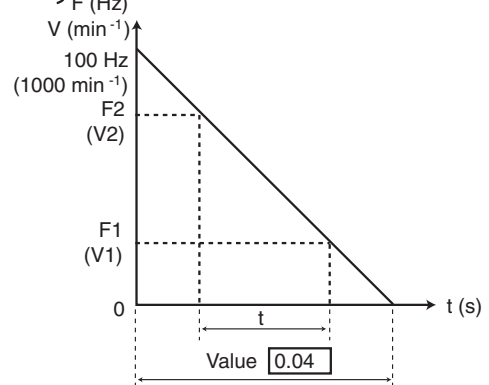
Time setting to accelerate from 0 to 100 Hz.

 and  :

Time setting to decelerate from 1000 min⁻¹ to 0.

Note: The **0.04** value applies to the 2 directions of rotation..

$$\begin{aligned} \text{Value of } \mathbf{0.04} \text{ (s)} &= \frac{t(\text{s}) \times 100 \text{ Hz}}{(F2-F1) \text{ Hz}} \\ \text{Value of } \mathbf{0.04} \text{ (s)} &= \frac{t(\text{s}) \times 1000 \text{ min}^{-1}}{(V2-V1) \text{ min}^{-1}} \end{aligned}$$



0.05 : Reference selection

It is the speed reference selection.

A1.A2 (0) : reference selection by voltage (A1) analogue input 1 or by the voltage (A2) analogue input 2, and pulse operation, by terminals 28 and 29.

A1.Pr (1) : reference selection by voltage (A1) analogue input 1 or 3 preset references, by terminals 28 and 29.

A2.Pr (2) : reference selection by voltage (A2) analogue input 2 or 3 preset references, by terminals 28 and 29.

Pr (3) : preset reference selection, by terminals 28 and 29.

Pad (4) : reference selection by keyboard (arrows  and ).

Prc (5) : precision speed reference (not used in menu 0).

Note: Terminals 28 and 29 are automatically configured depending on the value of **0.05**.



0.06 : Current limitation

It sets the maximum active current (percentage of the rated active current) supplied by the variable speed drive during the motor or the generator operation.

The output speed or frequency is limited in order to maintain the active current lower or equal to the limit set by **0.06**.

UNIDRIVE SP Commissioning

0.07 : Control mode 
Speed loop proportional gain

 and 

 :

The difference between these modes is the method used for the identification of motor parameters, especially of the stator resistance. These parameters vary depending on the motor temperature, depending on the cycle at operation.

To obtain optimum performances in vector mode, it is necessary that $\cos \varphi$ (**0.43**), the stator resistance and the voltage offset be precisely set.

Ur_S (0): the stator resistor and the voltage offset are measured each time the variable speed drive receives a run command.

These measurements are valid only if the machine is stopped, totally out of flow. The measurements are not performed if the run command is given quicker than one second after the previous stop.

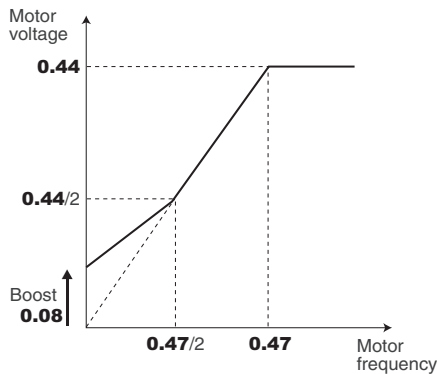
Vectorial control mode is the most accurate. However, the operating cycle must be compatible with the necessary second between a run command and a new run command.

Ur (1): the stator resistance and the voltage offset are not measured.

This mode is less accurate. Used only when the other modes are incompatible with the operating cycle.

In such a case, during the commissioning, proceed to an auto-tuning without rotation (see **0.40**), and then use the Ur mode in normal operation.

Fd (2): Voltage frequency curve with low speed fixed boost (boost adjustable by parameter **0.08**).



This mode is generally used to drive several motors from one variable speed drive.

Ur_Auto (3) : the stator resistor and the voltage offset are measured only during the first power up, after a run command. In this case, the stator resistance and the voltage offset are stored. Then **0.07** takes the "Ur" value.

CAUTION:

If the measurement fails, the stator resistance and the voltage offset are not registered, but **0.07** remains at the Ur_Auto value and you may try again on the following power up.

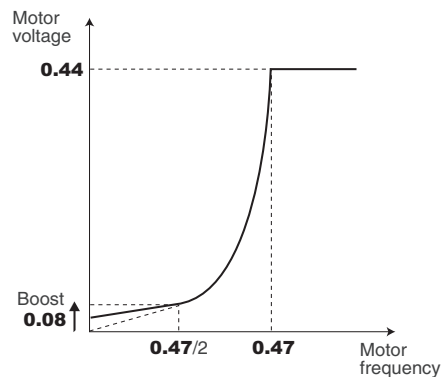
Ur_I (4) : the stator resistance and the voltage offset are measured on each power up of the variable speed drive, after a run command.

These measurements are valid only if the machine is stopped on power up.



• In Ur_I mode, a voltage is briefly applied to the motor. The security must be assured so that no electrical circuit may be accessible once the variable speed drive is powered up.

SrE (5) : this mode is used for centrifugal applications (fans, pumps ...) with low speed fixed boost (boost adjustable by parameter **0.08**).



 and  :

It adjusts the motor speed stability during extreme variations of the reference.

Increase the proportional gain until vibration occurs within the motor, then decrease the value from 20 to 30 %, checking that the motor stability is adequate during extreme variations of the reference, with and without load.

0.08 : Boost 
Integral gain of the speed loop  and 

 :


For the operation in U/F (**0.07** = Fd (2) or SrE (5)) mode, the parameter **0.08** is used to overflow the low speed motor so that it may supply more torque when starting.


This is a percentage of the motor rated voltage **0.44**. (See the diagrams of **0.07**).

 and  :

It adjusts the motor stability on a load impact. Increase the integral gain in order to obtain the same speed with load and without load on the load impact.

UNIDRIVE SP Commissioning

0.09 : Dynamic U/F selection  Gain derived from the speed loop  and 




 :
OFF (0) : the U/F ratio is fixed and it is set by the basic frequency (0.47).


On (1) : dynamic U/F curve.

It generates a voltage/frequency characteristic varying depending on the load. It shall be used in quadratic torque applications (pumps/fans/compressors). We may use it in low dynamic constant torque applications to reduce motor noises.

 and  :

It adjusts the motor speed stability on reference quick variations or load power cut. It reduces speed overshoot. Generally, let the setting at 0.

0.10 : Calculated motor speed  Measured motor speed  and 

 :
The motor speed is calculated based on the after ramp frequency reference (in Hz) or on the final frequency reference when used in frequency servo-control (reference signal on encoder input).

 and  :

This parameter is used to read the motor real speed, resulting from the speed feedback (incremental encoder, by instance).

0.11 : Synchro error

It indicates the reference error value between the master and slave encoder.

In speed adjustment mode the variation range corresponds to +/- max. slave speed.

In position synchro, the variation range corresponds to +/- 1 slave encoder turn.

0.12 : Master position encoder

Reading of the master code in $1/65535 \text{ min}^{-1}$. The measurement is performed based either on the power up position, or on top 0 if detected.

0.13 : Slave position return

Reading of the slave encoder position in $1/65535 \text{ min}^{-1}$. The measurement is performed starting with the power up position or with top 0 if detected.

0.14 : Total position shift

Reading of the total position shift. It is effective only in position synchro mode (0.26 \neq 0) and if the position shift is selected (18.35 = 1). The variation range corresponds to a user unit. Example: If the user expresses the slow shaft movement in degrees, there will be a 360 value for 1 slow shaft turn.

0.15 : Selected ratio

This parameter is used to find the selected ratio. Ratio 0 is selected by default.

0.16 : Ratio unit

This parameter is used to find the ratio units value.

Note: If the ratio gap function by inputs I_+ or I_- is used, the value of 0.16 takes into account this gap.

Example, if the ratio after correction is equal to 1.23456789, then 0.16 = 1.

0.17 : First 4 ratio decimals

This parameter is used to find the value of the first ratio decimals.

Note: If the ratio difference function by inputs I_+ or I_- is used, the value of 0.17 takes into account this difference.

Example, if the final ratio is equal to 1.23456789, then 0.17 = 2345.

0.18 : Last 4 ratio decimals

This parameter is used to find the value of the last ratio decimals.

Note: If the ratio difference function by inputs I_+ or I_- is used, the value of 0.18 takes into account this difference.

Example, if the final ratio is equal to 1.23456789, then 0.18 = 6789.

0.19 : Synchro window

It manages the Synchro OK information. The "Synchro OK" output (terminal 24) changes to 1 when the synchro error is below the value parametered in 0.19, in absolute values.

If the synchro mode is in speed, the window in which the synchro is OK is expressed in min^{-1} .

If the synchro mode is in position, the window in which the synchro is ok is expressed in encoder points.

0.20 : Max. slave speed

It is the maximum speed limitation at the output of the position loop. The maximum speed of the motor is fixed by parameter 0.02.

0.21 : Slave manu speed

It is the slave axis speed in manual run activated by inputs I_+ or I_- .

0.22 : Last 4 ratio decimals to be adjusted

This parameter adjusts the last 4 decimals of the ratio selected by parameter 0.25.

0.23 : First 4 ratio decimals to be adjusted

This parameter adjusts the first 4 ratio decimals selected by parameter 0.25.

0.24 : Ratio unit to be adjusted

This parameter adjusts the ratio unit selected by parameter 0.25.

UNIDRIVE SP Commissioning

0.25 : Selection of the ratio to be adjusted

This parameter is used to select the number of the ratio to be adjusted. The value is adjusted by parameters **0.22** to **0.24**.

Example of ratio selection:

The ratios are of the 1.23456789 type. They are stored in the drive internal parameters.

To read or write ratio 0 having a value of 1.23456789, it is necessary to program **0.25** = 0 and the content of the other parameters shall be:

0.24 = 1,
0.23 = 2345,
0.22 = 6789.

0.26 : Synchro mode

0 : speed synchronisation.

1 : non rigid position synchronisation.

2 : rigid position synchronisation.

0.27 : Numerator kinematics ratio


It is used to adjust the managing drive product.


0.28 : Denominator kinematics ratio

It is used to adjust the managed drive product.

0.29 : Restoring of synchro factory

This parameter starts an automatic procedure of return to the factory settings specific to the synchronisation application. In order to validate the return to factory settings, follow the procedure below:

Parameter	Setting	Description	Validation
0.00	1233	European factory settings configuration (50 Hz)	Pres the Reset key 
	or 1244	USA factory settings configuration (60 Hz)	
0.29	2047	Synchronisation program initialisation	





 • Check that the motor is stopped and that there is no problem related to the system security.

Synchronisation parameters cloning

This parameter is used to save or to load the parameters of menus 20, 70 and 71 by using the SMARTCARD.

Parameter	Setting	Description
0.29	3333	Saving of menus 20, 70 and 71 on the SMARTCARD
0.29	6666	Loading of menus 20, 70 and 71 from the SMARTCARD to the drive

0.30 : Parameter cloning




0.30	Action
nonE (0)	None
rEAd (1) + 	Transfer of parameters stored on the SMARTCARD to the drive
Prog (2) + 	Transfer of the drive parameters to the SMARTCARD
Auto (3) + 	Transfer of drive parameters to the SMARTCARD. Then, all modification of menu 0 parameter is automatically saved on the SMARTCARD
boot (4) + 	If upon powering up, a SMARTCARD is present, the SMARTCARD parameters are automatically transferred and stored in the drive.

See procedures of section J.

0.31 : Drive rated voltage

This parameter indicates the drive rated voltage.

0.32 : Drive rated current

This parameter indicates the drive permanent output current corresponding to the maximum overvoltage (possibility of 150%  or 175 %  and ).

0.33 : Quick restart Auto-tuned rated speed

 :

If this parameter is validated (**0.33** = 1 to 3), the variable speed drive in run command or after a mains supply carrier executes a procedure in order to calculate the motor frequency and direction of rotation. It will automatically decrease the output frequency on the measured value and will accelerate the motor until reaching the reference frequency.


0 : Invalidation of the quick restart of a revolving motor.
1 : validation of the quick restart of a clockwise or counterclockwise rotation motor.
2 : validation of the quick restart of a clockwise rotation motor.
3 : validation of the quick restart of a counterclockwise rotation motor.

 :

The motor slip is calculated based on the load rated speed **0.45**, and the motor rated frequency **0.47**.

However, as the slip varies depending on the temperature, the variable speed drive calculation based on **0.45** and **0.47** may be incorrect.

Set **0.33** at level 1 or 2 is used to automatically optimise the load rated speed.

To preserve the new value of **0.45**, proceed to parameter storing (**0.00** = 1000 + Reset .

This optimisation is active only if the speed is higher than 12.5% of the rated speed and when the motor load becomes higher than 62.5% on the rated load. The optimisation is no longer active when the load becomes lower than 50% of the rated load.

UNIDRIVE SP Commissioning

0.34 : User safety code

This parameter allows the introduction of a personal security code that locks all parameter modification (excepting **0.49**). The reading of the personal code can be performed only during its editing.

Do not choose zero code.

To validate or to use a code, follow the procedure described at section G12.

0.35 : Communication type

AnSI (0) : ANSI protocol used

RtU (1) : Modbus RTU protocol used

It defines the communication protocol used by the drive RS485 port.

This parameter may be changed by means of the keyboard, by an SM option or by the serial link itself. If the modification is transmitted by serial link, the command feedback will be transmitted by using the starting protocol. The master will have to wait 20ms before transmitting a new command in the new protocol.

Note : ANSI uses 7 data bits, 1 stop bit and 1 parity bit.

Modbus RTU uses 8 data bits, 2 stop bits and no parity bit.

Lcd (2) : specific protocol for locking the use of a "client" console.

0.36 : Serial link transmission speed

Used for selecting the transmission speed of the protocol used.

Note: The 57600 and 115200 speeds are used only for Modbus RTU.

This parameter may be modified by means of the keyboard, by a SM option or by the serial link itself. If the modification is transmitted by serial link, the command feedback will be transmitted by using the starting protocol. The master will have to wait 20ms before transmitting a new command in the new protocol.

0.37 : Serial link address

It is used to define the address of the drive, which is always the slave.

Modbus RTU:

For this protocol, the addresses 0 to 247 can be used. The address 0 is used to communicate with all the mains supply slaves (Broadcast), that is why this address must not be entered in this parameter.

ANSI :

For this protocol, the first digit corresponds to the group, and the second to the variable speed drive address in the group. The maximum number of groups is 9, and the maximum number of addresses in the group is 9. Therefore, the value of **0.37** is limited to 99. Besides, the address 0 is used to communicate with all the mains supply slaves, and the addresses x0 are used for the slaves of group x, that is why the addresses must not be entered in this parameter.

0.38 : Current loop proportional gain

0.39 : Current loop integral gain

Considering a certain number of internal variable speed drive factors, oscillations may occur in the following cases :

- Frequency adjustment with current limitation around the rated frequency and on the load impacts.

- Torque adjustment on the low load machines and around the rated speed.

- In case of mains supply cut or controlled deceleration ramp when the continuous current bus adjustment is required.


To diminish these oscillations, it is recommended, in this order :

- to increase the proportional gain **0.38**,

- to decrease the integral gain **0.39**.

Note: The gains are automatically set by auto-tuning according to the selected procedure (see **0.40**).

0.40 : Auto-tuning, measures and calculations

 • Check that the auto-tuning with rotation does not represent a risk as regards the safety and check that the motor is stopped before starting the procedure.


• After the modification of the operating mode or of the motor parameters, renew the auto-tuning.



0 : no auto-tuning.

1 :


 and  :

Characteristics measurements, stopped motor:

- voltage offset ,

- stator resistor  and ,

- current loop gains ,

- transient inductance .

Choose this mode when the load may not be disconnected from the motor.

Procedure:

- check that the motor parameters have been set and that the motor is stopped,

- enable the variable speed drive (close terminal 31),

- give a run command (close terminal 26 or 27). The display indicates alternately "Auto" and "tunE". Wait until the display stabilises at "**0.00**".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.

The parameter **0.40** reaches again 0 after the end of the auto-tuning.

 :

Measurement of the encoder phasing out angle. The motor must be disconnected.

Procedure :

- check that the motor parameters have been set and that the motor is stopped

- enable the variable speed drive (close terminal 31),

- give a run command (close terminal 26 or 27).

- The motor turns about 2 times in reverse direction, at a very low speed, then it stops. The display indicates alternately "Auto" and "tunE". Wait until the display stops at "**0.00**".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.








Parameter **0.40** reaches again 0 after auto-tune.

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2 :

 and  :

Measurements of the revolving motor characteristics:

- voltage offset ,
- stator resistor  and ,
- transient inductance ,
- $\cos \varphi$  and ,
- current loop gains 

This mode is used to obtain optimum performances, but the motor must be without load during the procedure.

Procedure :

- check that the motor parameters have been set and that the motor is stopped,
- enable the variable speed drive (close terminal 31),
- give a run command (close terminal 26 or 27).

The motor accelerates up to 2/3 of the rated speed, then it stops in free wheel. During auto-tuning, the display indicates alternately "Auto" and "tunE". Wait until the display stops at "0.00".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.

The parameter **0.40** reaches 0 again after the end of auto-tuning.

 :

Measurement of the encoder phasing out angle, stator resistor, transient inductance, and automatic setting of the current loop gains.

The motor must be disconnected.

Procedure:

- check that the motor parameters have been set and that the motor is stopped,
- enable the variable speed drive (close terminal 31),
- give a run command (close terminal 26 or 27).

The motor turns about two times, at a very low speed, then it stops.

The display indicates alternately "Auto" and "tunE". Wait until the display stops at "0.00".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.

Parameter **0.40** reaches 0 again after the end of auto-tuning.

3 :

 and  :

Measurement of total inertia (load and motor). The load may remain connected to the motor during the measurement, except the case when the load is not line or if it increases with the speed (erroneous measurement).

Procedure :

- check that the motor parameters have been set and that the motor is stopped
- enable the variable speed drive (close terminal 31),
- give a run command (close terminal 26 or 27).

The motor turns several times (3/4 of the load rated speed), then it stops. During auto-tuning, the display indicates alternately "Auto" and "tunE". Wait until the display stops at "0.00".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.

Parameter **0.40** reaches 0 again after the end of auto-tuning.

4 :

 :

Calculation of the current loop gains.

The transient inductance and the stator resistor must be set before the validation of the gain calculation. For this, proceed to an auto-tuning **0.40** = 1 or 2 (if the motor can be disconnected or not) before validating gain calculations.

Note : When the gain is calculated **0.40** pass from 4 to 0.

 :

Characteristics measurements, stopped motor :

- stator resistance,
- stator inductance,
- loop gains of the current loop.

Procedure :

- check that the motor parameters and the encoder phasing out **0.43** have been set and that the motor is stopped

- enable the variable speed drive (close terminal 31),
- give a run command (close terminal 26 or 27). The display indicates alternately "Auto" and "tunE". Wait until the display stops at "0.00".

Open terminal 31 and terminal 26 or 27.

The motor is then ready for normal operation.

Parameter **0.40** reaches 0 again after the end of auto-tuning.

5  :

Measurement of the encoder phasing out angle **0.43** with low rotation.

Low current pulses are applied to the motor in order to produce a motor movement, then it is restored to its initial position. If this procedure fails, it is automatically repeated 2 times (however, if the measurement is still unsatisfactory, the variable speed drive passes to "tunE2").

Then, the variable speed drive checks that the direction of rotation of the position sensor is correct.

The phasing out angle **0.43** is then updated and stored.

This test is correctly carried out if the load is an inertia and, taking into account the fact that the motor must not be of low power and the friction must be acceptable, the motor must not be highly loaded for this test (inertia lower than $0.715 \times C_{rated} / 5.38 \text{ kgm}^2$).

This test can not be used with sensors fitted with a single serial link, it is recommended to use an auto-tuning mode for types Ab.servo and Fr.servo.

6 :

 :

Calculation of the current loop gains.

This mode is not used for the simple applications of menu 0. For more information, see the manual Explanations of parameters ref. 3655.

Note : This value is not visible on the display that passes from 5 to 0. The return of **0.40** to 0 shows that the gains are calculated.

UNIDRIVE SP Commissioning

0.41 : Carrier frequency

It adjusts the PWM carrier frequency. Sampling frequency of digital and analogue inputs.

CAUTION:

• Depending on the carrier frequency and on the UNIDRIVE SP rating, it is necessary to make an output current derating. See section B3.3.

• A high carrier frequency reduces the magnetic noise and increases the variable speed drive losses, in exchange, it increases the motor heating and the level of emission of radio-frequency interference and reduces the start torque.

• If 0.41 is set to a value higher than 3 kHz, and when the junction temperature of the IGBT transistors reaches a certain alarm threshold, the carrier frequency is automatically reduced (0.41 remains at the value set by the user). When the variable speed drive cannot diminish the carrier frequency it passes to "O.ht1".

The variable speed drive restores the set carrier frequency as soon as the IGBT temperature drops under the alarm threshold.

0.42 : Number of motor poles

and :

Enter the number of motor poles.

Ex.: 2P (1) : 2 poles motor (3000 min⁻¹),
4P (2) : 4 poles motor (1500 min⁻¹),
6P (3) : 6 poles motor (1000 min⁻¹)...etc.

In factory setting, the value of 0.42 is set to "Auto (0)", and the variable speed drive calculates automatically the number of poles depending on the rated frequency (0.47) and on the load rated speed (0.45).

:

Enter the number of poles indicated on the motor plate.

In factory setting, the value of 0.42 is set at "6 POLE (3)".

0.43 : Cos φ and

Encoder phasing out

and :

Cos φ is automatically measured during the rotation auto-tuning phase (0.40 = 2), and it is set to this parameter. If this procedure cannot be carried out, enter the value of cos φ set on the motor nameplate.

Note: After an auto-tuning 0.40 = 2 in closed loop, the value of cos φ may not be manually modified.

:

In order to correctly control a servo motor, the phasing out between the rotor flow and the encoder position must be set. This phasing out is automatically set during an auto-tuning 0.40 = 1 or 2.

This parameter may be modified at any moment, and it is immediately taken into account by the drive

Note:

• After a return to the factory settings, the value of 0.43 is not modified.

• For a UNIMOTOR motor fabricated starting with 2002, the encoders are stalled in factory (0.43 = 0).

0.44 : Motor rated voltage

It is the rated voltage specified on the nameplate.

0.45 : Loaded motor rated speed and Motor thermal time constant

and :

It is the motor load speed specified on the nameplate.

Note: This parameter is used to define the motor thermal protection.

:

This parameter is used to define the motor thermal protection. For UNIMOTOR motors, set the thermal time constant of the coil (table B2.2 of the technical catalogue ref. 3863) in 0.45.

0.46 : Motor rated current and Stall current

and :

It is the value of the motor rated current specified on the motor nameplate. The overload is calculated based on this value.

:

This is the value of the stall current specified on the motor nameplate.

CAUTION:

If there is an ambient temperature of 50°C, check that the value of 0.46 does not exceed the value of the table section B3.3.

• To avoid fire risks in case of motor overload, 0.46 must be correctly set.

0.47 : Motor rated frequency and

This is the point when the motor operation passes from constant torque to constant power.

In standard operation, it is the frequency specified on the motor nameplate.

0.48 : Selection of the operating mode

This is the point when the motor operation passes from constant torque to constant power.

In standard operation, it is the frequency specified on the motor nameplate.

OPEN.LP (1) : operation in open loop in vector control or in U/F.

CL.VECT (2) : operation in vector control in closed loop with encoder.

Servo (3) : operation in Servo mode with autosynchronous motor (servo).

REgEn (4) : regenerative mode, not used.

Note:

• A procedure of return to factory settings does not modify the operating mode.

• The modification of the operating mode may be performed only when the variable speed drive is stopped.

0.49 : Access to level 2 and storing of the security code

L1 (0) : access to level 1. Only the parameters of menu 0 (0.00 to 0.50) are accessible from the keyboard.

L2 (1) : access to level 2. The parameters of all menus are accessible from the keyboard.

Loc (2) : used to store or to reactivate a security code (see the procedure described at section G12).

0.50 : Software version

It indicates the 2 first digits of the software version installed in the variable speed drive.

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H3 - Other menus

! Before attempting to adjust the variable speed drive using the help diagrams, it is essential to have respected the instructions for installation connection and commissioning described in previous chapters.

Additionally, in order to assure product and personal safety, precautions must be taken when setting the parameters marked by the symbol **!**.

For more information refer to document ref. 3655 available on electronic format on the CD ROM delivered with the drive.

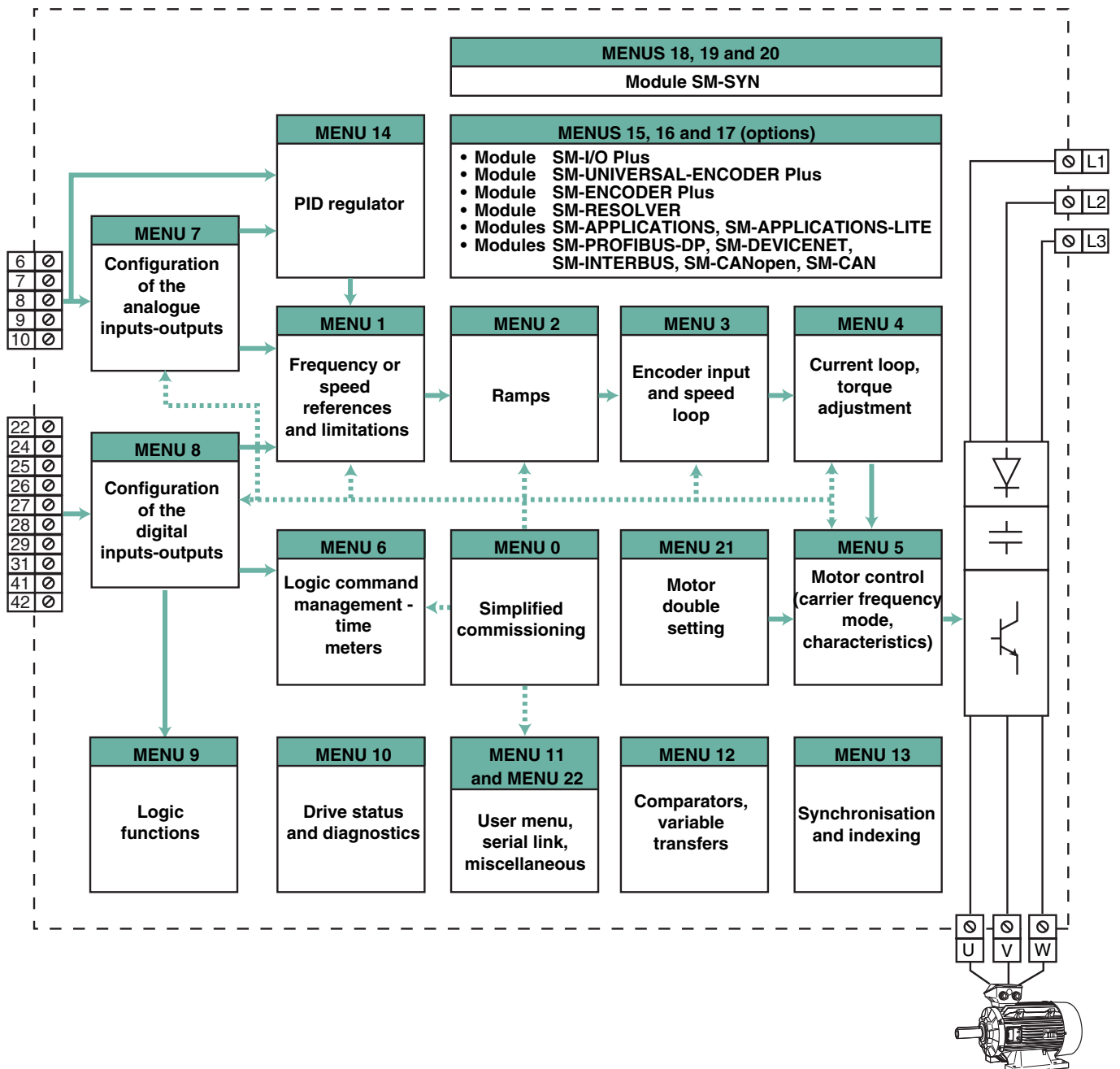
H3.1 - Menus

According to the application, it is sometimes necessary to optimise the parameter-setting of the variable speed drive in addition to that accessible by menu 0.

For this reason all the variable speed drive functions have been grouped into menus (22 menus).

For the cell winding / unwinding application, the user disposes of setting diagrams, as well as of explanations of parameters of menus 18, 19 and 20 related to the application.

However, all the basic functions of the variable speed drive and of the SM modules remain accessible by the menus 1 to 17, 21 and 22 (Diagrams).



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H3.2 - Types de paramètres

For each menu, a diagram schematises the menu parameter function.

The variation ranges that may not be schematised are integrated into a table below each diagram.

Symbols :

1.06 : A number in bold format makes reference to a parameter.

 : Makes reference to an input or output terminal of the variable speed drive.


• Reading/writing parameters

1.21 : The parameters contained in a rectangle or L-E identified parameters are Reading and Writing accessible parameters.

They can be assigned for connection to :

- digital inputs for bit parameters,
- analogue inputs for non-bit parameters,
- internal function outputs (comparators, logic operation, arithmetic operation ...).


• Reading parameters

 : The parameters contained in a lozenge or LS identified parameters are read only parameters.

They are used to give information regarding the operation of the variable speed drive and they may be connected to :

- digital inputs for bit parameters,
- analogue inputs for non-bit parameters,
- internal function outputs (comparators, logic operation, arithmetic operation ...).

• Reading / Assignment parameters

 : The parameters contained in a hexagon or L-A identified parameters are parameters that may not be assigned to digital inputs (for the bit parameters) or to analogue inputs (for the non-bit parameters).

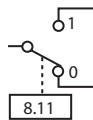
This type of parameter cannot be thus directly modified.

• Binary parameters

On the keyboard, they take the value " OFF " when they are disabled, and " On " when they are enabled.

By serial link, they take the value " 0 " when they are disabled, and "1" when they are enabled.

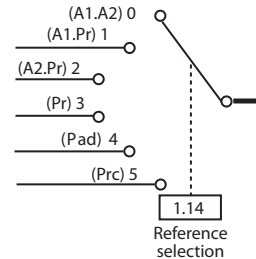
For a simplified reading of the diagrams, these parameters are represented by contacts, whose position corresponds to the factory settings.



• Decimal parameters

On the keyboard, they take a mnemonic value (ex.: A1.A2, Pr...), and by serial link, they take a value 0, 1, 2, 3 etc...

For a simplified reading of the diagrams, these parameters are represented by contacts, whose position corresponds to the factory settings.



• Digital parameter

A numeric parameter is used to :


- set a value that will be taken into account in the variable speed drive calculations (ex. : Irated name **5.09**),
- give indications on the variable speed drive operation (ex.: before ramp reference **1.03**).

The maximum value of certain parameters may vary depending on the type of variable speed drive and on the operating mode used, or depending on the influence of other parameters.

To simplify, the maximum values of these parameters are expressed by the mnemonics whose explanation is detailed in section H3.5.

Examples : REF. MAX, I MAX UTIL, U_{AC} MOT MAX ETC...

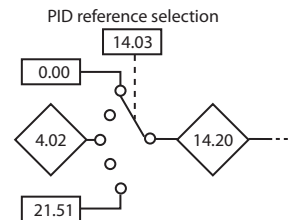
• " Source " parameters

A source parameter gives the possibility to the user to assign a parameter as a function input. After the modification of a source, press the Reset key for its reception by the variable speed drive (or store by **0.00** = 1000 + ).

The source value corresponds to :

$$\frac{\text{Input value} \times 100 \%}{\text{Max. value of the source parameter}}$$

Example :



14.20 = 100 % when **4.02** is equal to its maximum theoretical value.

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• " Destination " parameter

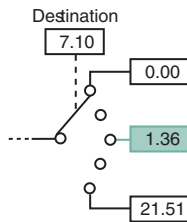
A destination parameter gives the possibility to the user to assign a parameter as a function output. After the modification of a destination, press the Reset (⏪) key for its reception by the variable speed drive **0.00** = 1000 + (⏪).

The destination value corresponds to :

- 0 or 1 if a binary parameter is assigned as destination,
- $$\frac{\text{Output value} \times \text{max. value of the destination parameter}}{100 \%}$$

if a non binary parameter is assigned as destination.

Example::



When the function output is at 100 %, **1.36** reaches its maximum theoretical value, that is REF MAX.

Note : If a protected parameter is assigned as destination, this assignment will not be taken into account.

H3.3 - Factory settings

The operation of the variable speed drive in factory settings is represented by a green line.

For the sources and destinations, the parameters assigned in factory settings are represented with green.

H3.4 - Use

• Assignments :

- Unknown parameter :

If an unknown parameter is assigned to a source or in a destination, then the value 0 will be considered by the variable speed drive.

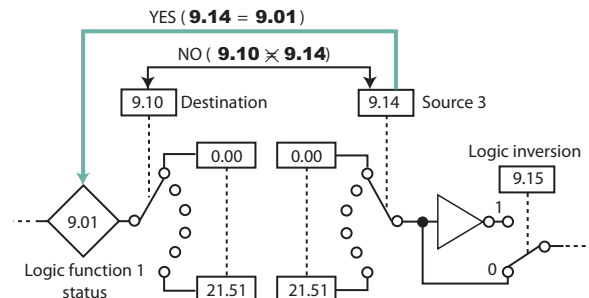
- Double assignment:

A parameter cannot be assigned 2 times as destination. In case of involuntary double assignment, the variable speed drive starts "dEst" by default, and it persists until the assignment-related problem is settled (except menus 15, 16 and 17).

Note : It may be necessary to check the parameters already assigned in factory settings, represented with green on the diagrams.

- Association :

Do not assign a destination parameter in a source parameter.



• After the modification of a destination, the former destination parameter returns to zero value, save the case of a return to factory settings where the former parameter finds its factory value. In case of a transfer by SMARTCARD to the variable speed drive, the former destination parameter preserves its former value, unless its value is modified by SMARTCARD.

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H3.5 - Definitions of maximum values

Range	Definition
REF MAX \square : 3000.0 Hz \square and \square : 40000.0 min ⁻¹	Maximum frequency reference (\square) or maximum speed reference (\square and \square) <ul style="list-style-type: none"> • If 1.08 = 0 : REF MAX = 1.06 • If 1.08 = 1 : REF MAX = 1.06 or - (1.07) <p>If the second motor is selected, the limits correspond to 21.01 (instead of 1.06) and 21.02 (instead of 1.07).</p>
LIM N MAX 40000.0 min ⁻¹	Maximum applied to the speed reference limitations A maximum limit may be applied to the speed reference so that the encoder rated frequency should not exceed 500 kHz. The maximum is defined by: $\text{LIM N MAX (min}^{-1}\text{)} = 410\text{kHz} \times 60 / \text{ELPR}$ $= 2.46 \times 10^7 / \text{ELPR}$ ELPR quadrature encoder : number of points by turn ELPR frequency encoder / direction : number of points by turn / 2 ELPR resolver : resolution / 4 ELPR SinCos : number of sinusoids by turn ELPR serial link encoder : resolution / 4
N MAX 40000.0 min ⁻¹	Maximum speed This maximum is used for certain speed-related parameters of menu 3. $N \text{ MAX} = 2 \times \text{REF MAX}$
I_N MAX 9999.99 A	Maximum motor rated current $I_N \text{ MAX} \leq 1.36 \times \text{Maximum variable speed drive rated current (11.32)}$.
I_{MAX} VAR 9999.99 A	Maximum variable speed drive current The maximum variable speed drive current corresponds to the level "OIAC" overvoltage default start, such as: $I_{\text{MAX VAR}} = \text{Maximum variable speed drive rated current (11.32)} / 0.45$
LIM IM1 MAX 1000.0 %	Maximum current limit set by motor 1 \square and \square : $\text{LIM IM1 MAX} = \sqrt{\frac{\left[\frac{I_{\text{MAX}}}{5.07}\right]^2 + \cos^2 \varphi - 1}{\cos \varphi}} \times 100 \%$ <p>Note: I_{MAX} corresponds to 1.75 x (I_{sp} with maximum overload) if the current set in 5.07 is lower or equal to the maximum value of the current with maximum overload given in 11.32, otherwise I_{MAX} corresponds to 1.1 x (I_{sp} with reduced overload). Cos φ = 5.10</p> \square : $\text{LIM IM1 MAX} = \frac{I_{\text{MAX}}}{5.07} \times 100 \%$ <p>Note: I_{MAX} corresponds to the variable speed drive rated current (11.32) x 1.75.</p>
LIM IM2 MAX 1000.0 %	Maximum current limit set for motor 2 $\text{LIM IM2 MAX} = \sqrt{\frac{\left[\frac{I_{\text{MAX}}}{21.07}\right]^2 + \cos^2 \varphi - 1}{\cos \varphi}} \times 100 \%$ <p>Note: I_{MAX} corresponds to 1.75 x (I_{sp} with maximum overload) if the current set in 21.07 is lower or equal to the maximum value of the maximum overload current given in 11.32 unless I_{MAX} corresponds to 1.1 x (I_{sp} with reduced overload). Cos φ = 21.10</p> \square : $\text{LIM IM1 MAX} = \frac{I_{\text{MAX}}}{21.07} \times 100 \%$ <p>Note: I_{MAX} corresponds the variable speed drive rated current (11.32) x 1.75.</p>
I_{ACTIVE} MAX 1000.0 %	It is the value of LIM IM1 MAX or LIM IM2 MAX depending on the settings used (motor 1 or 2).
I_{MAX} UTIL 1000.0 %	Limitation of the current parameters by user (4.24) The user may select a maximum for 4.08 (torque reference) and 4.20 (load percentage) to scale the analogue inputs / outputs with 4.24 . This maximum is limited by LIM IM1 MAX or LIM IM2 MAX depending on the selected motor.

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Mise en service

Definitions of maximum values (continued)

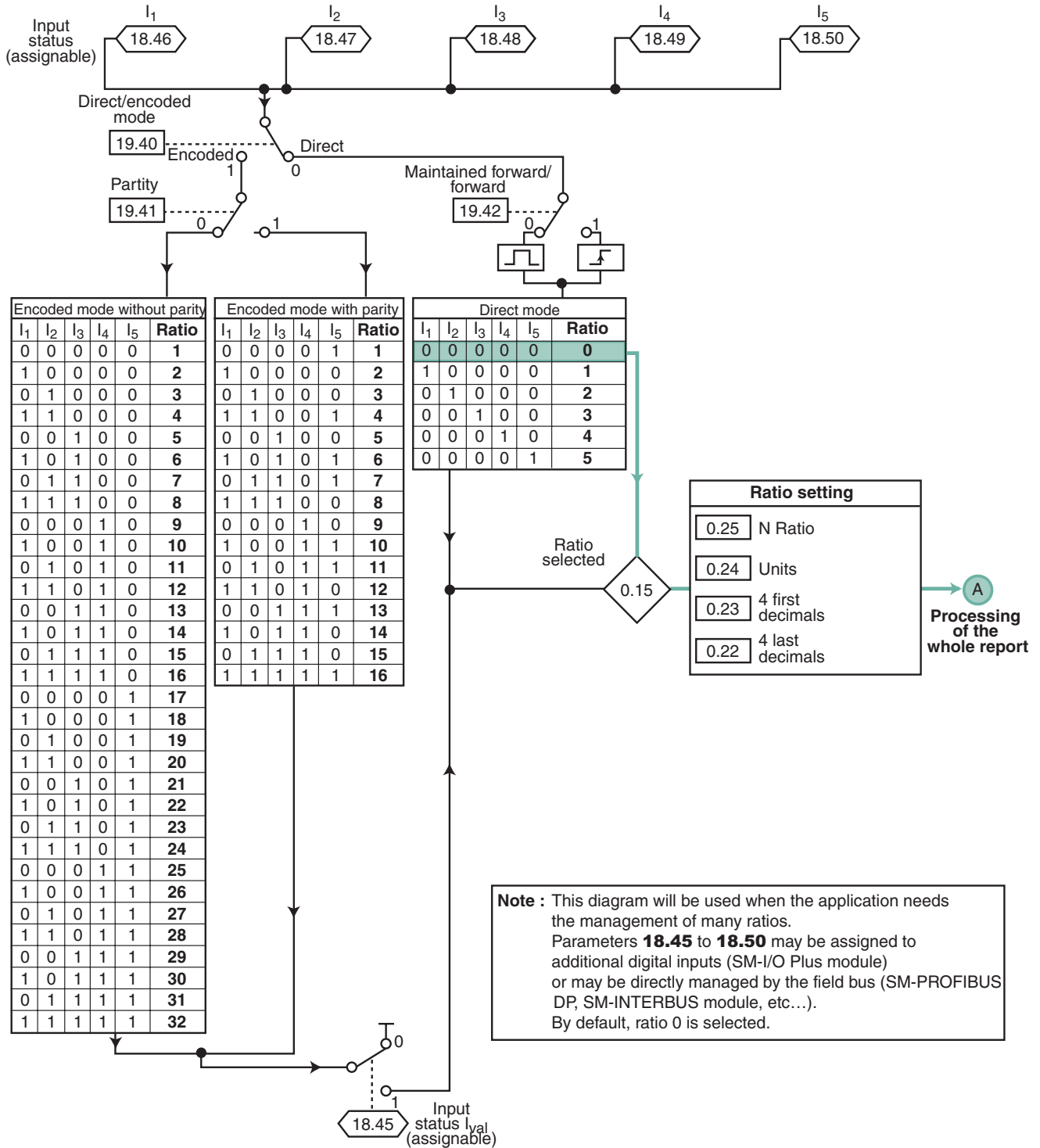
Range	Definition
U_{AC} MOT MAX 690V	Maximum output voltage It is the maximum motor voltage that can be used: TL: 240 V T : 480 V TM : 575V TH : 690V
U_{AC} OUT MAX 930 V	Maximum output voltage This value corresponds to the maximum voltage produced by the variable speed drive, including the operation in quasi-square modulation: $U_{AC} \text{ OUT MAX} = 0.78 \times U_{DC} \text{ MAX}$ TL: 325 V T : 650 V TM : 780V TH : 930V
SEUIL U_{DC} MAX 1150 V	DC voltage threshold TL: 400 V T : 800 V TM : 950V TH : 1150V
U_{DC} MAX 1190 V	Maximum DC bus voltage It is the maximum voltage of the DC bus TL: 415 V T : 830 V TM : 995V TH : 1190V
P MAX 9999.99 kW	Maximum power in kW It is the maximum power at U _{AC} OUT maximum, maximum current controlled and power factor equal to 1. $P \text{ MAX} = \sqrt{3} \times U_{AC} \text{ OUT MAX} \times I_N \text{ MAX} \times 1.75$



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H4 - Synchronisation Diagrams

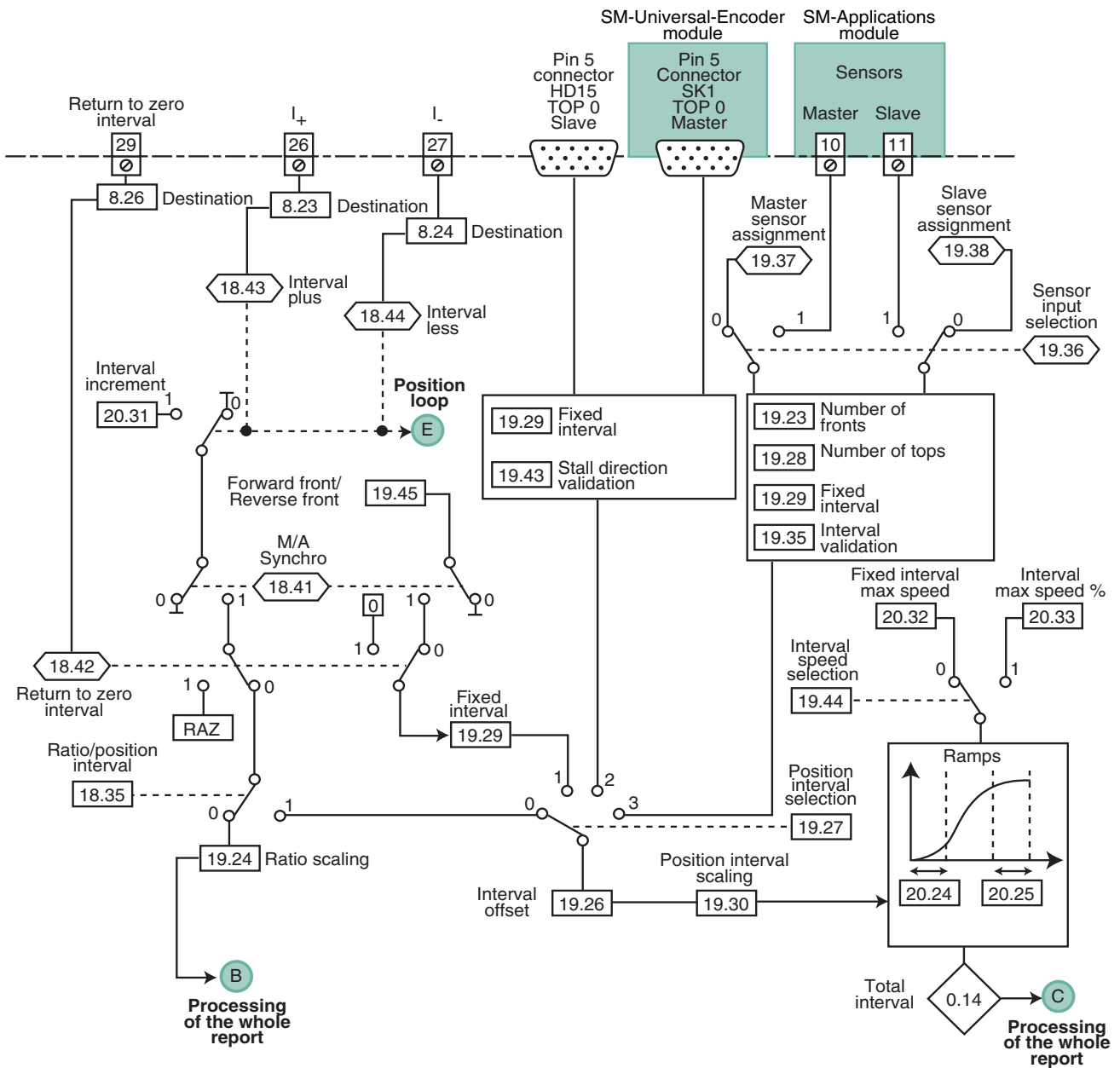
• Selection of electric ratios



Parameters	Variation range			Factory settings	
	□	□	⊞	⊞	□
0.15	± 32767			-	
15.21 to 15.26 18.46 to 18.50	OFF (0) or On (1)			-	

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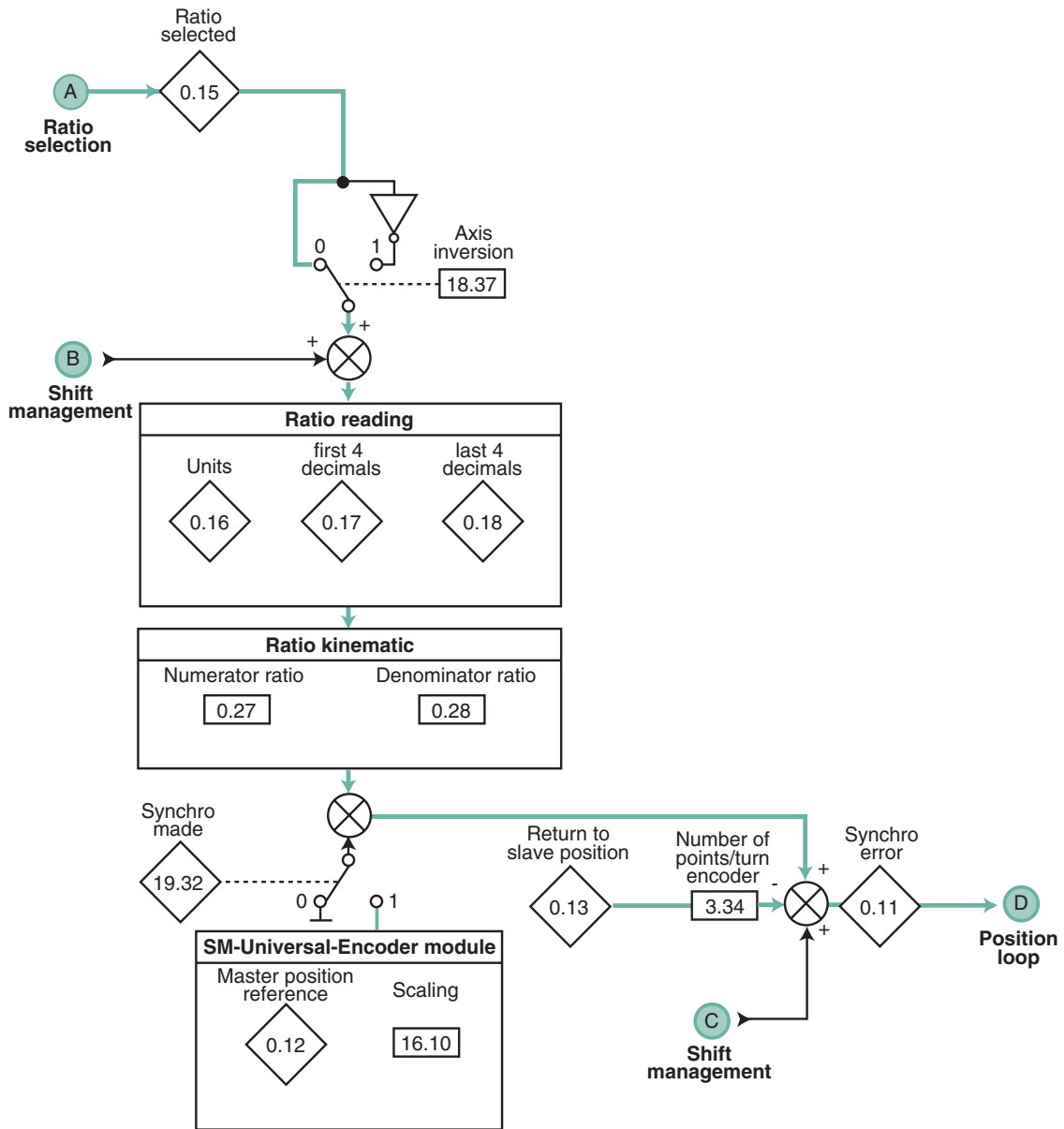
• Difference administration



Parameters	Variation range			Factory settings		
0.14 - 19.26 - 19.29	± 32767			0		
19.23	0 to 32767			1		
19.24 - 19.30	1 to 32767			1		
19.28	1 to 32767			3		
19.35	0 or 1			0		
19.37 - 19.38	OFF (0) or On (1)			-		
19.43 - 19.45	OFF (0) or On (1)			OFF (0)		
20.24 - 20.25	0 to 2147483647 x 0.01 s/1000 min ⁻¹			200 x 0.01 s/1000 min ⁻¹		
20.31	0 to 32767			0		
20.32	0 to 2147483647			1500		
20.33	105 to 200 %			105 %		

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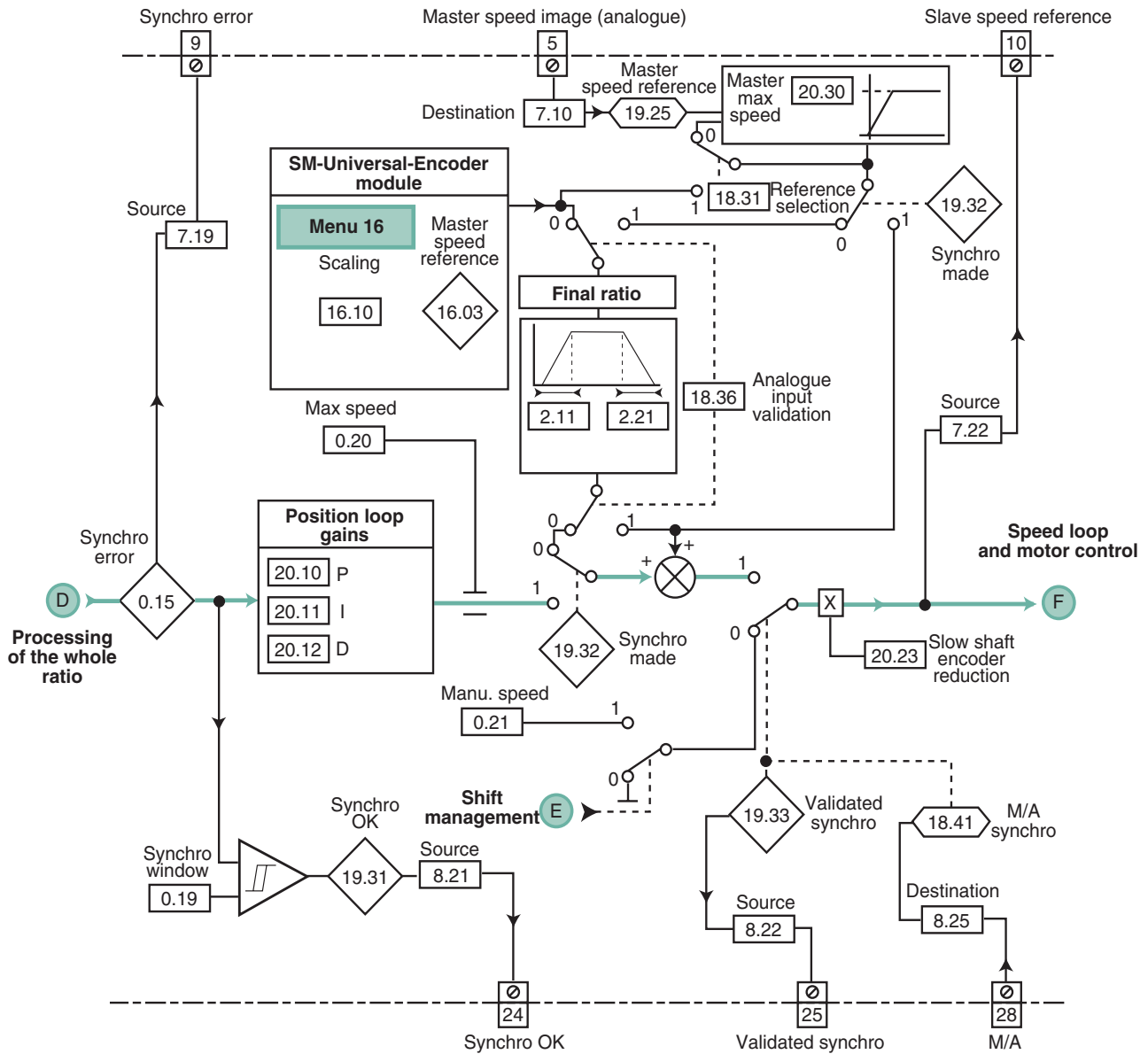
• Total ratio processing



Parameters	Variation range			Factory setting		
0.11	± 32767			-		
0.12	0 to 65535 points/turn			-		
0.13	0 to 65535 points/turn			-		
0.15	0 to 32			-		
0.16	0 to 15			-		
0.17	0 to 9999			-		
0.18	0 to 9999			-		
0.22 - 0.23	0 to 9999			0		
0.24	0 to 15			1		
0.25	0 to 32			0		
0.27 and 0.28	1 to 32767			1		
3.34	0 to 50000			1024	2048	4096
16.10	0 to 50000			4096		

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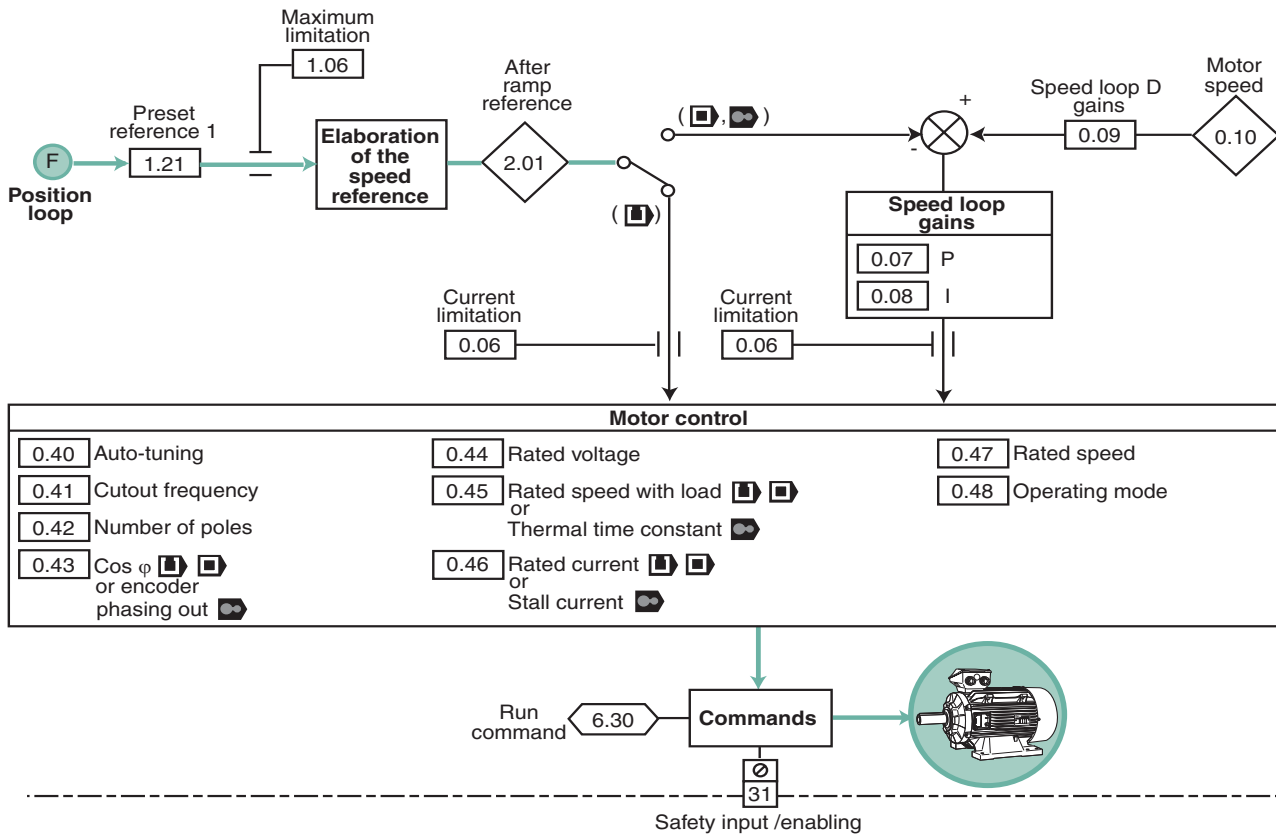
• Position



Parameters	Variation range			Factory settings		
0.15 - 19.25	± 32767			-		
0.19	0 to 2147483648 points			100 points		
0.20	0 to 32767 min ⁻¹			1500 min ⁻¹		
0.21	0.00 to 21.51			1.50		
2.11	0 to 3200.0 s/100	0 to 3200.000 s/1000 min ⁻¹		5.0 s/100 Hz	2.000 s/1000 min ⁻¹	0.0200 s/1000 min ⁻¹
2.21	0 to 3200.0 s/100	0 to 3200.000 s/1000 min ⁻¹		10.0 s/100 Hz	2.000 s/1000 min ⁻¹	0.0200 s/1000 min ⁻¹
7.10	0.00 to 21.51			19.25		
7.19	0.00 to 21.51			0.15		
7.22	0.00 to 21.5			1.21		
8.21	0.00 to 21.5			19.31		
8.22	0.00 to 21.5			19.33		
8.25	0.00 to 21.5			18.41		
16.03 - 16.10 - 19.31	OFF (0) or On (1)			-		
20.10 - 20.11	0 to 32767			200		
20.12	0 to 32767			1000		
20.23	0 to 2147483647			100		
20.30	0 to 2147483647			1500		

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• Speed Loop and Motor Control



Parameters	Variation range			Factory settings		
0.06	0 to LIM IM1 MAX (%)			165.0 %	175.0 %	
0.07	-	0 to 6.5535 (1/rads ⁻¹)		-	0.0100 (1/rads ⁻¹)	
0.08	-	0 to 655.35 (1/rad)		-	1.00 (1/rad)	
0.09	0 to 65336			0		
0.10	±N MAX (min ⁻¹)			-		
0.40	0 to 2	0 to 3		0		
0.41	3 (1), 4 (2), 6 (3), 8 (4), 12 (5), 16 (6) kHz 16 kHz not available for sizes 3			3 kHz		6 kHz
0.42	Auto (0) to 120POLE (60)			Auto (0)		6POLE (3)
0.43	0 to 1.000		0 to 359.9°	0.850		-
0.44	0 to Uac MOT MAX (V)			TL : 230V T : 400V (EUR)/400V (USA) TM : 575V		
0.45	0 to 180000 min ⁻¹	0 to 40000.00 min ⁻¹	0 to 400.0	1500 min ⁻¹ (EUR) 1800 min ⁻¹ (USA)	0 to 40000.00 min ⁻¹	0 to 400.0
0.46	0 à In MAX (A)			Irated VAR (11.32)		
0.47	0 to 3000.0 Hz	0 to 1250.0 Hz		50.0 Hz (EUR) 60.0 HZ (USA)		
0.48	OPEn LP (1), CL VECt (2), SerV (3), REgEn (4)			OPEn LP (1)		
1.06	0 to 3000,0 Hz	± REF. MAX		50 Hz (EUR) 60 Hz (USA)	1500.0 min ⁻¹ (EUR) 1800.0 min ⁻¹ (USA)	3000.0 min ⁻¹
1.21	± REF. MAX			0		
2.01	± REF. MAX			-		

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H5 - Explanation of synchronisation parameters

H5.1 - Explications of menu 18 parameters

18.01 to **18.28** : Not used

18.29 : Bus control word

Control of the variable speed drive by the field bus. It is used to address commands to the variable speed drive by a single parameter. If necessary, see section I.

Bit no.	18.29 =	Enabled parameter	Description
Bit 0	1	10.33	Drive reset
Bit 1	2	18.41	Synchro run
Bit 2	4	18.43	I ₊
Bit 3	8	18.44	I ₋
Bit 4	16	18.46	I ₁
Bit 5	32	18.47	I ₂
Bit 6	64	18.48	I ₃
Bit 7	128	-	-
Bit 8	256	18.49	I ₄
Bit 9	512	18.50	I ₅
Bit 10	1024	18.45	I _{val}
Bit 11	2048	18.42	RTZ shift
Bit 12	4096	18.35	Ratio/position shift
Bit 13	8192	18.36	Master speed analogue input validation

Note: The validation of the control word depends on the value of the "control word mask" **20.19**.

18.30 : Bus status word

Control of the variable speed drive by the field bus. It is used to obtain information of the variable speed drive status by a single parameter. If necessary, see section I.

Bit no.	18.30 =	Enabled parameter	Description
Bit 0	1	19.31	Synchro OK
Bit 1	2	19.32	Synchro disabled
Bit 2	4	19.33	Synchro enabled
Bit 3	8	-	-
Bit 4	16	-	-
Bit 5	32	-	-
Bit 6	64	-	-
Bit 7	128	-	-
Bit 8	256	-	-
Bit 9	512	-	-
Bit 10	1024	10.01	Drive ready
Bit 11	2048	10.02	Drive output enabled
Bit 12	4096	10.03	0 speed
Bit 13	8192	10.09	Current limitation enabled
Bit 14	16384	10.14	Back rotation

18.31 : Master speed reference selection

OFF (0) : used to select the master speed reference of analogue input 1 (terminal 5).

On (1) : used to select the master speed reference from the SM-Universal-Encoder module.

18.32 to **18.34** : Not used

18.35 : Ratio / position shift selection selected.

OFF (0) : Ratioshift shift function selected.

On (1) : Position shift function selected.

18.36 : Analogue input validation

The master speed reference shall be added to the control block reference in order to anticipate the error during the transient phases. They come from various sources according to **18.31**.

18.37 : Axis inversion

It is used to revert the axis direction of rotation.

18.38 to **18.40** : Not used

18.41 : Synchronisation Run / Stop validation

It gives the run command to the drive and validates the synchronisation (assigned to terminal 28).

18.42 : RTZ Shift

A pulse on **18.42** (assigned to terminal 29) resets to 0:

- the shift generated by I₊ and I₋ inputs,
- the fixed shift **19.29** when **19.27** = 1.

18.43 : Plus Shift, I₊

This parameter is assigned to terminal 26.

- If synchronisation is disabled (**18.41** = 0) : input I₊ is used for manual mode operation (or pulse) in the positive direction, according to the speed set in **20.22** (= **0.21**).

- If synchronisation is enabled (**18.41** = 1) : input I₊ shall perform a positive shift of the ratio (if **18.35** = 0) or of the position (if **18.35** = 1).

The shift value is parametered in **20.31**.

Input I₊ enabled for 4 seconds determines the quick incrementation of the shift (at the end of a 1 second, the shift corresponds to 2 x **20.31**, at the end of 2 seconds, the shift corresponds to 3 x **20.31**, and so on for all the seconds).

18.44 : Minus shift, I₋

This parameter is assigned to terminal 27.

- If the synchronisation is disabled (**18.41** = 0): input I₋ is used for manual mode operation (or pulse) in the negative direction, according to the speed set in **20.22** (= **0.21**).

- If synchronisation is enabled (**18.41** = 1): the I₋ shall perform a negative shift of the (if **18.35** = 0) or of the position (and **18.35** = 1).

The shift value is set in **20.31**.

Input I₋ enabled for 4 second triggers the quick incrementation of the shift (at the end of a 1 second, the shift corresponds to 2 x **20.31**, at the end of 2 seconds, the shift corresponds to 3 x **20.31**, and so on for all the seconds).

18.45 : Input I_{val}

This parameter can be assigned to a logic input.

During operation in coded mode, this input enables the combination of inputs I₁ to I₅.

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18.46 : Input I₁

18.47 : Input I₂

18.48 : Input I₃

18.49 : Input I₄

18.50 : Input I₅

These inputs are used to select up to 32 various ratios. They may be assigned to logic inputs or controlled by a field bus.

- direct mode **19.40** = 0: 6 ratios.

Each of the inputs corresponds to a ratio (ratio 0 to 5).

When all the inputs are to 0, ratio 0 is selected.

- coded mode **19.40** = 1:

• Without parity bit **19.41** = 0 (32 ratios)

Each binary combination of inputs I₁ to I₅ corresponds to a ratio. The selection of a ratio is not validated unless I_{val} is at 1 (**18.45**).

• With parity bit **19.41** = 1 (16 ratios).

In this case, 4 inputs are used to select the ratios. The 5th input is used as parity bit. The use of a parity bit allows the drive to check the selection coherence.

H5.2 - Explanation of menu 19 parameters

19.01 : Selected ratio

This parameter is used to find the selected ratio. By default, ratio 0 is selected.

19.02 : Synchro error

It indicates the error value of the master encoder and slave encoder tracking.

In speed control mode, the variation range corresponds to +/- the maximum slave speed.

In position synchro mode, the variation range corresponds to +/- 1 turn of the slave encoder.

19.03 : Ratio unit

This parameter is used to know the ratio unit value.

Note: If the ratio shift function by inputs I₊ or I₋ is used, the value of **19.03** takes this shift into account.

Example, if the ratio after correction is equal to 1.23456789, then **19.03** = 1.

19.04 : First 4 ratio decimals

This parameter is used to know the value of the first ratio decimals.

Note: If the ratio shift function of inputs I₊ or I₋ is used, the value of **19.04** takes this shift into account.

Example, if the final ratio is equal to 1.23456789, then **19.04** = 2345.

19.05 : Last 4 ratio decimals

This parameter is used to know the last ratio decimals.

Note: If the ratio shift function of inputs I₊ or I₋ is used, the value of **19.05** takes this shift into account.

Example, if the final ratio is equal to 1.23456789, then **19.05** = 6789.

19.06 : Total shift in position

Reading of the total shift in position. It is effective only in position synchro mode (**20.34** ≠ 0) and if the position shift is selected (**18.35** = 1). Its variation range corresponds to a user unit.

Example: If the user expresses in degrees the movement of its slow shaft, value 360 shall be obtained for 1 low shaft turn.

19.07 to **19.10** : Not used

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19.11 : Selection of the ratio to be settled

This parameter is used to select the number of the ratio to be adjusted. The setting of its value is performed by parameters **19.12** to **19.14**.

Example of ratio selection:

The ratios are of the 1.23456789 kind. They are stored in the internal drive parameters.

In order to read or write ratio 0 having a value 1.23456789, it is necessary to program **19.11** = 0 and the contents of the other parameters shall be :

19.12 = 1,

19.13 = 2345,

19.14 = 6789.

19.12 : Unit of the ratio to be set

This parameter sets the unit of the ratio selected by parameter **19.11**.

19.13 : First 4 decimals of the ratio to be set

This parameters sets the first 4 decimals of the ratio selected by parameter **19.11**.

19.14 : Last 4 decimals of the ratio to be set

This parameter sets the last 4 decimals of the ratio selected by parameter **19.11**.

19.15 : Numerator kinematics ratio

It is used to set the product of driving drives.

19.16 : Denominator kinematics ratio

It is used to set the product of driven drives.

19.17 to **19.22** : Not used

19.23 : Number of external sensor fronts

For the fixed shift function by sensors, this parameter is used to accept a number of different fronts (the number of slave sensor fronts can be higher or lower than the number generated by the master).

Nevertheless, if the number of additional or lacking fronts exceeds the set value, the drive stops in "t089".

19.24 : Ratio scaling

The coefficient multiplies the shift increase **20.31**.

This parameter is used for the scaling of the ratio shift (**18.35** = 0).

19.25 : Master speed reference

It is used to set the master speed reference which facilitates the the anticipation of transient phases.

19.26 : Shift offset

It is used to introduce an additional position shift.

19.27 : Position shift selection

0: the position shift is performed by inputs I₊ and I₋.

1: the position shift is fixed by **19.29 (see **19.45**).**

2: the position shift is performed on Top 0 (indexation after synchronisation).

3: the position shift is performed on the external sensors (1 master sensor and 1 slave sensor).

19.28 : Number of sensor tops

It sets the number of external sensor tops in order to measure the shift, to take into account the position correction.

19.29 : Fixed shift

It is used to set a fixed shift in position (scaling by **19.30**).

19.30 : Scaling of the position shift

It is a reduction ratio to associate the shift values to the movement performed by the drive slow shaft.

Example:

The drive is a turntable so the movement unit shall be an angle expressed in degrees. With a 10 gear motor, **19.30** = $360^\circ/10 = 36$.

For a 90° shift value, the movement shall be:

Movement (encoder) = $90 \times 65536 / 36 = 163840 \Rightarrow 2.5$ motor turns.

With a 65536 encoder points = 1 motor turn.

19.31 : Synchronisation Ok

Output (terminal 24) validated when the synchronisation error is the window set in **20.27** (in absolute value).

19.32 : Synchronisation performed

The parameter changes to 1 when the slave axis catches the speed of the master axis.

(information about the change from speed control to position control).

19.33 : Synchronisation validated

This output (terminal 25) indicates the taking into account of the run command and the correct operation of the SM-SYN module.

19.34 : Not used

19.35 : Validated fixed shift

OFF (0): validated fixed shift during the first correction performed by the external sensors.

On (1): fixed shift after the synchro run command.

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19.36 : External sensor input selection

Selection of the input type used for external sensor signals.
0: parameters 19.37 and 19.38 can be assigned to logic inputs managing external sensor tops (master and slave).

1: possibility to manage the external sensor tops by quick inputs (quick inputs of an SM-Applications module).

19.37 : Master sensor assignement

If the external master sensor goes via a drive logic input, it must be assigned to this parameter.

19.38 : Slave sensor assignment

If the external slave sensor goes via a drive logic input, it must be affected to this parameter.

19.39 : Not used

19.40 : Direct / coded mode

OFF (0): direct mode is selected, 6 ratios are possible (ratio 0 to ratio 5).

On (1): the coded mode is selected, 32 ratios or 16 ratios are possibles, according to the parity **19.41**.

19.41 : Parity

OFF (0): parity mode is not enabled, inputs I₁ to I₅ allow 32 ratios.

On (1): in code mode, this parameter is used to select 16 ratios with inputs I₁ to I₄, and input I₅ is used to obtain an odd coding in the Carnot table. This mode is used for safety reasons.

19.42 : Constant front / rising front

OFF (0): inputs must be constant in order that the ratio selection be validated.

On (1): the ratio is validated on the rising front of inputs. (Used only in direct mode **19.40** = 0).

19.43 : Stall direction validation

When this parameter is validated **19.43** = On (1), it avoids reverse rotations during stall on top 0 of the slave axis.

19.44 : Position shift speed selection

OFF (0): the speed during shift is fixed and limited by parameter 20.32.

On (1): the speed during shift is variable and limited by parameter **20.33**.

19.45 : Rising front / downward front

OFF (0): taking into account the run command on rising front.

On (1): taking into account the run command on downward front.


It is used so as not to shift the first time (concerns **19.27** = 1).

H5.3 - Explanation of menu 20 parameters

20.01 : Restoring the synchro factory settings

This parameter starts an automatic procedure of return to the factory settings specific to the synchronisation application.

To validate the return to factory settings, follow the procedure below:

Parameter	Setting	Description	Validation
0.00	1233	European factory settings configuration (50 Hz)	Press the reset button 
	or 1244	USA factory settings configuration (60 Hz)	
20.01	2047	Synchronisation program initialisation	



• Check that the motor is stopped and that there is no problem related to the system security.

Synchronisation parameter cloning

This parameter is used to save or to load the synchronisation parameters of menus 20, 70 and 71 by using the SMARTCARD.

Parameter	Setting	Description
20.01	3333	Saving of menus 20, 70 and 71 on the SMARTCARD
20.01	6666	Loading of menus 20, 70 and 71 from the SMARTCARD to the drive

20.02 to 20.09 : Not used

20.10 : Proportional gain of the position loop

It controls the proportional gain of the position loop.

20.11 : Integral gain of the position loop

It controls the integral gain of the position loop.

20.12 : Gain derived from the position loop

It controls the gain derived from the position loop.

20.13 and 20.14 : Not used

20.15 : Fault validation

For a binary conversion, this parameter is used to validate the faults related to the synchronisation application.

2: it validates the fault t081 "speed follow-up".

4: it validates the fault t082 "position follow-up".

64: it validates the fault t086 "tracing between master and slave encoder".

256: it validates the fault t088 "additional module placement fault".

512: it validates the fault "external sensor fault" (see **19.23**).

20.16 to 20.18 : Not used

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20.19 : Bus control word mask

The mask is used to validate the bits of the control word (**18.29**) and thus to mix the command by field bus and logic inputs.

Example :

20.19 = 15 = 0000 0000 0000 1111

bit 0 = 1 : resets drive **10.33** by command word.,

bit 1 = 1 : validation of the synchro command **18.41** by command word.

bit 2 = 1 : validation of I₊ **18.43** by command word.

bit 3 = 1 : validation of I₋ **18.44** by command word.

bit 4 = 0 : input I₁ **18.46** is not commanded by command word.

bit 5 = 0 : input I₂ **18.47** is not commanded by a command word.

...

Remark : check whether the destination of the digital inputs corresponds or not to the bit commanded by the field bus.

Example:

8.25 = **18.41** (synchro command).

Use **8.25** = **0.00**, the logic input terminal 28 is not used to control the run command.

20.20 : Not used

20.21 : Maximum slave speed

It is the maximum limitation of the position loop output speed. The maximum motor speed is fixed by parameter **1.06**.

20.22 : Manu slave speed

It is the speed of the slave axis in manual run, enabled by inputs I₊ or I₋.

20.23 : Slow shaft encoder reduction

When the slave encoder is installed on the slow shaft, this parameter controls the reduction ratio between motor and encoder.

20.24 : Position shift acceleration time

It determines the time to accelerate from 0 to 1000min⁻¹. In order to set the time to the maximum speed, it is necessary to set the relation between the time at 1000min⁻¹ and the maximum speed.

20.25 : Position shift deceleration time

It determines the time to change from 1000 min⁻¹ to 0. In order to set the time from maximum speed to 0 speed, it is necessary to set the relation between the time at 1000 min⁻¹ and the maximum speed.

20.26 : S ramp

20.27 : Synchro window

It manages the Synchro OK information. The "Synchro OK" output (terminal 24) changes to 1 when the synchro error is lower than the value set in **20.27**, in absolute values.

In the synchro mode is in speed, the window in which the synchro is OK is expressed in min⁻¹.

If the synchro mode is in position, the window in which the synchro is ok is expressed in encoder points.

20.28 and **20.29** : Not used

20.30 : Maximum master speed

It is used to scale the analogue input 5 for the master reference.

20.31 : Shift increment

It controls the shift increment for the ratio or for the position, controlled by inputs I₊ or I₋.

20.32 : Shift maximum fixed speed

Maximum speed limitation to stall back the slave axis.

20.33 : Shift maximum variable speed

Speed maximum limitation to restall the slave axis. It is proportional to the slave speed at the moment of restall.

20.34 : Synchronisation mode

It defines the synchronisation mode between the slave axis and the master axis.

0 : speed synchronisation.

1 : synchronisation in non rigid position.

2 : synchronisation in rigid position.

20.35 : Speed error threshold

Threshold starting from which a fault t081 occurs if validated by **20.15**.

20.36 : Error threshold in position

Threshold starting from which a fault t082 occurs if validated by **20.15**.

(1 encoder turn corresponds to 65536 points).

20.37 and **20.38** : Not used

20.39 : Encoder follow-up error threshold

Threshold starting from which a fault t086 occurs if validated by **20.15**.

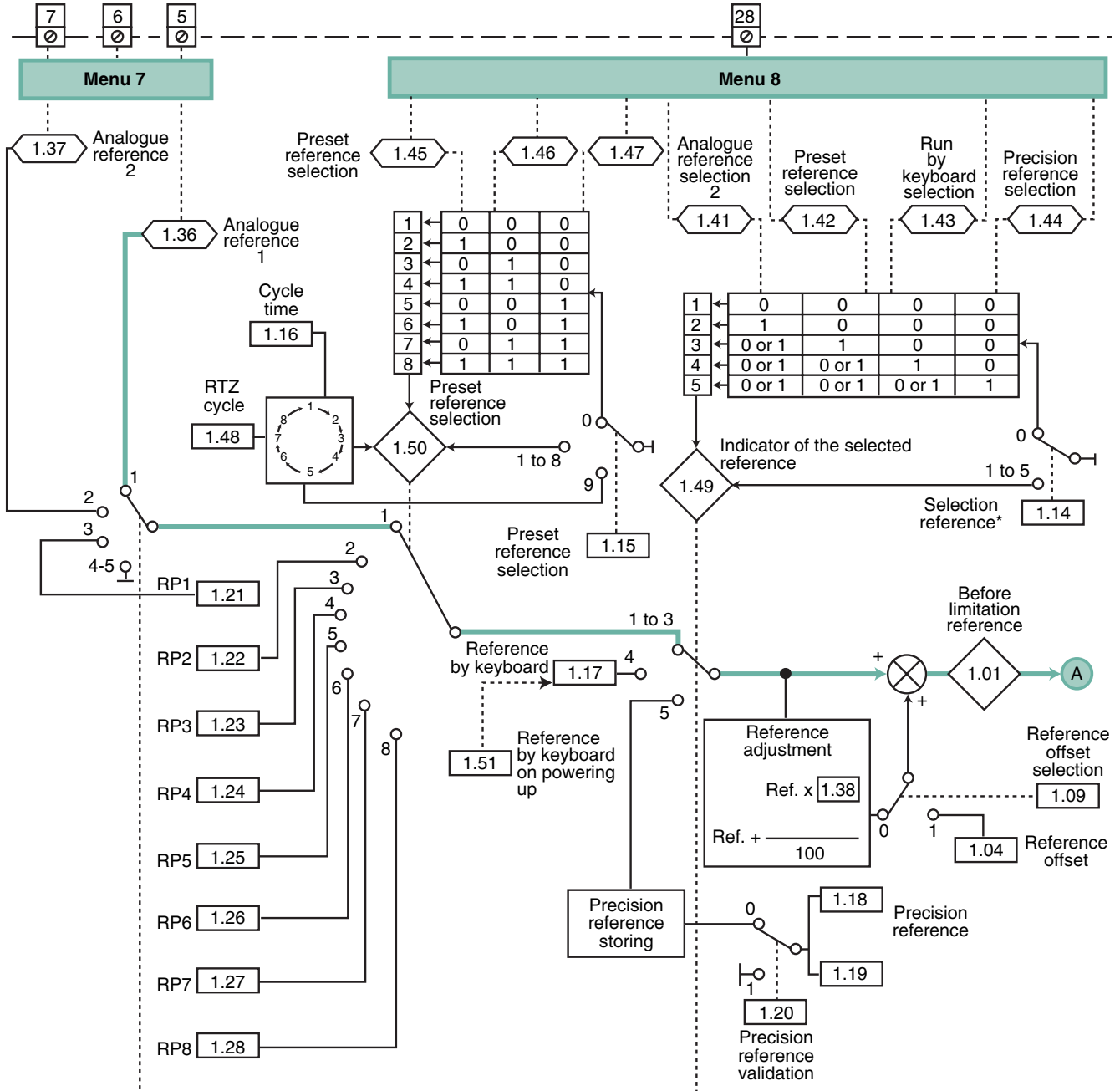
(1 encoder turn corresponds to 65536 points).

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Mise en service

H6 - Synoptiques des menus de base

H6.1 - Menu 1 : Frequency or speed reference (selections - limitations - or filters)

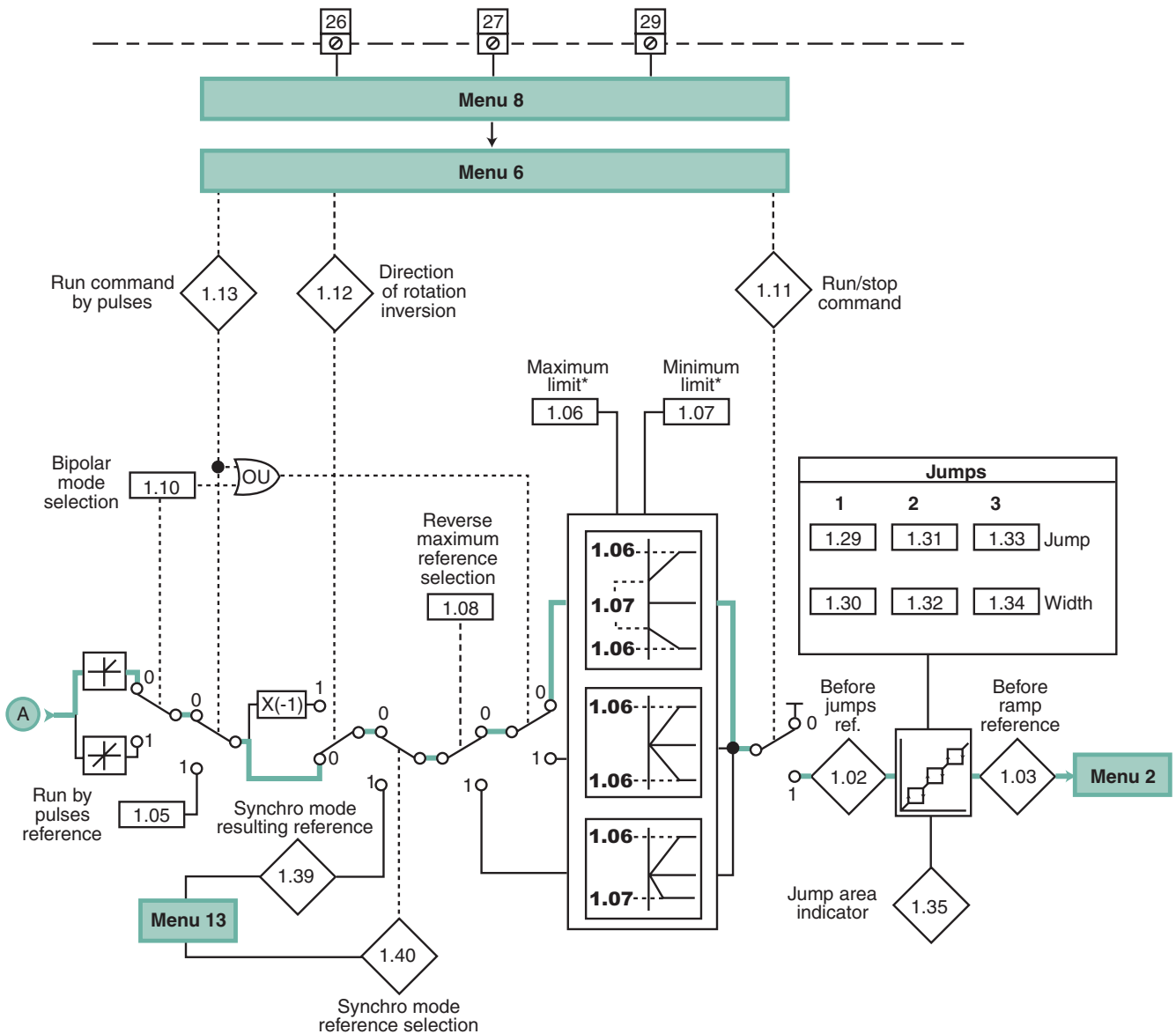


Parameters	Variation range		Factory settings		
1.01	± REF. MAX		-		
1.04	± 3000.0 Hz	± 40000.0 min ⁻¹	0		
1.14	A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), Pad (4), Prc (5)		A1.A2 (0)		
1.16	0 to 400.0 s		10.0 s		
1.17 - 1.18 - 1.36 - 1.37 1.21 to 1.28	± REF. MAX		0		
1.19	0 to 0.099 Hz	0 to 0.099 min ⁻¹	0		
1.38	± 100.00 %		0		
1.48	OFF (0) or On (1)		OFF (0)		
1.51	rESet (0), LAsT (1), PrS1 (2)		rESet (0)		

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Mise en service

Menu 1 (continued)



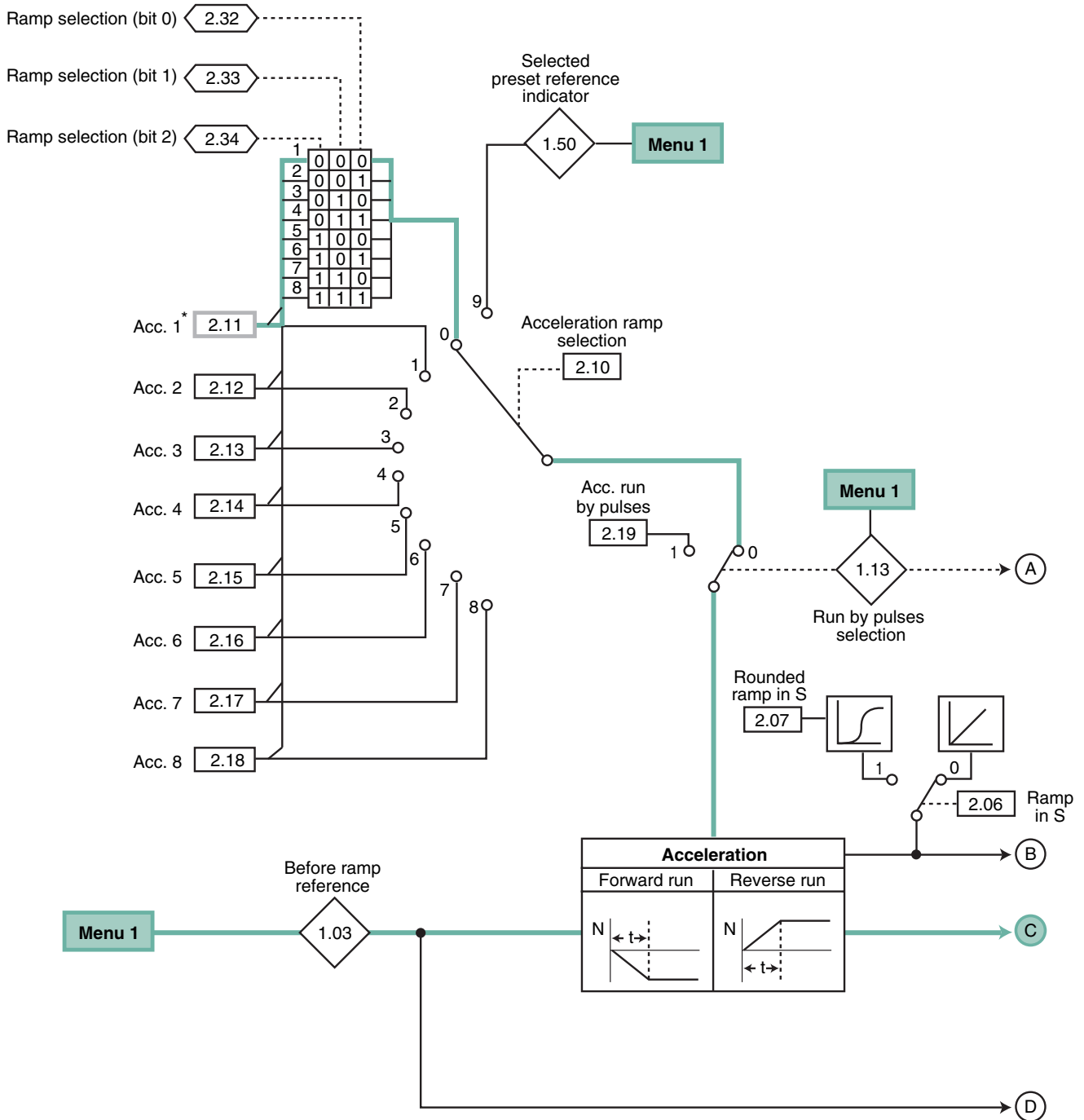
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range		Factory settings		
1.02 - 1.03	± REF. MAX		-		
1.05	0 to 400.0 Hz	0 to 4000.0 min ⁻¹	0		
1.06	0 to 3000.0 Hz	± LIN N. MAX	EUR : 50 Hz USA : 60 Hz	EUR : 1500.0 min ⁻¹ USA : 1800.0 min ⁻¹	3000.0 min ⁻¹
1.07	± 3000.0 Hz	± REF. MAX	0		
1.29 - 1.31 - 1.33	0 to 3000.0 Hz	0 to 40000 min ⁻¹	0		
1.30 - 1.32 - 1.34	0 to 25.0 Hz	0 to 250 min ⁻¹	0.5 Hz	5 min ⁻¹	
1.35	OFF (0) or On (1)		-		
1.39	± 3000.0 HZ	± 40000.0 min ⁻¹	-		

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Mise en service

H6.2 - Menu 2 : Ramps



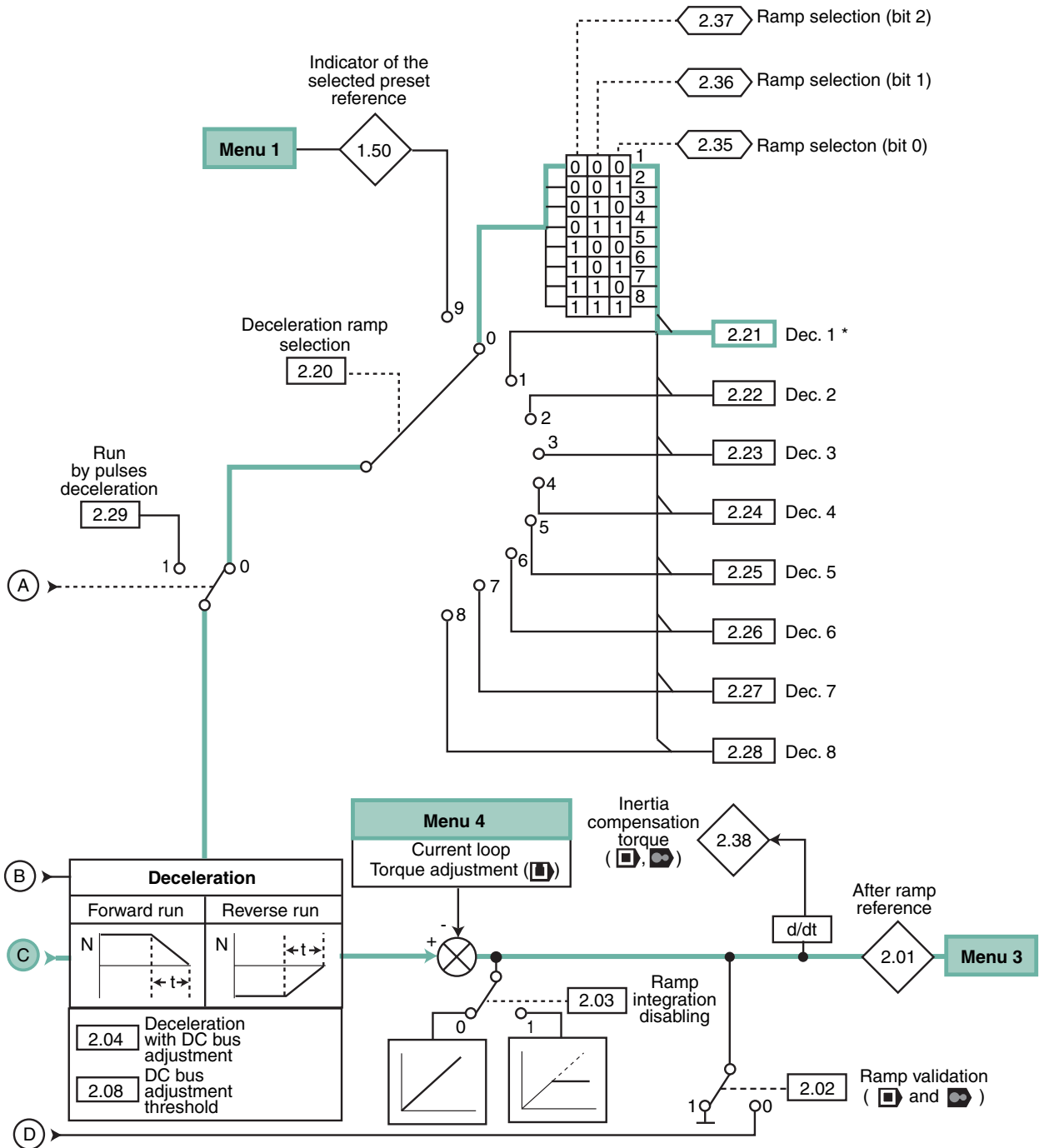
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range			Factory setting	
2.07	0 to 300.0s ² /	0 to 100.000s ² /1000min ⁻¹		3.1s ² /100Hz	1.500s ² /1000min ⁻¹
2.11 to 2.18	0 to 3200.0s/	0 to 3200.000 s/1000 min ⁻¹		5.0s/100Hz	2.000s/1000min ⁻¹
2.19	0 to 3200.0s/	0 to 3200.000 s/1000 min ⁻¹		0.2s/100Hz	0

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Mise en service

Menu 2 (continued)

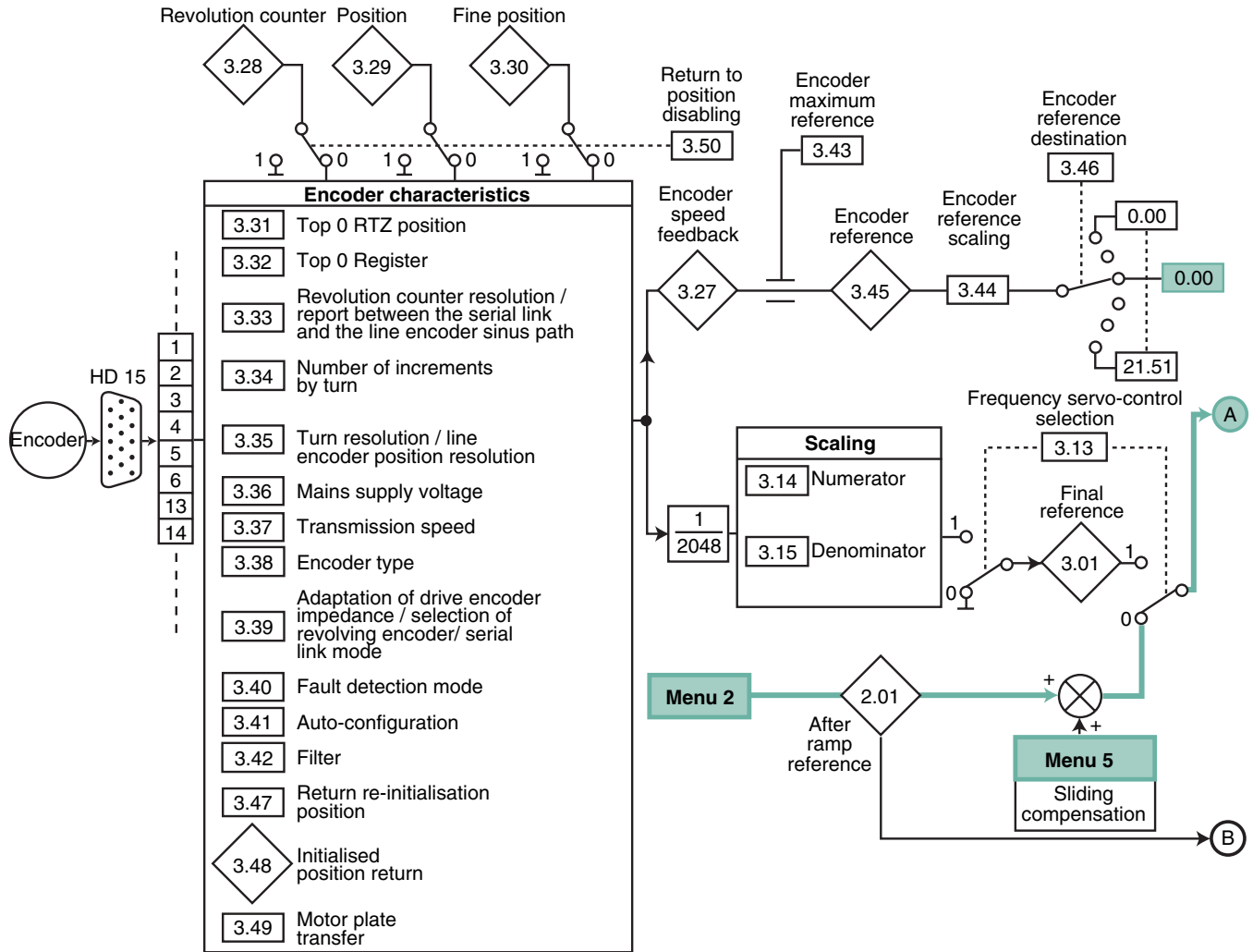




Parameters	Variation range			Factory settings		
2.01	± REF. MAX			-		
2.04	FASt (0), Std (1), Std.hV (2)	FASt (0), Std (1)		Std (1)		
2.08	0 to THRESHOLD U _{cc} MAX (V)			TL : 375V T : EUR = 750V / USA = 775V TM : 895V TH : 1075V		
2.21 to 2.28	0 to 3200.0s/100Hz	0 to 3200.000s/1000min ⁻¹		10.0s/100Hz	2.000s/1000min ⁻¹	0.0200s/1000min ⁻¹
2.29	0 to 3200.0s/100Hz	0 to 3200.000s/1000min ⁻¹		0.2s/100Hz	0	
2.38	-			± 1000.0 %		

UNIDRIVE SP

Mise en service

H6.3 - Menu 3 : Encoder input and speed loop in open loop

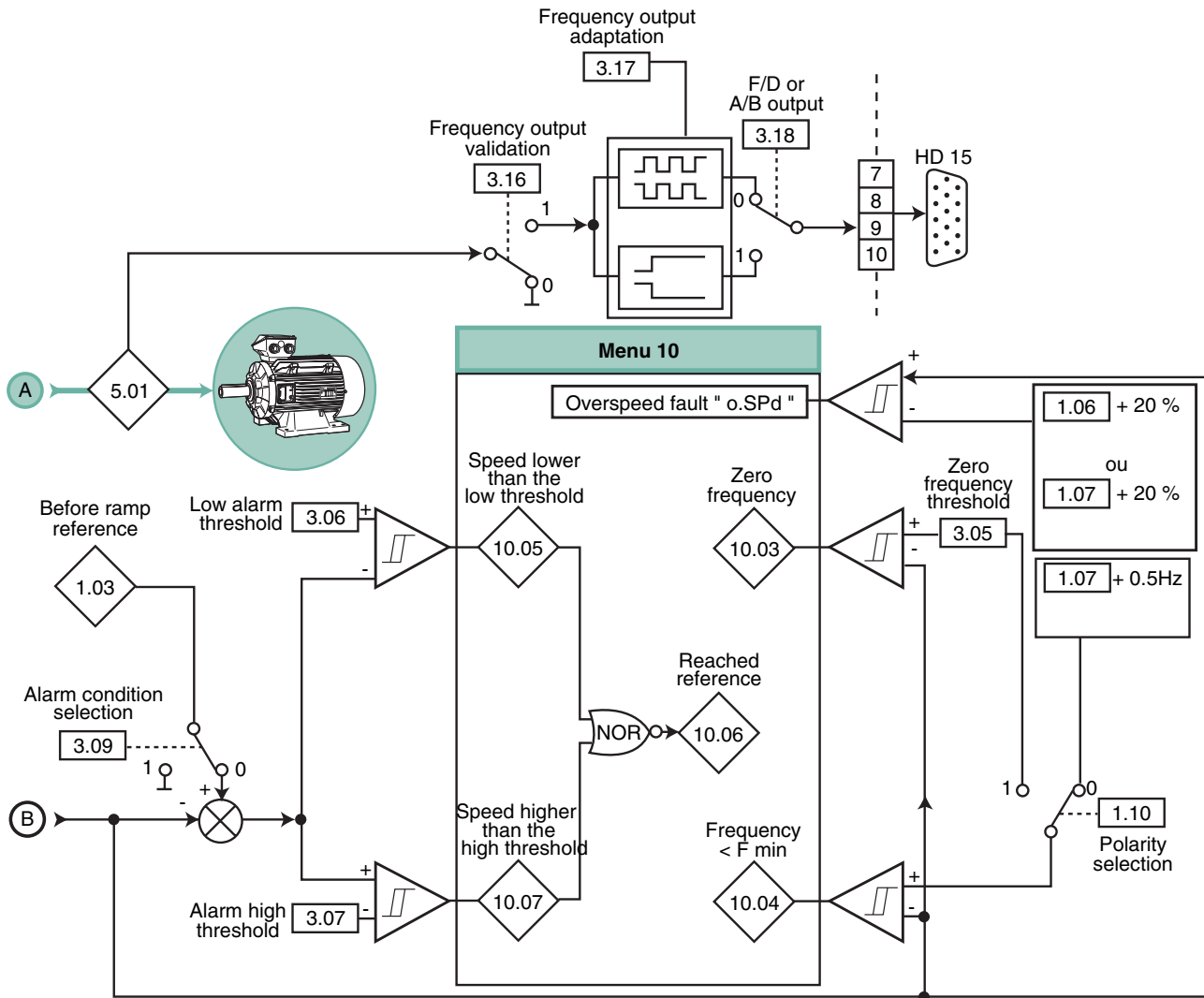


Parameters	Variation range 	Factory settings 
3.01	± 1000.0 Hz	-
3.14	0 to 1.000	1.000
3.15	0.001 to 1.000	1.000
3.27	± 40000.0 min ⁻¹	-
3.28	0 to 65535 tours	-
3.29	0 to 65535 (1/2 ¹⁶ per turn)	-
3.30	0 to 65535 (1/2 ³² per turn)	-
3.31 - 3.32 - 3.41 3.47 - 3.49	OFF (0) or On (1)	OFF (0)
3.33	0 to 255	16
3.34	0 to 50000	1024
3.35	0 to 32 bits	0
3.36	5V (0), 8V (1), 15V (2)	5V (0)
3.37	100 (0), 200 (1), 300 (2), 400 (3), 500 (4), 1000 (5), 1500 (6), 2000 (7) K Bauds	300 (2) K Bauds
3.38	Ab (0), Fd (1), Fr (2), Ab.SErvo (3), Fd.SErvo (4), Fr.SErvo (5), SC (6), SC.Hiper (7), EndAt (8), SC.EndAt (9), SSI (10), SC.SSI (11)	Ab (0)
3.39	0 to 2	1
3.40	0 to 3	0
3.42	0 to 5 (0 to 16 ms)	0
3.43	0 to 40000 min ⁻¹	1500 min ⁻¹
3.44	0 to 4.000	1.000
3.45	± 100.0 %	-
3.48	OFF (0) or On (1)	-

UNIDRIVE SP

Mise en service

Menu 3 in open loop (continued)



According to the encoder type, set at least the parameters below

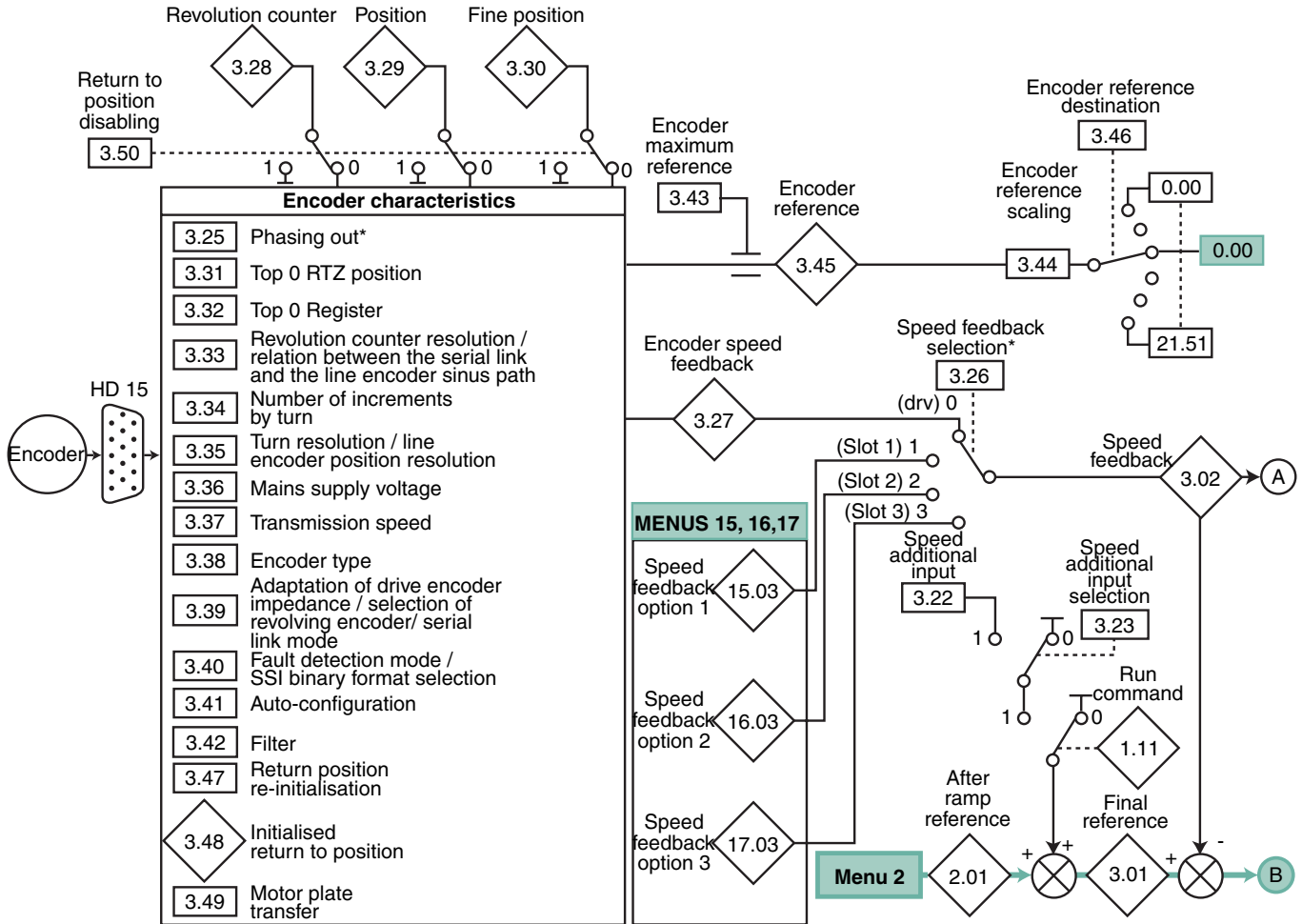
Incremental encoder or SinCos without serial link	SinCos encoder with Hiperface or EndAt link or EnDat encoder	SinCos encoder with SSI link or SSI encoder
3.34 : ELPR (0 to 50000) 3.36 : Voltage 3.38 : Type	3.36 : Voltage 3.37 : Transmission speed (accept the encoder with Hiperface link) 3.38 : Type 3.41 : Auto-configuration	3.33 : Number of turns 3.34 : ELPR (only for a SinCos encoder) 3.35 : Resolution 3.36 : Voltage 3.37 : Transmission speed 3.38 : Type 3.41 : SSI format selection

Parameters	Variation range	Factory settings
3.05	0 to 20.0 Hz	1.0 Hz
3.06 - 3.07	0 to 3000.0 Hz	1.0 Hz
3.17	OFF (0) or On (1)	On (1)





UNIDRIVE SP

Mise en service

H6.4 - Menu 3 : Encoder input and speed loop in closed loop and servo and



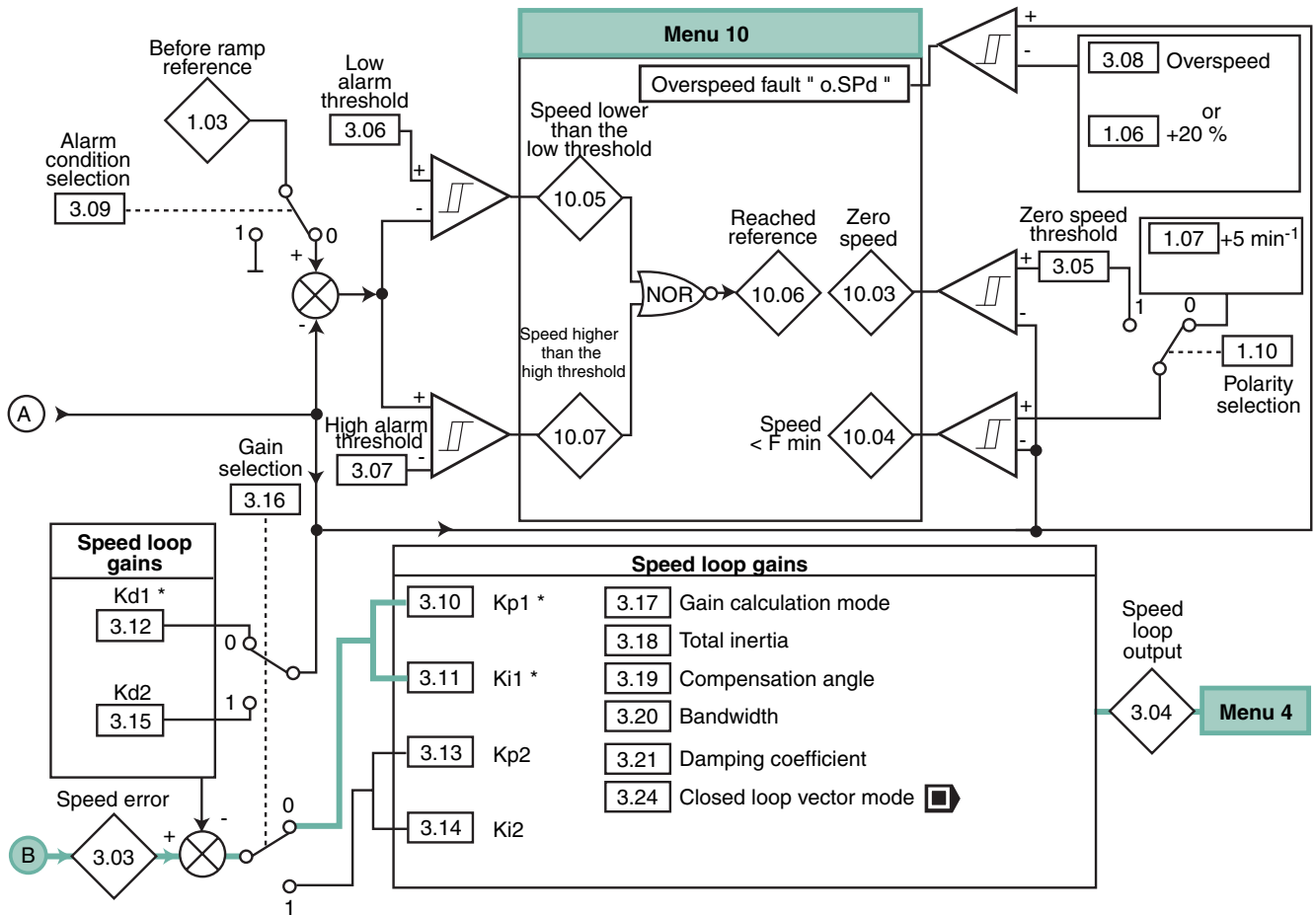
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range		Factory settings	
				
3.01 - 3.02	± N MAX		-	
3.22	± REF. MAX		0	
3.25	-	0 to 359.9°	-	0
3.27	± 40000.0 min ⁻¹		-	
3.28	0 to 65535 turns		-	
3.29	0 to 65535 (1/2 ¹⁶ th of turn)		-	
3.30	0 to 65535 (1/2 ³² th of turn)		-	
3.31 - 3.32 - 3.41 3.47 - 3.49	OFF (0) or On (1)		OFF (0)	
3.33	0 to 255		16	
3.34	0 to 50000		1024	4096
3.35	0 to 32 bits		0	
3.36	5V (0), 8V (1), 15V (2)		5V (0)	
3.37	100 (0), 200 (1), 300 (2), 400 (3), 500 (4), 1000 (5), 1500 (6), 2000 (7), 4000 (8) KBaud		300 (2) KBaud	
3.38	Ab (0), Fd (1), Fr (2), Ab.SErvo (3), Fd.SErvo (4), Fr.SErvo (5), SC (6), SC.Hiper (7), EndAt (8), SC.Endat (9), SSi (10), SC.SSi (11)		Ab (0)	Ab.SErvo (3)
3.39	0 to 2		1	
3.40	0 to 7		1	
3.42	0 to 5 (0 to 16ms)		0	
3.43	0 to 40000 min ⁻¹		1500 min ⁻¹	3000 min ⁻¹
3.44	0 to 4.000		1.000	
3.45	± 100.0 %		-	
3.48	OFF (0) or On (1)		-	

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Mise en service

Menu 3 in closed loop and servo (continued)



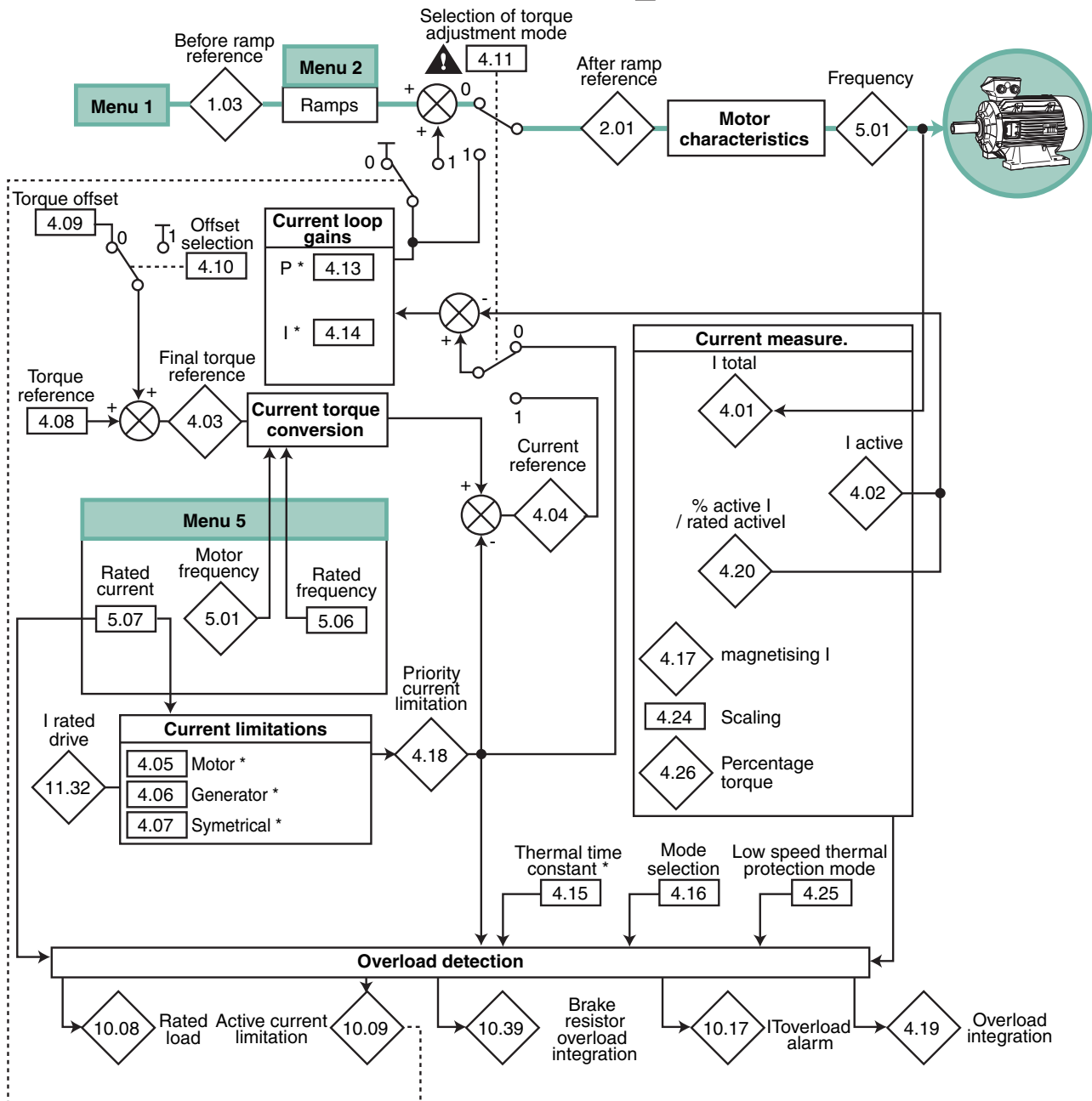
According to the encoder type, set at least the parameters below

Incremental encoder or SinCos without serial link	SinCos encoder with Hiperface or EndAt link or EnDat encoder	SinCos encoder with SSI link or SSI encoder
3.34 : ELPR (0 to 50000) 3.36 : Voltage 3.38 : Type	3.36 : Voltage 3.37 : Transmission speed (except the encoder with Hiperface link) 3.38 : Type 3.41 : Auto- configuration	3.33 : Number of turns 3.34 : ELPR (only for a SinCos encoder) 3.35 : Resolution 3.36 : Voltage 3.37 : Transmission speed 3.38 : Type 3.41 : SSI format selection



Parameters	Variation range		Factory settings	
3.03	± N MAX		-	
3.04	± Δ _{ACTIVE} MAX (%)		-	
3.05	0 to 200 min ⁻¹		5 min ⁻¹	
3.06 - 3.07	0 to 40000 min ⁻¹		5 min ⁻¹	
3.08	0 to 40000 min ⁻¹		0	
3.10 - 3.13	0 to 6.5535 (1/rads ⁻¹)		0.0100 (1/rads ⁻¹)	
3.11 - 3.14	0 to 655.35 (1/rad)		1.00 (1/rad)	
3.12 - 3.15	0 to 0.65535 (s)		0	
3.17	0 to 3		0	
3.18	0 to 100.0000 kgm ²		0	
3.19	0 to 359.9 °		4.0 °	
3.20	0 to 255 Hz		10 Hz	
3.21	0 to 10.0		1.0	
3.24	0 to 3	-	0	-

UNIDRIVE SP Mise en service

H6.5 - Menu 4 : Current loop, torque adjustment in open loop



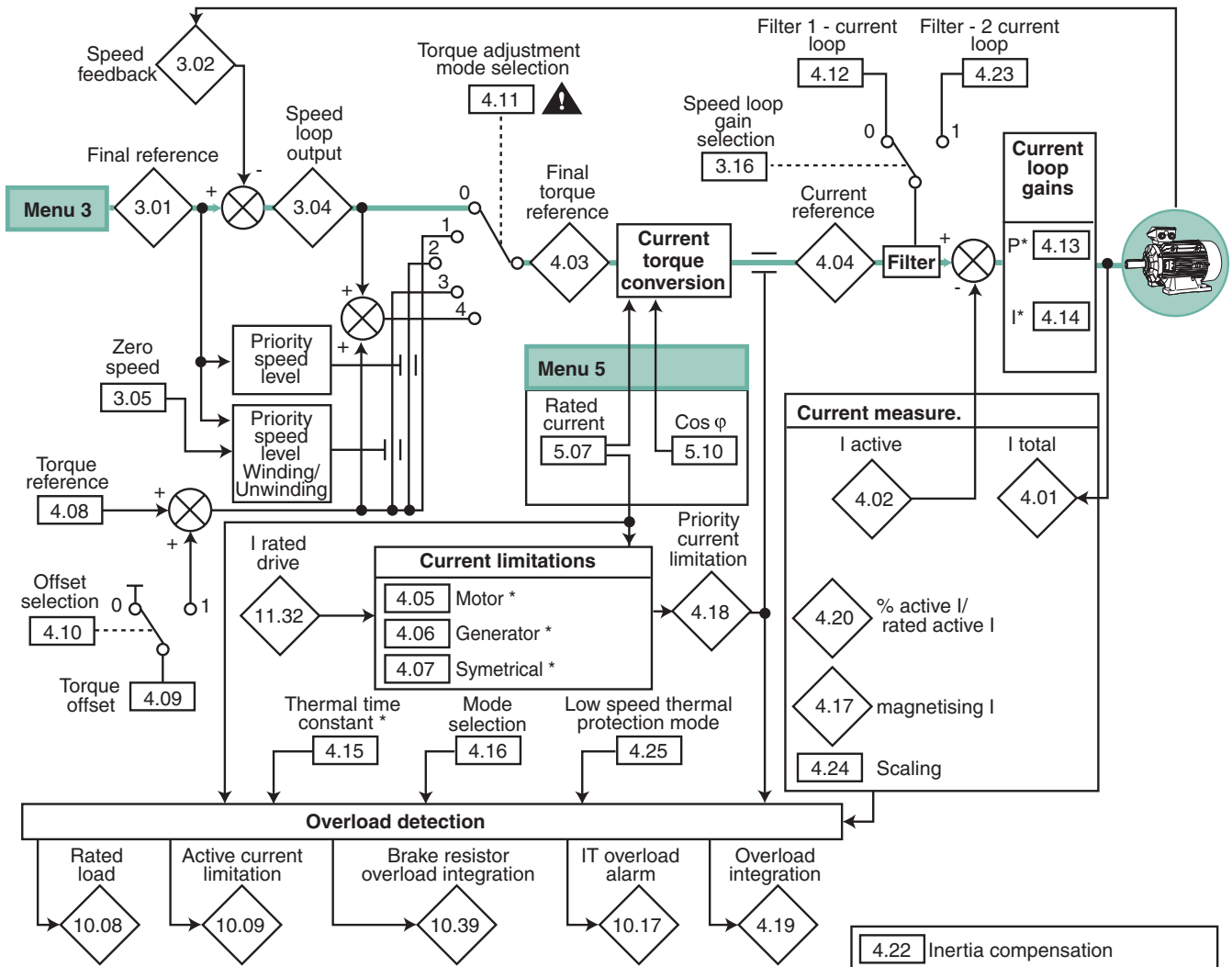
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range 	Factory settings 
4.01	0 to I_{MAX} VAR (A)	-
4.02 - 4.17	$\pm I_{MAX}$ VAR (A)	-
4.03 - 4.04 - 4.18	$\pm I_{ACTIVE MAX}$ (%)	-
4.05 - 4.06 - 4.07	0 to LIM. IM1 MAX (%)	165.0 %
4.08 - 4.09	$\pm I_{MAX}$ UTIL. (%)	0
4.13	0 to 30000	20
4.14	0 to 30000	40
4.15	0 to 400.0 s	89.0 s
4.16 - 4.25	OFF (0) or On (1)	OFF (0)
4.19	0 to 100.0 %	-
4.20	$\pm I_{MAX}$ UTIL. (%)	-
4.24	0 to $I_{ACTIF MAX}$ (%)	165.0 %
4.26	$\pm I_{MAX}$ UTIL. (%)	-

UNIDRIVE SP

Mise en service

H6.6 - Menu 4 : Current loop, torque adjustment in closed loop



- ⚠ When the torque command mode without speed control is validated (4.11 = 1) and on the zero resistant torque, the drive accelerates up to the overspeed threshold 3.08 (stop). If 3.08 is at 0, the maximum speed reached will be 1.06 + 20 %.
- When modes 2 or 3 are selected, the drive does not take into account the stopping mode set and generates a stop without ramp.

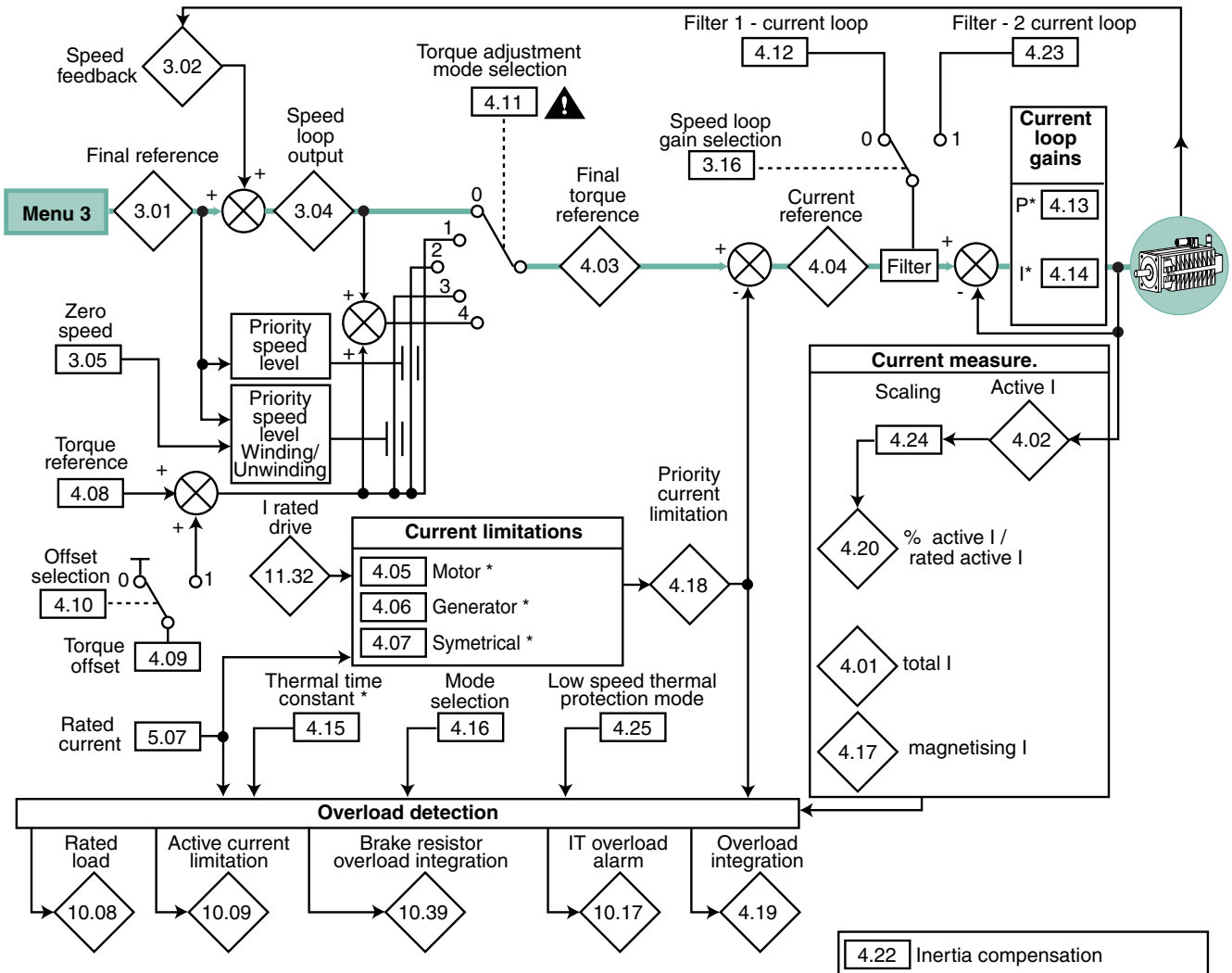
* When motor 2 is selected (11.45 = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range	Factory settings
4.01	0 to I_{MAX} VAR (A)	-
4.02 - 4.17	$\pm I_{MAX}$ VAR (A)	-
4.03 - 4.04 - 4.18	$\pm I_{ACTIVE MAX}$ (%)	-
4.05 - 4.06 - 4.07	0 to LIM. IM1 MAX (%)	175.0 %
4.08 - 4.09	$\pm I_{MAX}$ UTIL. (%)	-
4.12 - 4.23	0 to 25.0 ms	0
4.13	0 to 30000	TL : 75 / T : 150 / TM : 180 / TH : 215
4.14	0 to 30000	TL : 1000 / T : 2000 / TM : 2400 / TH : 3000
4.15	0 to 400.0 s	89.0 s
4.16 - 4.22 - 4.25	OFF (0) or On (1)	OFF (0)
4.19	0 to 100 %	-
4.20	$\pm I_{MAX}$ UTIL. (%)	-
4.24	$\pm I_{ACTIVE MAX}$ (%)	175.0 %

UNIDRIVE SP

Mise en service

H6.7 - Menu 4 : Current loop, servo torque adjustment



⚠ When the torque command mode without speed control is validated (4.11 = 1) and on the zero resistant torque, the drive accelerates up to the overspeed threshold 3.08 (stop). If 3.08 is at 0, the maximum speed reached will be of 1.06 + 20 %.

- When the modes 2 or 3 are selected, the drive does not take into account the stopping mode set and generates a stop without ramp.

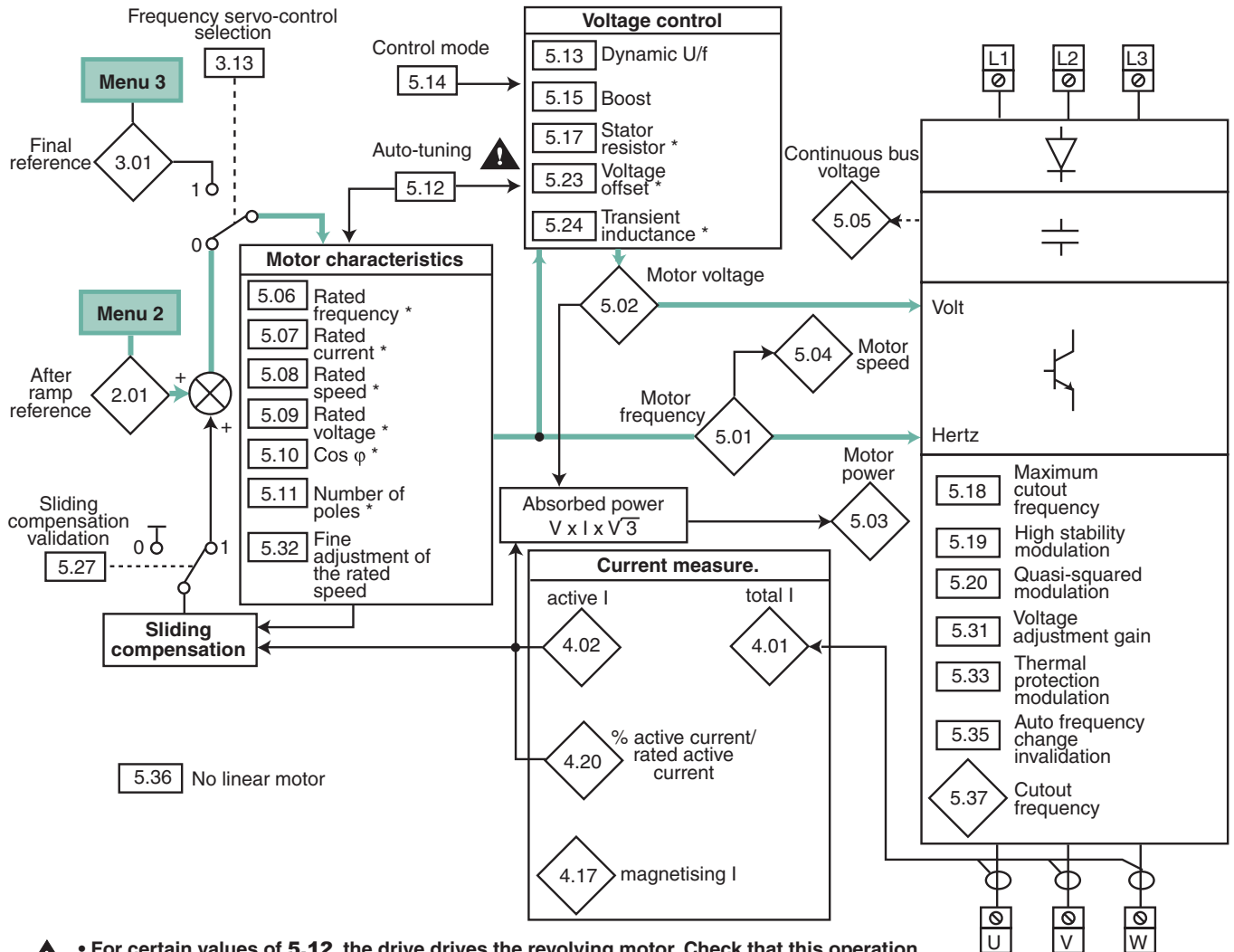
* When motor 2 is selected (11.45 = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range	Factory settings
4.01	0 to I _{MAX} VAR (A)	-
4.02 - 4.17	± I _{MAX} VAR (A)	-
4.03 - 4.04 - 4.18	± I _{ACTIVE} MAX (%)	-
4.05 - 4.06 - 4.07	0 to LIM. IM1 MAX (%)	175.0 %
4.08 - 4.09	± I _{MAX} UTIL. (%)	-
4.12 - 4.23	0 to 25.0 ms	0
4.13	0 to 30000	TL : 75 / T : 150 / TM : 180 / TH : 215
4.14	0 to 30000	TL : 1000 / T : 2000 / TM : 2400 / TH : 3000
4.15	0 to 3000.0 s	20.0 s
4.16 - 4.22 - 4.25	OFF (0) or On (1)	OFF (0)
4.19	0 to 100 %	-
4.20	± I _{MAX} UTIL. (%)	-
4.24	± I _{ACTIVE} MAX (%)	175.0 %

UNIDRIVE SP



Mise en service

H6.8 - Menu 5 : Motor control in open loop



- For certain values of 5.12, the drive drives the revolving motor. Check that this operation is safe and that the motor is stopped before auto-tuning.
- After modification of the motor parameters, restart auto-tuning.

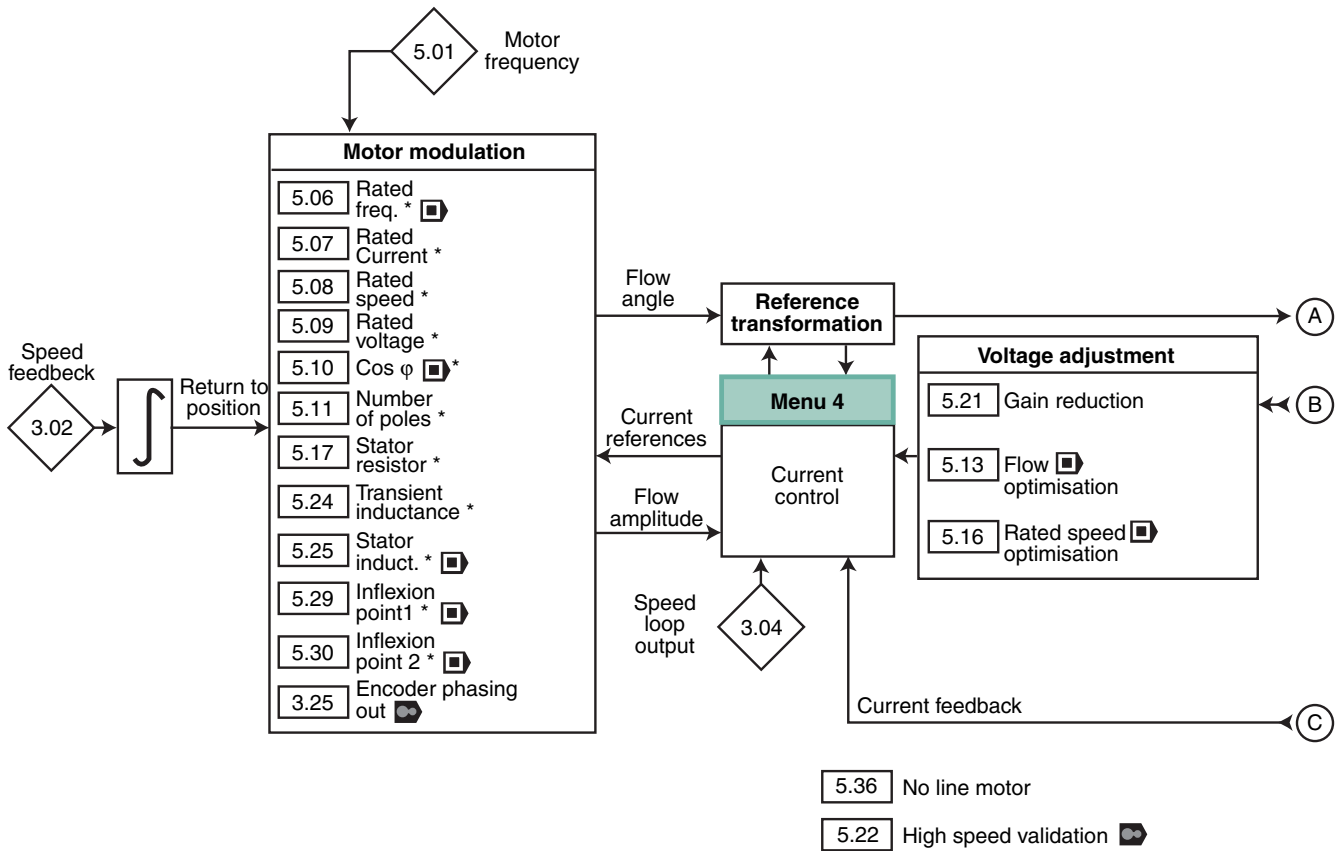
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range 	Factory settings 
5.01	± REF. MAX (Hz)	-
5.02	0 to U _{AC} OUT MAX (V)	-
5.03	± P MAX (kW)	-
5.04	± 180000 min ⁻¹	-
5.05	0 to U _{DC} MAX (V)	-
5.06	0 to 3000 Hz	EUR : 50.0 Hz / USA : 60.0 Hz
5.07	0 to I _N MAX (A)	I _{RATED} VAR (11.32)
5.08	0 to 180000 min ⁻¹	EUR : 1500 min ⁻¹ / USA : 1800 min ⁻¹
5.09	0 to U _{AC} MOT. MAX (V)	TL : 200V / T : EUR = 400V, USA = 480V / TM : 575V / TH : 690V
5.10	0 to 1.000	0.850
5.11	Auto to 120 Poles (0 to 60)	Auto (0)
5.12	0 to 2	0
5.13 - 5.35 - 5.19 - 5.20	OFF (0) or On (1)	OFF (0)
5.14	Ur_S (0), Ur (1), Fd (2), Ur_Auto (3), Ur_I (4), SrE (5)	Ur_I (4)
5.15	0 to 25.0 % de U _{RATED} MOT.	3.0 %
5.17	0 to 65.000 Ω	0
5.18	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz	3 (0) kHz
5.23	0 to 25.0 V	0
5.24	0 to 500.000 mH	0
5.31	0 to 30	1
5.36	0 to 655.35 mm	0
5.37	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5), 6 rEd (6), 12 rEd (7)	-

UNIDRIVE SP

Mise en service

H6.9 - Menu 5 : Motor control in closed loop and servo



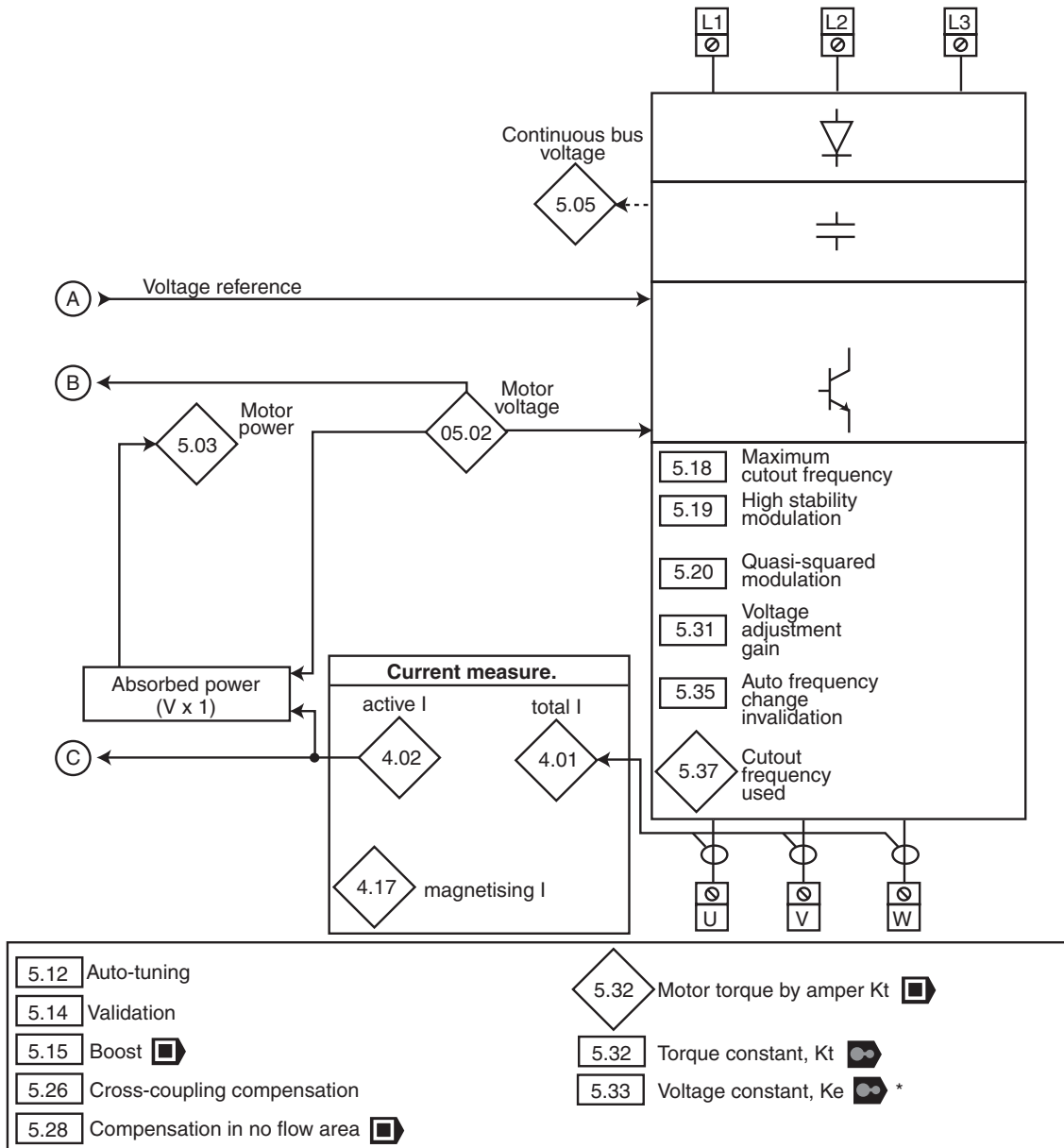
* When motor 2 is selected (**11.45** = On (1)), these parameters are no longer active and they are replaced by menu 21 parameters.

Parameters	Variation range		Factory settings	
5.01	± 1250.0 Hz		-	
5.06	0 to 1250.0 Hz	-	EUR : 50.0Hz / USA : 60.0Hz	-
5.07	0 to I_R MAX (A)		I_{RATED} VAR (11.32)	
5.08	0 to 40000.00 min ⁻¹		EUR : 1450.00 min ⁻¹ USA : 1770.00 min ⁻¹	3000.00 min ⁻¹
5.09	0 to U_{AC} MOT. MAX (V)		TL : 200V / T : EUR = 400V, USA = 480V / TM : 575V / TH : 690V	
5.10	0 to 1.000	-	0.850	-
5.11	Auto to 120POLE (0 to 60)		Auto (0)	6POLE (3)
5.13	OFF (0) or On (1)	-	OFF (0)	-
5.16	0 to 2	-	0	-
5.17	0 to 65.000 Ω		0	
5.21	OFF (0) or On (1)		OFF (0)	
5.22	-	OFF (0) or On (1)	-	OFF (0)
5.24	0 to 500000 mH		0	
5.25	0 to 5000.00 mH	-	0	-
5.29	0 to 100 % of the rated flux		50 %	-
5.30	0 to 100 % of the rated flux		75 %	-
5.36	0 to 655.35 mm		0	

UNIDRIVE SP

Mise en service

Menu 5 in closed loop and servo (continued)



- For certain values of **5.12**, the drive drives the revolving motor. Check that this operation is safe and that the motor is stopped before the auto-tuning.
- After the modification of the motor parameters, renew the auto-tuning.

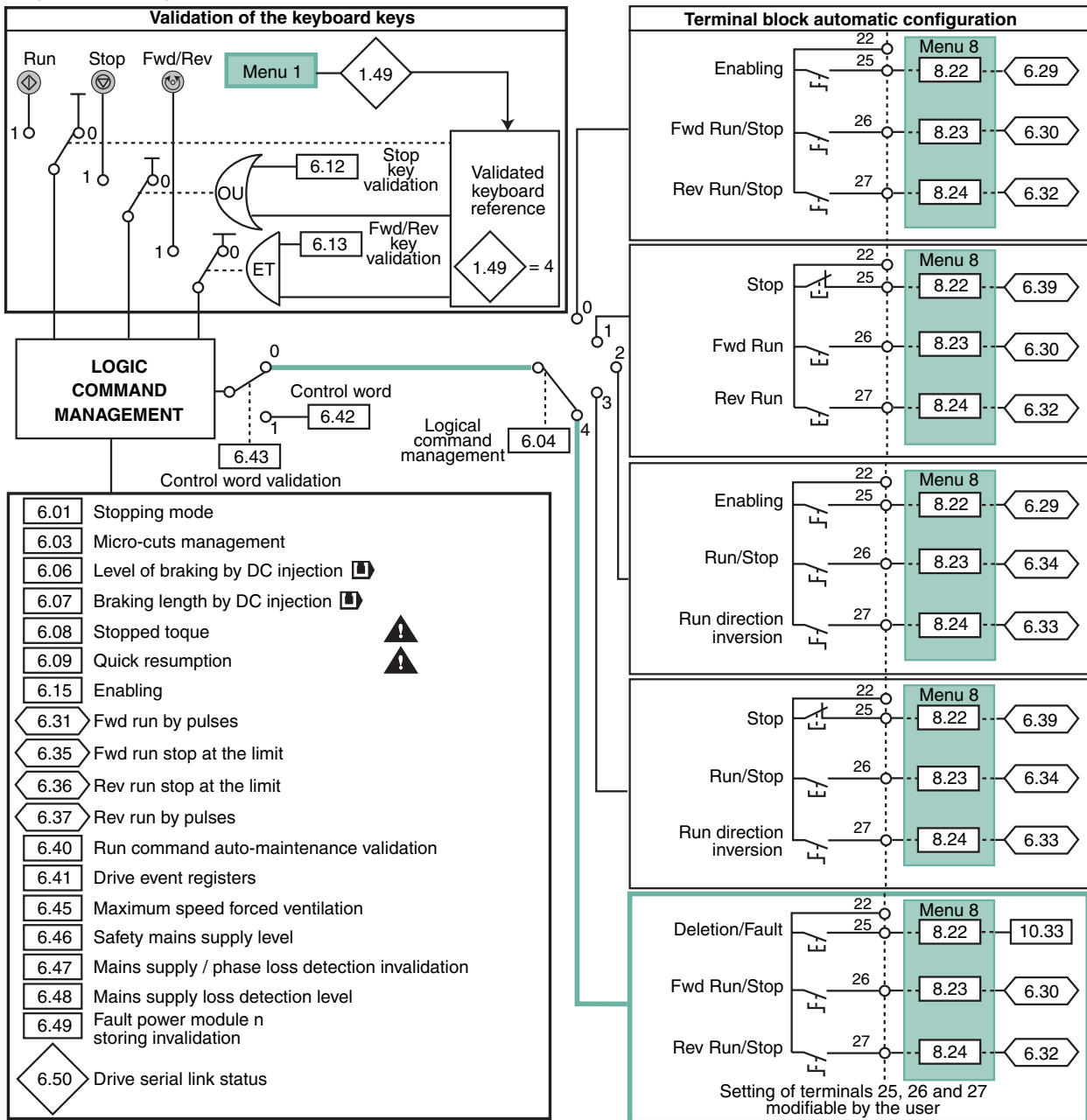
Parameters	Variation range		Factory settings	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.02	0 to $U_{AC\ OUT\ MAX}$ (V)		-	-
5.03	$\pm P\ MAX$ (kW)		-	-
5.05	0 to $U_{DC\ MAX}$ (V)		-	-
5.12	0 to 4	0 to 6	0	
5.14	-	nonE (0), PhEnI (1), PhInIt (2)	-	nonE (0)
5.15	0 to 25.0 % $U_{RATED\ MOT.}$	-	1.0	-
5.18	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz		3 (0) kHz	6 (2) kHz
5.19 - 5.20 - 5.26	OFF (0) or On (1)		OFF (0)	
5.35	OFF (0) or On (1)		OFF (0)	
5.28	OFF (0) or On (1)	-	OFF (0)	-
5.31	0 to 30		1	
5.32	0 to 500.00 NmA^{-1}		-	1.60 NmA^{-1}
5.33	-	0 to 10000 V	-	98 V
5.37	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5), 6 rEd (6), 12 rEd (7)		-	

UNIDRIVE SP

Mise en service

H6.10 - Menu 6 : Management of digital commands and meters

• Management of digital commands



⚠ • If the stopped torque is validated, voltage presence at the stopped motor terminals.
 • If the motor is just a little loaded, the quick resumption validation may cause the revolving of the machine in a non defined direction, with the motor acceleration. Make sure that there is no danger for persons and goods.

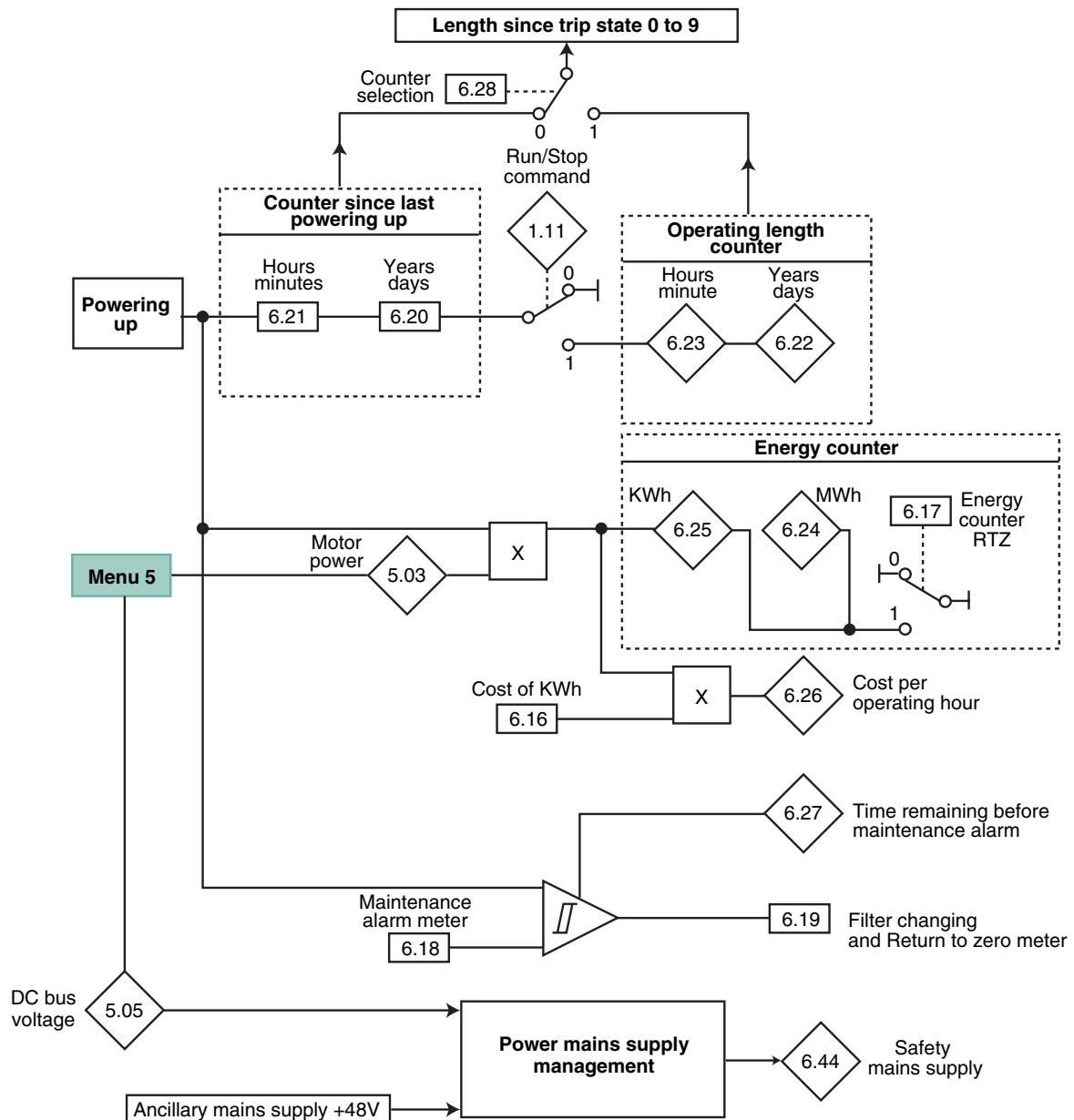
Parameters	Variation range			Factory settings	
	☑	☐	🔍	🔍	☑
6.01	COASt (0), rP (1), rP.dcl (2), dcl (3), td.dcl (4), disable (5)	COASt (0), rP (1), no.rP (2)		rP (1)	no.rP (2)
6.03	diS (0), StoP (1), ridE.th (2)			diS (0)	
6.06	0 to 150.0 %	-		100.0 %	-
6.07	0 to 25.0 s	-		1.0 s	-
6.08	OFF (0) or On (1)			OFF (0)	On (1)
6.09	0 to 3	0 to 1		0	1
6.12 - 6.13 - 6.30 - 6.31 - 6.32 - 6.33 - 6.34 - 6.35 - 6.36 - 6.37 - 6.39 - 6.40 - 6.45 - 6.47 - 6.49	OFF (0) or On (1)			OFF (0)	
6.15	OFF (0) or On (1)			On (1)	
6.29	OFF (0) or On (1)			-	
6.41	0 or 65535			0	
6.42	0 or 32767			0	
6.46	Size 1 : 48V, sizes 2 and 3 : 48V to 72V			48V	
6.48	0 to threshold U _{dc} MAX (V)			TL : 205V, T : 410V, TM : 540V, TH :	
6.50	Drv (0), Slot (1), Slot 2 (2), Slot 3 (3)			-	

UNIDRIVE SP

Mise en service

Menu 6 (continued)

• Time meters

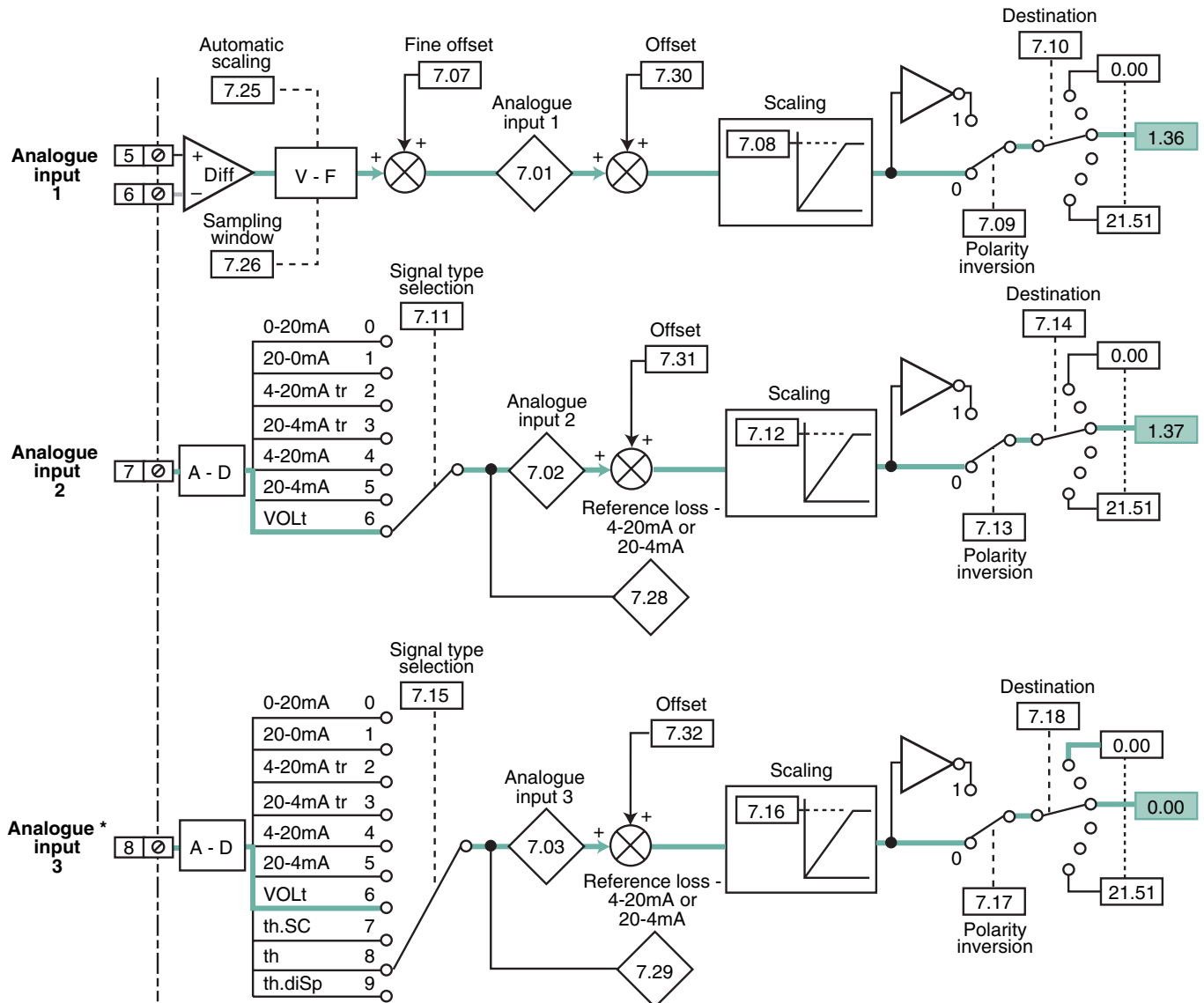


Parameters	Variation range			Factory settings		
6.16	0 to 600.0 device/kWh			0		
6.19 - 6.28	OFF (0) or On (1)			OFF (0)		
6.18	0 to 30000 h			0		
6.20 - 6.22	0 to 9365 years, days			-		
6.21 - 6.23	0 to 23.59 h, min			-		
6.24	0 to 999.9 MWh			-		
6.25	0 to 99.99 kWh			-		
6.26	± 32000 device/hours			-		
6.27	0 to 30000 h			-		
6.44	OFF (0) or On (1)			-		

UNIDRIVE SP

Mise en service

H6.11 - Menu 7 : Configuration of the analogue inputs - outputs



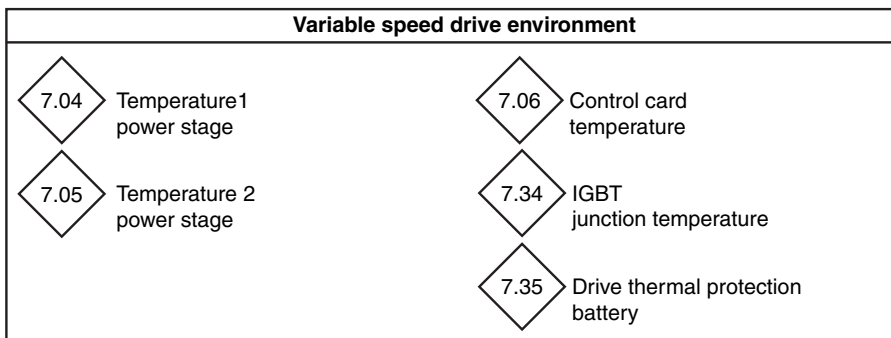
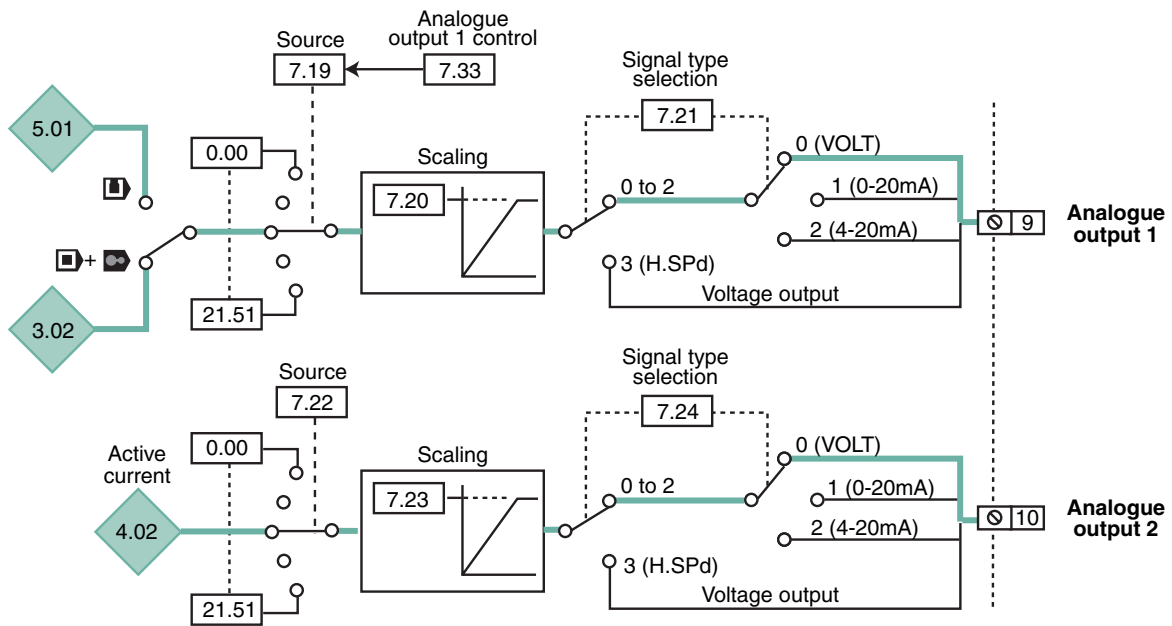
* Terminal 8 is internally connected to pin 15 of the HD-15 connector.
If the motor probes are connected to pin 15, terminal 8 is no longer available.

Parameters	Variation range			Factory settings		
7.01	± 100.00 %			-		
7.02 - 7.03	± 100.0 %			-		
7.07	± 10.000 %			0		
7.08 - 7.12 - 7.16	0 to 4.000			1.000		
7.25	OFF (0) or On (1)			OFF (0)		
7.26	0 to 8.0 ms			4.0 ms		
7.28 - 7.29	OFF (0) or On (1)			-		
7.30	± 100.00 %			0		
7.31 - 7.32	± 100.0 %			0		

UNIDRIVE SP


Mise en service



Menu 7 (continued)








Note : If the user wants to obtain the image of the speed on the analogue output 1, the output full scale value corresponds to the maximum value of the source parameter selected.

In factory settings (7.21 = VOLT (0)) :

- in , the selected source is **5.01** " motor frequency ", the analogue output will be full scale (9.8V) when REF MAX is reached (**1.06**),

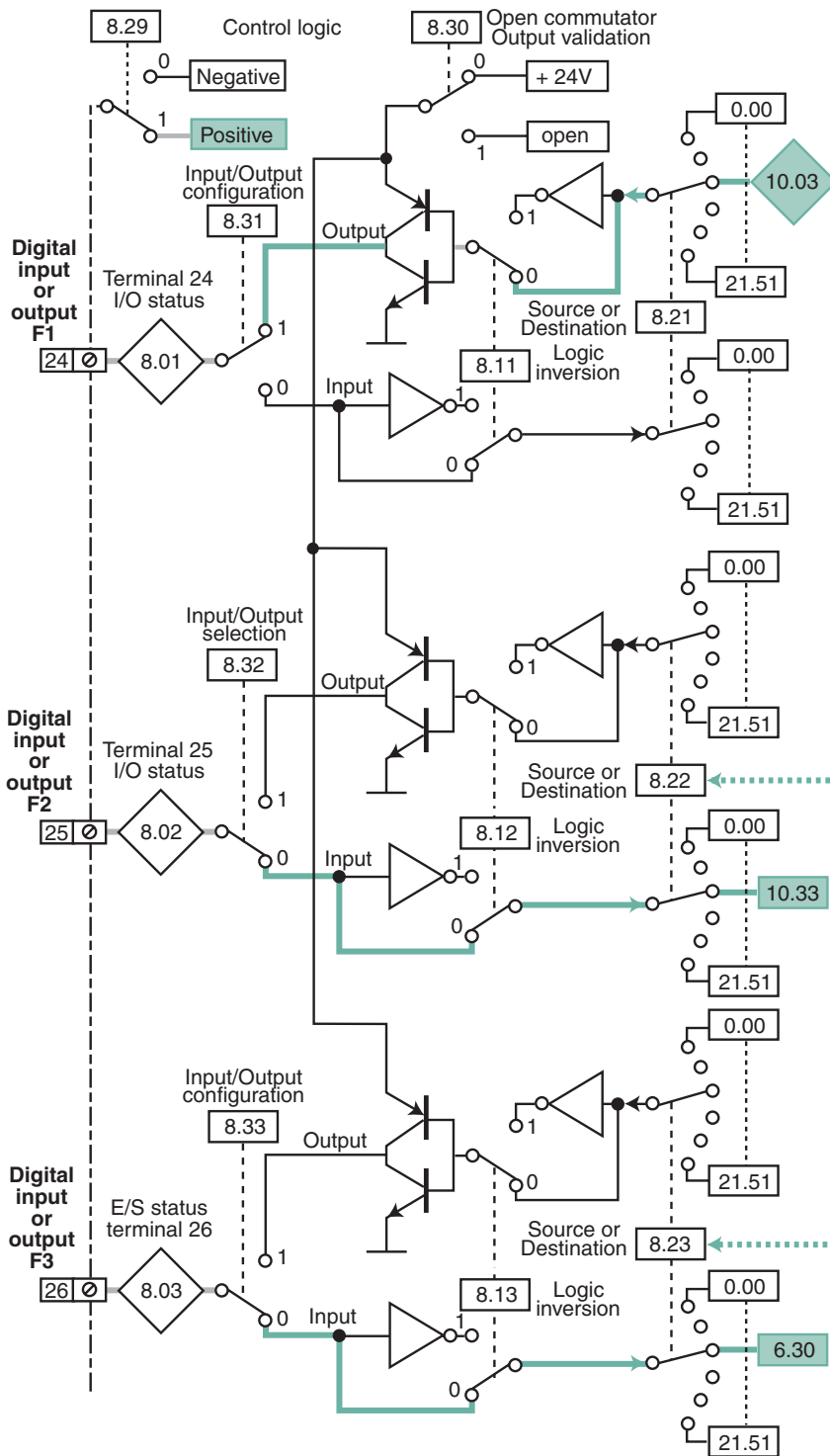
- in  or , the selected source is **3.02** " Speed feedback ", the analogue output will be full scale (9.8V) when N MAX is reached (2 x **1.06**).

Parameters	Variation range			Factory settings	
					
7.04 - 7.05 - 7.06	-128 to +127 °C			-	
7.20 - 7.23	0 to 4.000			1.000	
7.33	Fr (0), Ld (1), Adv (2)			Adv (2)	
7.34	± 200 °C			-	
7.35	0 to 100.0 %			-	

UNIDRIVE SP

Mise en service

H6.12 - Menu 8 : Configuration of digital inputs - outputs



6.04 Logic command management			
	Terminal 25	Terminal 26	6.40
0	6.29 Enabling	6.30 Fwd Run	0 (maintained)
1	6.39 Stop\	6.30 Fwd Run	1 (pulse)
2	6.29 Enabling	6.34 Run	0 (maintained)
3	6.39 Stop\	6.34 Run	1 (pulse)
4	User settings (10.33)	User settings (6.30)	User settings

Validation 6.04 : Press the Reset key (disabled drive)

CAUTION:

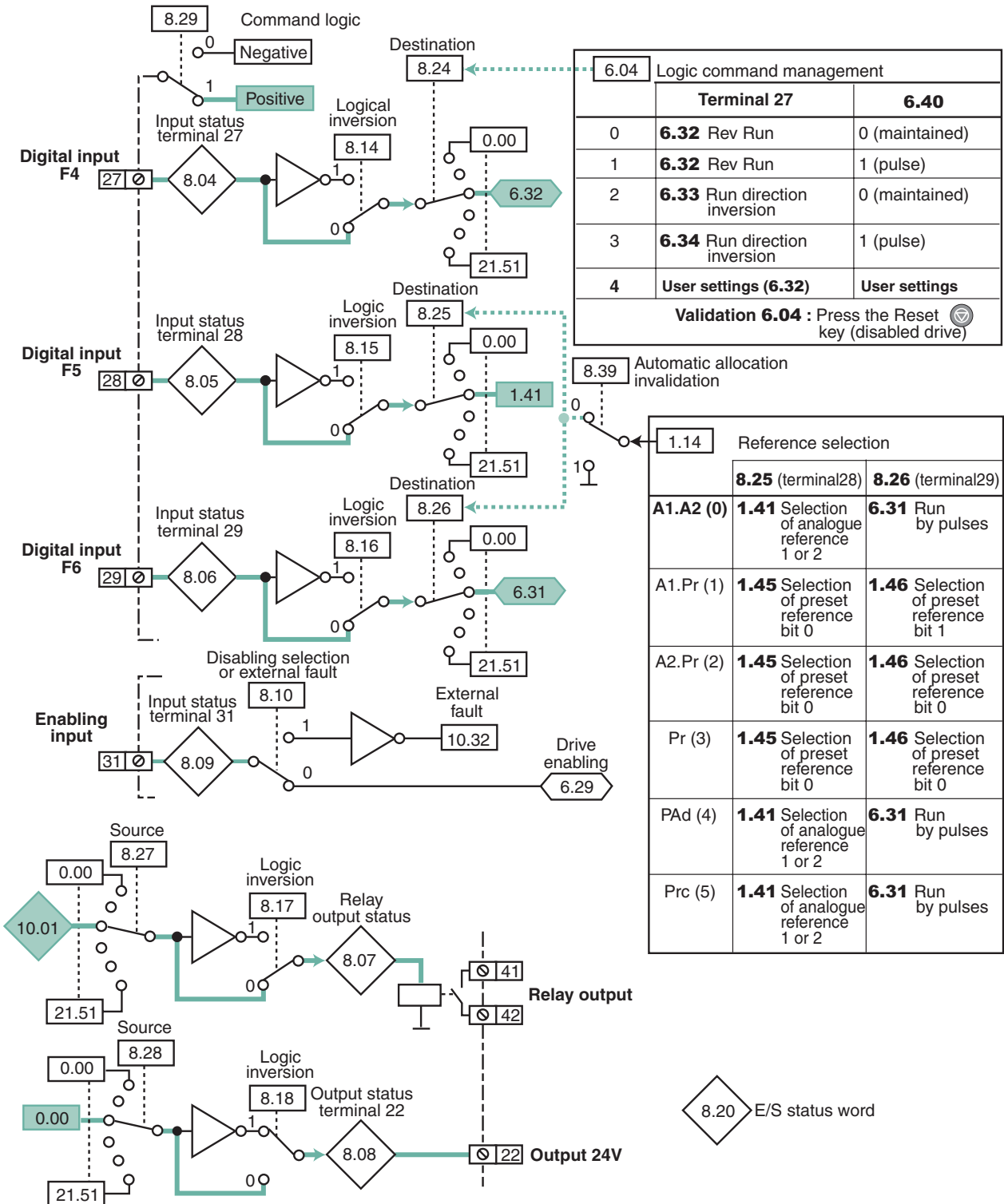
If the brake command is validated by 12.41 = 1 or 2, it has effect on terminal 25 (with priority on 6.04) so that 8.12 = 0 and 8.22 = 10.01 (if 12.41 = 1) or 8.22 = 12.40 (if 12.41 = 2).

Parameters	Variation range			Factory settings		
8.01 - 8.02 - 8.03	OFF (0)	On (1)				

UNIDRIVE SP

Mise en service

Menu 8 (continued)



CAUTION:

If the brake command is validated by 12.41 = 1, it has effect on the relays, so that 8.17 = 0 and 8.27 = 12.40.

Parameters	Variation range			Factory settings		
8.04 to 8.09	OFF (0) or On (1)			-		
8.20	0 to 511			-		

UNIDRIVE SP

Mise en service

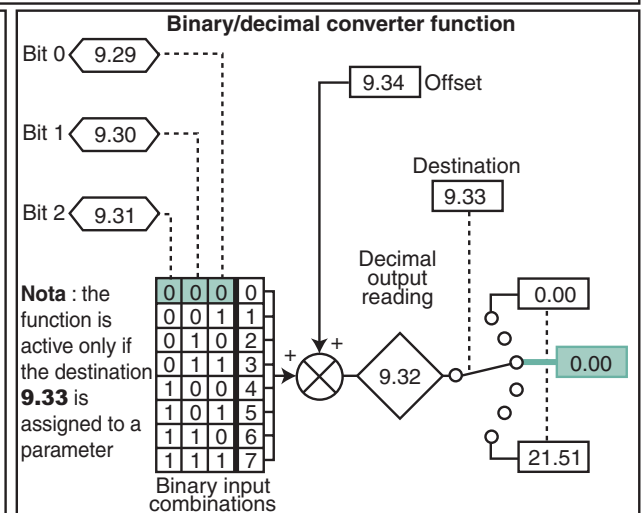
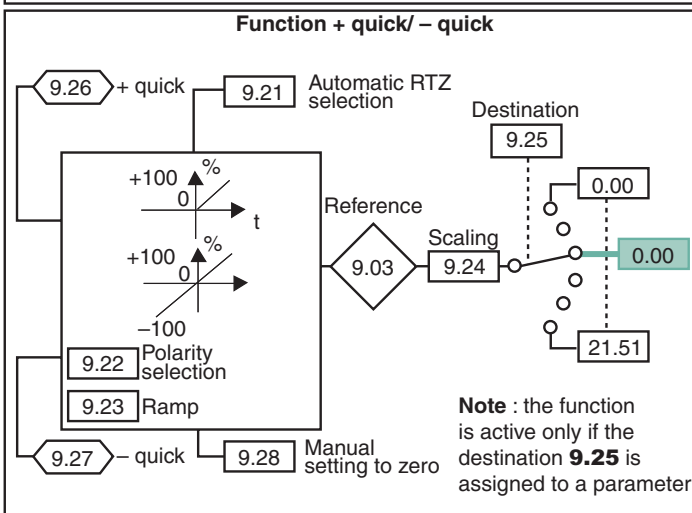
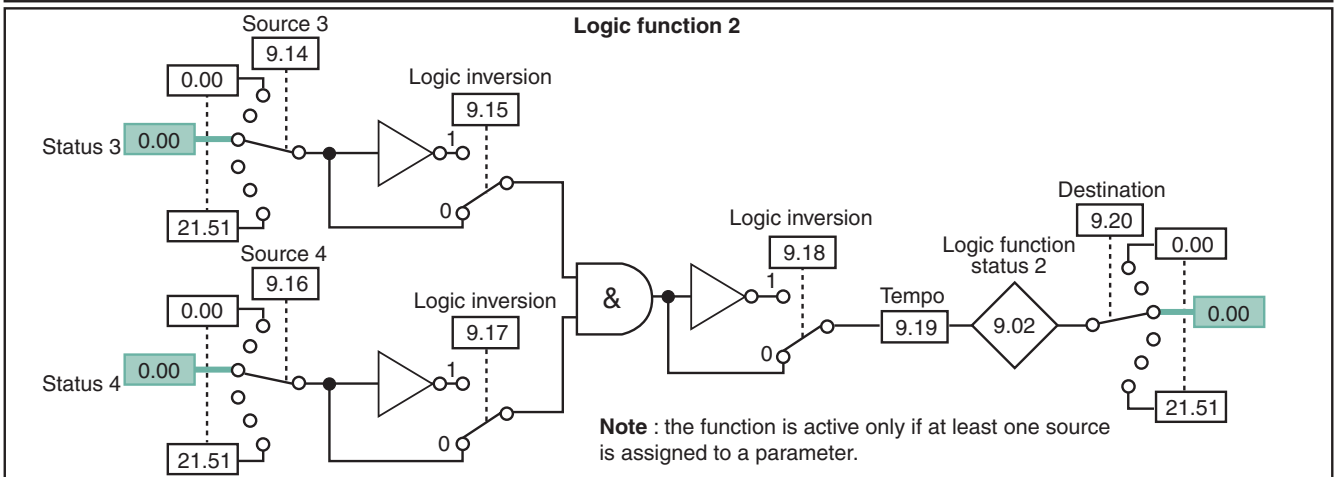
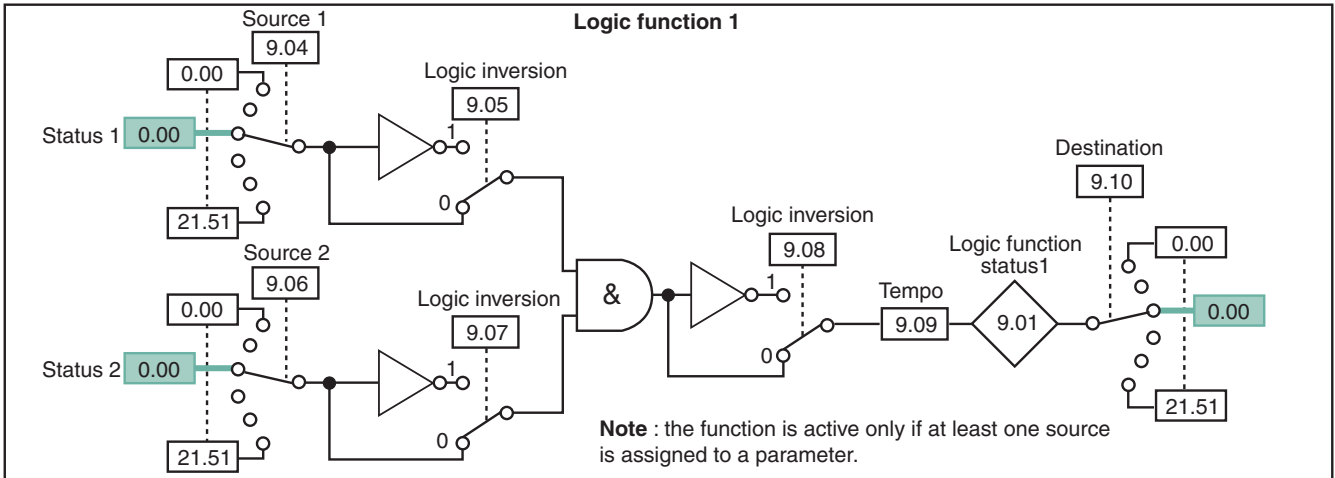
Notes



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Mise en service

H6.13 - Menu 9 : Digital functions



Parameters	Variation range		Factory settings	
	📏	📏	📏	📏
9.01 - 9.02	OFF (0) or On (1)		-	
9.03	± 100.00 %		-	
9.09 - 9.19	± 25.0 s		0	
9.21	0 to 3		2	
9.23	0 to 250 s		20 s	
9.24	0 to 4.000		1.000	
9.26 - 9.27 - 9.28 - 9.22	OFF (0) or On (1)		OFF (0)	
9.32	0 to 255		-	
9.34	0 to 248		0	

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Mise en service

Notes



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Mise en service

H6.14 - Menu 10 : Variable speed drive status and diagnosis

Operating status

Parameters	Description	Variation range			Factory settings		
10.01	Ready variable speed drive	OFF (0) or ON (1)			-		
10.02	Activated variable speed drive output	OFF (0) or ON (1)			-		
10.03	Zero frequency or speed	OFF (0) or ON (1)			-		
10.04	Minimum frequency or speed	OFF (0) or ON (1)			-		
10.05	Frequency or speed lower than the low threshold	OFF (0) or ON (1)			-		
10.06	Reach reference	OFF (0) or ON (1)			-		
10.07	Frequency or speed higher than high threshold	OFF (0) or ON (1)			-		
10.08	Rated load	OFF (0) or ON (1)			-		
10.09	Active current limitation	OFF (0) or ON (1)			-		
10.13	Required reverse rotation	OFF (0) or ON (1)			-		
10.14	Reverse rotation	OFF (0) or ON (1)			-		

Braking







Parameters	Description	Variation range			Factory settings		
10.10	Dynamic braking	OFF (0) or ON (1)			-		
10.11	Braking on resistors	OFF (0) or ON (1)			-		
10.12	Overload alarm, braking resistor	OFF (0) or ON (1)			-		
10.30	Resistor maximum braking length	0 to 400.00 s			TL : 0.09 s, T : 0.02 s, TM : 0.01, TH : 0.01 For drivers sizes 3 and higher: 0		
10.31	Resistor maximum braking cycle	0 to 1500.0 s			2.0 s For drivers sizes 3 and higher: 0		
10.39	Integration of braking resistor overload	0 to 100.0 %			-		

UNIDRIVE SP

Mise en service

Menu 10 (continued)







Faults

Parameters	Description	Variation range			Factory settings		
							
10.15	Mains supply absence	OFF (0) or ON (1)			-		
10.16	Powered up detection	OFF (0) or ON (1)			-		
10.17	IT overheating alarm	OFF (0) or ON (1)			-		
10.18	Variable speed drive overheating alarm	OFF (0) or ON (1)			-		
10.19	Variable speed drive alarm	OFF (0) or ON (1)			-		
10.20	Fault - 0	0 to 230 (value by serial link)			-		
10.21	Fault - 1	0 to 230 (value by serial link)			-		
10.22	Fault - 2	0 to 230 (value by serial link)			-		
10.23	Fault - 3	0 to 230 (value by serial link)			-		
10.24	Fault - 4	0 to 230 (value by serial link)			-		
10.25	Fault - 5	0 to 230 (value by serial link)			-		
10.26	Fault - 6	0 to 230 (value by serial link)			-		
10.27	Fault - 7	0 to 230 (value by serial link)			-		
10.28	Fault - 8	0 to 230 (value by serial link)			-		
10.29	Fault - 9	0 to 230 (value by serial link)			-		
10.32	External fault	OFF (0) or ON (1)			-		
10.33	Fault deletion	OFF (0) or ON (1)			OFF (0)		
10.34	Number of automatic fault deletion	0 to 5			0		
10.35	Time delay of automatic fault deletion	0 to 25.0 s			1.0 s		
10.36	Maintenance of the ready drive status on automatically deleted defaults	OFF (0) or ON (1)			OFF (0)		

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Mise en service

Faults (continued)

Parameters	Description	Variation range			Factory settings		
							
10.37	Minor faults	0 or 3			0		
10.38	User faults	0 to 255			0		
10.40	Status word	0 to 32767			-		
10.41	Length since fault 0 (Year.days)	0 to 9.365 an.jour			-		
10.42	Length since fault 0 (Hour.minutes)	0 to 23.59 H.min			-		
10.43	Module fault number 1, Length between default 1 and default 0	0 to 600.00 H.min			-		
10.44	Module fault number 2, Length between default 2 and default 0	0 to 600.00 H.min			-		
10.45	Module fault number 3, Length between default 3 and default 0	0 to 600.00 H.min			-		
10.46	Module fault number 4, Length between default 4 and default 0	0 to 600.00 H.min			-		
10.47	Module fault number 5, Length between default 5 and default 0	0 to 600.00 H.min			-		
10.48	Module fault number 6, Length between default 6 and default 0	0 to 600.00 H.min			-		
10.49	Module fault number 7, Length between default 7 and default 0	0 to 600.00 H.min			-		
10.50	Module fault number 8, Length between default 8 and default 0	0 to 600.00 H.min			-		
10.51	Module fault number 9, Length between default 9 and default 0	0 to 600.00 H.min			-		



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Mise en service

H6.15 - Menu 11 : Setting of menu 0 - serial link - variable speed drive characteristics

Configuration of menu 0

Parameters	Description	Variation range			Factory setting		
11.01	Setting of 0.11 of menu 0	1.00 to 21.51			5.01		3.29
11.02	Setting of 0.12 of menu 0	1.00 to 21.51			4.01		
11.03	Setting of 0.13 of menu 0	1.00 to 21.51			4.02		7.07
11.04	Setting of 0.14 of menu 0	1.00 to 21.51			4.11		
11.05	Setting of 0.15 of menu 0	1.00 to 21.51			2.04		
11.06	Setting of 0.16 of menu 0	1.00 to 21.51			8.39	2.02	
11.07	Setting of 0.17 of menu 0	1.00 to 21.51			8.26	4.12	
11.08	Setting of 0.18 of menu 0	1.00 to 21.51			8.29		
11.09	Setting of 0.19 of menu 0	1.00 to 21.51			7.11		
11.10	Setting of 0.20 of menu 0	1.00 to 21.51			7.14		
11.11	Setting of 0.21 of menu 0	1.00 to 21.51			7.15		
11.12	Setting of 0.22 of menu 0	1.00 to 21.51			1.10		
11.13	Setting of 0.23 of menu 0	1.00 to 21.51			1.05		
11.14	Setting of 0.24 of menu 0	1.00 to 21.51			1.21		
11.15	Setting of 0.25 of menu 0	1.00 to 21.51			1.22		
11.16	Setting of 0.26 of menu 0	1.00 to 21.51			1.23	3.08	
11.17	Setting of 0.27 of menu 0	1.00 to 21.51			1.24	3.34	
11.18	Setting of 0.28 of menu 0	1.00 to 21.51			6.13		
11.19	Setting of 0.29 of menu 0	1.00 to 21.51			11.36		
11.20	Setting of 0.30 of menu 0	1.00 to 21.51			11.42		

Serial link

Parameters	Description	Variation range			Factory settings		
11.23	Serial link address	0 to 247			1		
11.24	Communication Type	AnSi (0), rtU (1), Lcd (2)			rtU (1)		
11.25	Serial link transmission speed	300 (0), 600 (1), 1200 (2), 2400 (3), 4800 (4), 9600 (5), 19200 (6), 38400 (7), 57600 (8)*, 115200 (9)*			19200 (6)		
11.26	Serial link communication time limit	0 to 250 ms			2 ms		

* Only Modbus RTU.

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Mise en service

Menu 11 (continued)

Variable speed drive configuration

Parameters	Description	Variation range			Factory setting		
11.21	Scaling of parameter 0.30	0 to 9.999			1.000		
11.22	Parameter displayed when powering up	0.00 to 0.50			0.10		
	Specific variable speed drive	0 to 16			-		
	Software version (aa.bb)	1.00 to 99.99			-		
11.30	User safety code	0 to 999			0		
11.31	Selection of the operating mode	OPEn LP (1), CL VECt SErVO (3), rEGEn (4)			OPEn LP (1)	CL VECt (2)	SErVO (3)
	Variable speed drive rated current	0 to 9999.99 A			-		
	Variable speed drive rated voltage	200 (0), 400 (1), 575 (2), 690 (3)			-		
11.34	Software version (DC)	0 to 99			-		
	Number of power modules	1 to 8			-		
11.41	Length of return to initial display	0 to 250 s			240 s		
11.43	Return to factory settings	nonE (0), Eur (1), USA (2)			nonE (0)		
11.44	Access to level 2 and storing of the safety code	L1 (0), L2 (1), Loc (2)			L1 (0)		
11.45	Selection of motor 2	OFF (0) or On (1)			OFF (0)		
	Previously loaded factory settings	0 to 2000			-		
11.47	Internal program validation	0 to 2			2		
	Internal program status	- 128 to + 127			-		
	Internal program events	0 to 65535 s			-		
	Internal program max. execution time	0 to 65535 ms			-		
	Internal program first execution	OFF (0) or ON (1)			-		

Note: • For the setting of **0.31** to **0.59**, see menu 22.










• The parameters **11.47** to **11.51** are used during the execution of the "Syptlite" program, conceived up by means of the Syptlite software available on the CD Rom delivered together with the variable speed drive.

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Mise en service

Menu 11 (continued)

Parameter transfer by SMARTCARD

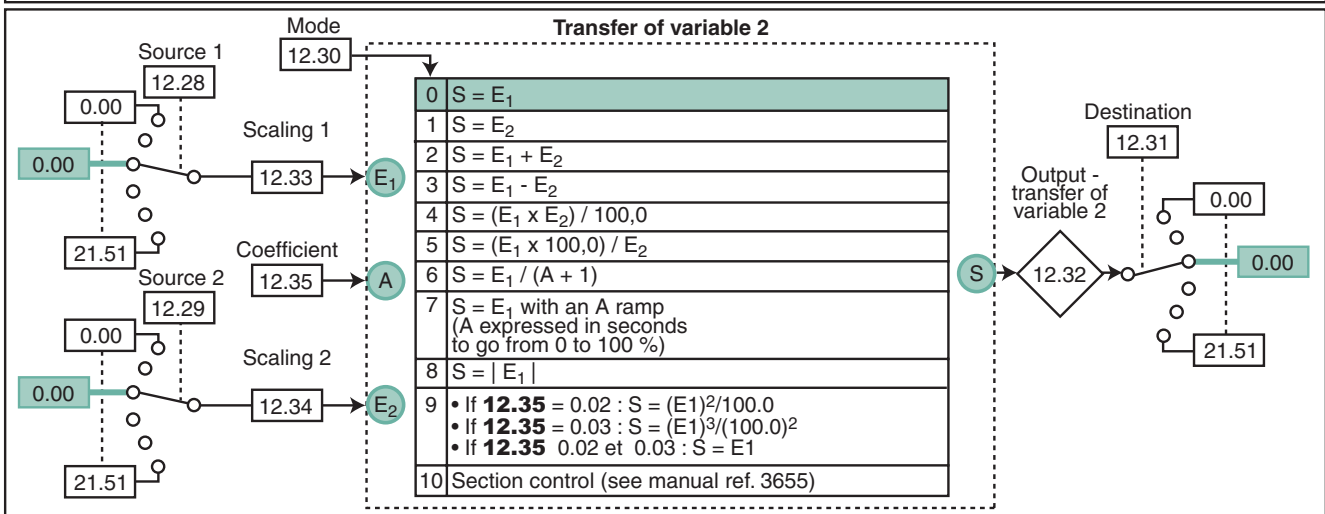
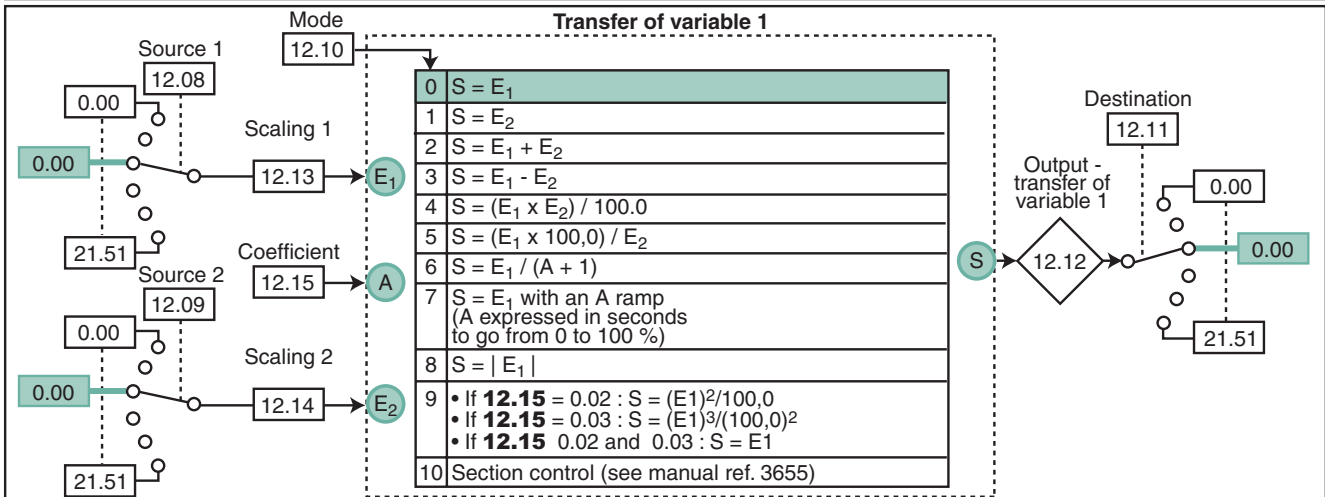
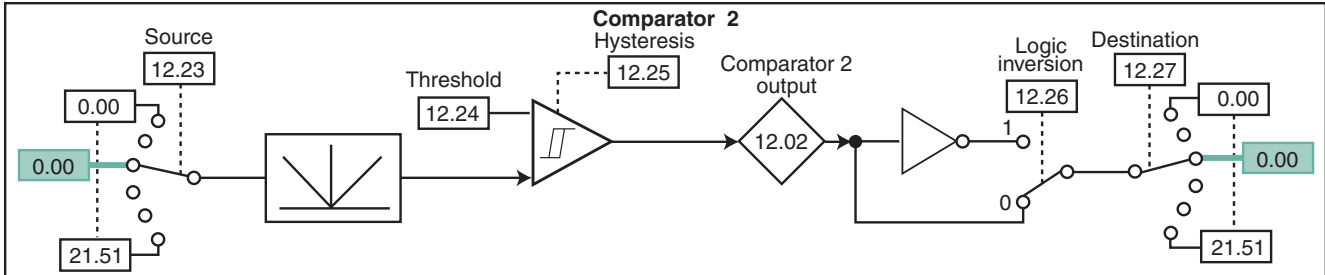
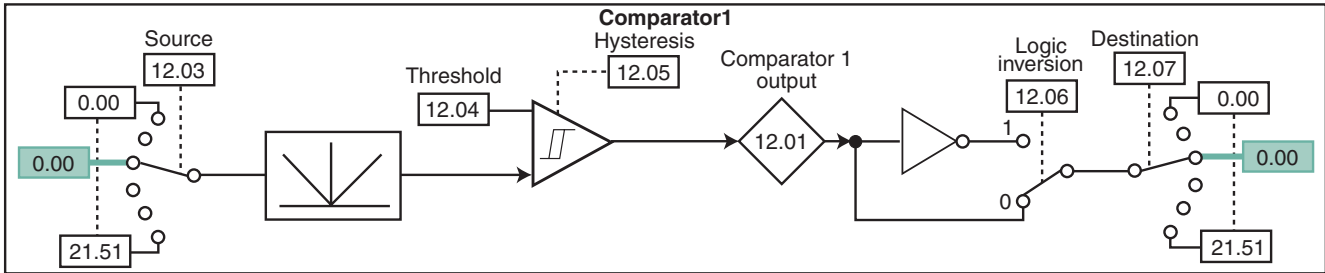
Parameters	Description	Variation range			Factory settings		
							
 11.36	Last set of parametes transferred by SMARTCARD	0 to 999			-		
11.37	Database selection	0 to 1002			0		
 11.38	Type of data and operating mode	0 : FrEE, 1 : 1, 2 : 3OpEn.LP, 3 : 3CL.VECt, 4 : 3SErVO, 5 : 3rEGEn, 6 : 3Un, 7 : 3Un, 8 : 3Un, 9 : 9, 10 : 4OpEn.LP, 11 : 4CL.VECt, 12 : 4SErVO, 13 : 4rEGEn, 14 : 4Un, 15 : 4Un, 16 : 4Un, 17 : LAddEr, 18 : Option			-		
11.39	Number of SMARTCARD version	0 to 9999			0		
 11.40	Unit checksum	0 to 65335			-		
11.42	Parameter cloning	nonE (0), rEAd (1), Prog (2), Auto (3), boot (4)			nonE (0)		

H

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Mise en service

H6.16 - Menu 12 : Comparators, transfers of variables



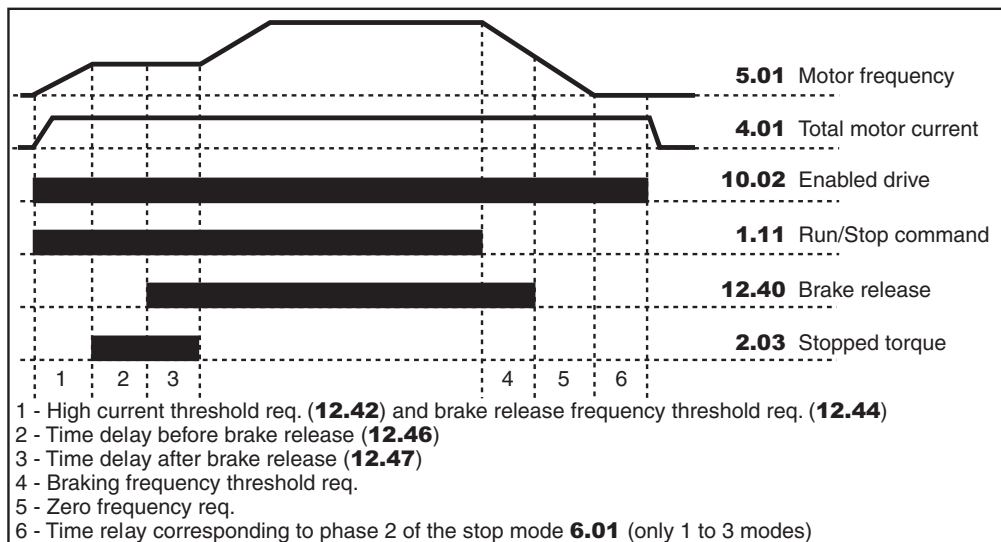
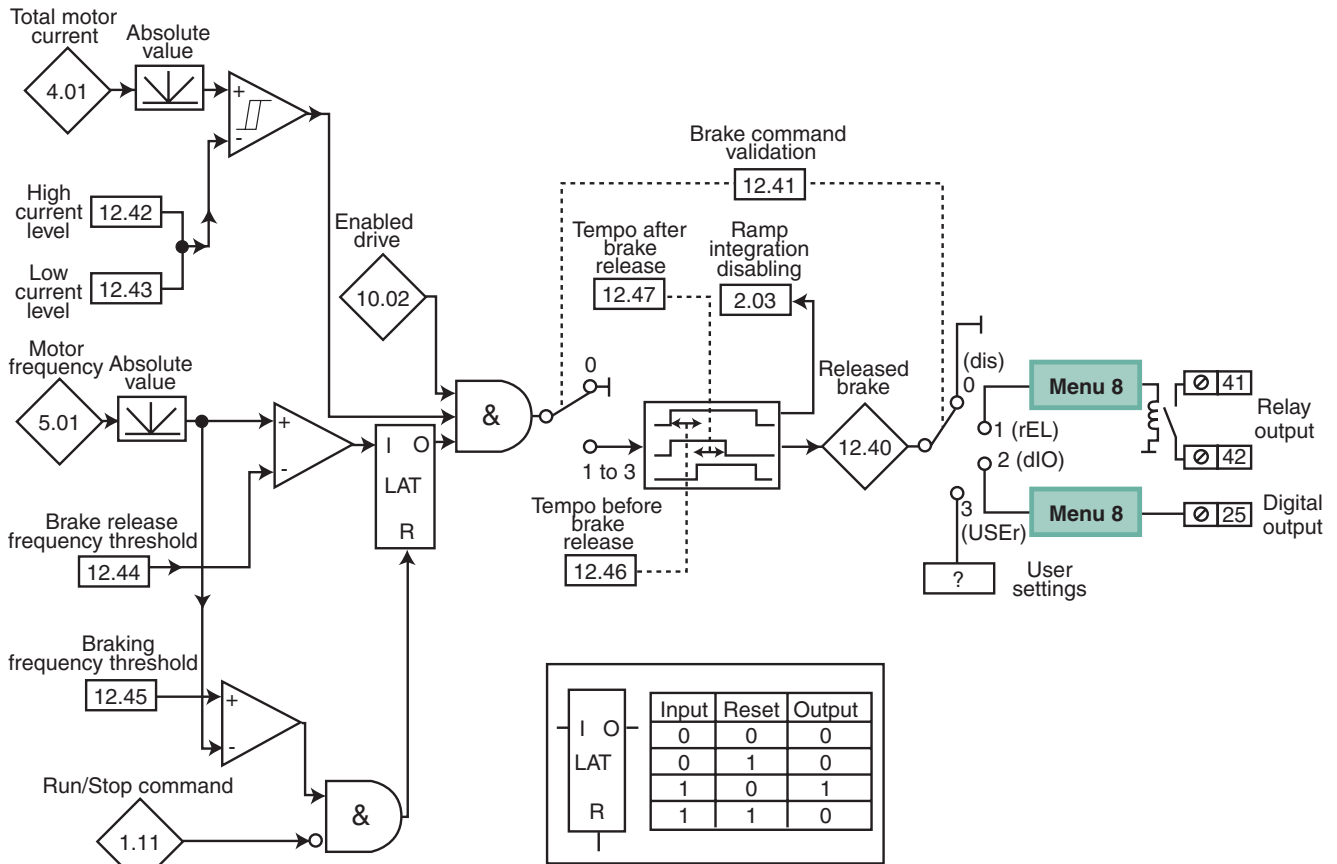
Parameters	Variation range			Factory settings		
12.01 - 12.02	OFF (0) or On (1)			-		
12.04 - 12.24	0 to 100.00 %			0		
12.05 - 12.25	0 to 25.00 %			0		
12.12 - 12.32	± 100.00 %			-		
12.13 - 12.14 - 12.33 - 12.34	± 4.000			1.000		
12.15 - 12.35	0 to 100.00			0		



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Mise en service

Menu 12 (continued)

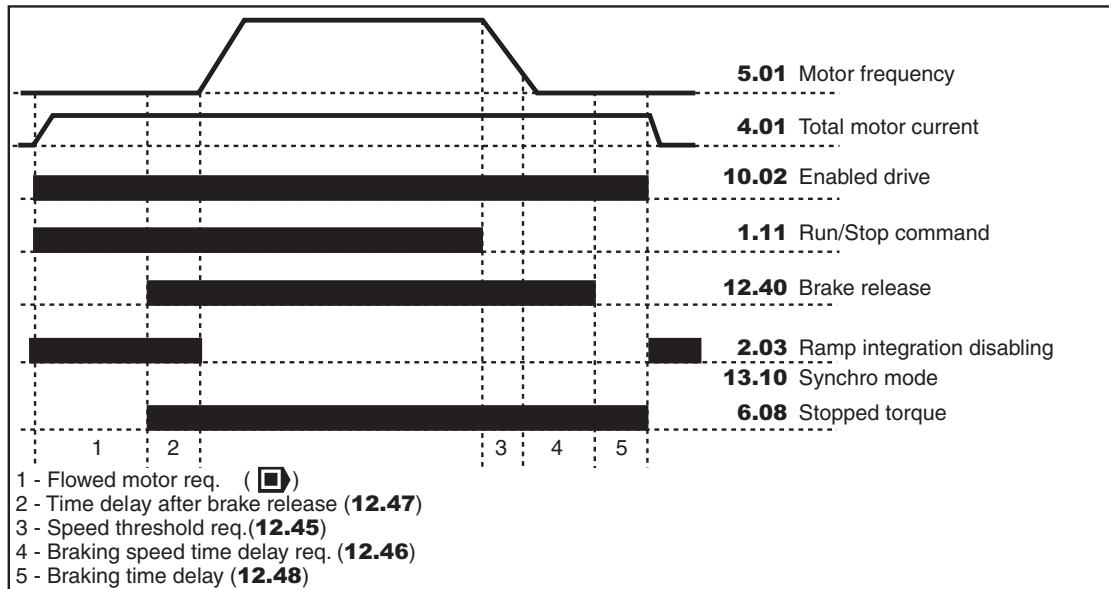
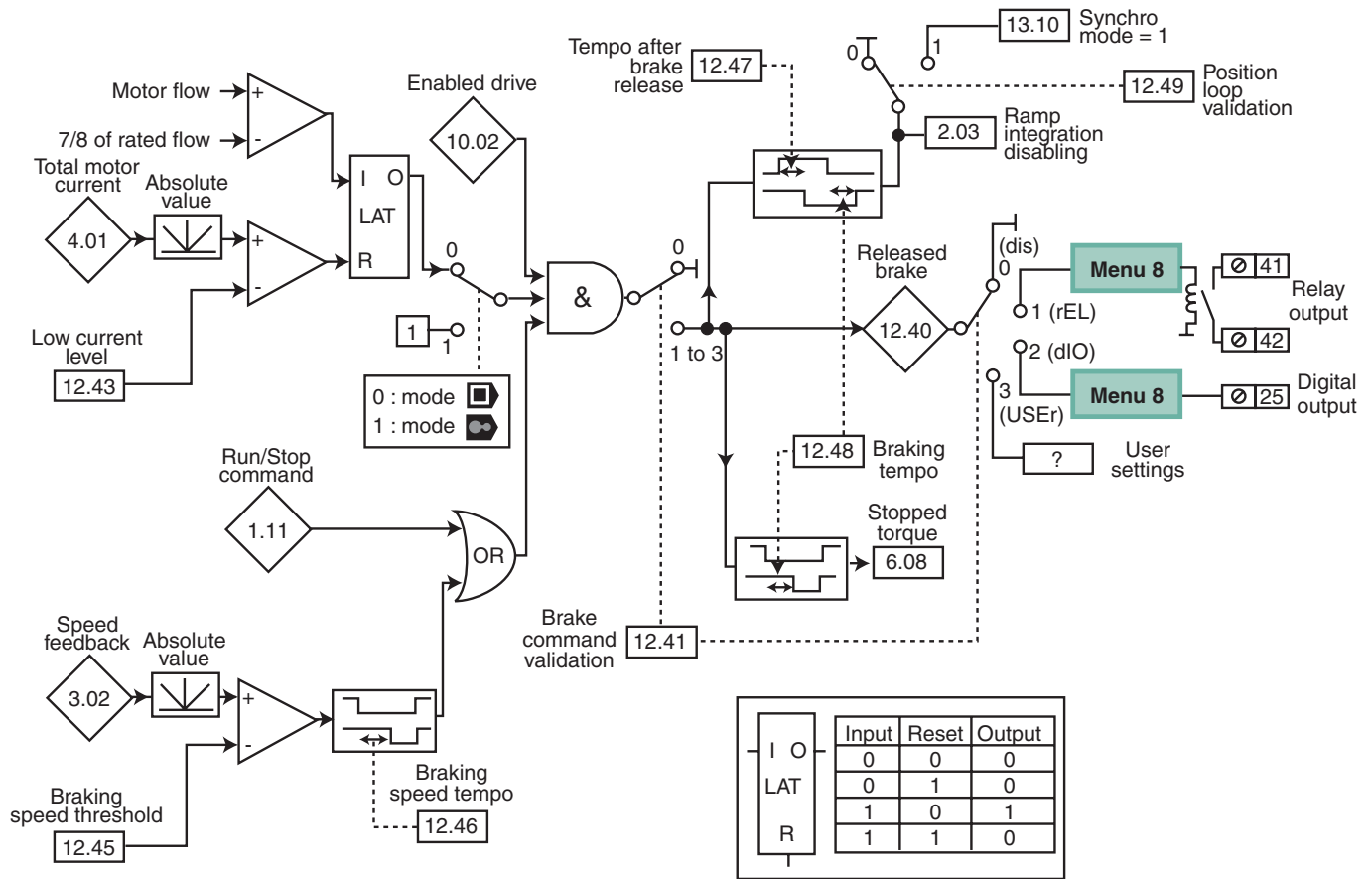
• Brake command in open loop







Parameters	Variation range 	Réglage usine 
12.40	OFF (0) or On (1)	-
12.42	0 to 200 %	50 %
12.43	0 to 200 %	10 %
12.44	0 to 20.0 Hz	1.0 Hz
12.45	0 to 20.0 Hz	2.0 Hz
12.46 - 12.47	0 to 25.0 s	1.0 s

UNIDRIVE SP Mise en service

• Brake command in closed loop and servo ,

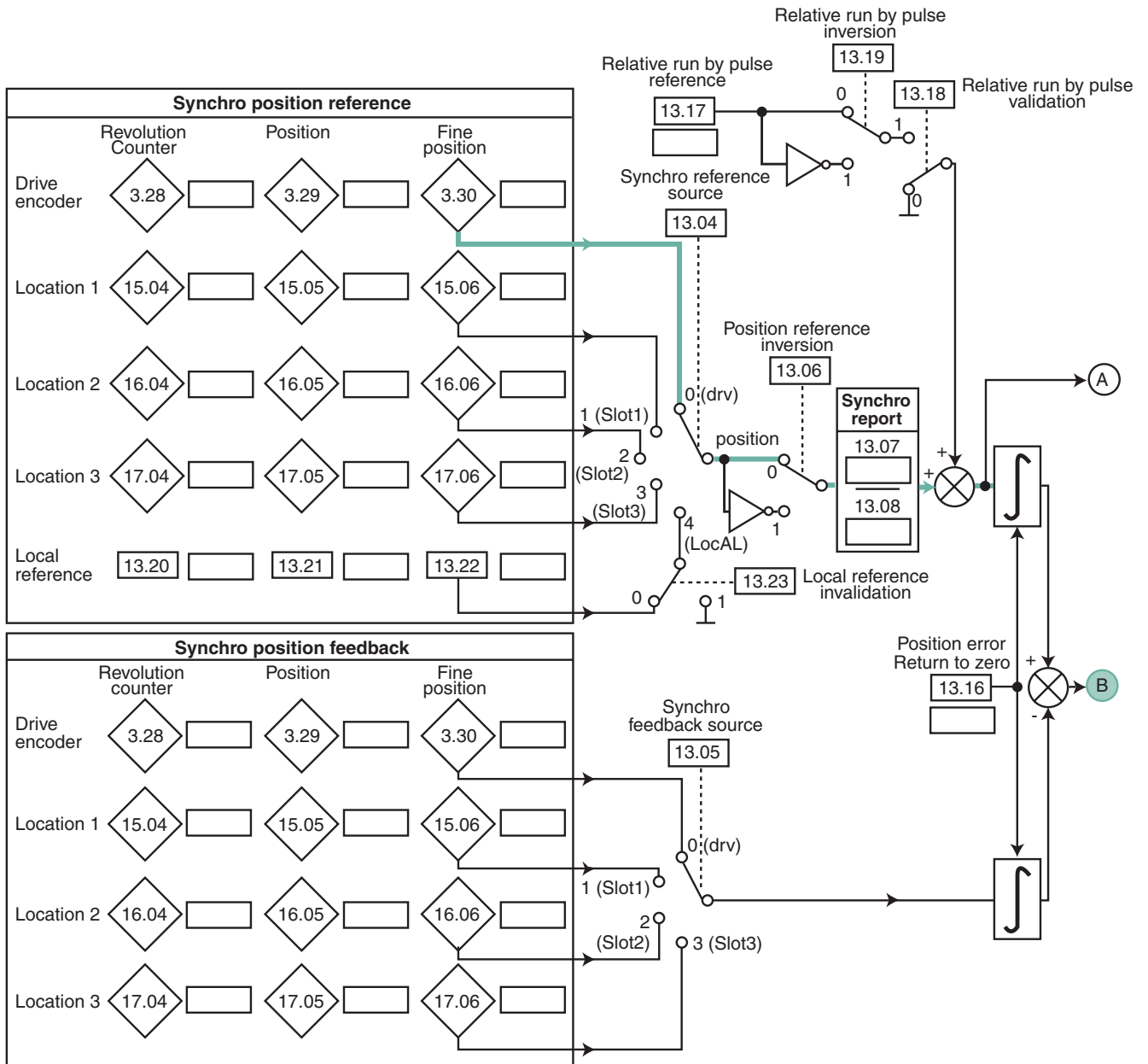




Parameters	Variation range		Factory setting	
				
12.40	OFF (0) or On (1)		-	
12.43	0 to 200 %		10 %	
12.45	0 to 200 min ⁻¹		5 min ⁻¹	
12.46 - 12.47 - 12.48	0 to 25.0 s		1.0 s	

UNIDRIVE SP

Mise en service

H6.17 - Menu 13 : Synchronisation in open loop

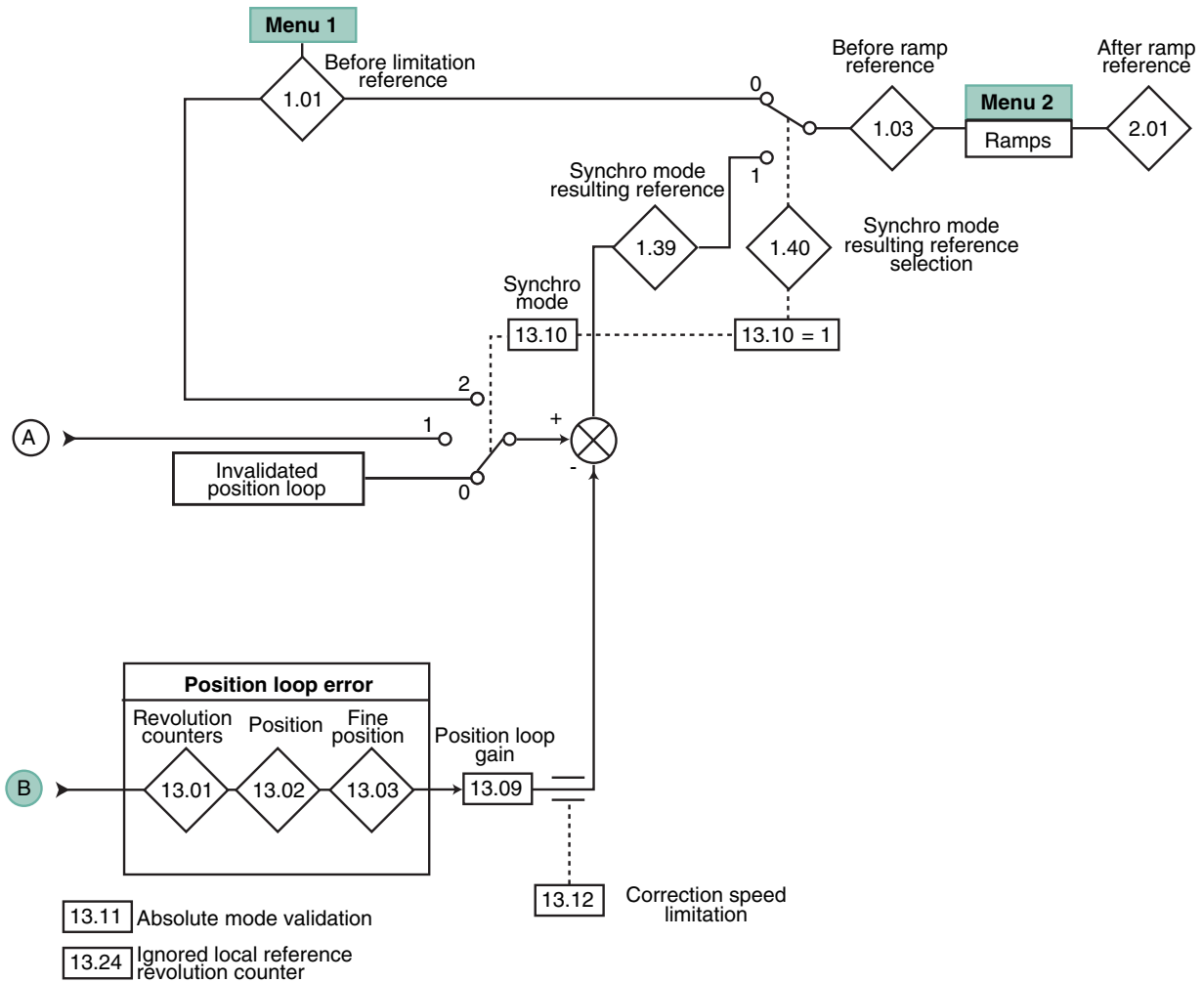




Parameters	Variation range ()	Factory settings ()
13.07	0 to 4.000	1.000
13.08	0 to 1.000	1.000
13.16	OFF (0) or On (1)	OFF (0)
13.17	0 to 4000.0 min ⁻¹	0

UNIDRIVE SP

Mise en service

Menu 13 in open loop (continued)

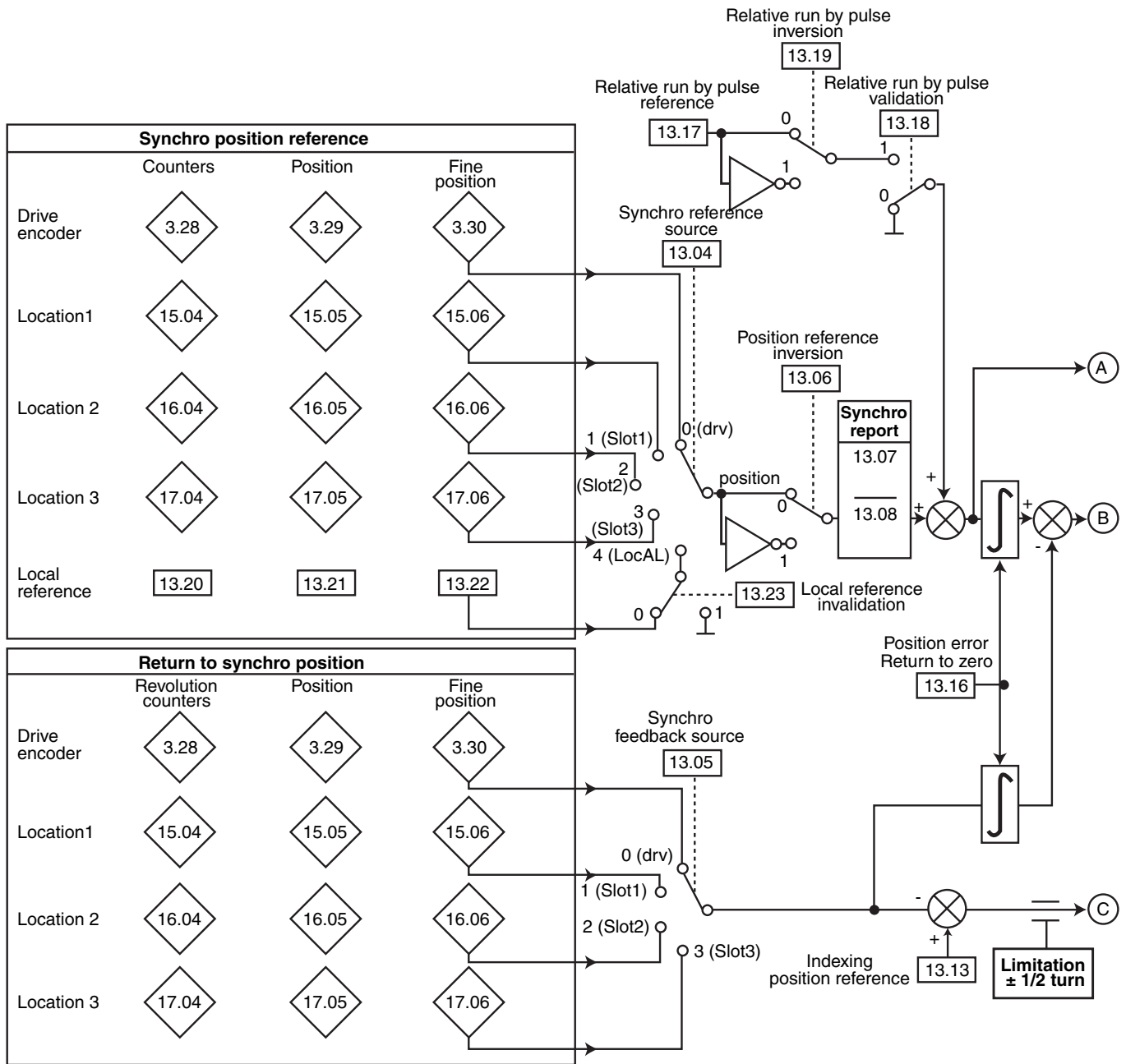






Parameters	Variation speed ()	Factory setting ()
13.01 - 13.02 - 13.03	- 32768 to + 32767	-
13.09	0 to 100.00 rads ⁻¹ /rad	25.00 rads ⁻¹ /rad
13.10	0 à 2	0
13.11 - 13.23 - 13.18 - 13.19	OFF (0) or On (1)	OFF (0)
13.12	0 to 250	150
13.15	OFF (0) or On (1)	-
13.20 - 13.21 - 13.22	0 to 65535	0
13.24	OFF (0) or On (1)	OFF (0)

UNIDRIVE SP

Mise en service

H6.18 - Menu 13 : Synchronisation and indexing in closed loop and servo ,

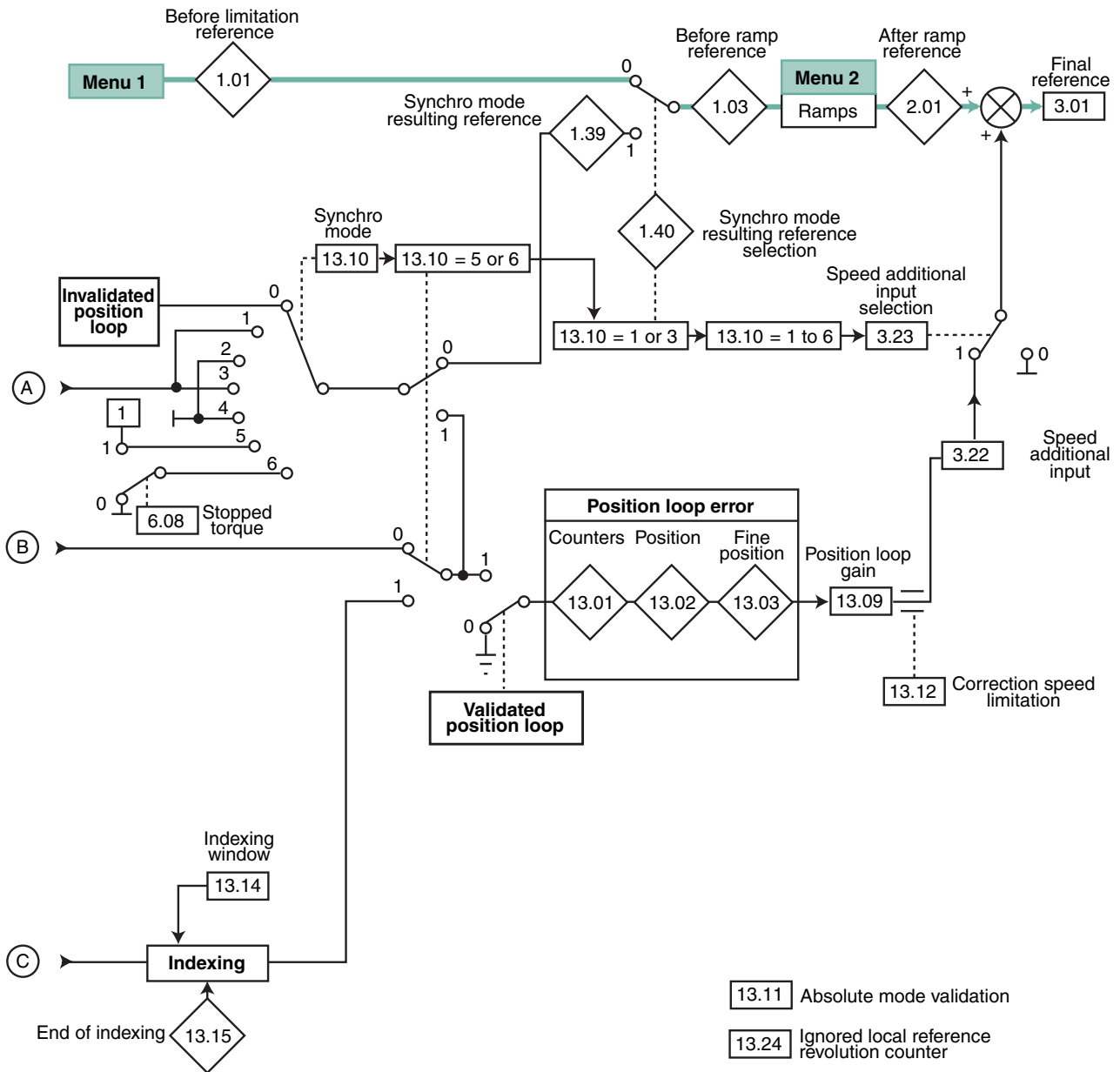


Parameters	Variation range		Factory settings	
				
13.07	0 to 4.000		1.000	
13.08	0 to 1.000		1.000	
13.16	OFF (0) or On (1)		OFF (0)	
13.13	0 to 65535		0	
13.17	0 to 4000.0 min ⁻¹		0	
13.20 - 13.21 - 13.22	0 to 65535		0	

UNIDRIVE SP

Mise en service

Menu 13 in closed loop and servo (continued)

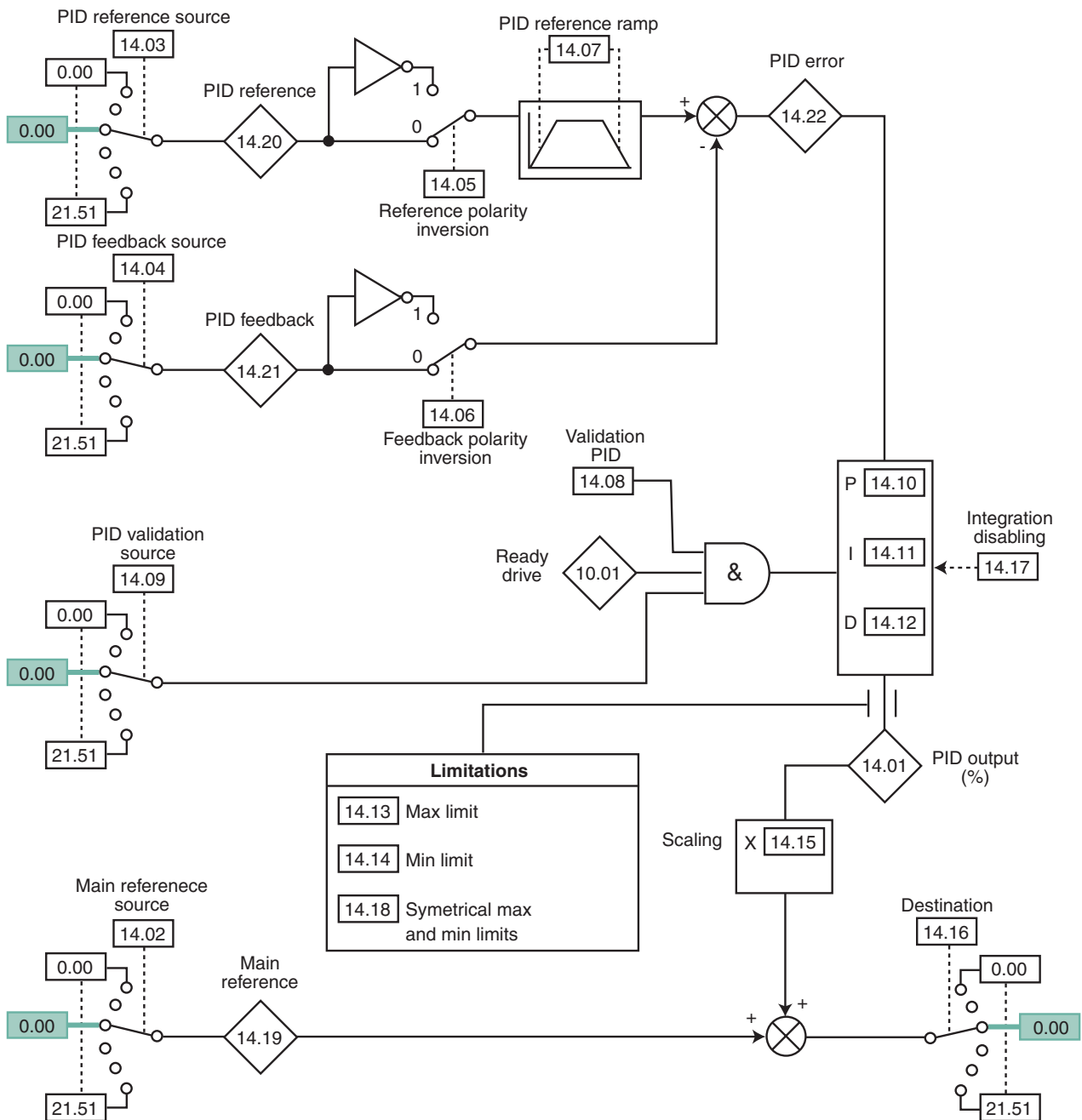


Parameters	Variation range		Factory settings	
13.01 - 13.02 - 13.03	- 32768 to + 32767		-	
13.09	0 to 100.00 rads ⁻¹ /rad		25.00 rads ⁻¹ /rad	
13.10	0 to 6		0	
13.11 - 13.18 - 13.19 - 13.23 - 13.24	OFF (0) or On (1)		OFF (0)	
13.12	0 to 250		150	
13.14	0 to 4096		256	
13.15	OFF (0) or On (1)		-	
13.24	OFF (0) or On (1)		OFF (0)	

UNIDRIVE SP

Mise en service

H6.19 - Menu 14 : PID



Note : The PID function is not activated if the destination **14.16** remains assigned to **0.00**.

Parameters	Variation range			Factory settings		
14.01 - 14.19 - 14.20 - 14.21 14.22	± 100.00 %			-		
14.07	0 to 3200.0 s			0		
14.08 - 14.17 - 14.18	OFF (0) or On (1)			OFF (0)		
14.10 - 14.15	0 to 4.000			1.000		
14.11	0 to 4.000			0.500		
14.12	0 to 4.000			0		
14.13	0 to 100.00 %			100.00 %		
14.14	± 100.00 %			100.00 %		

UNIDRIVE SP

Mise en service

H6.20 - Menus 15, 16, 17 : MODULES SM

H6.20.1 - Introduction

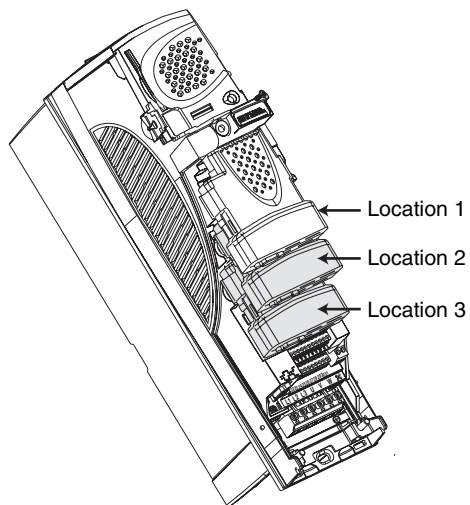
In certain applications, an additional SM module can be necessary (by instance, the SM-Universal-Encoder which is used to manage an isolated encoder).

However, the number of modules must be limited to 3.

Each location corresponds to a menu :

- **location 1 : menu 15,**
- **location 2 : menu 16,**
- **location 3 : menu 17.**

The menus will be represented by 1x on the diagrams.



UNIDRIVE SP

Mise en service

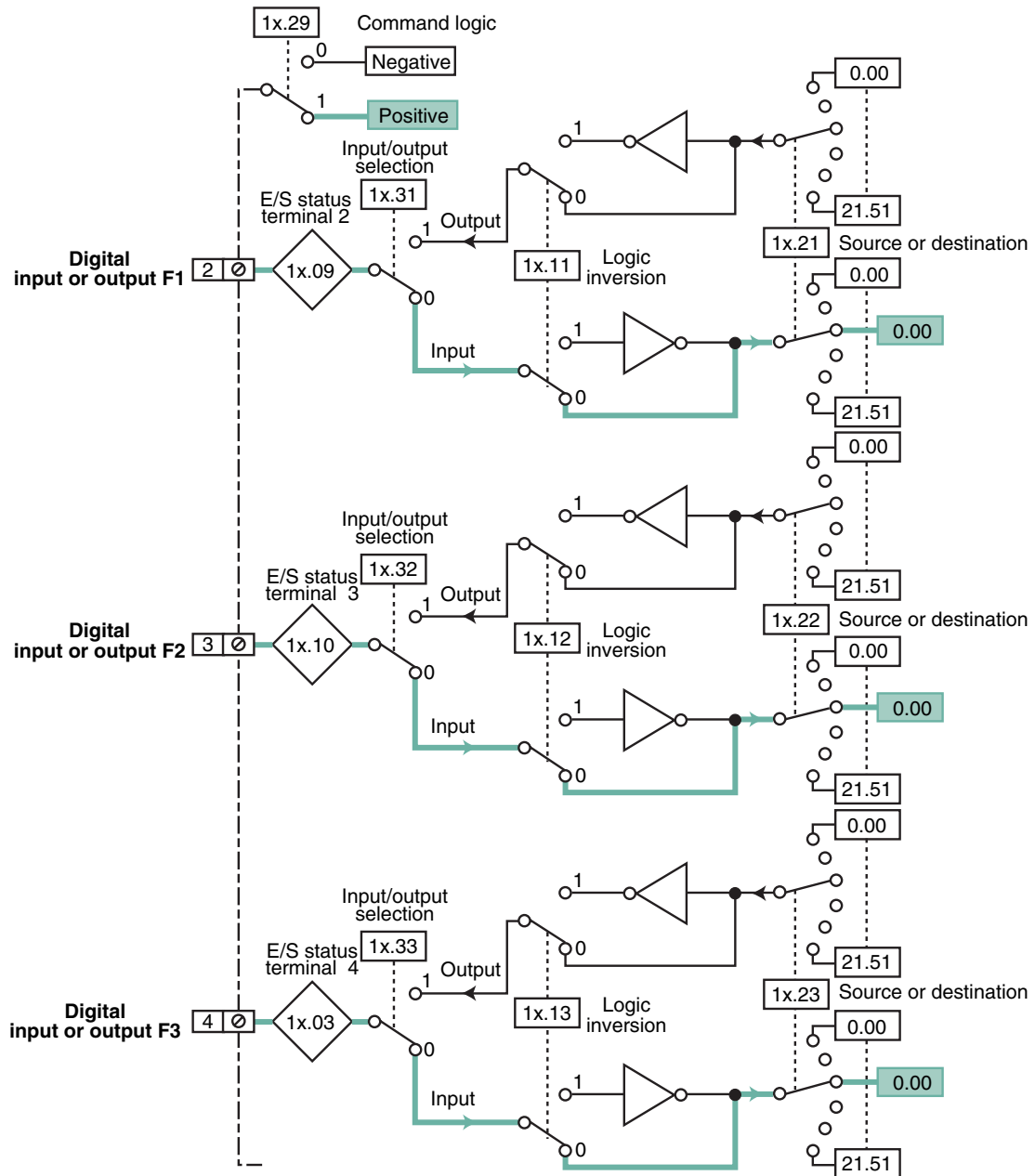
H6.20.2 - SM-I/O PLUS Module

1x.01 : Type of module

1x.20 : Digital input and output status word

1x.50 : Fault reading

• Digital inputs / outputs



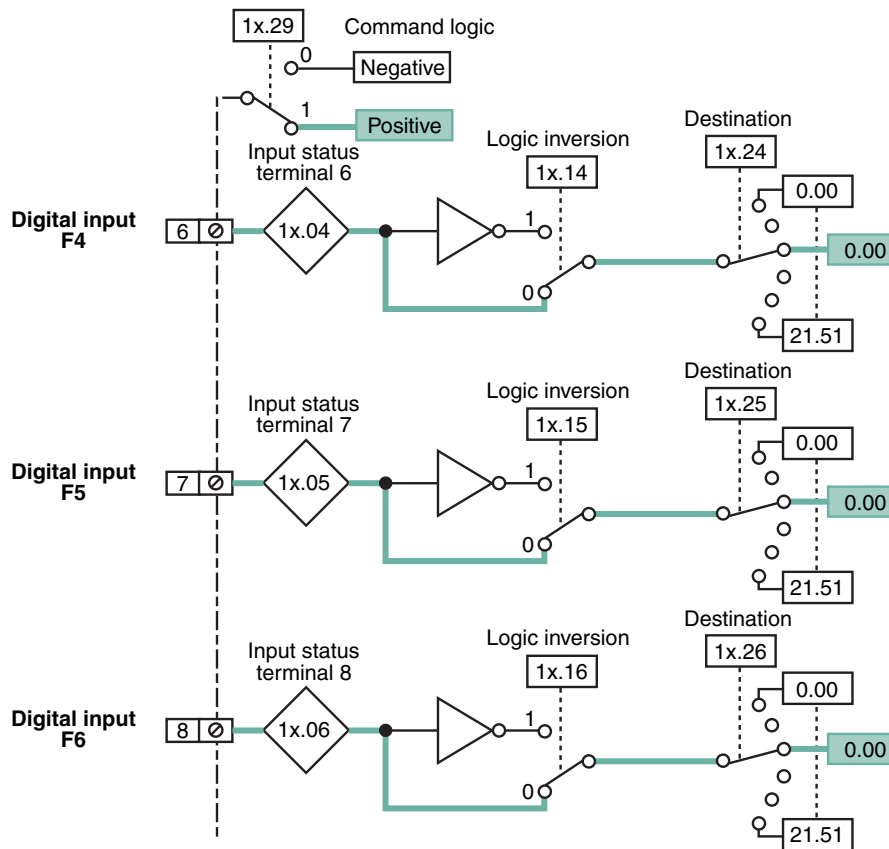
Parameters	Variation range			Factory settings		
1x.01	0 to 499			-		
1x.02	0 to 99.99			-		
1x.03 - 1x.09 - 1x.10	OFF (0) or On (1)			-		
1x.20	0 to 511			-		
1x.50	0 to 255			-		
1x.51	0 to 99			-		

UNIDRIVE SP

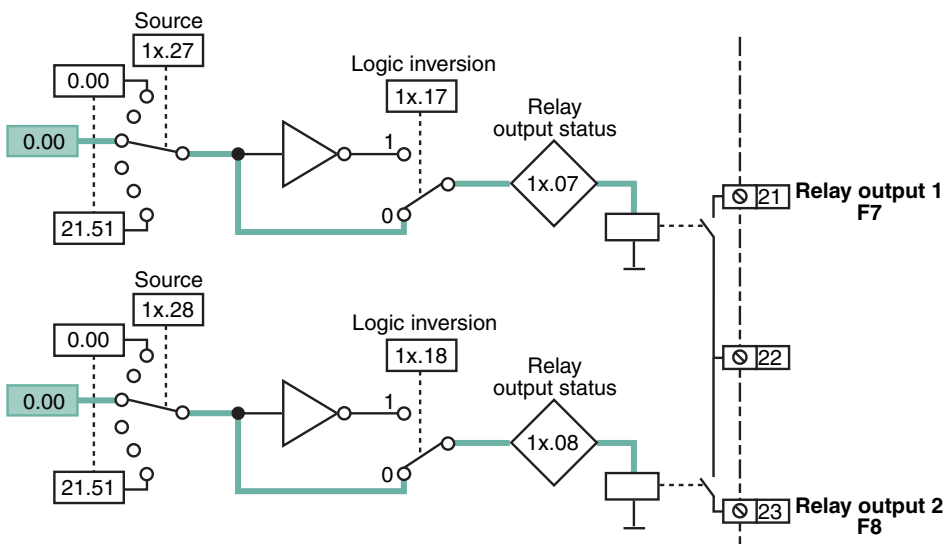
Mise en service

Module SM-I/O PLUS (continued)

• Digital inputs



• Relay outputs



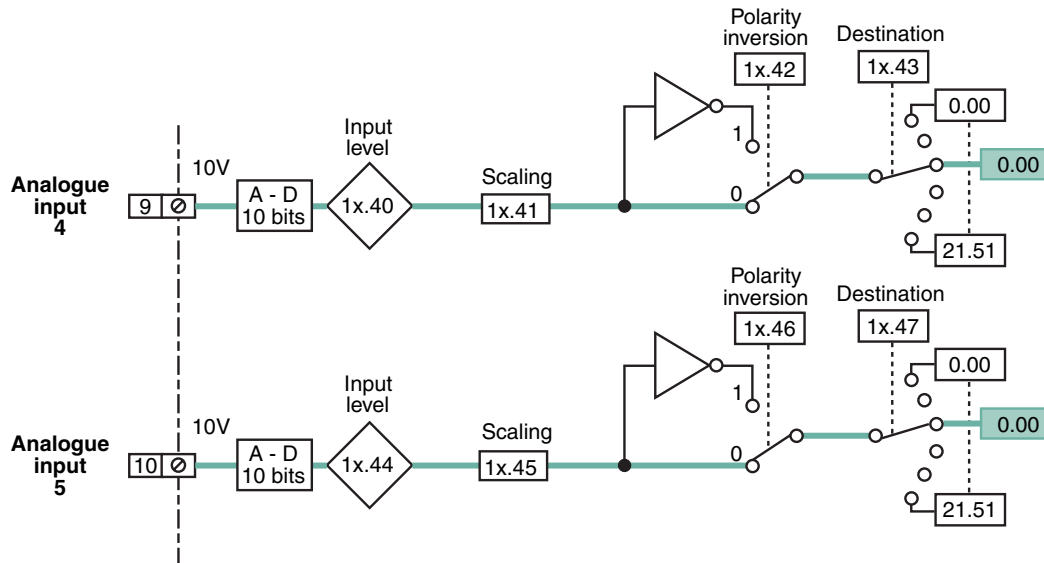
Parameters	Variation range			Factory settings		
1x.04 - 1x.05 - 1x.06 - 1x.07 1x.08	OFF (0) or On (1)			-		

UNIDRIVE SP

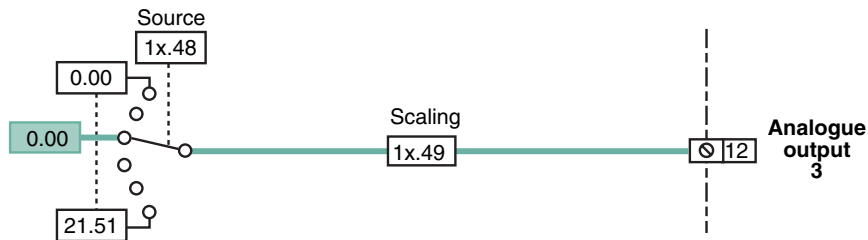
Mise en service

SM-I/O PLUS Module (continued)

• Digital inputs



• Analogue outputs



Parameters	Variation range			Factory settings	
1x.40 - 1x.44	± 100.0 %			-	
1x.41 - 1x.45 - 1x.49	0 to 4.000			1.000	

UNIDRIVE SP

Mise en service

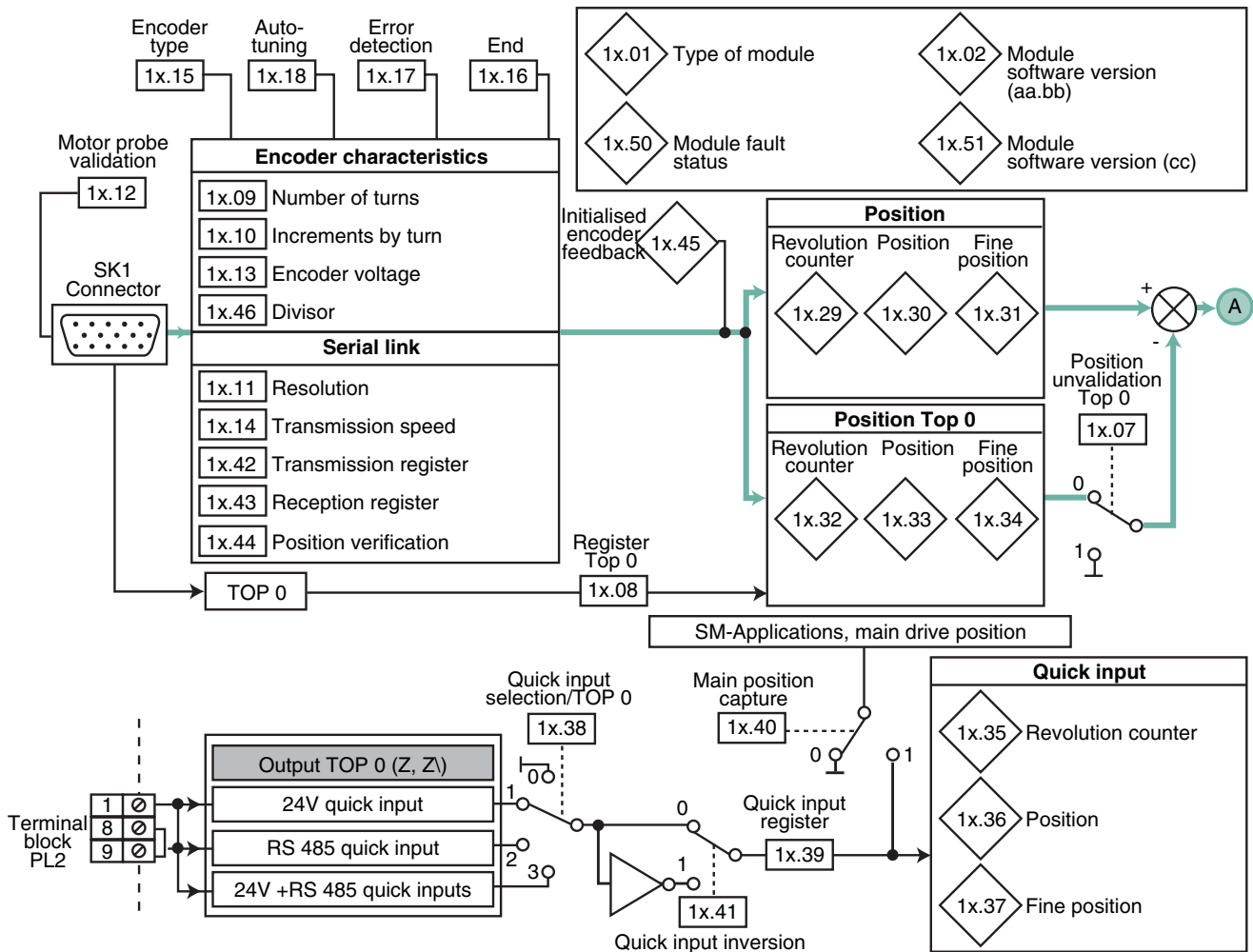
Notes



UNIDRIVE SP

Mise en service

H6.20.3 - SM-UNIVERSAL ENCODER PLUS Module

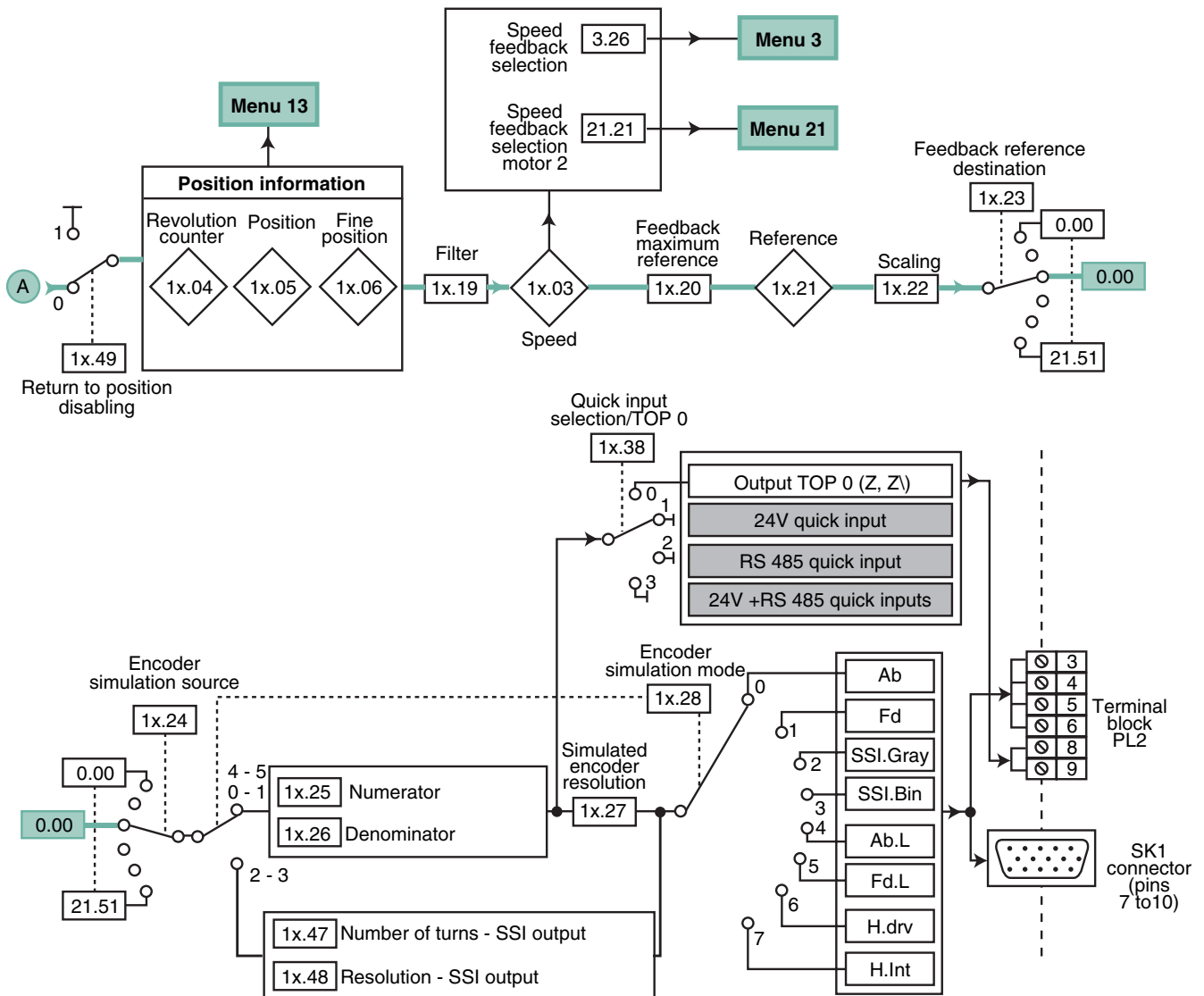


Parameters	Variation range			Factory settings		
1X.01	0 to 499			-		
1x.02	0 to 99.99			-		
1x.08 - 1x.12 - 1x.18 - 1x.39 - 1x.44	OFF (0) or On (1)			OFF (0)		
1x.09	0 to 255 bits			16 bits		
1x.10	0 to 50000			4096		
1x.11	0 to 32 bits			0		
1x.13	5V (0), 8V (1), 15V (2)			5V (0)		
1X.14	100 (0), 200 (1), 300 (2), 400(3), 500 (4), 1000 (5), 1500 (6), 2000 (7)			300 (2)		
1x.15	Ab (0), Fd (1), Fr (2), Ab.SErvo (3), Fd.SErvo (4), Fr.SErvo (5), SC (6), SC.HiPEr (7), EndAt (8), SC.EndAt (9), SSI (10), SC.SSI (11), SC.UVW (12)			Ab (0)		
1x.16	0 to 2			1		
1x.17	0 to 7			1		
1x.29 - 1x.32 - 1x.35	0 to 65535 turns			-		
1x.30 - 1x.33 - 1x.36	0 to 65535 (1/2 ¹⁶ th of turn)			-		
1x.31 - 1x.34 - 1x.37	0 à 65535 (1/2 ³² th of turn)			-		
1x.42 - 1x.43	0 to 65535 turns			0		
1x.45	OFF (0) or On (1)			-		
1x.46	0 to 1024			1		
1x.50	0 to 255			-		
1x.51	0 to 99			-		

UNIDRIVE SP

Mise en service

SM-UNIVERSAL ENCODER PLUS Module (continued)

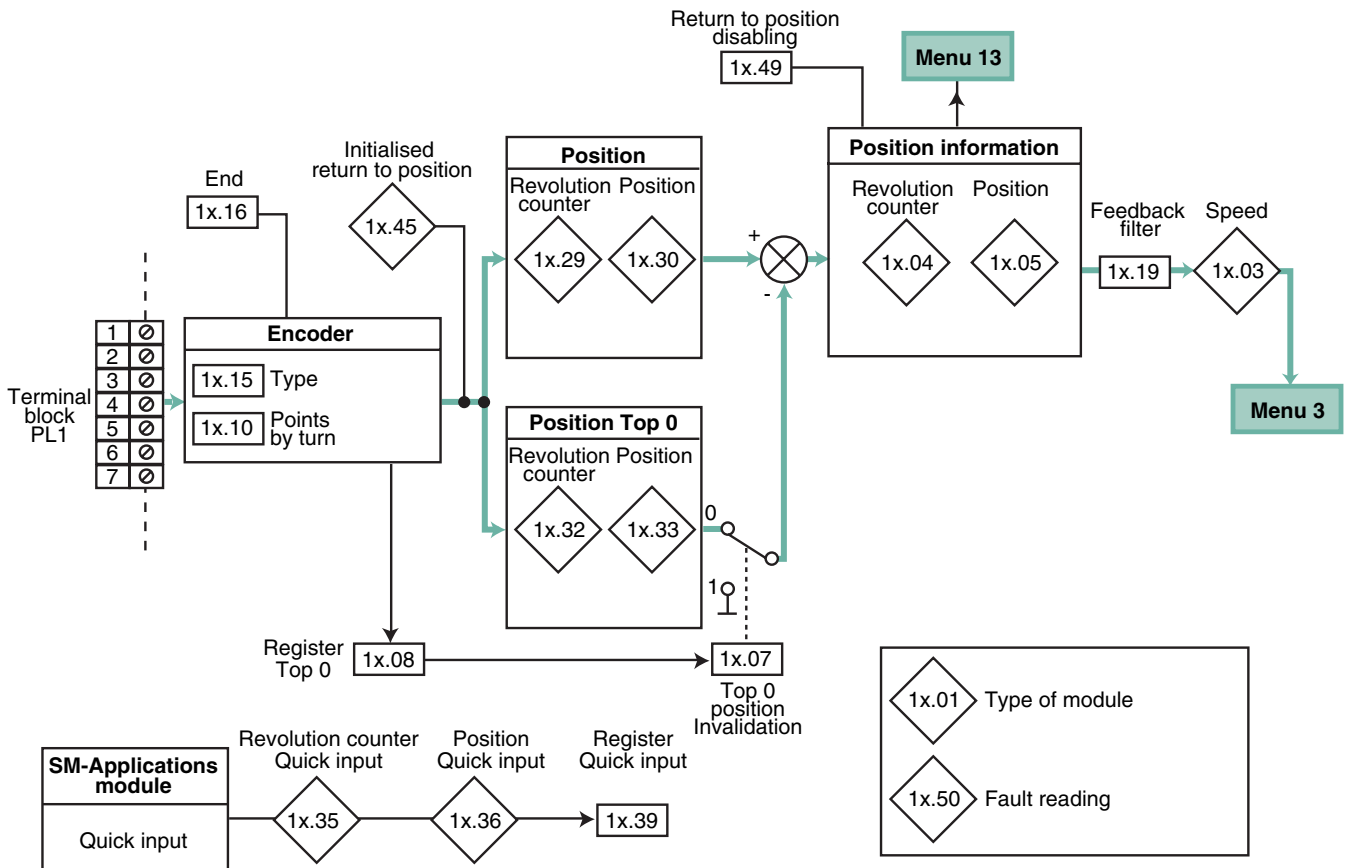


Parameters	Variation range			Factory settings	
1x.03	$\pm 40000.0 \text{ min}^{-1}$			-	
1x.04	0 to 65535 turns			-	
1x.05	0 to 65535 ($1/2^{16}$ th of turn)			-	
1x.06	0 to 65535 ($1/2^{32}$ th of turn)			-	
1x.19	0 (0), 1 (1), 2 (2), 4 (3), 8 (4), 16 (5) ms			0	
1x.20	0 to 40000.0 min^{-1}			1500.0 min^{-1}	
1x.21	$\pm 100.0 \%$			-	
1x.22	0 to 4.000			1.000	
1x.25	0 to 3.0000			0.25	
1x.26	0 to 3.0000			1.0000	
1x.27	OFF (0) or On (1)			OFF (0)	
1x.47	0 to 16 bits			16 bits	
1x.48	0 to 32 bits			0	

UNIDRIVE SP

Mise en service

H6.20.4 - SM-ENCODER PLUS Module

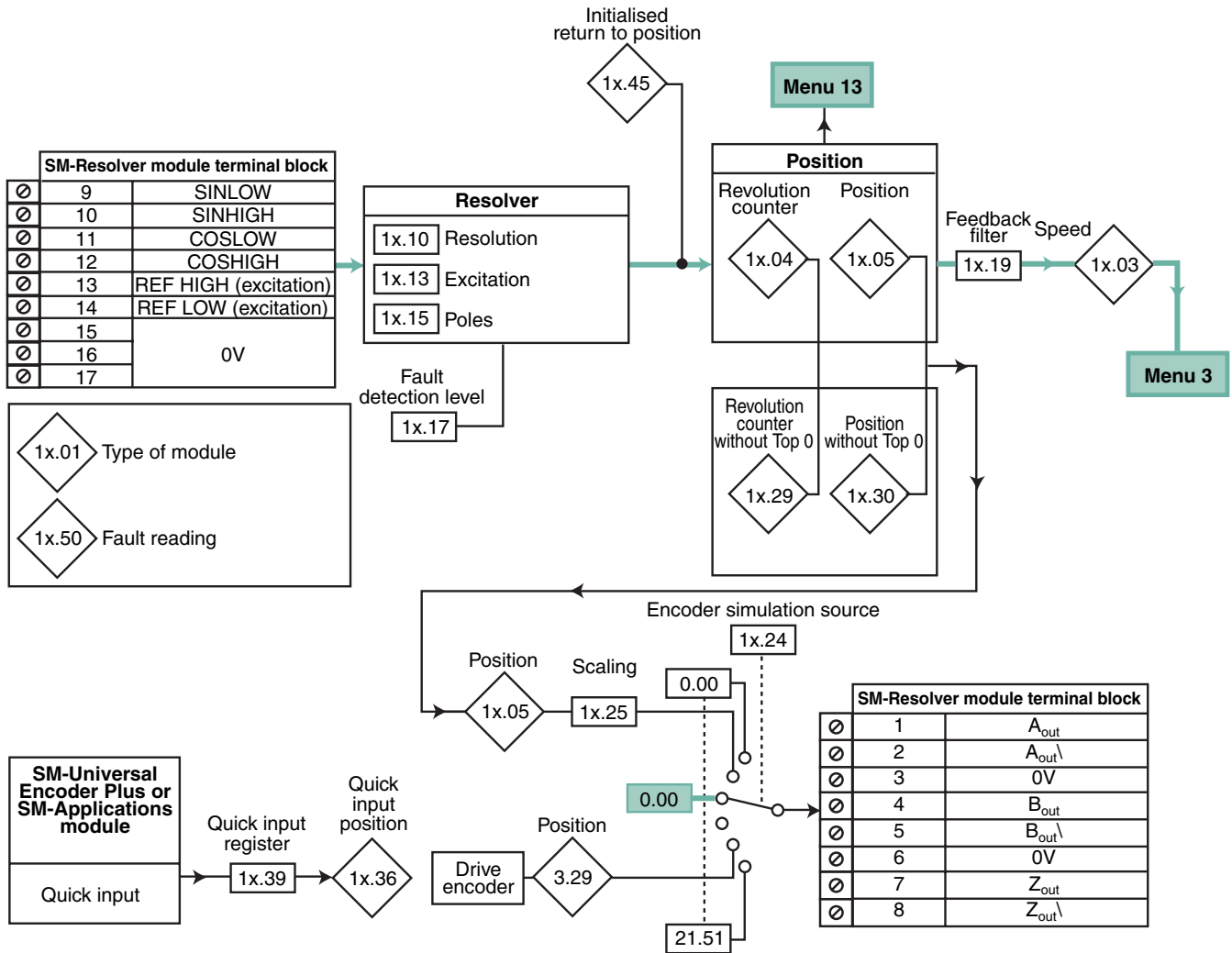


Parameters	Variation			Factory settings		
1x.01	0 to 499			-		
1x.03	$\pm 40000.0 \text{ min}^{-1}$			-		
1x.04 - 1x.29 - 1x.32 - 1x.35	0 to 65535 turns			-		
1x.05 - 1x.30 - 1x.33 - 1x.36	0 to 65535 (1/2 ¹⁶ th of turn)			-		
1x.08 - 1x.39 - 1x.49	OFF (0) or On (1)			OFF (0)		
1x.10	0 to 50000			4096		
1x.15	Ab (0), Fd (1), Fr (2)			Ab (0)		
1x.16	0 to 2			1		
1x.19	-	0 to 5 (0 to 16ms)		-	0	
1x.45	OFF (0) or On (1)			-		
1x.50	0 to 255			-		

UNIDRIVE SP

Mise en service

H6.20.5 - SM-RESOLVER Module



Parameters	Variation range			Factory settings		
1x.01	0 to 499			-		
1x.03	± 40000.0 min ⁻¹			-		
1x.04 - 1x.29	0 to 65535 tours			-		
1x.05 - 1x.30 - 1x.36	0 to 65535 (1/2 ¹⁶ turn)			-		
1x.10	0 to 50000			4096		
1x.13	3:1 (0), 2:1 (1 or 2)			3:1 (0)		
1x.15	2 POLE (0), 4 POLE (1), 6 POLE (2), 8 POLE (3 to 11)			2 POLE (0)		
1x.17	0 to 7			1		
1x.19	-	0 to 5 (0 to 16ms)		-	0	
1x.25	0 to 3.0000			0.2500		
1x.39	OFF (0) or On (1)			OFF (0)		
1x.45	OFF (0) or On (1)			-		
1x.50	0 to 255			-		

UNIDRIVE SP

Mise en service

H6.20.6 - SM-field bus module

Parameters	Description	Variation range			Factory settings		
1x.01	Module type	0 to 499			-		
1x.02	Module software version	0 to 99.99			-		
1x.03	Station address	65535			65535		
1x.04	Transmission speed	-128 to +127			+127		
1x.05	Mode	65535			4		
1x.06	Diagnosis	±9999			-		
1x.07	Stop time delay	0 to 3000			200		
1x.08	"Little endianism" selection	OFF (0) or On (1)			OFF (0)		
1x.09	Register control	OFF (0) or On (1)			OFF (0)		
1x.10 to 1x.19	Input words IN 0 to 9	-32768 to +32767			-		
1x.20 to 1x.29	Output words OUT 0 to 9	-32768 to +32767			-		
1x.30	Return to factory settings of SM module	OFF (0) or On (1)			OFF (0)		
1x.31	Storing of module parameters	OFF (0) or On (1)			OFF (0)		
1x.32	Reset of SM module	OFF (0) or On (1)			OFF (0)		
1x.33	Transfer of module memory	OFF (0) or On (1)			OFF (0)		
1x.34	Compression	OFF (0) or On (1)			OFF (0)		
1x.35	Serial number	-2147 483648 to 2147 483647			-		
1x.36 and 1x.37	Specific to the bus	OFF (0) or On (1)			OFF (0)		
1x.38	Selection of mode specific to the bus	0 to 255			0		
1x.39	Number of IN cyclic words	0 to 255			0		
1x.40	Number of OUT cyclic words	0 to 255			0		
1x.41 and 1x.48	Specific to the bus	0 to 255			0		
1x.49	Data assignment error	0 to 255			0		

UNIDRIVE SP

Mise en service

H6.20.7 - SM-Applications Module

Parameters	Description	Variation range			Factory settings		
1x.01	Module type	0 to 499			-		
1x.02	Module software version (xx.yy)	0 to 99.99			-		
1x.03	Sypt program status	None(0), Stop(1),Run(2), Trip(3)			-		
1x.04	System resource available	0 to 100			-		
1x.05	RS485 address	0 to 255			11		
1x.06	RS485 Mode	0 to 255			1		
1x.07	RS485 transmission speed	300(0), 600(1), 1200(2),2400(3), 4800(4), 9600(5), 19200(6), 38400(7), 57600(8), 115200(9) bauds			300(0) bauds		
1x.08	RS485 cycle time	0 to 255 ms			2 ms		
1x.09	RS485 Tx validation time	0 to 1 ms			0		
1x.10	Transmission path for DPL PrintSYPT:	OFF(0) or RS485: On(1)			SYPT: OFF(0)		
1x.11	Time of scrutinising the clock-related charge	0 to 200 ms			0		
1x.12	Time of scrutinising the Pos charge	DISAbLEd(0); 0.25 ms(1); 0.5 ms(2); 1 ms (3); 2 ms(4); 4 ms(5); 8 ms(6)			DISAbLEd(0)		
1x.13	Operation validation	OFF(0) or On(1)			On(1)		
1x.14	Module fault validation	OFF(0) or On(1)			OFF(0)		
1x.15	No Reset module on the drive fault deletion	OFF(0) or On(1)			OFF(0)		
1x.16	Update of the encoder data	0 to 3			0		
1x.17	Limit exceeding fault validation	OFF(0) or On(1)			OFF(0)		
1x.18	Wizard validation	OFF(0) or On(1)			OFF(0)		
1x.19	Immediate saving of parameters	OFF(0) or On(1)			OFF(0)		
1x.20	Save upon powering down	OFF(0) or On(1)			OFF(0)		
1x.21	Saving validation and restitution of menu 20	OFF(0) or On(1)			OFF(0)		
1x.22	Address of CTNet token ring	0 to 255			0		
1x.23	CTNet address	0 to 255			0		
1x.24	CTNet mains supply speed	5.000(0); 2.500(1); 1.250(2); 0.625(3)			2.500(1)		
1x.25	Configuration of CTNet Sync exchanges	0 to 9999			0		
1x.26	Destination of the 1 st cyclic word CTNet easy mode	0 to 25503			0		
1x.27	Source of the 1 st cyclic word CTNet easy mode	0 to 9999			0		
1x.28	Destination of the 2 nd cyclic word CTNet easy mode	0 to 25503			0		
1x.29	Source of the 2 nd cyclic word CTNet easy mode	0 to 9999			0		
1x.30	Destination of the 3 rd cyclic word CTNet easy mode	0 to 25503			0		

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Mise en service

SM-Module Applications (continued)

Parameters	Description	Variation range			Factory settings		
1x.31	Source of the 3 rd cyclic word CTNet easy mode	0 to 9999			0		
1x.32	Destination transfer slot 1	0 to 9999			0		
1x.33	Destination transfer slot 2	0 to 9999			0		
1x.34	Destination transfer slot 3	0 to 9999			0		
1x.35	Synchronisation of Event charges	Disable(0), Event(1), Event1(2), Event2(3), Event3(4)			Disable(0)		
1x.36	Status of CTNet bus	-3 to 0			-		
1x.37	Reject of loading authorisation	OFF(0) or On(1)			OFF(0)		
1x.38	No trip state on APC error	OFF(0) or On(1)			OFF(0)		
1x.39	Status of Sync master	0 to 3			0		
1x.40	Data transfer mode	0 to 10			1		
1x.41	Reserved						
1x.42	Saved main position	OFF(0) or On(1)			OFF(0)		
1x.43	Inversion sauvegarde de position	OFF(0) or On(1)			OFF(0)		
1x.44	Charge priority level	0 to 255			0		
1x.45	Reserved						
1x.46	Reserved						
1x.47	Reserved						
1x.48	Fault program line	0 to 2 147 483 647			-		
1x.49	User parameter	± 32767			-		
1x.50	Fault reading						
1x.51	Software version (zz)						

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Mise en service

H6.21 - Menu 18 : application parameters

Parameters	Description	Variation range			Factory settings		
18.01	Application parameter (stored when powered down)	-32768 to + 32767			0		
18.02 to 18.10	Application parameter	-32768 to + 32767			0		
18.11 to 18.30	Application parameter	-32768 to + 32767			0		
18.31 to 18.50	Application parameter	OFF (0) or On (1)			OFF (0)		

H6.22 - Menu 19 : application parameters

Parameters	Description	Variation range			Factory settings		
19.01	Application parameter (stored when powered down)	-32768 to + 32767			0		
19.02 to 19.10	Application parameter	-32768 to + 32767			0		
19.11 to 19.30	Application parameter	-32768 to + 32767			0		
19.31 to 19.50	Application parameter	OFF (0) or On (1)			OFF (0)		

H6.23 - Menu 20 : application parameters

Parameters	Description	Variation range			Factory settings		
20.01 to 20.20	Application parameter	-32768 to + 32767			0		
20.21 to 20.40	Application parameter	-2^{31} to $(2^{31}-1)$			0		

Note: These application parameters are mainly used with SM-Applications or SM-Applications Lite modules, or for the conception of a "Syptlite" program (execution of a program internal to the variable speed drive by means of a Syptlite software, available on CD Rom delivered together with the variable speed drive).

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Mise en service

H6.24 - Menu 21: Operating Parameters of a Second Motor

Parameters	Description	Variation range			Factory settings		
21.01	Maximum limit	0 to 3000.0 Hz	0 to LIM N MAX		EUR : 50.0 Hz USA : 60.0 Hz	EUR : 1500min ⁻¹ USA : 1800.0min ⁻¹	3000.0 min ⁻¹
20.02	FWD/REV minimum limit	± 3000.0 Hz	± LIM N MAX		0		
20.03	Reference selection	A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), Pad (4),Prc (5)			A1.A2 (0)		
20.04	Reference selection	0 to 3200.0s/100Hz	0 to 3200.000s/1000min ⁻¹		5.0s/100Hz	2.000s/1000min ⁻¹	0.200s/1000min ⁻¹
20.05	Acceleration ramp	0 to 3200.0s/100Hz	0 to 3200.000s/1000min ⁻¹		10.0s/100Hz	2.000s/1000min ⁻¹	0.200s/1000min ⁻¹
20.06	Rated frequency	0 to 3000.0 Hz	0 to 1250.0 Hz	-	EUR : 50.0 Hz / USA : 60.0 Hz		-
20.07	Rated current	0 to I _R MAX (A)			I _{NAME} VAR (11.32)		
20.08	Rated speed	0 to 180000min ⁻¹	0 to 40000.00min ⁻¹		EUR : 1500min ⁻¹ USA : 1800min ⁻¹	EUR : 1450.00min ⁻¹ USA : 1770.00min ⁻¹	3000.00 min ⁻¹
20.09	Rated voltage	0 to U _{AC} MOT MAX (V)			TL : 230V / T : EUR = 400V, USA = 460V / TM : 575V / TH : 690V		
20.10	Cos φ	0 to 1.000		-	0 to 0.850		-
20.11	Number of motor poles	Auto with 120 poles (0 to 60)			Auto (0)		6 POLE (3)
20.12	Stator resistor	0 to 30.000 Ω			0		
20.13	Offset voltage	0 to 25.0V		-	0	-	
20.14	Transient inductance	0 to 500.000 mH			0		
21.15	Active motor 2 parameters	OFF (0) or On (1)			-		
20.16	Thermal time constant	0 to 400.0 s			89.0 s		20.0 s
20.17	Speed loop Kp gain	-	0 to 6.5535 (1/rads ⁻¹)		-	0.0100 (1/rads ⁻¹)	
20.18	Speed loop Ki gain	-	0 to 655.35 (1/rad)		-	1.00 (1/rad)	
20.19	Speed loop Kd gain	-	0 to 0.65535 (s)		-	0	
20.20	Encoder phasing out	-	0 to 359.9 °		-	0	
20.21	Speed feedback selection	-	drv (0), SLot 1 (1), SSlot 2 (2), SSlot 3 (3)		-	drv (0)	
20.22	Current loop Ki gain	0 to 30000			20	TL : 75, T : 150, TM : 180, TH : 215	
20.23	Current loop Ki gain	0 to 30000			40	TL : 1000, T : 2000, TM : 2400, TH : 3000	
20.24	Stator inductance	-	0 to 5000.00 mH	-	-	0	-
20.25	Inflexion point 1	-	0 to 100 % of the rated flux	-	-	50 %	-
20.26	Inflexion point 2	-	0 to 100 % of the rated flux	-	-	75 %	-
20.27	Motor active current limit	0 to LIM. IM1 MAX (%)			165.0 %	175.0 %	
20.28	Generator active current limit	0 to LIM. IM1 MAX (%)			165.0 %	175.0 %	
20.29	Symmetrical active current limit	0 to LIM. IM1 MAX (%)			165.0 %	175.0 %	
20.30	Motor voltage for 1000min ⁻¹ Ke	-	-	0 to 10000 V	-	-	98 V
20.31	No line motor	0 to 655.35 mm			0		

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H6.25 - Menu 22 : Menu 0 Setting (continued)

Menu 0 Configuration

Parameters	Description	Variation range			Factory settings		
22.01	Setting of 0.31 of menu 0	1.00 to 21.51			11.33		
22.02	Setting of 0.32 of menu 0	1.00 to 21.51			11.32		
22.03	Setting of 0.33 of menu 0	1.00 to 21.51			6.09	5.16	0.00
22.04	Setting of 0.34 of menu 0	1.00 to 21.51			11.30		
22.05	Setting of 0.35 of menu 0	1.00 to 21.51			11.24		
22.06	Setting of 0.36 of menu 0	1.00 to 21.51			11.25		
22.07	Setting of 0.37 of menu 0	1.00 to 21.51			11.23		
22.08 and 22.09	Not used	-			-		
22.10	Setting of 0.40 of menu 0	1.00 to 21.51			5.12		
22.11	Setting of 0.41 of menu 0	1.00 to 21.51			5.18		
22.12 to 22.17	Not used	-			-		
22.18	Setting of 0.48 of menu 0	1.00 to 21.51			11.31		
22.19	Not used	-			-		
22.20	Setting of 0.50 of menu 0	1.00 to 21.51			11.29		
22.21	Setting of 0.51 of menu 0	1.00 to 21.51			0.00		
22.22	Setting of 0.52 of menu 0	1.00 to 21.51			0.00		
22.23	Setting of 0.53 of menu 0	1.00 to 21.51			0.00		
22.24	Setting of 0.54 of menu 0	1.00 to 21.51			0.00		
22.25	Setting of 0.55 of menu 0	1.00 to 21.51			0.00		
22.26	Setting of 0.56 of menu 0	1.00 to 21.51			0.00		
22.27	Setting of 0.57 of menu 0	1.00 to 21.51			0.00		
22.28	Setting of 0.58 of menu 0	1.00 to 21.51			0.00		
22.29	Setting of 0.59 of menu 0	1.00 to 21.51			0.00		

Nota : For setting **0.11** to **0.30**, refer to menu 11.

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UNIDRIVE SP Communication

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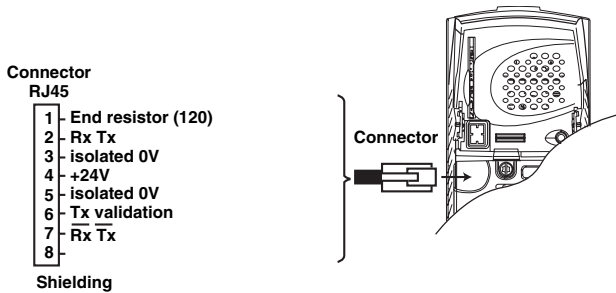


UNIDRIVE SP Communication

I1 - Serial link

In standard version UNIDRIVE SP integrates a serial link port RS485 / 2 wires accessible by a RJ45 connector.

I1.1 - Localisation and connection



To validate the end resistor, connect pin 8 to pin 1.

I1.2 - Isolation

The drive serial link port has a double isolation. It complies with the SELV safety requirements of the EN50178 standard. The drive serial link is isolated from the power stage and from the control terminals.

! In order to comply with the SELV safety requirements of the CEI60950 standard regarding the IT conditions, the element connected to the serial link must be connected to earth. In case of a portable PC or of another similar equipment for which the earthing is not possible, an additional isolation must be inserted into the cable.

The CT Comms cable option is used to directly connect a PC to UNIDRIVE SP. This cable, with a SUB-D 9 connector at one end and RJ45 at the other end, integrates an isolated RS232/RS485 converter.

I1.3 - Protocols

The drive manages the protocols (selected by parameter-setting) :

- Modbus RTU (factory settings),
- CT ANSI.

I1.4 - Parameter-setting

Depending on the application, the following parameters must be changed.

0.35 : Type of communication

0.36 : Serial link transmission speed

0.37 : Serial link address

For details regarding these parameters, see section H2.1.

I1.5 - Connection to mains supply

The UNIDRIVE SP serial port allows the drive to communicate to the RS 485 2 wire mains supply.

- The mains supply must be then a " chain " connection (and not a star connection).
- The terminals 2, 3, 7 and the shielding must be connected at minimum.
- The terminals 4 of all mains supply drives may be connected altogether, but the maximum power available will be the same as for a single drive (the terminals 4 may be thus separately supplied with power).
- For a drive located at the chain end in a mains supply, validate the end resistor by connecting the terminals 1 and 8.
- CT Comms cable may be used on the mains supply, but only occasionally, for diagnosis or setting, and with UNIDRIVE SP drives only.

In this case, the terminals 6 of each drive must be connected, and terminal 4 must be connected to a single drive (1 single CT Comms cable may be used on the mains supply).

I2 - Setting by PC

The LS SOFT parameter-setting allows a user-friendly commissioning of UNIDRIVE SP from a PC.

- Interactive setting: the setting of the drive is made automatically starting with answers to a questionnaire concerning the installation.
- Supervision during the commissioning: LS SOFT is used to supervise on a single and same screen different information regarding the operation.
- File storing: LS SOFT is used to save the parameter files allowing thus to duplicate very quickly an already existing setting.

To connect the PC to UNIDRIVE SP, use the CT Comms cable option described above or use a RS232/RS485 2 wire converter (example : Amplicon 485 FI).

For the PC fitted with USB ports, contact your usual LEROY-SOMER correspondent.

During the use of a converter with Unidrive SP, it is recommended not to connect the end resistor to the mains supply. It may be necessary to disconnect the end resistor depending on the type used.

UNIDRIVE SP Communication

13 - Control word and status word

The UNIDRIVE SP control commands may be managed by a single parameter **6.42**, named " control word ".

In fact, the value of **6.42** corresponds to a word within which each bit is associated with a command. The command is validated when the bit is set to 1, and it is invalidated when the bit is set to 0.

To validate the commands by control word, set **6.43** = 1 (the control commands by terminal block are no longer active).

The parameter **10.40** named status word is used to regroup the information on the variable speed drive. The value of **10.40** corresponds to a 15-bit word, and each bit is associated with a drive status parameter.

6.42 : Control word

Bits of control word 6.42	Corresponding parameters	Functions
0	6.15	Drive enabling
1	6.30	Fwd run
2	6.31	Run by pulses
3	6.32	REV run
4	6.33	Fwd/rev
5	6.34	Run
6	6.39	Stop\
7	-	Automatic/Manual
8	1.42	Analogue reference - preset reference
9	6.37	Rev run by pulses
10	-	reserved
11	-	reserved
12	-	Drive trip state
13	10.33	Drive trip state reset / Reset
14	-	Keyboard wizard

10.40 : Status word

Bits of status word 10.40	Corresponding parameters	Drive status
0	10.01	Drive ready
1	10.02	Activated drive output
2	10.03	Zero speed or frequency
3	10.04	Minimum speed or frequency
4	10.05	Frequency or speed lower than the low threshold
5	10.06	Reached reference
6	10.07	Frequency or speed higher than the high threshold
7	10.08	Rated load
8	10.09	Active current limitation
9	10.10	Dynamic braking
10	10.11	Braking on resistor
11	10.12	Overload alarm, braking resistor
12	10.13	Required reverse rotation
13	10.14	Reverse rotation
14	10.15	Mains supply absence

14 - MODBUS RTU, **0.35** = rtU (1)

14.1 - General information

The MODBUS RTU protocol is a master - slave type protocol. (a single master by mains supply).

Description	Characteristics
Normal physical layer for multi-points operation	RS485 2 wires
Chain of bits	Standard UART asynchronous symbols with No Return to Zero (NRZ)
Symbol	Each symbol is made of: 1 bit start 8 bits of data (last significant bit sent first) 2 bits stop
Transmission speed	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bauds

14.2 - Description of exchanges

The exchanges are made on the initiative of the master, which imposes its demands: if the related slave comprised it, it sends its answer. Each frame (question or response) contains four types of information :

- the address of the related slave receiving the question frame (master demands) or the address of the slave sending the response frame (encoded on a byte),
- the function code that selects a command (reading or writing of words, of bits...) for the question and response frames (encoded on a byte),
- the information field containing the command-related parameters (encoded on "n" bytes),
- the CRC of the frame, calculated on sixteen bits which is used to detect the transmission errors.

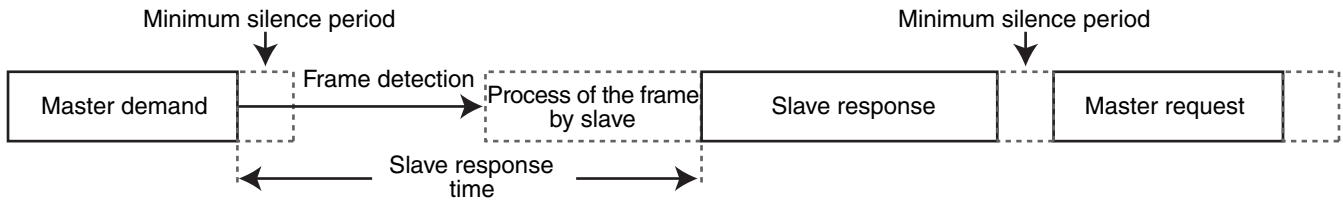
The frame is terminated by a minimum silence period, equivalent to the transmission time for 3.5 characters (by instance, at 19200 bauds, the silence period must be at least of 1/19200 x 11 bits x 3.5, that is 2 ms). This silence period indicates the message end, and the slave may begin to process the information sent.

All the information is encoded in hexadecimal.

Slave address	Function code	Message data	CRC 16 bits	Silence interval
---------------	---------------	--------------	-------------	------------------

UNIDRIVE SP Communication

All the master demands, excepting the general diffusion demands, will generate the response of a single slave. The slave will respond within the maximum time assigned for it (the minimum response time will be never shorter than the silence period). After a general demand, the master may send a new demand after a period equivalent to the maximum response time of the slave.



14.3 - Global addressing

When the master sends a message with the zero address, this message is sent to all the slaves of the mains supply. The slave knots do not send response messages for general demands.

14.4 - Parameter assignment

The UNIDRIVE SP drives are parameter-set by using a **menu.parameter** notation. The indices "menu" and "parameter" may have the values 0 - 99. Le menu.parameter is assigned to a MODBUS RTU register **menu x 100 + parameter**.

To correctly assign the parameters, the slave increments by (+1) the address of the register received.

Example : X = menu ; Y = parameter

Drive parameter	Register address (protocol level)
X.Y	$(X \times 100) + (Y - 1)$
Examples :	
1.02	101
1.00	99
0.01	0
70.00	6999

14.5 - Data encoding

MODBUS RTU uses a "big-endian" representation for data information and addresses (save for CRC which is "little-endian"). That is, when a digital quality, "larger" than a byte is sent, the most significant byte is sent first. By instance:

16 – bits 0x1234 must be: 1st 2nd ...
 32 – bits 0x12345678L must be: 0x12 0x34 0x56 0x78

14.6 - "Function" codes

The function code determines the data context and format of the message. Bit 7 of the function code is used in the slave response to indicate an exception.

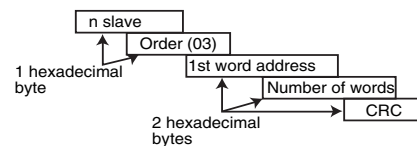
Code function	Description
3	Multiple reading of 16-bit registers
16	Multiple writing of 16-bit registers
23	Multiple reading and writing of 16-bit registers
64	CMP "capsulated" protocol Non standard function code

14.6.1 - Function code 3 : reading

Reading of a register adjacent area. The slave imposes a high limit on the number of registers that may be read. If the limit is exceeded, the slave will produce a code 2 exception.

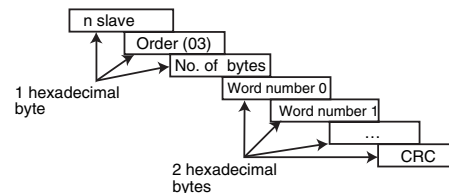
Frame sent by the master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x03
2	High weight of the first word address
3	Low weight of the first word address
4	High weight of the number of word to read
5	Low weight of the number of word to read
6	Low weight of CRC
7	High weight of CRC



Frame sent by the slave:

Bytes	Description
0	Slave address
1	Function code 0x03
2	Number of bytes to read
3	High weight of word 0
4	Low weight of word 0
5	High weight of word 1
6	Low weight of word 1
...	...
n	Low weight of CRC
n + 1	High weight of CRC



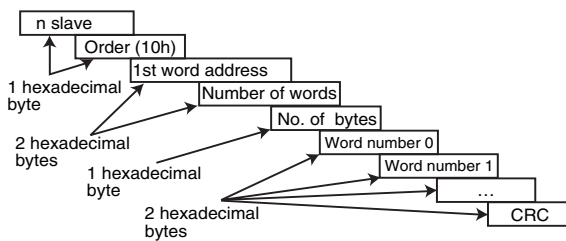
UNIDRIVE SP Communication

14.6.2 - Function code 16 : writing

Writing a register adjacent area. The slave imposes a high limit on the number of registers that may be written. If the limit is exceeded, the slave will abandon the demand and the master will not respond ("timeout").

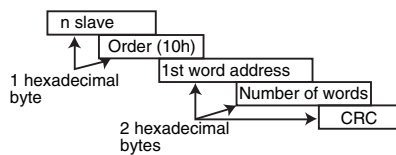
Frame sent by the master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x10
2	High weight of the first word address
3	Low weight of the first word address
4	High weight of the number of word to write
5	Low weight of the number of word to write
6	Number of bytes to write
7	High weight of word 0 to write
8	Low weight of word 0 to write
9	High weight of word 1 to write
10	Low weight of word 1 to write
...	...
n	Low weight of CRC
n + 1	High weight of CRC



Frame sent by the slave:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x03
2	High weight of the first word address
3	Low weight of the first word address
4	High weight of the number of written bytes
5	Low weight of the number of written bytes
6	Low weight of CRC
7	High weight of CRC



14.6.3 - Function code 23 : reading/writing

Writing and reading of two adjacent register areas. The slave imposes a high limit on the number of registers that may be written. If the limit is exceeded, the slave will abandon the demand and the master will not respond ("timeout").

Frame sent by the master:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	High weight of the first word address to read
3	Low weight of the first word address to read
4	High weight of the number of word to read
5	Low weight of the number of word to read
6	High weight of the first word address to write
7	Low weight of the first word address to write
8	Low weight of the first word address to write
9	Low weight of the number of words to write
10	Number of bytes to write
11	High weight of word 0
12	Low weight of word 0
13	High weight of word 1
14	Low weight of word 1
...	...
n	Low weight of CRC
n + 1	High weight of CRC

Frame sent by the slave:

Bytes	Description
0	Slave address (1 to 247)
1	Function code 0x17
2	Number of bytes to read
3	High weight of word 0
4	Low weight of word 0
5	High weight of word 1
6	Low weight of word 1
...	...
n	Low weight of CRC
n + 1	High weight of CRC

14.6.4 - Example

Drive address = 11.

Reading of 3 parameters starting with **1.08**.

0108 becomes 0107 which is equal to 006B in hexadecimal (modbus address = parameter address - 1).

• Request

	Example (hexa)	RTU (binary)
Slave address	B	0000 1011
Function	03	0000 0011
1st word address (strong)	00	0000 0000
1st word address (weak)	6B	0110 1011
Number of words (strong)	00	0000 0000
Number of words (weak)	03	0000 0011
Check-up		CRC (16 bits)
Total of bytes:		8

• Response

	Example (hexa)	RTU (binary)
Slave address	B	0000 1011
Function	03	0000 0011
Number of bytes	06	0000 0110
Word 0 (strong)	02	0000 0010
Word 0 (weak)	2B	0010 1011
Word 1 (strong)	00	0000 0000
Word 1 (weak)	00	0000 0000
Word 2 (strong)	00	0000 0000
Word 2 (weak)	63	0110 0011
Check-up		CRC (16 bits)
Total of bytes :		11

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14.7 - Waiting delay

In MODBUS RTU, when the master sends a message to a slave, it needs a waiting delay between the end of its demand and the beginning of the slave response, this allowing to detect a possible outstanding response.

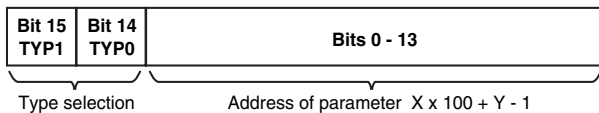
14.8 - Types of large data

14.8.1 - 32 bit registers

The standard MODBUS RTU registers have 16 bits, and a single parameter X.Y is assigned to a single register MODBUS RTU. To manage 32 bits data (entire or floating), we may use multiple MODBUS RTU readings and writings to transfer a 32-bit register adjacent area.

Generally, the slaves contain 16-bit registers and 32-bit registers. In order to allow the master to select 16 or 32 bits, the 2 bits of the highest weight of the register address are used to indicate the type of data selected.

Note : The selection applies to all the units.



Bits 14 and 15 select the data type according to the table below:

Bits 15-14	Type of data selected	Comment
00	INT16	Standard type - 16 bits
01	INT32	Specific type - 32 bits
10	Float32	IEEE794 standard not managed by all equipment
11	Reserved	

If a 32-bit data type is selected, then the slave uses 2 MODBUS RTU registers of 16 consecutive bits (in "big endian"). The master must also correctly adjust the "number of 16-bit registers".

14.8.2 - Reading of a type of parameter different from the selected one

The slave will send the last significant word of a 32-bit parameter if this parameter is read as a 16-bit parameter. The slave will sign the last significant word of a 16-bit parameter if this parameter is read as a 32-bit parameter. The number of 16-bit registers must be even during a 32-bit reading.

Example :

If :

- **20.01** is a 32-bit parameter with a value of 0x12345678,
- **20.02** is a 16-bit parameter with a value of 0xABCD (negative value),
- **20.03** is a 16-bit parameter with a value of 0x0123 (positive value).

Reading	Register beginning address	Number of 16-bit registers	Response	Comments
20.01	200	1	0x5678	Standard 16-bit reading of a 32-bit register will return a 16-bit word ("truncated" data)
20.01	16584	2	0x12345678	Correct 32-bit reading
20.01	16584	1	Exception 2	The number of registers must be even for a 32-bit reading
20.02	201	1	0xABCD	Standard 16-bit reading of a 16-bit register will return a 16-bit word
20.02	16585	2	0xFFFFABCD	32-bit reading of a 16-bit register will return a 32-bit signed word
20.03	16586	2	0x00000123	
20.01 20.02	200	2	0x5678, 0xABCD	Standard 16-bit reading of a 32-bit register will return a 16-bit word ("truncated" data)
20.01 20.02	16584	4	0x12345678, 0xFFFFABCD	Complete 32-bit reading

Example:

Slave address: 08

Reading from **20.01** to **20.04** 32-bit parameters, by using the function code 03.

• Master Request

Bytes	Value	Description
0	0x08	Slave address
1	0x03	Multiple reading, function code 03
2	0x40	Address of initial register 20.01
3	0xC8	(0x4000 + 201 - 1) = 16584 = 0x40C8
4	0x00	Number of 16-bit registers to read:
5	0x08	20.01 to 20.04 correspond to 4 32-bit registers = 8 16-bit registers
6	Low weight of CRC	-
7	High weight of CRC	-

Note : the value 0x4000 corresponds to the INT32 type (bit15 = 0, bit 14 = 1).

• Slave response:

Bytes	Value	Description
0	0x08	Slave address
1	0x03	Multiple reading, function code 03
2	0x10	Data length (bytes) = 4 32-bit registers = 16 bytes
3-6		20.01
7-10		20.02
11-14		20.03
15-18		20.04
19	Low weight of CRC	-
20	High weight of CRC	-

UNIDRIVE SP Communication

14.8.3 - Writing of a type of parameter different from the selected one

The slave will allow the writing of a 32-bit value in a 16-bit parameter, if the 32-bit value does not exceed the normal range of a 16-bit parameter.

The slave will allow the writing of a 16-bit value in a 32-bit parameter. The slave will sign the written value, so the range of this type of writing will be ± 32767 .

Example :

If for :

- **20.01** the variation range is of + 100000,

- **20.02** the variation range is of + 10000.

Writing	Register beginning address	Number of 16-bit registers	Response	Comments
20.01	200	1	0x1234	Standard 16-bit writing in a 32-bit register. Written value: 0x00001234 (4660)
20.01	200	1	0xABCD	Standard 16-bit writing in a 32-bit register. Written value: 0xFFFFABCD (-11213)
20.01	16584	2	0x00001234	Written value: 0x00001234 (4660)
20.02	201	1	0x0123	Written value: 0x0123 (291)
20.02	16585	2	0x00000123	Written value: 0x00000123 (291)

14.9 - Exceptions

If an error is detected in the master demand, the slave will respond with an exception response. If the message is inadequate and the frame is not received, or if CRC stops, then the slave will produce no exception, and in this case the master will not receive the slave response ("timeout"). If a writing demand (function code 16 or 23) exceeds the maximum size accepted by the slave, the slave will reject the message. No exception will be sent and the master will not respond.

Format of an exception message:

Bytes	Description
0	Slave address
1	Initial function code with bit 7 to 1
2	Exception code
3	Low weight of CRC
4	High weight of CRC

Exception codes:

Code	Description
1	Not managed function code
2	Register address beyond the range or too important reading demand (too many registers)

Parameters beyond the range during a writing function (function code 16)

The slave processes the writing unit in the order in which the data are received. If a writing fails due to a value beyond the range, the writing unit is ended.

The slave will not produce exception response, but it will signal to the master the number of actually performed writing.

Parameters beyond the range during the reading/writing (function code 23)

There is no indication when the value is beyond the range, during a CF23 access.

14.10 - CRC

This control word is used for the detection of the transmission errors. It is calculated on 16 bits starting with all the question and response frame bytes.

Algorithm:

START

CRC = 0xFFFF;

Number of processed bytes = 0 ;

Following byte = first byte;

REPEAT{

Byte to be processed = following byte ;

CRC = CRC or exclusive byte to be processed;

REPEAT eight times

IF (CRC odd)

THEN CRC = CRC or exclusive 0xA001 ;

Number of processed bytes = Number of processed bytes + 1 ;

}WHILE (number of processed bytes < Number of bytes to be processed)

END.

UNIDRIVE SP SMARTCARD

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UNIDRIVE SP SMARTCARD

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J

UNIDRIVE SP SMARTCARD

J1 - Functionalities and installation

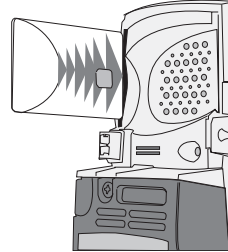
SMARTCARD is supplied in the standard version with UNIDRIVE SP.

It is used to simply configure the drive:

- saving the drive parameters in order to duplicate them in other drives,
- loading parameters by means of SMARTCARD.

A single SMARTCARD may be inserted in the drive, but the user may have several different programming cards.

• SMARTCARD Slot



Note : UNIDRIVE SP is supplied with the SMARTCARD already placed in its location.

J2 - Saving a set of parameters

To transfer the drive parameters and to store them in SMARTCARD, various solutions may be considered :

- manual and selective saving of parameters on SMARTCARD,
- automatic saving of parameters and of their modifications on SMARTCARD,
- saving the drive parameters on a SMARTCARD in order to automatically transfer them to another drive, only by inserting the card.

J2.1 - Manual saving

Parameter	Setting	Description	Validation
0.00	1000	Storing of all drive parameters	Press the Reset key.
0.30	Prog (2)	Storing of all drive parameters in SMARTCARD	Press the Reset key. After the transfer, 0.30 returns to 0 (none).
0.29	3333	Storing of all drive LEROY-SOMER application program parameters on a SMARTCARD (menus 20, 70 and 71)	Press .

CAUTION:
If SMARTCARD contains already parameters, they will be " deleted and reset " by this procedure.

J2.2 - Automatic saving

Parameter	Setting	Description	Validation
0.00	1000	Storing of all drive parameters	Press the Reset key.
0.30	Auto (3)	All drive parameters are stored on the SMARTCARD. Then, only the modifications of menu 0 will be automatically stored on the card.	Press the Reset key. Let the SMARTCARD in its place in the drive.
0.00	1000	Storing of the modification of other menus on the SMARTCARD	Press the Reset key.

Subsequently, on each powering up, all drive parameters are stored on the SMARTCARD. During the transfer, the display indicates " cArD ".

CAUTION:
If the SMARTCARD contains already parameters, they will be " deleted and reset " by this procedure.

J2.3 - Saving for automatic transfer to another drive

Parameter	Setting	Description	Validation
0.00	1000	Storing of all drive parameters	Press the Reset key.
0.30	boot (4)	All drive parameters are stored on the SMARTCARD.	Press the Reset key. Remove the card

Consequently, insert the SMARTCARD into another drive powered down. When powering up, all the SMARTCARD parameters are automatically transferred to the drive. During the transfer, the display indicates " boot ". Remove the card.

CAUTION:
If SMARTCARD contains already parameters, they will be " deleted and reset " by this procedure.

J2.4 - Writing Protection

Parameter	Setting	Description	Validation
0.00	9888	Memory block in SMARTCARD. No parameter saving may be transferred to the SMARTCARD. Only the SMARTCARD loading into a drive is authorised.	Press the Reset key.

To unblock the memory in the card:

Parameter	Setting	Description	Validation
0.00	9777	The SMARTCARD memory is unblocked	Press the Reset key.

J2.5 - Reset

Parameter	Setting	Description	Validation
0.00	9999	Reset of all parameters previously stored on the SMARTCARD.	Press the Reset key.

UNIDRIVE SP SMARTCARD

J3 - Loading a set of parameters



To load a set of parameters from the SMARTCARD into the drive, proceed as follows :

- manual loading of the parameters stored on the SMARTCARD to the drive,
- the parameters contained on the SMARTCARD have been stored so that they are automatically loaded once the SMARTCARD is inserted into the drive.




CAUTION:

- If the drive rating is different from the one stored on SMARTCARD, the drive sets to " C.rtg " and the parameters related to the drive rating are no longer transferred.
- The **0.43** encoder phase angle is also saved on the SMARTCARD. During the transfer from the card to the drive, the then stored phase angle may be different from the one of the encoder installed. In order to avoid any problem, proceed to a self-rating after transfer, or apply manually **0.43**.

J3.1 - Manual loading

Parameter	Setting	Description	Validation
0.30	REAd (1)	Loading of the SMARTCARD parameters into the drive.	Press the Reset  key. After the transfer, 0.30 returns to 0 (none).
0.29	6666	Loading of all drive LEROY-SOMER application program parameters on the SMARTCARD (menus 20, 70 and 71))	Press  .

CAUTION:




The operating mode - Open loop () , the vector mode - Closed loop () or Servo () of the drive and that contained on the SMARTCARD during the transfer, must be identical. Otherwise, the drive mode will be modified by SMARTCARD.

J3.2 - Automatic loading

Previously, the saving of parameters on the SMARTCARD must be performed by the procedure described at section J2.3 (**0.30** = boot (4)).

- Insert the card.
- All SMARTCARD parameters are automatically transferred to the drive. During the transfer, the display indicates " boot ".
- Remove the SMARTCARD

CAUTION :

When powering up, The operating mode - Open loop () , the vector mode - Closed loop () or Servo () of the drive and that contained on the SMARTCARD during the transfer, must be identical. Otherwise, the drive sets to " C.typ " and the drive mode is not modified.

UNIDRIVE SP Diagnostics

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UNIDRIVE SP Diagnostics

Notes

K

UNIDRIVE SP Diagnostics

K1 - Introduction

UNIDRIVE SP supplies a diagnostic information. This information may be divided into 3 categories :

- indications concerning the operation,
- operating alarms,
- fault tripps.


In addition, the fault type may be recovered by serial link as a code.





• **The user must neither repair the drive by itself nor give a diagnosis other than those listed in this chapter. In case of drive failure, it will be returned to LEROY-SOMER by your normal contact.**

K2 - Operational indicators


The lower display of Unidrive SP displays the drive status when stopped or during its operation.

	Comments	Output status
ACt	The drive is in regenerative mode, and it is synchronised with the mains supply	
ACUU	Loss of mains supply: the drive tends to maintain the voltage on the DC bus, by decelerating the motor	Active
Auto/tunE	Ongoing auto-tuning phase	
boot	Automatic transfer of SMARTCARD parameters to the drive (after power up)	-
cArd	Automatic transfer of the drive parameters to the SMARTCARD (after power up)	-
dc	Braking phase by direct current injection	Active
dEC	Deceleration after a stop command	Active

	Comments	Output status
inh	- The drive is disabled, and will not start the motor - Free wheel stop	Inactive
IoAAding	The drive transfers information to an optional module	-
POS	The drive positions the motor shaft	Active
rdY	- The drive is enabled, and waits for a command - the motor is ready to start	Inactive
run	The motor is controlled by the drive	Active
SCAn	In open loop () , motor quick resumption upon micro-cut	Active
StoP	The drive maintains the motor torque at zero speed.	Active
triP	The drive is stopped and it does no longer control the motor. The fault code is displayed on the lower display.	Inactive

K3 - Operating alarms

Alarms may occur during drive operation. These alarms are for preventive actions only, to alert the user: the drive continues to operate but there is a risk of stopping if no corrective action is taken.

	Comments
br.rs	Overheats the braking resistor (the braking thermal battery reached 75% of the value at which the drive stops)
OVLd	Overheats the motor I ² t (the motor thermal reserve reached 75% of the value at which the drive stops)
hot	Overheats the heater or the control card

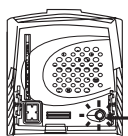
K4 - Fault tripping

If the drive stops, the output bridge of the drive is inactive, and the drive does not control the motor.



If a LED display is used, the upper display indicates "triP" and the lower display indicates the fault type.

All the faults indicated by the display are listed in the table below in alphabetical order.




If the drive has no display, a LED indicates the drive status.

If it is stable, the operation is normal, and if it flashes, the drive is faulty. The type of fault may be then known by consulting the value of parameter **10.20** by serial link. The value of **10.20** indicates then a fault code (1 to 230), and the correspondance of each code may be found in the table of section K4.3.

After consulting the fault table, follow the procedure below:
- make the necessary check-up in order to eliminate the cause

of the fault,





- check that the drive is disabled (terminal 31 open),
- press  : if the drives is no longer in trip state, the display indicates " inh ".

• **The opening and the closing of the enabling terminal may cancel the fault. If during the fault cancellation, the Fwd Run or Rev Run terminal is closed, the motor will immediately start.**




Note : In the table, the faults related to UNIDRIVE SP options contain the letter X, representing the location of the module having detected the fault.

UNIDRIVE SP Diagnostics


K4.1 - Fault table

Mnemonic Display	Reason of fault	Solution																						
ACUU.P (101)	Detection of mains supply loss by means of a power module	<ul style="list-style-type: none"> • Check the mains supply 																						
C.Acc (185)	Problem of communication with SMARTCARD	<ul style="list-style-type: none"> • Insert the SMARTCARD • Check that SMARTCARD is correctly inserted • The fault can be cleared only after one second 																						
C.Chg (179)	The unit selected in SMARTCARD already contains parameters	<ul style="list-style-type: none"> • Delete the unit parameters before attempting a new transfer to SMARTCARD • Select another unit not used on the SMARTCARD • The fault can be cleared only after one second 																						
C.Cpr (188)	The drive parameters are not identical to the parameters of the unit selected on the SMARTCARD	<ul style="list-style-type: none"> • To cancel the fault, press the Reset  key. • The fault can be cleared only after one second 																						
C.dat (183)	The unit selected on the SMARTCARD does not contain any parameter	<ul style="list-style-type: none"> • Check the unit number • The fault can be cleared only after one second 																						
C.Err (182)	SMARTCARD : incorrect data	<ul style="list-style-type: none"> • Insert the SMARTCARD • Check that the SMARTCARD is correctly inserted • Delete the parameters and proceed again with the transfer • The fault can be cleared only after one second 																						
C.Full (184)	SMARTCARD is full	<ul style="list-style-type: none"> • Delete a unit before proceeding again with the transfer • Insert another SMARTCARD • The fault can be cleared only after one second 																						
CL2 (28)	Current reference loss on the analogue input 2, terminal 7 (0.19 = 4-20 or 20-4)	<ul style="list-style-type: none"> • Check that the current reference is > 3mA • If 10.37 = 1 or 3, the motor stops before the stop of the drive 																						
CL3 (29)	Current reference loss on the analogue input 3, terminal 8 (0.21 = 4-20 or 20-4)																							
CL.bit (35)	Stop by the control word 6.42	<ul style="list-style-type: none"> • Invalidate the control word (6.43 = 0) • Check the settings of 6.42 																						
C.Optn (180)	The drive module(s) is (are) different from that (those) of the SMARTCARD	<ul style="list-style-type: none"> • Check the location and the type of the module(s) mounted on the drive, There should be no difference from the configuration stored on the SMARTCARD • Check that the options are correctly inserted in the drive • Press the Reset  key • The fault can be cleared only after one second 																						
C.rdo (181)	The storage on the SMARTCARD is disabled	<ul style="list-style-type: none"> • Set XX.00 = 9777 + Reset  to store a set of parameters on the SMARTCARD • Check the selected unit is not protected (blocs no. 500 to 999) • The fault can be cleared only after one second 																						
C.rtg (186)	The drive rating does not correspond to that stored on the SMARTCARD	<ul style="list-style-type: none"> • Press the Reset  key • SMARTCARD transferred all parameters excepting those related to the drive rating which resume their factory settings : <table border="1"> <thead> <tr> <th>Parameters</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>2.08</td> <td>DC bus voltage threshold</td> </tr> <tr> <td>4.05 to 4.07 21.27 to 21.29</td> <td>Current limitation</td> </tr> <tr> <td>5.07 and 21.07</td> <td>Motor rated current</td> </tr> <tr> <td>5.09 and 21.09</td> <td>Motor rated voltage</td> </tr> <tr> <td>5.17 and 21.12</td> <td>Stator resistor</td> </tr> <tr> <td>5.18</td> <td>Carrier frequency</td> </tr> <tr> <td>5.23 and 21.13</td> <td>Offset de tension</td> </tr> <tr> <td>5.24 and 21.14</td> <td>Voltage offset</td> </tr> <tr> <td>5.25 and 21.24</td> <td>Transient inductance</td> </tr> <tr> <td>6.06</td> <td>Stator inductance</td> </tr> </tbody> </table>	Parameters	Function	2.08	DC bus voltage threshold	4.05 to 4.07 21.27 to 21.29	Current limitation	5.07 and 21.07	Motor rated current	5.09 and 21.09	Motor rated voltage	5.17 and 21.12	Stator resistor	5.18	Carrier frequency	5.23 and 21.13	Offset de tension	5.24 and 21.14	Voltage offset	5.25 and 21.24	Transient inductance	6.06	Stator inductance
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UNIDRIVE SP Diagnostics






Mnemonic Display	Reason of fault	Solution
C.Type (187)	The unit selected in SMARTCARD is not compatible with the drive	<ul style="list-style-type: none"> • Press the Reset  key • Check that the drive type is identical to that contained on the SMARTCARD unit • The fault can be cleared only after one second
dEst (199)	Conflict: 2 parameters or more have the same destination parameter	<ul style="list-style-type: none"> • Set XX.00 = 12001 : the drive displays all the destination parameters, enabling error detection • The fault can be cleared only after one second
EEF (31)	EEPROM fault	<ul style="list-style-type: none"> • The operating mode becomes the open loop mode, and if a display is connected to the serial link, this will be automatically invalidated • Proceed to a return to factory settings and store the parameters (XX.00 = 1000 + Reset ) , then cut the power supply and power up again • Fault will not clear without returning to factory settings
Enc1 (189)	Encoder power supply overload	<ul style="list-style-type: none"> • Check that the encoder power supply current is lower than the maximum admissible current (200mA at 15V or 300mA at 8V and 5V) • The fault can be cleared only after one second
Enc2 (190)	Encoder connection interruption	<ul style="list-style-type: none"> • Check the connections and the encoder voltage • Replace the encoder • The fault cancellation is possible only after one second • The detection of the encoder cable breaking is not necessary on the drive encoder, set 3.40 = 0 to invalidate the fault Enc2 (ex : feedback of the encoder connected to a SM-Resolver module)
Enc3 (191)	Encoder : Incorrect UVW phase offset during the operation	<ul style="list-style-type: none"> • Check that the encoder signals are being received • Perform again the offset measurement procedure • Check the encoder mechanical mounting • The fault cancellation is possible only after one second
Enc4 (192)	Link-related problem with the encoder	<ul style="list-style-type: none"> • Check the transmission speed and the power supply • Check that the encoder signals are being received • Replace the encoder • The fault can be cleared only after one second
Enc5 (193)	Encoder : control amount or CRC error	<ul style="list-style-type: none"> • Check that the encoder signals are not interfered • With the EnDat encoders, check the link resolution and/or proceed to the automatic configuration 3.41 • The fault can be cleared only after one second
Enc6 (194)	Encoder error	<ul style="list-style-type: none"> • For a SSI encoder, check the power supply settings as well as the cabling • Replace the encoder • The fault can be cleared only after one second
Enc7 (195)	Encoder initialisation problem	<ul style="list-style-type: none"> • Press Reset  • Check that the encoder type, its cabling and the power supply are correctly set in 3.38 and 3.36 • Proceed to the automatic configuration by 3.41 • Replace the encoder • The fault can be cleared only after one second
Enc8 (196)	There was no automatic configuration when powering up	<ul style="list-style-type: none"> • Check the resolution of the serial link • Set 3.41 to 0, and enter manually the number of encoder turns 3.33 and the number of increments by turn 3.34 • The fault can be cleared only after one second
Enc9 (197)	The information related to the module return to position is not accessible from the selected location	<ul style="list-style-type: none"> • Check the settings of 3.26 (or of 21.21 if a second motor is used) • The fault can be cleared only after one second
Enc10 (198)	The encoder phase angle (3.25 or 21.20) is incorrect	<ul style="list-style-type: none"> • Check the encoder connection • Proceed to an auto-tuning or enter manually the value of the encoder phasing out in 3.25 or 21.20 • In case of untimely Enc10 faults related to certain applications, the fault may be reset by setting a value higher than 0 in 3.08 (pay attention, a too high value may invalidate the detection of an encoder fault).

UNIDRIVE SP Diagnostics

Mnemonic Display	Reason of fault	Solution
Enc11 (161)	Fault generated in case of difference between the sinus/ cosinus signals and the position permanently measured by the serial link. This fault is generally due to a spike in of the sinus-cosinus paths	<ul style="list-style-type: none"> • Check the shielding of the encoder cable. • Check that the sinus and cosinus signals are not disconnected.
Enc12 (162)	Hiperface encoder-related problem: the encoder may not be identified by the auto-configuration procedure	<ul style="list-style-type: none"> • Check that the encoder type may be recognised by the auto-configuration procedure. • Check the encoder cable. • Enter manually the encoder characteristics.
Enc13 (163)	EndAt encoder-related problem: the number of encoder turns read during the auto-configuration phase does not correspond to the power of 2	<ul style="list-style-type: none"> • Select another type of encoder.
Enc14 (164)	EndAt encoder-related problem: during the auto-configuration, the number of bits which define the encoder position in a turn is too important	<ul style="list-style-type: none"> • Select another type of encoder • The encoder is damaged
Enc15 (165)	Encoder-related problem : the number of periods by turn calculated during the auto-configuration phase is either lower than 2 or higher than 50 000	<ul style="list-style-type: none"> • The number of points by turn or the non polarity of a linear motor is incorrect, by instance 5.36 = 0 or 21.31 = 0 • The encoder is damaged
Enc16 (166)	EndAt encoder-related problem: the number of serial link bits by period for a linear motor is higher than 255	<ul style="list-style-type: none"> • Select another type of encoder • The encoder is damaged
Enc17 (167)	Revolving sincos encoder-related problem: the periods by turn obtained during the auto-configuration phase do not correspond to 2	<ul style="list-style-type: none"> • Select another type of encoder • The encoder is damaged
EnP.Er (176)	Data error in the encoder electronic plate	<ul style="list-style-type: none"> • Remplacer le codeur • The fault cancellation is possible only after one second
Et (6)	External fault on the input of terminal 31	<ul style="list-style-type: none"> • Check that terminal 31 is connected to 24V (in positive logic) • Check 10.32. Enter 12001 in 0.00, and check the parameter which controls the value of 10.32 • Check that 10.32 or 10.38 (=6) are not controlled by the serial link • The fault can be cleared only after one second
HF01 to HF19 and HF20 to HF30	Internal error	<ul style="list-style-type: none"> • Power down, then power up • Contact your usual LEROY-SOMER interlocutor if the faults persists • The Reset key can not cancel these faults
It.AC (20)	Motor overload I^2t	<ul style="list-style-type: none"> • Read the battery value in 4.19 • Check the motor is not overloaded • Adjust the rated speed () • Check that motor rated current is correctly set (0.46) • Speed feedback: check the connection, and check that the signal is not interfered • Check parameter 0.42 - motor pole number • The fault can be cleared only after one second

UNIDRIVE SP












Diagnostics

Mnemonic Display	Reason of fault	Solution
It.br (19)	Overload of the braking resistor	<ul style="list-style-type: none"> • Read the battery value in 10.39 • Check the resistance value • Check that 10.30 and 10.31 are correctly set (too many braking cycles). For setting refer to the manual available on CDROM (ref. 3655) • Check the cabling and the resistor • Check the built-in transistor • The fault can be cleared only after one second
O.CtL (23)	Overheating of the control card	<ul style="list-style-type: none"> • Check that the fans turn, the cooling vents are not obstructed, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Decrease the carrier frequency 0.41 • The fault can be cleared only after one second
O.ht1 (21)	Thermal simulation of the power components depending on I^2t	<ul style="list-style-type: none"> • Decrease the motor load, the cycle, the carrier frequency and the acceleration and deceleration ramps • Check the motor I_N • The fault can be cleared only after one second
O.ht2 (22)	Heater overheating	<ul style="list-style-type: none"> • Check that the fans turn, the cooling vents are not obstructed, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Decrease the motor load, the cycle, the carrier frequency and the acceleration and deceleration ramps • Increase the ventilation flow • The fault can be cleared only after one second
O.ht2.P (105)	Overheating of a power module heater	<ul style="list-style-type: none"> • Check that the fans turn, the cooling vents are not obstructed, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Decrease the motor load, the cycle, the carrier frequency and the acceleration and deceleration ramps • Increase the ventilation flow • The fault can be cleared only after one second
O.ht3 (27)	Thermal simulation of the drive	<ul style="list-style-type: none"> • Check that the fans turn, the cooling vents are not obstructed • Increase the ventilation flow • Decrease the motor load, the cycle, and the acceleration and deceleration ramps • The fault can be cleared only after one second
O.ht4.P (102)	Overheating of a power module rectifier	<ul style="list-style-type: none"> • Check that the fans turn, the cooling vents are not obstructed, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Decrease the motor load, the cycle, the carrier frequency and the acceleration and deceleration ramps • Increase the ventilation flow • The fault can be cleared only after one second • Check that there is no phase imbalance
OI.AC (3)	<ul style="list-style-type: none"> • Surintensité en sortie du variateur (pointe d'intensité en sortie > 225 %) • Boost trop élevé pendant la phase d'autocalibrage 	<ul style="list-style-type: none"> • Check the motor coupling and isolation • Increase the acceleration and deceleration ramps • Check the cabling, the coupling and the signal (interference) of the speed feedback • Check that the motor cable is not too long • Decrease the speed loop gains (0.07, 0.08 and 0.09)  and  • If not already performed, proceed with an auto-tuning 0.40 = 2  • Decrease the current loop gains (0.38 and 0.39)  and  • The fault cancellation is possible only after 10 seconds







UNIDRIVE SP

Diagnostics

Mnemonic Display	Reason of fault	Solution
OI.AC.P (104)	Overcurrent detected by a power module	<ul style="list-style-type: none"> • Increase the acceleration and deceleration ramps • If this occurs during an auto-tuning, decrease the value of Boost in 5.15 • Check that there is no short-circuit at the drive output • Check the motor insulation • Check the cabling, the coupling and the signals (interference) of the speed feedback • Check that the motor cable is not too long • Decrease the speed loop gains 0.07, 0.08 and 0.09 ( et ) • If not already performed, proceed with an auto-tuning 0.40 =2 .  • Decrease the current loop gains 0.38 and 0.39 ( et ) • The fault can be cleared only after 10 seconds
OI.br (4)	Overcurrent of the braking resistor	<ul style="list-style-type: none"> • Check the resistor insulation • Eliminate the resistor output short-circuit • Set a higher resistance value • The fault can be cleared only after 10 seconds
OI.br.P (103)	Overcurrent of the braking resistor detected by a power module	<ul style="list-style-type: none"> • Check the cabling and the insulation of the braking resistor • Check that the braking resistance value is higher than the minimum resistance value
OIdc.P (109)	Overcurrent detected by a power module	<ul style="list-style-type: none"> • IGBT Vce protection detected • Check the motor and cable insulation
O.Ld1 (26)	Power supply +24V or logic outputs overload	<ul style="list-style-type: none"> • Check the total current consumed by +24V (terminal 22) and the logic outputs of terminals 24 to 26 or of SM module terminals (it must be < 200mA) • If 10.37 = 1 or 3, the motor stops before the drive is in trip state • Check the total current consumed by +24V (terminal 22)
O.SPd (7)	Overspeed	<ul style="list-style-type: none"> • The speed is 1,2 times higher than the value of 0.02 () • Check the load is being driven • Check the adequate adjustment of the overspeed threshold in 3.08 ( and ) • Adjustment of the speed loop gains ( and ) • Set a higher deceleration time in 0.04 • The fault can be cleared only after one second
OV (2)	Continuous bus overvoltage: <ul style="list-style-type: none"> • TL : > 405Vdc perm., 415V peak • T : > 810Vdc perm., 830V peak • TM : > 960Vdc perm., 990V peak • TH : > 1160Vdc perm., 1190V peak 	<ul style="list-style-type: none"> • Provide a braking resistor (option). If a resistor is already connected decrease its value (according to the authorised limit). • Check that the mains supply is not interfered (overvoltages) • Check the motor insulation • Set a higher deceleration time in 0.04 • Check the deceleration mode in 0.15 • The fault can be cleared only after one second
OV.P (106)	Overvoltage of a power module	<ul style="list-style-type: none"> • Provide a braking resistor (optional). If a resistor is already connected decrease its value (according to the authorised limit). • Check that the mains supply is not interfered (overvoltages) • Check the motor insulation • Set a higher deceleration time in 0.04 • Check the deceleration mode in 0.15 • The fault can be cleared only after one second
PAd (34)	The drive is waiting for a reference from the keyboard and the latter has been removed	<ul style="list-style-type: none"> • Replace the keyboard and press Reset  • Select another speed reference • The fault can be cleared only after one second
Ph (32)	<ul style="list-style-type: none"> • Loss of a supply phase • Important phase imbalance 	<ul style="list-style-type: none"> • Check the mains supply (3 existing and balanced phases) • Check the mains supply level (with full load) Note : • The loss of a phase may be detected only if the active current is between 50 % and 100 % of the rated value. • The drive tends to stop the motor before fault tripping " Ph " . • The fault can be cleared only after one second
Ph.P (107)	<ul style="list-style-type: none"> • Loss of a phase of a power module 	<ul style="list-style-type: none"> • Check the mains supply (3 existing and balanced phases) • Check the mains supply level (with full load)

UNIDRIVE SP Diagnostics

Mnemonic Display	Reason of fault	Solution
PS (5)	Internal power supply fault	<ul style="list-style-type: none"> In case of presence of application modules, remove them and press  Check the status of the tape connecting the power card to the control card (sizes 4, 5, 6) "Hard" fault: consult LEROY-SOMER The fault can be cleared only after one second
PS.10V (8)	Overcurrent on the internal analogue source +10V (>10mA)	<ul style="list-style-type: none"> Check the cabling and the load of terminal 4 The fault can be cleared only after one second
PS.24V (9)	Power supply overload +24V	<ul style="list-style-type: none"> In case of presence of application modules, remove them and press Reset  Validate the internal adaptation impedances in 3.24 and/or 16.09 Reduce the output load (check the consumption of the encoders and of the digital outputs) An external power supply of 24V (> 50W) The fault can be cleared only after one second
PS.P (108)	Power supply fault of a power module	<ul style="list-style-type: none"> In case of presence of application modules, remove them and press Reset  Check the status of the tape connecting the power card to the control card (sizes 4, 5, 6) "Hard" fault: consult LEROY-SOMER The fault can be cleared only after one second
rS (33)	Fault during the measurement of the stator resistance when performing the auto-tuning or when 5.14 = 0 or 3	<ul style="list-style-type: none"> Adapt the drive power to the motor power Check the motor cable connection The fault can be cleared only after one second
SCL (30)	Communication loss by serial link	<ul style="list-style-type: none"> Replace the keyboard or the cable Check the connectors between the keyboard and the drive Check that the cable is not damaged If 10.37 = 1 or 3, the motor stops before the drive trips
SL.rtd (215)	The drive operating mode changed and the module data no longer correspond	<ul style="list-style-type: none"> Press the Reset  key If the fault persists, consult LEROY-SOMER The fault can be cleared only after one second
t010	Reserved	
t036 to t038	Reserved	
t040 to t080	Reserved	
t081	Speed error higher than the slave shaft threshold preset in 20.35	<ul style="list-style-type: none"> Check the speed loop gains. Check the connections and the encoder supply. Check the mechanical connections.
t082	Position error at the threshold preset in 20.36 between the master and the slave shaft.	<ul style="list-style-type: none"> Check the position loop gains Check the encoder connections and supply Check mechanical connections
t083 to t085	Reserved.	
t086	Follow-up error higher than the threshold preset in 20.39 between the master and slave shaft	<ul style="list-style-type: none"> Check the speed loop and the position loop gains Check the encoder connections and supply Check mechanical connections
t087 to t119	Reserved	
t120	Additional module location fault	<ul style="list-style-type: none"> Check the additional module location
t121	External sensor fault	<ul style="list-style-type: none"> Check the external sensor connection and their signals, and that no sensor fronts are missing between the master and the slave according to 19.23
t122 to t160	Reserved	
t168 to t175	Reserved	
t216 and t217	Reserved	
th (24)	Motor thermal probe start	<ul style="list-style-type: none"> Check the motor load Decrease the overload value Check the motor ventilation and the ambient temperature Check the probe cabling (pin 15 of HD-15 connector or terminal 8 of control terminal block) The fault can be cleared only after one second



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Mnemonic Display	Reason of fault	Solution
thS (25)	Short-circuit motor thermal probe	<ul style="list-style-type: none"> • Check the ohmic value of the motor probe • The fault can be cleared only after one second
tunE (18)	Auto-tuning stop before the end of procedure	<ul style="list-style-type: none"> • Drive trip state during the auto-tuning phase • The Stop key has been pressed • Terminal 31 was opened during the auto-tuning phase • The fault can be cleared only after one second
tunE1 (11)	<ul style="list-style-type: none"> • The position information has not changed during the auto-tuning • Problem during the inertia measure. procedure (see 5.12) 	<ul style="list-style-type: none"> • Check the encoder cabling • Check that the motor rotation is normal • The fault can be cleared only after one second
tunE2 (12)	Incorrect direction of rotation during auto-tuning	<ul style="list-style-type: none"> • For the closed loop, reverse 2 motor phases or 2 encoder paths • The fault can be cleared only after one second
tunE3 (13)	Incorrect connection of the commutation paths of the encoder detected during the auto-tuning (see 5.12)	<ul style="list-style-type: none"> • Check the motor cabling and the encoder commutation paths • The fault can be cleared only after one second
tunE4 (14)	Encoder : U commutation signal failure during auto-tuning (see 5.12)	<ul style="list-style-type: none"> • Check the encoder connection (encoder U path) • Replace the encoder • The fault can be cleared only after one second
tunE5 (15)	Encoder : V commutation signal failure during auto-tuning (see 5.12)	<ul style="list-style-type: none"> • Check the encoder connection (encoder V path) • Replace the encoder • The fault can be cleared only after one second
tunE6 (16)	Encoder : W commutation signal failure during auto-tuning (see 5.12)	<ul style="list-style-type: none"> • Check the encoder connection (encoder W path) • Replace the encoder • The fault cancellation is possible only after one second
tunE7 (17)	Setting of the incorrect motor pole number	<ul style="list-style-type: none"> • Check the number of increments by encoder turn • Check the settings of 5.11 number of poles • The fault can be cleared only after one second
Unid.P (110)	Unknown fault of a power module	<ul style="list-style-type: none"> • Check all the cabling between the power modules • Check that the cables are directed towards area without interferences
UP.ACC (98)	Impossible to access the "Syptlite" program	<ul style="list-style-type: none"> • The drive must be enabled • A task is already ongoing, try again when the task is ended • The fault cancellation is possible only after one second
UP.diVO (90)	The program tries to divide by 0 (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.OfI (95)	The program variables and the function units used use a RAM memory higher than the memory allowed.	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.ovr (94)	The program tries to write a value outside the parameter range (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.PAr (91)	The program looks for a non-existent parameter (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.ro (92)	The program tries to write in an LS parameter (read only) (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.so (93)	The program tries to read a writing parameter (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.udf (97)	Fault not defined in the program (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UP.uSEr (96)	The program is waiting for a fault (Syptlite program)	<ul style="list-style-type: none"> • Check the program • The fault can be cleared only after one second
UU (1)	Continuous bus powered up : TL: <175V DC T : <350V DC TM: <435V DC	<ul style="list-style-type: none"> • Check the mains supply (mains supply powering up) • Fault disappearance when the mains voltage increases in relation to the threshold

UNIDRIVE SP Diagnostics

K4.2 - Faults related to an option module

K4.2.1 - Fault table

In the table, the faults contain the letter X which represents the location of the module responsible of the fault.

Mnemonic Display	Reason for fault	Solution
SLX.df (204, 209, 214)	The option inserted in location X changed	<ul style="list-style-type: none"> • Store and press Reset  • The fault can be cleared only after one second
SLX.Er (202, 207, 212)	The option inserted in location X has detected a fault	<ul style="list-style-type: none"> • Read the value of parameters 15.50, 16.50 or 17.50. Then see the table section K4.2.2 that lists the faults for the speed feedback, Application or Input/Output modules • In case of use of an application (positioning, synchronisation...), check the type of data exchanged in 1x.34(set 1x.34 to 1) • The fault can be cleared only after one second
SLX.HF (200, 205, 210)	Hardware fault of the module inserted in location X	<ul style="list-style-type: none"> • Check that the module is correctly inserted • Replace the module (contact your usual LEROY-SOMER interlocutor) • The Reset key may not cancel these faults
SLX.nF (203, 208, 213)	The module has been removed	<ul style="list-style-type: none"> • Check that the module is correctly inserted • Save the parameters and press the Reset  key • The fault can be cleared only after one second
SLX.tO (201, 206, 211)	Module wizard time exceeded	<ul style="list-style-type: none"> • Press the Reset  key • If the fault persists, consult LEROY-SOMER • The fault can be cleared only after one second

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K4.2.2 - Error codes related to " SLX.Er " fault

• Error codes for a speed feedback module:

Value	Problem	Solution
0	No fault	-
1	Encoder power supply overload	See Enc1 fault
2	Encoder connection interruption	See Enc2 fault For a SM-Universal Encoder Plus module, this fault may be invalidated by 1x.17 = 0 (ex. when the module is used only to give the image of the main encoder)
3	Encoder : Incorrect U, V, W phase offset during the operation	See Enc3 fault
4	Encoder link-related problem	See Enc4 fault
5	Encoder : control sum or CRC error	See Enc5 fault
6	Encoder error	Replace the encoder
7	Encoder initialisation problem	<ul style="list-style-type: none"> •Check the type of encoder set in 15.15, 16.15 or 17.15 •Check the encoder power supply and cabling •Replace the encoder
8	The automatic configuration when powering up could not be done	Modify the settings of 15.18, 16.18 or 17.18 and enter manually the number of encoder turns in 15.09, 16.09 or 17.09 and the number of increments by turn in 15.10, 16.10 or 17.10
9	-	Motor probe fault
10	-	Motor probe short-circuit
11	Resolver : the number of poles does not correspond to the motor	Check the settings of the number of poles in 15.15, 16.15 or 17.15
74	The module heated too much	

• Error code for an application module:

Value	Problem
39	User level exceeded
40	Unknown error
41	Non-existent parameter
42	Read only parameter
43	Write parameter
44	Parameter value outside range
45	Invalid synchronisation modes
46	Not used
47	Synchronisation lost with the master
48	RS485 is not in the user mode
49	Invalid RS485 configuration
50	Mathematical error
51	Pointer outside the limits
52	User control word fault
53	DPL program incompatible with the target
54	Microprocessor overload / exceeded task
55	Invalid encoder configuration
56	Invalid time unit configuration
57	Function unit not processed by the system

Value	Problem
58	Non volatile flash memory damaged
59	Impossible to consider the Application module as a synchronisation reference
60	Hardware CTNet error
61	Invalid CTNet configuration
62	The CTNet transmission speed does not correspond to the mains supply
63	The already used CTNet ID node
64	Digital output overload
65	Invalid function unit parameters
66	The user demand is too important
67	Non existent file
68	Not associated file
69	Problem related to the access to the Flash version during the loading
70	User program transfer when the drive is enabled
71	The modification of the drive mode failed
72	Invalid CTNet register operation
73	Failure of quick initialisation of the parameter
74	Module overheating

• Error code for an Input/Output module:

Value	Problem
0	No error
1	Digital output short-circuit
74	Module overheating

• Error code for a Field bus module:

Value	Bus Type	Problem
52	All except DPLCAN	All except DPLCAN
61	All	All
65	All except DPLCAN	All except DPLCAN
66	Devicenet, CANopen and DPLCAN	Devicenet, CANopen and DPLCAN
67	CANopen	A node has not received the "SYNC" telegram during the assigned time
68	CANopen	No reception of surveillance message of the mains supply nodes during the specified time
69	DPLCAN	A node sends a frame and no other node detects the reception of this frame
70	All	No valid field bus menu is available in the module for the transfer to the drive; The user may not store the data or the storing may not be correctly performed
71	DeviceNet	External power supply loss when the module communicates with the master.
74	All	Module overheating
80	Profibus	The communication time is exceeded. The cause of the fault is unknown.
98	All	The basic task of the module is not finished
99	All	Software fault

UNIDRIVE SP Diagnostics

K4.3 - Fault codes by serial link

A fault may be read by serial link, by means of a parameter **10.20** which indicates a code.

The table below gives the correspondance of these codes to the faults detected by the drive or by the options.

No.	Fault
1	UU
2	OU
3	OI.AC
4	OI.br
5	PS
6	Et
7	O.SPd
8	PS.10V
9	PS.24V
10	t010
11	tunE1
12	tunE2
13	tunE3
14	tunE4
15	tunE5
16	tunE6
17	tunE7
18	tunE
19	It.br
20	It.AC
21	O.ht1
22	O.ht2
23	O.CtL
24	th
25	thS
26	O.Ld1
27	O.ht3
28	CL2
29	CL3
30	SCL
31	EEF
32	ph
33	RS
34	Pad
35	CL.bit

No.	Fault
36 to 38	t036 to t038
39	L.SYNC
40 to 89	t040 to t089
90	UP.diVO
91	UP.PAr
92	UP.ro
93	UP.so
94	UP.Ovr
95	UPOFL
96	UP.USER
97	UP.udf
98	UP.ACC
99	t099
100	-
101	ACUU.P
102	Oht4.P
103	Oibr.P
104	OIAC.P
105	Oht2.P
106	OVP
107	Ph.P
108	PS.P
109	OIdc.P
110	Unid.P
111 to 160	t111 to t160
161	Enc11
162	Enc12
163	Enc13
164	Enc14
165	Enc15
166	Enc16
167	Enc17
168 to 175	t168 to t175
176	EnP.Er
177 and 178	t177 and t178
179	C.Chg
180	C.Optn
181	C.rdO

No.	Fault
182	C.Err
183	C.dat
184	C.FUII
185	C.Acc
186	C.rtg
187	C.Typ
188	C.cpr
189	Enc1
190	Enc2
191	Enc3
192	Enc4
193	Enc5
194	Enc6
195	Enc7
196	Enc8
197	Enc9
198	Enc10
199	dESt
200	SL1.HF
201	SL1.tO
202	SL1.Er
203	SL1.nF
204	SL1.dF
205	SL2.HF
206	SL2.tO
207	SL2.Er
208	SL2.nF
209	SL2.dF
210	SL3.HF
211	SL3.tO
212	SL3.Er
213	SL3.nF
214	SL3.dF
215	SL.rtd
216 and 217	t216 and t217
220 to 232	HF20 to HF32



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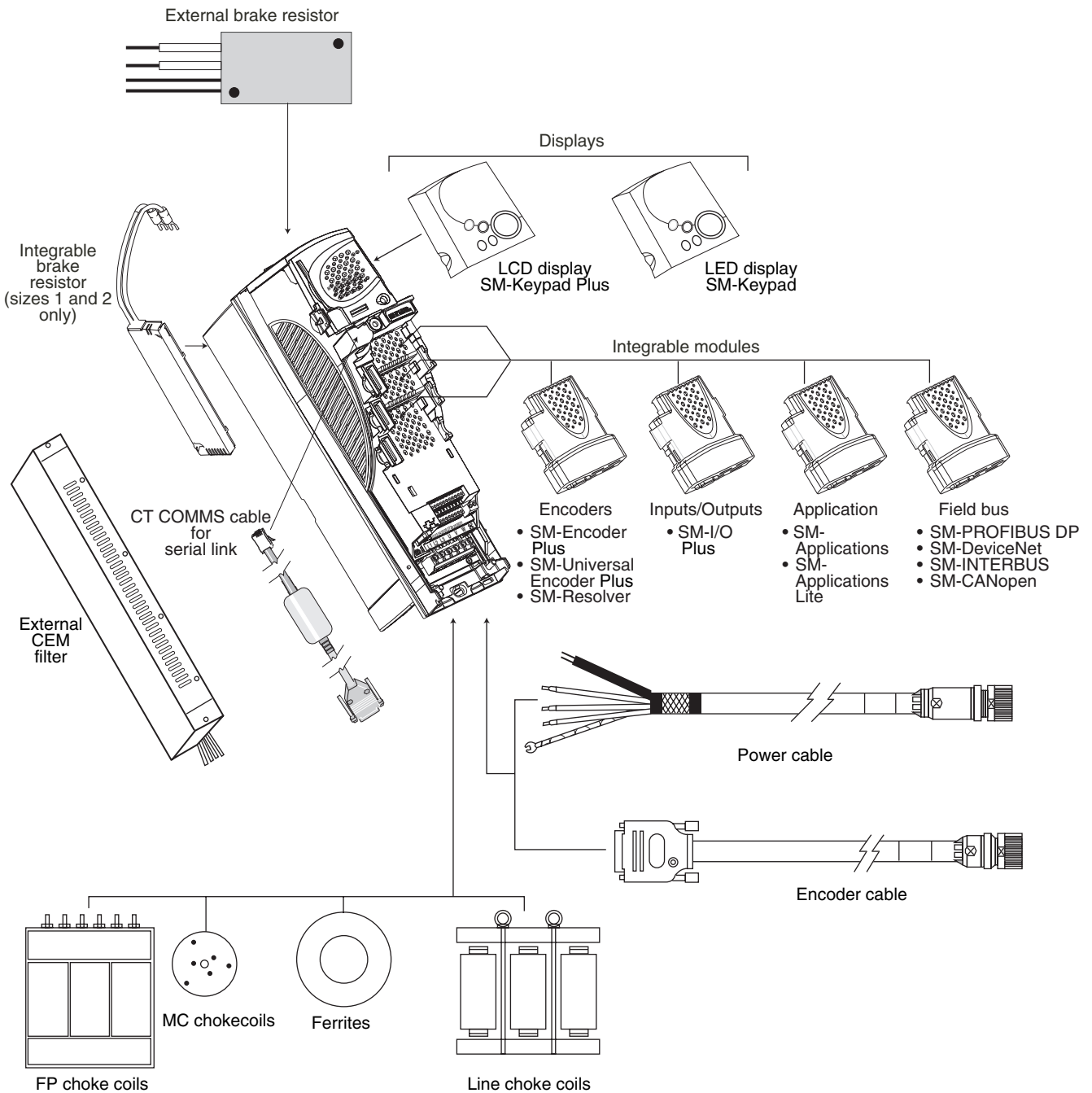
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UNIDRIVE SP Options

L1 - Introduction

• UNIDRIVE SP and its options



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L2 - SM modules

L2.1 - General information

• Sizes

The SM modules may be integrated into any UNIDRIVE SP range, without any tool and without modifying the general sizes.

3 locations are provided for the module installation: locations 1, 2 and 3.

• Settings

For setting the parameters of the module-related functions:

- location 1 corresponds to menu 15,
- location 2 corresponds to menu 16,
- location 3 corresponds to menu 17.



• Check the adequate status of the SM module : a damaged module must not be installed into the drive.

• Before installing a SM module, power down the drive (including thr power supply +48V and +24V), and wait for 10 minutes. Otherwise, the module may be damaged.

The diagrams of SM options may be consulted at section H6.20.

L2.2 - SM modules summary

Type	Colour	Designation	Details
Additional inputs/outputs	Yellow	SM-I/O Plus	Additional input/output module : • 3 digital inputs • 3 digital inputs or outputs • 2 voltage analogue inputs • 1 voltage analogue output • 2 relays
Field bus	Violet	SM-PROFIBUS DP	Option for communication in Profibus DP.
	Medium grey	SM-DeviceNet	Option for communication in Devicenet.
	Dark grey	SM-INTERBUS	Option for communication in Interbus.
	Light grey	SM-CANopen	Option for communication in CANOpen.
	Beige	SM-Ethernet	Option for communication in Ethernet
Speed feedback	Light green	SM-Universal-Encoder Plus	Speed feedback module which may manage the encoder signals : • Incremental • SinCos • SSI • EnDat It is used to simulate SSI or incremental encoder, and integrates a quick input.
	Brown	SM-Encoder Plus	Speed feedback module to manage the incremental encoder signals.
	Light blue	SM-Resolver	Resolver feedback module. It is used to simulate an incremental encoder (A/B).
Applications	Dark green	SM-Applications	Module with a 2nd micro-processor for the conception and the execution of applicative programs, with communication by CTNet.
	White	SM-Applications Lite	Module with a 2nd micro-processor for the conception and the execution of applicative programs, without communication by CTNet.

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L2.3 - SM-I/O Plus module

L2.3.1 - General information

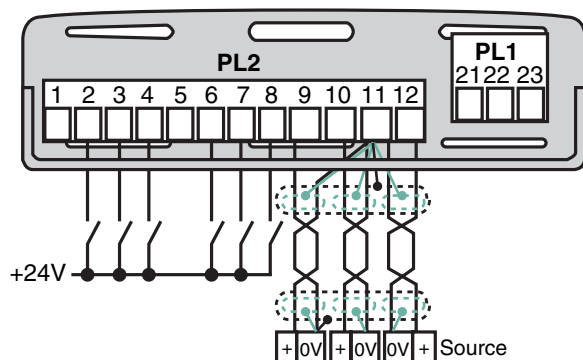
SM-I/O Plus module is used to increase the number of inputs and outputs of the drive. This option is totally configurable.

Additional functions :

- 3 digital inputs,
- 3 digital inputs or outputs,
- 2 voltage analogue inputs,
- 1 voltage analogue output,
- 2 assigning relays.

PL1 (terminals 21 to 23) and PL2 (terminals 1 to 12) terminal blocks may be released.

L2.3.2 - Connection



L2.3.3 - Characteristics

• PL2 terminal block

1	Common 0V (logic)
2	Digital input or output (F1)
3	Digital input or output (F2)
4	Digital input or output (F3)
5	Common 0V (logic)
6	Digital input (F4)
7	Digital input (F5)
8	Digital input (F6)
Command logic	
Positive, according to CEI61131 standard (for digital inputs only : negative logic accessible by settings of 1x.29)	
Isolation	
Not isolated from the control electronics	
Input	
Absolute max. voltage	± 30V
Load	> 2mA at +15Vdc
Thresholds	10V ± 0.8V
Output	
Max. current	250 mA
9	Analogue input 4
10	Analogue input 5
11	Common 0V (analogue)
Characteristics	
Bipolar analogue voltage	
Full scale rated voltage	± 9.8 V
Absolute max. voltage	± 36 V in relation to 0V
Input impedance	>20 kΩ
Resolution	10 bits plus sign
Isolation	
Not isolated from the control electronics	
12	Analogue output 3
Characteristics	
Bipolar analogue voltage	
Full scale rated voltage	± 10 V
Max. current	± 20 mA protected against short-circuits
Load resistor	1 kΩ at ∞
Resolution	10 bits plus sign
Isolation	
Not isolated from the control electronics	

Note : If the total consumption exceeds 240mA at 24V, it is then necessary to use an external power supply of +24V, available on terminals 1 and 2 of the drive control terminal block.

• PL1 terminal block

21	Relay 1 (F7)
22	Relay - common
23	Relay 2 (F8)
Contact voltage	
240 Vca	
Maximum contact current	2 Aac 240V/4Adc 30V resistive load
Minimum level of contact recommended	12V, 100 mA
Configuration	
Normally open contact	

• Sampling

Sampling interval for inputs, outputs and relays (parameter update) :

- 8 ms for 1 SM-I/O Plus option,
- 16 ms for 2 SM-I/O Plus options,
- 24 ms for 3 SM-I/O Plus options.

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L2.4 - SM-PROFIBUS DP module

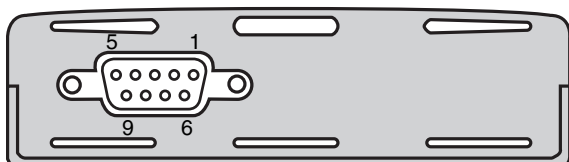
L2.4.1 - General information

SM-PROFIBUS DP is used to communicate with a PROFIBUS DP mains supply.

It integrates a 16-bit micro-processor, and its transmission speed may reach 12 Mbit/s.

Unidrive SP feeds the module internally.

L2.4.2 - Connection



Pins SUB-D	Functions	Description
1	Shielding	Connection for the cable shielding
3	RxD/TxD-P	Positive data line (B)
4	CNTR-P	RTS line
5	0V ISO	Isolated 0V, used only for the end resistors
6	+5V ISO	isolated 5V power supply, used only for the end resistors
8	RxD/TxD-N	Negative data line (A)

It is strongly recommended to use Profibus certified connectors.

These connectors accept 2 Profibus cables and they have a 4 screw-terminal block, one for each data connection. They have also a shielding connection support, this providing the shielding continuity for an adequate immunity to Profibus mains supply interference.

L2.5 - SM-DeviceNet module

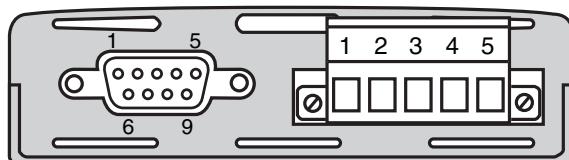
L2.5.1 - General information

The SM-DeviceNet module is used to communicate with the DeviceNet mains supply.

It integrates a 16-bit micro-processor, and its transmission speed may reach 500 Kbit/s.

The module must be fed by the DeviceNet mains supply. Due to the drive safety power supply (terminal 2, see section E2.2), the drive and its module electronics is maintained, allowing the DeviceNet mains supply to continue to communicate with the drive despite the mains supply loss.

L2.5.2 - Connection



Terminal block 5 terminals	SUB-D 9 pins	Functions	Description
1	6	0V	0V of the external power supply
2	2	CAN-L	Negative data line
3	3.5	Blindage	Cable shielding connection
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

CAUTION :

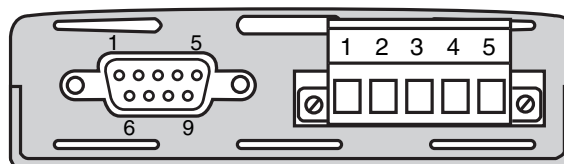
It is recommended to use the terminal block with screw instead of the SUB-D connector for the connection to the Devicenet mains supply, because the SUB-D connectors are not recognised for the DeviceNet conformity.

L2.6 - SM-CANopen module

L2.6.1 - General information

The SM-CANopen module is used to communicate with a CANopen mains supply. It integrates a 16-bit micro-processor and its transmission speed may reach 1 Mbit/s. Unidrive SP feeds the module internally. Due to the drive safety power supply (terminal 2, see section E2.2), the drive and its module electronics is maintained, this allowing the CANopen mains supply to continue to communicate with the drive despite the mains supply loss.

L2.6.2 - Connection



Terminal block 5 terminals	SUB-D 9 pins	Functions	Description
1	6	0V	0V of the external power supply
2	2	CAN-L	Negative data line
3	3.5	Shielding	Cable shielding connection
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

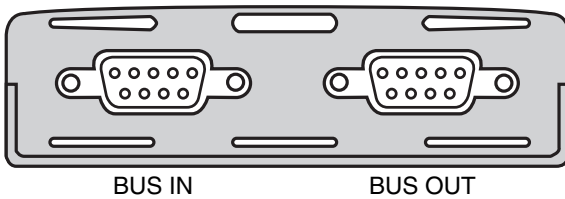
L2.7 - SM-INTERBUS module

L2.7.1 - General information

The SM-INTERBUS module is used to communicate with an INTERBUS mains supply. It integrates a 16-bit micro-processor, and its transmission speed may reach 500 Kbit/s. Unidrive SP feeds the module internally. GDue to the drive safety power supply (terminal 2, see section E2.2), the drive and its module electronics is maintained, allowing the INTERBUS mains supply to continue to communicate with the drive despite the mains supply loss.

UNIDRIVE SP Options

L2.7.2 - Connection



Pins	Functions	Description
IN1	DO1	Positive data IN line
IN6	/DO1	Negative data IN line
IN2	DI1	Positive data OUT line
IN7	/DI1	Negative data OUT line
IN3	0V ISO IN	isolated 0V for IN bus
Blindage IN	Blindage	IN bus cable shielding
OUT1	DO2	Positive data IN line
OUT6	/DO2	Negative data IN line
OUT2	DI2	Positive data OUT line
OUT7	/DI2	Negative data OUT line
OUT3	0V ISO OUT	Isolated 0V for OUT bus
OUT5	+5V ISO OUT	Isolated +5V for OUT bus
OUT9	RBST	OUT bus validation
OUT_shield	Shielding	IN bus cable validation
Earth	Earth	

L2.8 - SM-Universal Encoder Plus module

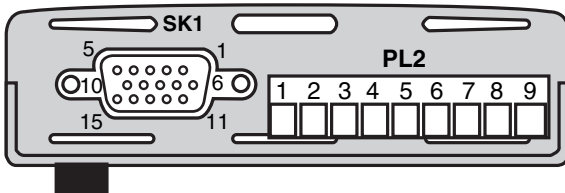
L2.8.1 - General information

The SM-Universal Encoder Plus module is used to exploit the signal of a second encoder (reference signal, synchronisation...), and to deliver the simulation of an incremental encoder (quadrature, frequency/direction) or SSI.

This module is compatible with many types of encoders:

- incremental quadrature with or without commutation paths
- incremental frequency/direction with or without commutation paths
- incremental forward/reverse with or without commutation paths
- SinCos without serial link, with Hiperface or EnDat protocol
- EnDat
- SSI

L2.8.2 - Connection



PL2 pins	Functions
1	Quick input +24V
2	0V
3	Path output A _{out} (AB encoder) or F _{out} (FD encoder) or Data _{out} (SSI encoder)
4	Path output A _{out} \ (AB encoder) or F _{out} \ (FD encoder) or Data _{out} \ (SSI encoder)
5	Path output B _{out} (AB encoder) or D _{out} (FD encoder) or Clock _{in} \ (SSI encoder)
6	Path output B _{out} \ (AB encoder) or D _{out} \ (FD encoder) or Clock _{in} (SSI encoder)
7	0V
8	RS 485 quick input or Top 0 _{out} or Z _{out} output
9	RS 485\ quick input or Top 0 _{out} \ or Z _{out} \ output

Sampling interval for inputs, outputs and relays (parameter update) :

- 8 ms for 1 SM-Universal Encoder Plus module
- 16 ms for 2 SM-Universal Encoder Plus modules
- 24 ms for 3 SM-Universal Encoder Plus modules

SK1 Pins	Encoders														
	Incremental (quadrature, frequency/direction, Fwd/Rev)			SinCos		SinCos with hiperface link		SinCos with EnDat or SSI link		EnDat		SSI		SinCos with U, V, W paths	
1	-	B or F	A or F	-	Cos	-	Cos	-	Cos	-	-	-	-	-	Cos
2	-	B\ or F\	A\ or F\	-	CosRef	-	CosRef	-	CosRef	-	-	-	-	-	CosRef
3	-	A or D or R	B or D or R	-	Sin	-	Sin	-	Sin	-	-	-	-	-	Sin
4	-	A\ or D\ or R\	B\ or D\ or R\	-	SinRef	-	SinRef	-	SinRef	-	-	-	-	-	SinRef
5	-	C or O or Z	-	-	-	-	Data	-	Data	-	Data	-	Data	-	Z
6	-	C\ or O\ or Z\	-	-	-	-	Data\	-	Data\	-	Data\	-	Data\	-	Z\
7	A _{out} or F _{out} or Data _{out}	U		A _{out} or F _{out} or Data _{out}							U				
8	A _{out} \ or F _{out} \ or Data _{out} \	U\		A _{out} \ or F _{out} \ or Data _{out} \							U\				
9	B _{out} or D _{out} or Clock _{in} (SSI)\	V		B _{out} or D _{out} or Clock _{in} (SSI)\							V				
10	B _{out} \ or D _{out} \ or Clock _{in} (SSI)	V\		B _{out} \ or D _{out} \ or Clock _{in} (SSI)							V\				
11	-	-	W	-	-	-	-	-	Clock _{out}	-	Clock _{out}	-	Clock _{out}	-	W
12	-	-	W\	-	-	-	-	-	Clock _{out} \	-	Clock _{out} \	-	Clock _{out} \	-	W\
13	+5V or +8V or +15V														
14	0V														
15	Motor thermal probe														

UNIDRIVE SP Options

L2.8.3 - Connector characteristics SK1

Codeurs incrémentaux en quadrature, Fréquence/Direction, Avant/Arrière

1	B or F path (□); A or F path (⊞)
2	B\ or F\ path (□); A\ or F\ path (⊞)
3	A, D or R path (□); B, D or R path (⊞)
4	A\, D\ or R\ path (□); B\, D\ or R\ path (⊞)
5	Z or 0 or C path (□, ⊞)
6	Z\ or 0\ or C\ path (□, ⊞)
7	U path (⊞)
8	U\ path (⊞)
9	V path (⊞)
10	V\ path (⊞)
11	W path (⊞)
12	W\ path (⊞)
Characteristics	RS485 differential voltage
Maximum input frequency	600 kHz
Line load	< 2 drives for terminals 1 to 4 32 drives for terminals 5 and 6 1 drive for terminals 7 to 12
Input impedance	120 Ω
Operating range	-7 to +12V
Absolute maximum voltage	± 14V / 0V
Absolute maximum differential voltage	± 14V

SinCos, absolute SinCos encoders with Hiperface or EnDat or SSI link and SinCos encoder with U, V, W paths

1	Cos path
2	Cosref path
3	Sin path
4	Sinref path
Characteristics	Differential voltage
Maximum signal	1.25V peak to peak
Maximum input frequency	115 KHZ
Absolute maximum differential voltage	± 1.5V

Absolute SinCos encoders with Hyperface, EnDat or SSI link, EnDat and SSI encoders

5	Data
6	Data\
Characteristics	RS 485 differential voltage
Maximum input frequency	2 MHz
Line load	32 drives
Operating range	-7 to +12V
Absolute maximum voltage	± 14V/0V
Absolute maximum differential voltage	± 14V

Absolute SinCos encoders with EnDat or SSI link and EnDat and SSI encoders

11	Clock _{out}
12	Clock _{out} \
Characteristics	RS 485 differential voltage
Maximum input frequency	2 MHz
Line load	1 drive
Operating range	-7 to +12V
Maximum voltage	± 14V/0V
Absolute maximum differential voltage	± 14V

SinCos encoders with U, V, W paths

7	U path
8	U\ path
9	V path
10	V\ path
11	W path
12	W\ path
Characteristics	RS 485 differential voltage
Maximum input frequency	600 kHz
Line load	1 drive
Input impedance	120 Ω
Operating range	-7 to +12V
Maximum voltage	± 14V / 0V
Absolute maximum differential voltage	± 14V

Simulation of incremental encoders or SSI

7	Path output A _{out} or F _{out} or Data _{out} (Data for SSI)
8	Path output A _{out} \ or F _{out} \ or Data _{out} \ (Data\ for SSI)
9	Path output B _{out} or D _{out} or Clock _{in} (Clock for SSI)
10	Path output B _{out} \ or D _{out} \ or Clock _{in} (Clock for SSI)
Characteristics	RS 485 differential voltage
Maximum output frequency	500 kHz
Line load	1 drive
End	120 Ω
Operating range	-7 to +12V
Maximum voltage	± 14V / 0V
Absolute maximum differential voltage	± 14V

Note : The simulation of the SK1 terminal block encoder (pins 7 to 10) is identical to that of PL2 terminal block (terminals 3 to 6)

13	Encoder power supply
Power supply voltage	5V, 8V or 15V
Maximum output current	300 mA for 5V and 8V 200 mA for 15V
14	Common 0V

15	Motor thermal probe input
Short-circuit detection level	< 50 Ω ± 30%
"Hot" alarm detection level	< 3.3 KΩ ± 10%
Return to zero level	> 3.3 KΩ

L2.8.4 - Characteristics of PL2 terminal block
• Incremental encoders in quadrature, frequency/direction, Fwd/Rev and SinCos encoders without serial link or with hiperface or EnDat or SSI serial link or U, V, W. paths.

1	Quick input +24V
8	Quick input RS 485
9	
Characteristics	RS485 differential voltage
Maximum input frequency	600 kHz
Line load	< 2 drives for terminal 1 1 drive for terminals 8 and 9
Input impedance	120 Ω
Operating range	-7 to +12V
Absolute maximum voltage	± 14V / 0V
Absolute maximum differential voltage	± 14V

Note : The quick input is not active with the EnDat or SSI encoders.

UNIDRIVE SP Options

• Simulation of incremental encoder

3	Path output A _{out} or F _{out} or Data _{out} (Data for SSI)
4	Path output A _{out} \ or F _{out} \ or Data _{out} \ (Data\ for SSI)
5	Path output B _{out} or D _{out} or Clock _{in} \ (Clock for SSI)
6	Path output B _{out} \ or D _{out} \ or Clock _{out} (Clock for SSI)
8	Path output Z _{out} or Top 0 _{out}
9	Path output Z _{out} \ or Top 0 _{out} \
Characteristics	
RS485 differential voltage	
Maximum input frequency	500 kHz
Line load	< 2 drives for terminals 3 and 4 32 drives for terminals 5 and 6 1 drive for terminals 8 and 9
Input impedance	120 Ω
Operating range	-7 to +12V
Absolute maximum differential voltage	± 14V

L2.9 - SM-Encoder Plus module

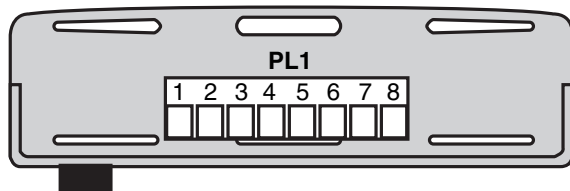
L2.9.1 - General information

The SM-Encoder Plus module is used to exploit the signal of a second incremental encoder (reference signal, synchronisation...).

This module is compatible with many types of encoders:

- incremental in quadrature,
- incremental frequency/direction,
- incremental fwd/rev.

L2.9.2 - Connection



Terminals	Functions			
	PL1	Quadrature	Frequency/Direction	Fwd/Rev
1	B	F	F	
2	B\<	F\<	F\<	
3	A	D	R	
4	A\<	D\<	R\<	
5	Z or O or C			
6	Z\< or O\< or C\<			
7	0V			
8	External power supply			

Note : The SM-Encoder Plus module is supplied directly by the drive. However, the maximum output current is limited to 300 mA (5V power supply) or 200 mA (8V or 15V power supply), including the consumption of the encoder connected to the drive.

If the drive power supply is overloaded, use an external power supply connected to terminals 7 and 8 of the module.

The module sampling time SM-Encoder Plus (parameter update) is of 4 ms. However, this time is increased in the following cases :

- if a SM-I/O Plus module is integrated to the drive, add 8 ms to the sampling time,
- if another SM-Encoder Plus module is integrated to the drive, add 4 ms to the sampling time,
- if a SM-Resolver module is integrated to the drive, add 4 ms to the sampling time.

L2.9.3 - Characteristics

1	B or F path
2	B\< or F\< path
3	A or D or R path
4	A\< or D\< or R\< path
5	Z or 0 or C path
6	Z\< or 0\< or C\<
Characteristics	
RS485 differential voltage	
Maximum input frequency	600 kHz
Line load	< 2 drives for terminals 1 to 4 32 drives for terminals 5 and 6
Input impedance	120 Ω
Operating range	-7 to +12V
Maximum voltage	± 14V / 0V
Absolute maximum differential voltage	± 14V

7	Common 0V
---	-----------

8	External power supply
Maximum power supply voltage	± 50 Vdc

UNIDRIVE SP Options

L2.10 - SM-Resolver module

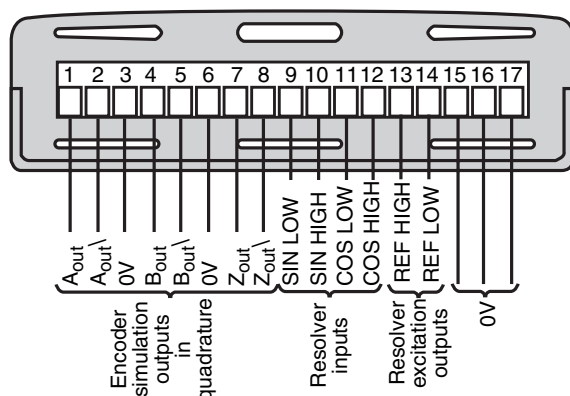
L2.10.1 - General information

The SM-Resolver module is used to exploit the signal of a resolver, used as a position or speed information feedback, and to simulate an incremental encoder signal in quadrature (image of the drive main encoder or of the encoder connected to the SM-Resolver option).

Note :

The SM-resolver module cannot be used in open loop.

L2.10.2 - Connection



• Characteristics

1	Path output A _{out} encoder simulation
2	Path output A _{out} \ encoder simulation
Characteristics	RS 485 differential voltage
Maximum frequency	500 kHz
Absolute maximum voltage	± 14V / 0V
Protection	Current limitation with thermal protection

3	0V
Total current for all module 0V terminals	200 mA

4	Path output B _{out} encoder simulation
2	Path output B _{out} \ encoder simulation
Characteristics	RS 485 differential voltage
Maximum frequency	500 kHz
Absolute maximum voltage	± 14V / 0V
Protection	Current limitation with thermal protection

6	0V
Total current for all module 0V terminals	200 mA

7	Top 0 _{out} output or Z _{out} path encoder simulation
8	Top 0 _{out} \ output or Z _{out} \ path encoder simulation
Characteristics	RS 485 differential voltage
Maximum frequency	500 kHz
Absolute maximum voltage	± 14V / 0V
Protection	Current limitation with thermal protection

9	SIN LOW resolver input
10	SIN HIGH resolver input
11	COS LOW resolver input
12	COS HIGH resolver input
Characteristics	Sinusoidal signal of 2Vrms (maximum)
Operating frequency	6 kHz
Absolute maximum DC voltage (SIN LOW or COS LOW)	± 2.5V/0V
Absolute maximum DC voltage (SIN HIGH or COS HIGH)	± 12V/0V
Protection	Serial resistors and diodes

13	REF HIGH resolver excitation
14	REF LOW resolver excitation
Characteristics	Sinusoidal signal of 6 kHz synchronised with the drive control loops
Maximum load (minimum impedance)	85 Ω
Rated voltage	<ul style="list-style-type: none"> • 6Vrms (transformation ratio = 3:1) • 4Vrms (transformation ratio = 2:1)
Absolute maximum DC voltage (REF HIGH)	± 36V/0V
Absolute maximum current (REF LOW)	200 mA
Protection	Overcurrent protection

15	
16	0V
17	
Total current for all module 0V terminals	200 mA

15	
16	0V
17	
Total current for all module 0V terminals	200 mA

UNIDRIVE SP Options

L2.11 - SM-Applications module

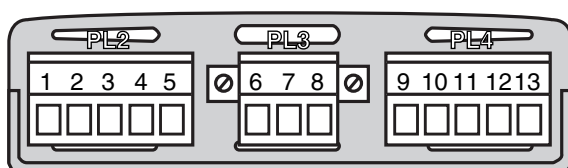
L2.11.1 - General information

The SM-Applications module is used to extend the Unidrive SP functions.

This module integrates a second micro-processor which is used by the user to access functions pre-set in factory or to write an application-specific program. This module is also used for the communication between several drives (or another equipment), this representing a complete solution for a complex application.

Unidrive SP feeds the module internally.

L2.11.2 - Connection



Terminals	Functions	Description
1	0V SC	0V connection for the RS485 port
2	RX\	RS485 negative reception line (input)
3	RX	RS485 positive reception line (input)
4	TX\	RS 485 negative transmission line (output)
5	TX	RS485 positive transmission line (output)
6	CTNet-	CTNet data line (negative)
7	CTNet Shielding	Shielding connection for CTNet
8	CTNet+	CTNet data line (positive)
9	0V	0V connection for digital inputs/ outputs
10	DI0	Digital input 0
11	DI1	Digital input 1
12	DO0	Digital output 0
13	DO1	Digital output 1

UNIDRIVE SP Options

L3 - External RFI filters

L3.1 - General information

The mains supply filters are used to reduce the drive electro-magnetic emissions, and to meet thus the CEM emission norms.

CAUTION :

Use an external mains supply RFI filter for each drive.

L3.2 - Characteristics

• Electric characteristics

UNIDRIVE SP	Filter reference (Schaffner)	Voltage (V)	Rated current (A)		Maximum leakage current (mA)	Joule losses (W)
			40°C	50°C		
1.5TL, 2TL, 1.5T, 2T, 2.5T, 3.5T	FS6008-10-07	240/480	10	10	29.4	6.9
2.5TL, 3.5TL, 4.5T, 5.5T	FS6008-16-07	240/480	16	16	38.8	9.2
4.5TL, 5.5TL, 8TL, 8T, 11T, 16T	FS6008-32-07	240/480	32	28.2	38	11
22T, 27T, 33T	FS6008-62-07	480	62	56.6	66	23
40T to 60T	FS6008-101-35	240/480	101		73	24.5
11TL, 16TL	FS6008-75-07	240	75	68.5	24	29
22TL to 33TL	FS6008-101-35	240/480	101		73	24.5
3.5TM, 4.5TM, 5.5TM, 8TM, 11TM, 16TM, 22TM	FS6008-30-07	575	30		102	15
22TH to 60TH	FS6008-58-53	690	58		66	
75T and 100T	FS6008-164-40	480	164	150		30
75TH and 100TH	Consult LEROY-SOMER					
120T and 150T	FN3359HV-400-99	690	400	400	6	50
120TH and 150TH	FN3359HV-250-99	690	250	250	6	57

Maximum overload current: 150% of the rated current during 1minute for 1-hour period.

Voltage between phases : 480V,

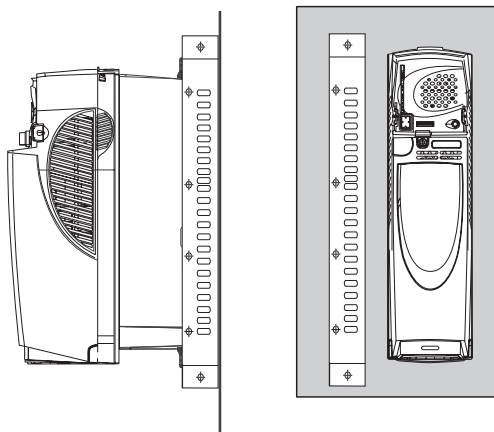
Phase voltage/Earth : 275V.

UNIDRIVE SP	Filter reference (Epcos)	Voltage (V)	Rated current (A)		Maximum leakage current (mA)	Joule losses (W)
			40°C	50°C		
1.5TL, 2TL, 1.5T, 2T, 2.5T, 3.5T	B84143-A10-R207	200/400	10	9.1	<30	4.2
2.5TL, 3.5TL, 4.5T, 5.5T	B84143-A16-R207	200/400	16	14.6	<30	10.8
4.5TL, 5.5TL, 8TL, 8T, 11T, 16T	B84143-A32-R207	200/400	32	29.1	<30	17.8
22T, 27T, 33T	B84143-A75-R207	200/400	75	68.3	<30	19.4
40T to 60T	B84143-A0101-R207	200/400	101	75	<30	30
11TL, 16TL	B84143-A75-R207	200/400	75	68.3	<30	19.4
22TL to 33TL	B84143-A0101-R207	200/400	101	75	<30	30
3.5TM, 4.5TM, 5.5TM, 8TM, 11TM, 16TM, 22TM	B84143-A0030-R207	380/660	30	22.5	<35	17.6
22TH to 60TH	Consult LEROY-SOMER					
75T and 100T	B84143-A165-R207	380/480	165			
75TH and 100TH	Consult LEROY-SOMER					
120T and 150T	Consult LEROY-SOMER					
120TH and 150TH	Consult LEROY-SOMER					

• Mechanical characteristics

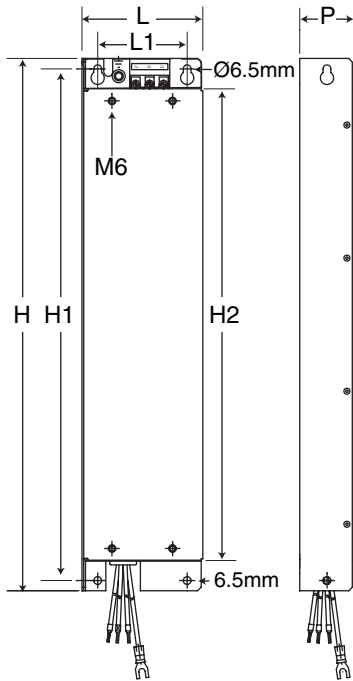
- Protection : IP20.

- Installation for drives sizes 1 to 3 : the filter may be mounted backward or it may be installed on the drive side.

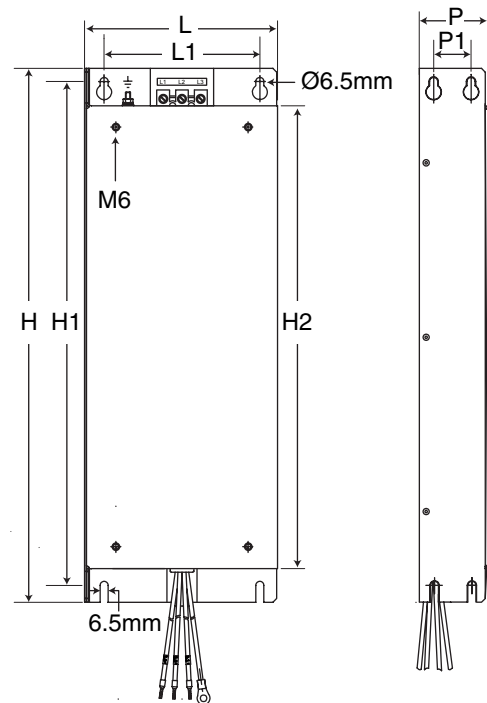


UNIDRIVE SP Options

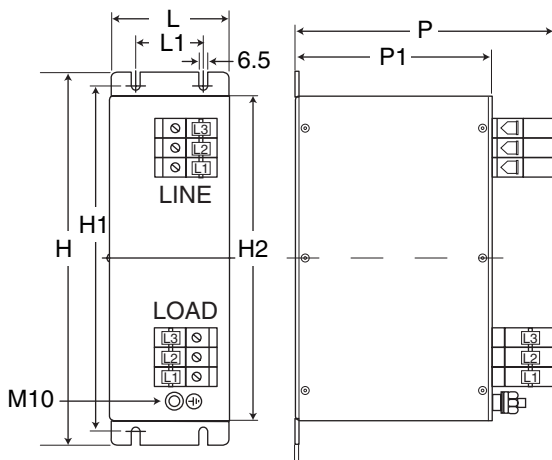
FS6008-10-07, FS6008-16-07,
B84143-A10-R207, B84143-A16-R207



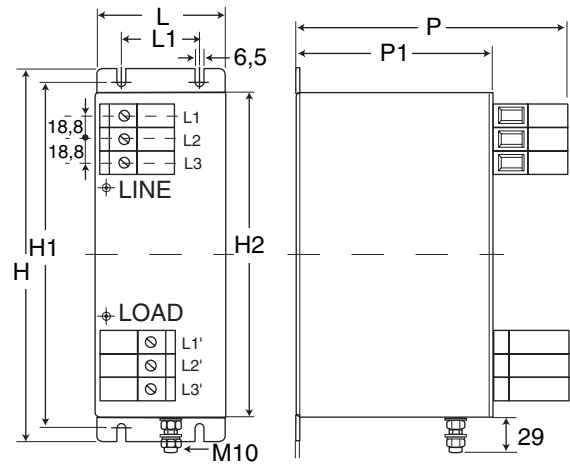
FS6008-32-07, FS6008-62-07, FS6008-75-07
B84143-A32-R207, B84143-A75-R207, B84143-A0030-R207



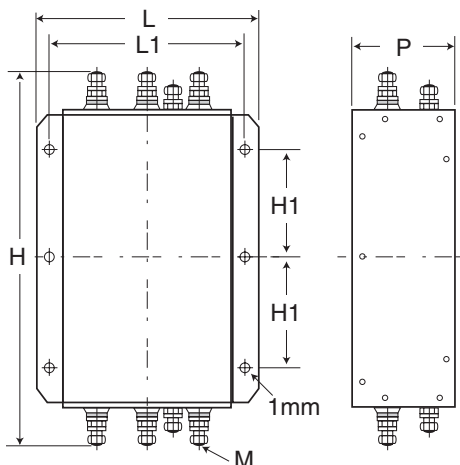
FS6008-101-35



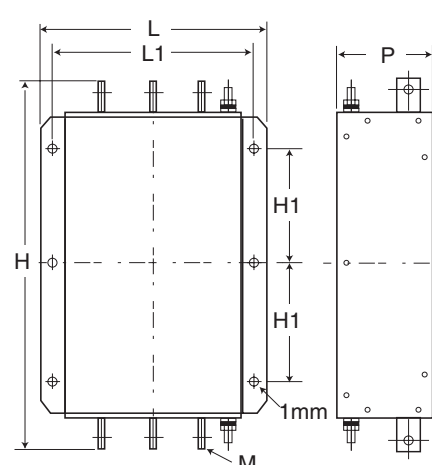
B84143-A0101-R207



FN3359HV-250-99



FN3359HV-400-99



UNIDRIVE SP Options

Filter reference	Width (mm)		Height (mm)			Depth (mm)		Output cable section		Weight (kg)	Terminal \pm		Terminals L1, L2, L3		
	L	L1	H	H1	H2	P	P1	mm ²	AWG		\varnothing	Braking torque (Nm)	Maximum cable section		Braking torque (Nm)
													mm ²	AWG	
FS6008-10-07	100	74	440	423	390	45	-	2.5	14	1.4	M5	3.5	4	12	0.8
FS6008-16-07	100	74	440	423	390	45	-	2.5	14	1.4	M5	3.5	4	12	0.8
FS6008-30-07	250	210	414	396	361	60	30	16	6	3.5	M6	3.9	10	8	2.2
FS6008-32-07	155	125	428.5	404.5	371.5	55	30	4	10	2	M5	3.5	16	6	2
FS6008-58-53															
FS6008-62-07	250	210	414	396	361	60	30	16	6	3.5	M6	3.9	16	6	2.2
FS6008-75-07	250	210	414	396	361	60	30	16	6	3.5	M6	3.9	16	6	2.2
FS6008-101-35	100	65	300	275	260	225	170	-	-	4	M10	25			8
FS6008-164-40			300							6.8	M10	25	95	4/0	20
B84143-A10-R207	100	74	450	423	390	45	-	2.5	14	2.1	M5	3	4	12	0.6
B84143-A16-R207	100	74	450	423	390	45	-	2.5	14	2.1	M5	3	4	12	0.6
B84143-A32-R207	155	125	431.5	404.5	371.5	55	30	4	10	3.3	M5	3	10	8	1.3
B84143-A75-R207	250	210	425	396	365	60	30	16	6	5.1	M6	5.1	16	6	2.2
B84143-A0030-R207	250	210	425	396	365	60	30	4	10	5.1	M6	5.1	10	8	1.3
B84143-A0101-R207	90	65	300	275	260	205	150	-	-	7.8	M10	10	50	1	6.8
B84143-A165-R207															
FN3359HV-250-99	230	205	300	120	-	125	-	150	6/0	7	M10	30	150	6/0	30
FN3359HV-400-99	260	235	386	120	-	115	-	150	6/0	10.5	M12	30	150	6/0	30

L4 - Ferrites

L4.1 - General information

The ferrites contribute to the decrease of the emissions conducted by the drive, for compliance with the EN61800-3 standard.

Place the ferrite at the drive output and run the U, V, W cables through the ferrite (if possible, make a turn).

Note : Do not run the shielding through the ferrite.

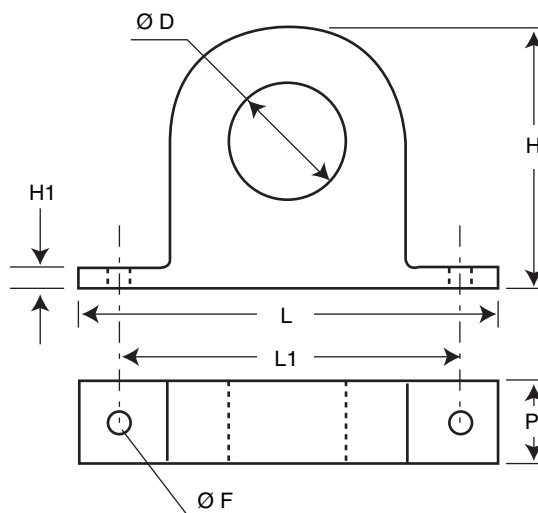
L4.2 - Characteristics

• Characteristics of the ferrites delivered in standard version (drives size 2 and 3)



Sizes (mm)	\varnothing inside	\varnothing outside	Height
B64290-L48 (Epcos)	20.5 ± 0.5	34.0 ± 0.7	12.5 ± 0.3
B64290-L40 (Epcos)	40.8 ± 0.8	58.3 ± 1.0	17.6 ± 0.4

• Characteristics of the optionally delivered ferrite



Sizes (mm)	H	H1	L	L1	P	\varnothing F	\varnothing D
RU1261 (Schaffner)	62	5	105	90	24	5	28

UNIDRIVE SP Options

L5 - MC choke coils

L5.1 - General information

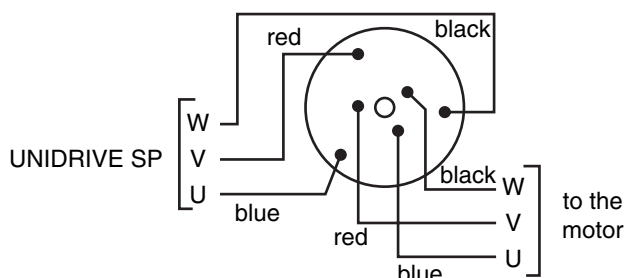
The MC choke coils are three-phase choke coils that diminish the HF earth leakage currents, as well as the interference produced.

L5.2 - Connection and characteristics

• Connection

The MC choke coils are cabled directly to the drive output (terminal U, V, W), as close as possible to the drive, in compliance with the diagram below.

Their form is cylindrical and they are flange mounted.



Note : For the rating in 575V (TM) or 690V (TH), consult your usual LEROY-SOMER interlocutor.

CAUTION :

The MC choke coils are delivered with cables having a length of 30 cm.

• Characteristics

UNIDRIVE SP	Choke Coil reference	Current (A)	Sizes (mm)			Weight (kg)
			Diam.	Height	Hole diam.	
1.5T to 2.5T 1.5TL	MC 3.5T	5.6	80	50	5.1	0.5
3.5T to 8T 2TL to 4.5TL	MC 11T	16	80	50	5.1	0.75
11T to 22T 5.5TL and 8TL	MC 27T	38	125	55	6.2	3
27T to 40T 11TL to 22TL	MC 50T	76	125	65	6.2	3
50T, 60T 27TL, 33TL	MC 75T	110	145	90	8.3	4.5
75T, 100T	MC 120T	180	220	120	10 x 25	8

Note: The selections correspond to a "low overcharge" drive current.

L6 - FP choke coils

L6.1 - General information

The FP loss slow choke coils filter the HF earth leakage currents, but also the differential currents (circulating currents between phases).

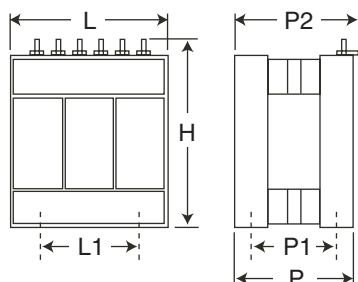
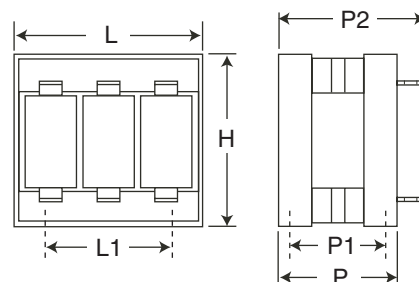
This choke coil is mainly used at the output of a drive that feeds several motors, reducing the differential HF leakage currents that disturb the operation of the motor protection thermal relay.

Provide a FP choke coil for maximum 5 motors (efficient for up to 200 m of motor cable).

L6.2 - Characteristics

• 2mH/6A, 0.6mH/16A, 0.3mH/38A

• 0.15mH/90A



UNIDRIVE SP	Choke Coil reference	Sizes (mm)						Weight (kg)
		L	L1	H	P	P1	P2	
1.5T to 2.5T 1.5TL	FP3.5T 2mH/6A	104	60	95	55	45	80	1
3.5T to 8T 2TL to 4.5TL	FP11T 0.6mH/16A	125	75	115	70	60	95	1.8
11T to 22T 5.5TL and 8TL	FP27T 0.25mH/38A	162	100	150	92	80	110	3.5
27T and 33T	FP60T 0.15mH/90A	263	175	180	108	92	128	10

Note : • For higher rating and mains supply of 575V (TM) or 690V (TH), consult your LEROY-SOMER interlocutor.

• The selections correspond to a "low overload" drive current.

UNIDRIVE SP Options

L7 - Line choke coils

L7.1 - General information

The line choke coils are used to reduce the drive damaging risk due to a phase imbalance or to high interference on the mains supply.

The line choke coil recommended reactance must be of 2%, allowing a phase imbalance of 5%. An additional value may be used, but this generates a drive output loss (High speed torque drop) due to a voltage drop.

The line choke coils are particularly recommended for the rating of 1.5T(L) to 3.5T(L) in case of high interference as follows:

- cos φ lifting condenser battery connected to the mains supply,
- high power thyristor drives fed by the same mains supply (especially if they must not be fitted by line choke coils),
- direct start asynchronous motors connected to the mains supply generating transient voltage drops higher than 20%,
- drives connected to a high capacity mains supply (power of the mains supply transformer higher than 175 kVA).

The other ratings have an internally mounted DC choke coil and in consequence they do not need the addition of line choke coil, excepting the cases of high phase imbalance or in extreme conditions.

Provide a line choke coil for each drive, connected upstream from the drive.

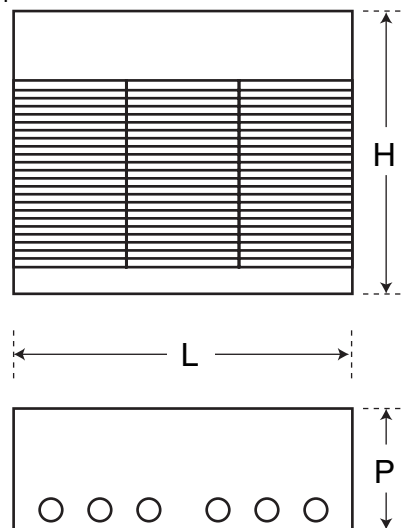
L7.2 - Electrical characteristics

Rating	Choke Coil reference	Current (A)	Inductance (mH)	Losses (W)
1.5T to 2.5T	9 ST 2.5	8.6	2.5	27
1.5TL and 2TL 3.5T to 5.5T	16 ST 1.5	16	1.5	32
8T and 11T	25 ST 1	25	1	44
2.5TL to 4.5TL 16T and 22T	38 ST 0.65	38	0.65	50
5.5TL et 8TL 27T and 33T	60 ST 0.4	60	0.4	65
11TL and 16TL 40T and 50T	90 ST 0.28	90	0.25	83
60T	130 ST 0.19	130	0.19	105
75T and 100T	176 ST 0.14	176	0.14	170
120T and 150T	292 ST 0.085	292	0.085	200

Note : For the other ratings and mains supply of 575V (TM) and 690V (TH), consult your usual LEROY-SOMER interlocutor.

L7.3 - Mechanical characteristics

They are give for information only and may vary depending on the supplier.



Protection : IP00

Choke Coil reference	Sizes (mm)			Weight (kg)
	L	H	P	
9 ST 2.5	140	160	85	1.8
16 ST 1.5	125	115	95	1.8
25 ST 1	155	190	105	5.5
38 ST 0.65	185	210	110	7
60 ST 0.4	220	240	120	11
90 ST 0.28	220	240	140	17
130 ST 0.19	250	280	170	22
176 ST 0.14	265	220	180	30
292 ST 0.085	270	230	220	30

UNIDRIVE SP Options

L8 - Brake Resistor

L8.1 - General information

! • The brake resistor must be installed so as to avoid the damage of the close components by its calorific dissipation.

• Particular attention must be paid to each handling next to the resistor, because of the presence of a high voltage and of the heat emission (resistor temperature higher than 70°C).

• The brake resistor (the resistor integrable into the heater is not concerned) must be serially cabled to a thermal relay rated to a resistor efficient current in order to avoid the fire risks that may be generated by a disfunction of the brake transistor or by a short-circuit.

• If a brake resistor must be externally mounted, check that it is integrated into a ventilated metallic terminal box, in order to avoid any direct contact with the resistor.

The braking occurs when the drive decelerates the motor or when the drive opposes to a motor speed increase, due to the mechanical environment (driving load, for instance).

During the braking, the energy is sent back to the drive that may absorb only an energy equivalent to its own losses. When the energy to be dissipated is higher, the DC bus voltage increases. In factory settings, the drive increases automatically the deceleration time in order to avoid the DC bus overvoltage stop.

If the drive must decelerate rapidly or if it must retain a load, it is necessary to connect a brake resistor.

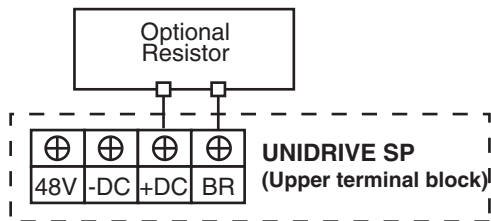
For ratings 1.5TL to 8TL and 1.5T to 16T, integrable brake resistors may be mounted into the heater slots.

! • If a brake resistor is connected, it is necessary to set **0.15** to "FAST".

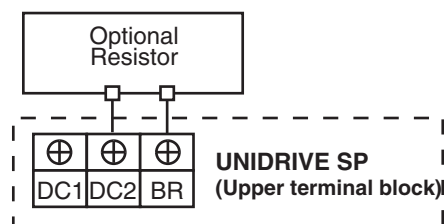
• The heater integrable resistors benefit from the drive overload protection. To validate the external resistor protection, the maximum braking length (**10.30**) and the minimum time between 2 braking cycles (**10.31**) must be set.

L8.2 - Connection

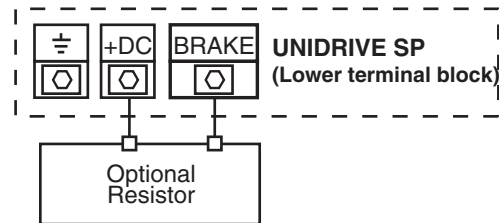
• Size 1



• Sizes 2 and 3



• Size 4



Note : For the protection of the external brake resistors, provide a thermal relay.

! • Check that the brake resistors are adequately connected, as indicated before. Otherwise, the resistor may be permanently powered up, without any possible control by the drive. It will result an excessive overheating of the resistor that may lead to burns or fire risks.

L8.3 - Electric characteristics

L8.3.1 - Minimum resistor compatible with the drive

UNIDRIVE SP	Minimum ohmic value (Ω)
1.5TL to 2.5TL	43
3.5TL	29
4.5TL to 8TL	18
11TL to 33TL	5
1.5T to 3.5T	74
4.5T and 5.5T	58
8T to 16T	19
22T to 33T	18
40T and 50T	11
60T	9
75T and 100T	7
120T and 150T	
3.5TM to 22TM	18
22TH to 60TH	13
75TH and 100TH	10
120TH and 150TH	

Tolerance of the ohmic value : $\pm 10\%$.

In most of the applications, the braking occurs occasionally, allowing a permanent rated power of the resistor lower than that of the drive. However, it is necessary that the peak power of the resistor be sufficient for the extreme cases encountered in the braking cycle.

Note : For "continuous" braking or high inertia applications the permanent power dissipated in the brake resistor must be equivalent to the rated power of the drive. The total energy dissipated by the resistor is independent of the quantity of energy.

Select a resistor value equal or higher than the minimum resistor value indicated for each drive rating. A higher value resistor provides an increased safety in case of occurrence of a braking system-related problem, but the drive may stop if the chosen resistor value is too high.

UNIDRIVE SP Options

L8.3.2 - Heater integrable brake resistors

Type of integrable resistor	Ohmic value (Ω)	Reated resistor peak power during 1 ms (kW)	Average power during 60 sec. (W)	Factory settings 10.30		Factory settings 10.31		Associated drive
				TL	T	TL	T	
1220-2757	75	8	50	0.09	0.02	2		1.5TL to 3.5TL 1.5T to 5.5T
1220-2759	37.5	16	100	0.09	0.02	2		4.5TL to 8TL 8T to 16T

Note : if the integrable brake resistor must be used with a power higher than its average power/2, validate the high speed ventilation par **6.45** = On (1).

L8.3.3 - External brake resistors

RF Resistor type	Ohmic value (Ω)	Thermal power (W)	Peak power (W)		Efficient current (A)*	Possibility of association with UNIDRIVE SP								
			230V	400V		1.5TL to 2.5TL	3.5TL	4.5TL to 8TL	11TL and 33TL	1.5T to 5.5T	8T to 33T	40T and 50T	60T to 100T	120T and 150T
RF-SIR-600-100	100	100	1406	5184	1.1	x	x	x	x	x	x	x	x	x
RF-SIR-1100-100	100	600	1406	5184	2.7	x	x	x	x	x	x	x	x	x
RF-MD-2000-75	75	2000	1870	6912	5.7	x	x	x	x	x	x	x	x	x
RF-SIR-1100-50	50	600	2813	10368	3.8	x	x	x	x	x	x	x	x	x
RF-MD-5500-40	40	5500	3500	12960	12.9		x	x	x		x	x	x	x
RF-SIR-1100-25	25	600	5625	20736	5.4			x	x		x	x	x	x
RF-MD-3000-25	25	3000	5625	20736	12			x	x		x	x	x	x
RF-MD-11000-25	25	11000	5625	20736	23			x	x		x	x	x	x
RF-MD-11000-15	15	11000	9325	34560	29.5				x			x	x	x
RF-MD-3000-12	12	3000	11700	43200	17.5				x			x	x	x
RF-MD-7500-10	10	7500	14063	51840	30				x				x	x
RF-MD-19500-10	10	19500	14063	51840	48.6				x				x	x
RF-MD-7500-5	5	7500	28125	103680	42				x					
RF-MD-11000-5	5	11000	28125	103680	51.6				x					

* Adjustment current of the serial thermal relay in the resistor.

Resistors depending on the application

SP rating	Pword (W)	Horizontal movements to CN/2			Horizontal movements to CN			Vertical movements reverse ≤ 20 sec.			Vertical movements reverse < 120 sec.		
		Pc/Pmot	Resistor	10.30/10.31	Pc/Pmot	Resistor	10.30/10.31	Pc/Pmot	Resistor	10.30/10.31	Pc/Pmot	Resistor	10.30/10.31
1.5TL	750	1.88	RF-SIR-600-100	10/20	1.88	RF-SIR-600-100	5.3/20	3.75	RF-SIR-1100-50	16/20	3.75	RF-SIR-1100-50	60/120
2TL	1100	1.28	RF-SIR-600-100	7.2/20	1.28	RF-SIR-600-100	3.6/20	2.56	RF-SIR-1100-50	10.9/20	2.56	RF-SIR-1100-50	40/120
2.5TL	1500	0.94	RF-SIR-600-100	5.3/20	1.88	RF-SIR-1100-50	16/20	1.88	RF-SIR-1100-50	8/20	1.25	RF-MD-2000-75	120/120
3.5TL	2200	0.64	RF-SIR-600-100	3.6/20	1.28	RF-SIR-1100-50	10/20	1.28	RF-SIR-1100-50	5.5/20	1.60	RF-MD-5500-40	120/120
4.5TL	3000	1.88	RF-SIR-1100-25	16/20	1.88	RF-SIR-1100-25	8/20	1.88	RF-MD-3000-25	20/20	1.88	RF-MD-3000-25	120/120
5.5TL	4000	1.41	RF-SIR-1100-25	12/20	1.41	RF-SIR-1100-25	6/20	1.41	RF-MD-3000-25	15/20	1.41	RF-MD-3000-25	80/120
8TL	5500	1.02	RF-SIR-1100-25	8/20	1.02	RF-SIR-1100-25	4/20	1.02	RF-MD-3000-25	10.9/20	1.02	RF-MD-3000-25	52/120
11TL	7500	0.75	RF-SIR-1100-25	6/20	1.56	RF-MD-3000-12	16/20	1.56	RF-MD-3000-12	8/20	1.56	RF-MD-3000-12	27/120
16TL	11000	1.07	RF-MD-3000-12	20/20	1.07	RF-MD-3000-12	10/20	1.07	RF-MD-3000-12	5.5/20	1.28	RF-MD-7500-10	63/120
22TL	15000	0.85	RF-MD-3000-12	12/20	2.03	RF-MD-7500-5	20/20	2.03	RF-MD-7500-5	10/20	2.03	RF-MD-7500-5	16/120
27TL	18500	1.64	RF-MD-7500-5	20/20	1.64	RF-MD-7500-5	10/20	1.64	RF-MD-7500-5	5/20	1.64	RF-MD-7500-5	25/120
33TL	22000	1.38	RF-MD-7500-5	20/20	1.38	RF-MD-7500-5	8.6/20	1.38	RF-MD-7500-5	4.3/20	1.38	RF-MD-11000-5	26/120
1.5T	750	6.91	RF-SIR-600-100	10/20	6.91	RF-SIR-1100-100	20/20	6.91	RF-SIR-1100-100	16/20	6.91	RF-SIR-1100-100	60/120
2T	1100	4.71	RF-SIR-600-100	7.2/20	4.71	RF-SIR-1100-100	20/20	4.71	RF-SIR-1100-100	10.9/20	4.71	RF-SIR-1100-100	40/120
2.5T	1500	3.46	RF-SIR-600-100	5.3/20	3.46	RF-SIR-1100-100	16/20	3.46	RF-SIR-1100-100	8/20	3.46	RF-SIR-1100-100	30/120
3.5T	2200	2.36	RF-SIR-1100-100	20/20	2.36	RF-SIR-1100-100	10.9/20	2.36	RF-SIR-1100-100	5.5/20	3.14	RF-MD-2000-75	98/120
4.5T	3000	1.73	RF-SIR-1100-100	16/20	1.73	RF-SIR-1100-100	8/20	1.73	RF-SIR-1100-100	4/20	2.30	RF-MD-2000-75	55/120
5.5T	4000	1.30	RF-SIR-1100-100	12/20	1.30	RF-SIR-1100-100	6/20	1.30	RF-SIR-1100-100	3/20	1.73	RF-MD-2000-75	36/120
8T	5500	3.77	RF-SIR-1100-25	8/20	3.77	RF-SIR-1100-25	4.4/20	2.36	RF-MD-5500-40	20/20	2.36	RF-MD-5500-40	120/120
11T	7500	2.76	RF-SIR-1100-25	6.4/20	2.76	RF-SIR-1100-25	3.2/20	1.73	RF-MD-5500-40	14/20	1.73	RF-MD-5500-40	34/120
16T	11000	1.89	RF-SIR-1100-25	4.4/20	1.89	RF-MD-3000-25	10/20	1.89	RF-MD-3000-25	5.5/20	1.18	RF-MD-5500-40	22/120
22T	15000	1.38	RF-SIR-1100-25	3.2/20	1.38	RF-MD-3000-25	8/20	1.38	RF-MD-3000-25	4/20	1.38	RF-MD-11000-25	65/120
27T	18500	1.12	RF-SIR-1100-25	2.6/20	1.12	RF-MD-3000-25	6.5/20	1.12	RF-MD-3000-25	3.2/20	1.12	RF-MD-11000-25	50/120
33T	22000	0.94	RF-SIR-1100-25	2.2/20	0.94	RF-MD-3000-25	5.5/20	0.94	RF-MD-3000-25	2.7/20	0.94	RF-MD-11000-25	40/120
40T	30000	1.69	RF-MD-3000-12	6.6/20	1.35	RF-MD-11000-15	11/20	1.35	RF-MD-11000-15	5.5/20	1.35	RF-MD-11000-15	27/120
50T	37000	1.37	RF-MD-3000-12	5/20	1.09	RF-MD-11000-15	8/20	1.09	RF-MD-11000-15	4/20	1.05	RF-MD-11000-15	21/120
60T	45000	1.12	RF-MD-3000-12	2.2/20	1.35	RF-MD-7500-10	5.3/20	1.35	RF-MD-19500-10	6/20	1.35	RF-MD-19500-10	30/120
75T	55000	2.2	RF-MD-7500-10	9/20	1.1	RF-MD-7500-10	5/20	1.1	RF-MD-19500-10	7/20	1.1	RF-MD-19500-10	28/120
100T	75000	1.6	RF-MD-7500-10	6/20									
120T	90000												
150T	110000												

For any additional information, contact your usual LEROY-SOMER interlocutor.

UNIDRIVE SP Options

L8.4 - Mechanical characteristics

L8.4.1 - Heater integrable brake resistors

⚠ The brake resistor must be found outside the cabinet. For this, it is necessary to provide the running of the resistor cables from the back of the drive to the front of the drive, and an additional cutout must be provided. See section C5.4.

• However, if the application involves the installation of the heater inside the cabinet, the resistor losses must be added to the global losses in the cabinet listed in the table of section C4.2. In addition, provide a non-inflammable base plate.

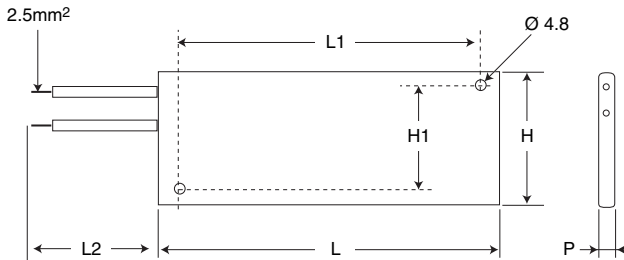
IP40 protection, maximum altitude : 2000 m.

For information concerning the mechanical installation, see the technical manual supplied with the resistor.

L8.4.2 - External brake resistors

⚠ The brake resistor and the thermal relay must be located outside the cabinet (above or as close as possible).

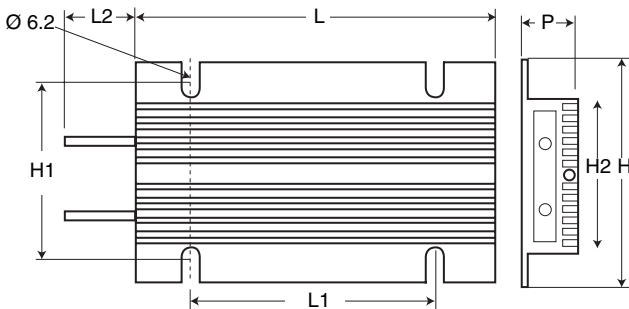
• RF - SIR 600 - 100



Weight : < 1 Kg / Protection : IP33

Type	Sizes (mm)					
	L	L1	L2	H	H1	P
RF-SIR 600-100	102	81	300	68	57	13

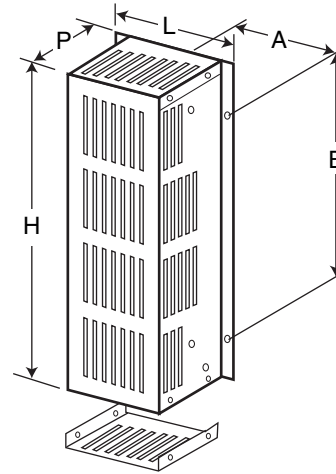
• RF-SIR-1100-100, RF-SIR-1100-50, RF-SIR-1100-25



Weight : 1.3 kg / Protection : IP55

Type	Sizes (mm)						
	L	L1	L2	H	H1	H2	P
RF-SIR-1100-xx	320	240	300	95	82 ±2	71	30

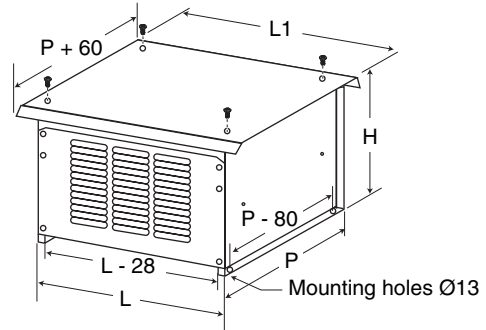
• RF-MD-2000-75, RF-MD-3000-25, RF-MD-3000-12



Protection : IP20

Type	Sizes (mm)			Mounting (mm) Ø 11		Weight (kg)
	L	P	H	A	B	
RF-MD-2000-75	182	140	450	160	310	5
RF-MD3000-25	227	140	450	205	310	6
RF-MD-3000-12	227	140	450	205	310	6

• RF-MD-5500-40, RF-MD-7500-10, RF-MD-7500-5,
RF-MD-11000-25, RF-MD-11000-15, RF-MD-11000-5,
RF-MD-19500-10



Protection : IP13

Type	Sizes (mm)				Weight (kg)
	L	L1	P	H	
RF-MD-5500-40	420	450	480	440	21
RF-MD-7500-10	500	530	480	440	25
RF-MD-7500-5	500	530	480	440	25
RF-MD-11000-25	670	690	480	440	32
RF-MD-11000-15	670	690	480	440	32
RF-MD-11000-5	670	690	480	440	32
RF-MD-19500-10	960	990	540	440	52

UNIDRIVE SP Options

L9 - Cables

L9.1 - CT-COMMS cable (réf. 4500-0087)

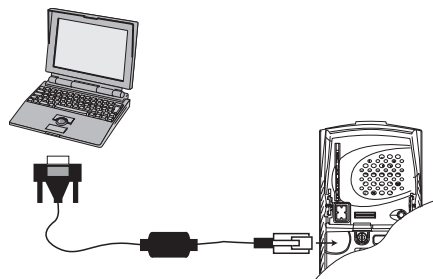
The CT-COMMS cable is used to connect directly a PC RS232 with serial port to Unidrive SP.

Beside the RS232/RS485 converter, this option integrates the additional isolation required in case of IT condition installation.

CAUTION :

Do not connect the end resistor to the mains supply.

The cable is made of a 9-point SUB-D plug of the RS 232 type for connection to PC, and of a RJ45 plug of the RS 485 type for connection to UNIDRIVE SP (cable length : 2 m).



L9.2 - Power cables and encoder

L9.2.1 - Introduction

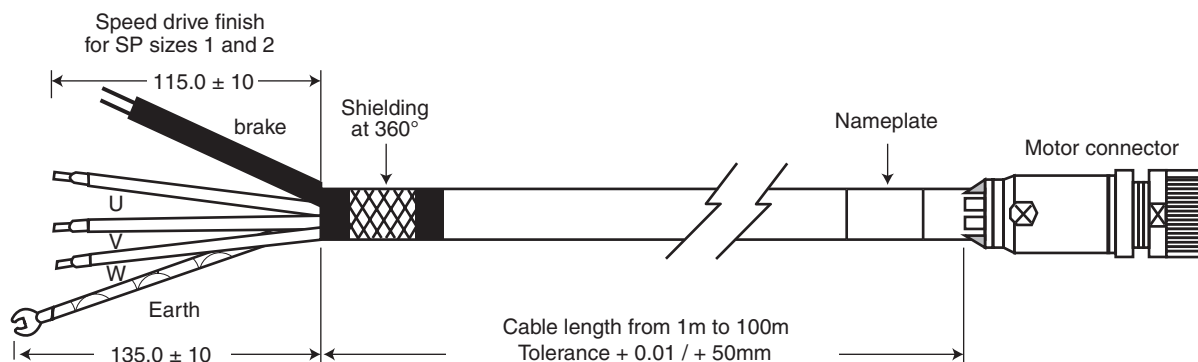
The cables are important components of the moto-drive unit for which a certain number of essential points must be processed with caution :

- covering depending on the environment aggressiveness,
- quality of shielding for the conformity with the CEM directive,
- mechanical resistance to stresses and rates for mounted motors,
- high density connectors requiring particular attention.

For these reasons, Leroy-Somer proposes optionally cables ready for use.

L9.2.2 - Power cables (for Unimotor exclusively)

• Presentation



• Designation

PB	A	A	A	005
Power cable	Insulator	Cable section	Motor side finish	Length
PB : with brake PS : without brake*	B : PUR	A : 4 x 2.5 mm ² B : 4 x 4.0 mm ² G : 4 x 1.5 mm ²	U : connector + finish for Unidrive SP	010 : 10m 001 to 100 : 1 to 100m

* Available with section of 1.5 mm² or 2.5 mm² only.

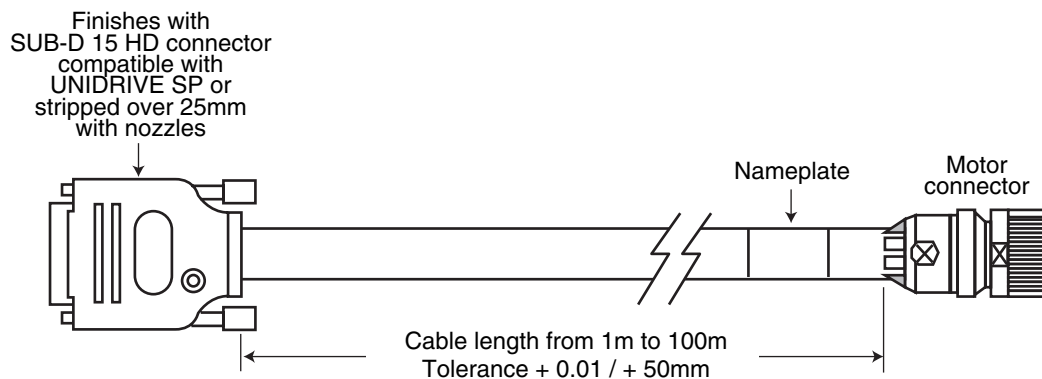
UNIDRIVE SP Options

• Characteristics

Description		Isolated cable comprising 4 power conductors and 1 shielded twisted pair for the brake (option)				
Power conductors		4 x 1.5 mm ²	4 x 2.5 mm ²	4 x 4 mm ²		
Brake conductors (option)		2 x 1 mm ²				
Insulator	external gain	PUR				
	conductors	TPE	TPE	Polyethylene		
Class		6 according to VDE 0295				
Colour	external gain	Orange RAL 2003				
	power conductor	Black ref. U / V / W + green/yellow				
	brake conductor	White and black ref. + and -				
Shielding		Steel braid				
External diameter	Without brake conductors	9.5 mm	11.9 mm	13.5 mm		
	With brake conductors	11.1 mm	14.1 mm	15.6 mm		
Curve ray		10 x diameter	10 x diameter	12 x diameter		
Maximum acceleration		4 m / s ²	4 m / s ²	7 m / s ²		
Maximum speed		120 m / mn	120 m / mn	180 m / mn		
Resistance to stretch	Static	50 N / mm ²				
	Dynamic	20 N / mm ²				
Maximum number of cycles		5 000 000	5 000 000	10 000 000		
Temperature of use		- 20°C to + 80°C	- 20°C to + 80°C	- 40°C to + 90°C		
Leakage capacity	Without brake conductors	Phase-phase		40 pf / m	35 pf / m	40 pf / m
		Phase-shielding		200 pf / m	190 pf / m	220 pf / m
	With brake conductors	power conductor	Phase-phase	50 pf / m	50 pf / m	50 pf / m
		brake conductor	Phase-shielding	220 pf / m	220 pf / m	240 pf / m
			Phase-phase	45 pf / m	45 pf / m	45 pf / m
		Phase-shielding	480 pf / m	380 pf / m	350 pf / m	
Voltage		1000 V				
Dielectric resistor		3000 V				
Isolation resistor		> 10 Mohms/km				
Weight	Without brake conductors	143 kg / km	219 kg / km	299 kg / km		
	With brake conductors	212 kg / km	279 kg / km	360 kg / km		
Certification - UL / CSA		Yes	Yes	No		

L9.2.3 - Encoder cables

• Presentation



• Designation

Encoder type		Incremental encoder		SinCos encoder - Hiperface link		Resolver	SinCos encoder - EndAt link
Motor type		Asynchronous	Servo	Asynchronous	Servo	Servo	Asynchronous
Designation	Nozzles *	SCBACxxx	Consult	Consult	SSBBCxxx	SRBBCxxx	Consult
	Connectors *	SCBADxxx	SIBBAxxx	SABADxxx	SSBBDxxx	Not available	SEBAAx

* Unidrive SP side finishing

Note : In the designation, xxx defines the cable length. This length may be comprised between 1 and 100m. However, the length of 10 m was standardised in order to favour the short periods.

Example :

- Unimotor servo-motor,
- Cable for SinCos encoder,
- Drive side finish: HD 15 connector
- Length : 10 m,

Designation : SSBBD010.

UNIDRIVE SP Options

• Characteristics

Description		Incremental encoder (asyn.) or resolver (servo) or SinCos - Hiperface link (asyn.)	Incremental encoder (servo)	SinCos - EndAt link (asyn.) or SinCos - Hiperface link (servo)
Insulator	external gain	PUR		
	conductors	TPE		
Class		6 according to VDE 0295		
Cable composition	Signal conductors	3 x (2 x 0.14 mm ²)	6 x (2 x 0.34 mm ²)	3 x (2 x 0.38 mm ²)
	Power supply conductors	2 x 0.5 mm ²	2 x 1 mm ²	2 x 0.5 mm ²
	Thermal probe conductors	x	2 x 0.34 mm ²	2 x 0.38 mm ²
Colour	External gain	Green RAL 6018		
	Conductors	DIN 47100		
Shielding		Covering by braids > 80 %		
External diameter		8.6 mm	11 mm	9 mm
Curve ray		10 x diameter		
Maximum acceleration		4 m / s ²		
Maximum speed		120 m / min		
Maximum number of cycles		5 000 000	6 000 000	5 000 000
Temperature of use		- 20°C to + 80°C		
Leakage capacity	Between signal conductors	45 pf / m	70 pf / m	130 pf / m
	Signal conductors - shielding	225 pf / m	120 pf / m	220 pf / m
	Between power supply conductors	255 pf / m	85 pf / m	150 pf / m
	Power supply conductors - shielding	465 pf / m	145 pf / m	255 pf / m
Dielectric resistor	Between conductors	2000 V		
	Shielding conductors	1000 V		
Weight		113 kg / km	116 kg / km	76 kg / km
Certification - UL / CSA		Yes		

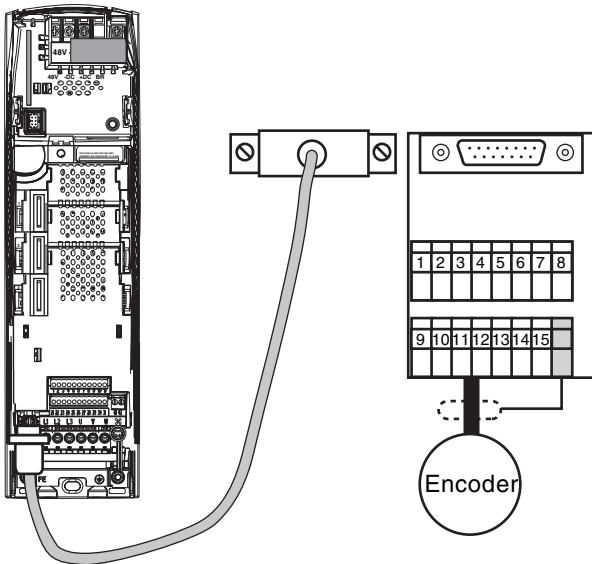
UNIDRIVE SP Options

L10 - Intercod 15

L10.1 - General information

Intercod 15 is used to convert the 15-point HD encoder plug of UNIDRIVE SP into 15 flexible blade terminals.

L10.2 - Connection



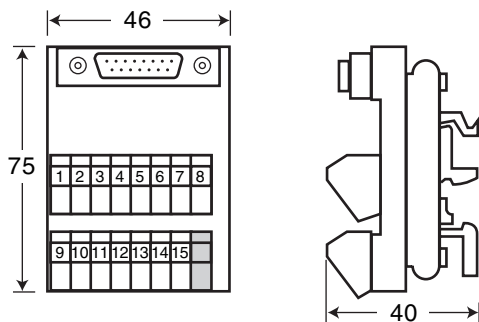
L10.3 - Characteristics

• Composition

The INTERCOD 15 interface is made of a connection cord and of an interface module.

Cord	Type	15 shielded conductors of 0,22 mm ²
	Drive side plug	High density 15-point HD screw plug with shielding connected to pin 14
	Interface side socket	Standard 15-point HD screw socket with shielding connected to terminal box.
	Length	1.5m
Interface module	Mounting	On rail TS 35
	Terminals	Flexible blade terminals numbered from 1 to 15 for a wire of 0.08 to 2.5 mm ²
	Shielding continuity	Green terminal connected to the terminal box of HD-15 plug for the connection of the use shielding.

• Sizes



UNIDRIVE SP Options

Notes



UNIDRIVE SP Maintenance

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UNIDRIVE SP Maintenance

Notes



UNIDRIVE SP Maintenance

M1 - Introduction and warning

! • All works related to installation , commissioning and maintenance must be carried out by experienced, qualified personnel.

• When a fault detected by the drive causes its powering down, fatal residual voltages are present on the output terminals and in the drive.

• Before carrying out any work, disconnect and lock the drive power supply and wait 10 min before unloading the capacitors.

• Check that the continuous bus voltage is below 40V, before carrying out any work.

• During the maintenance operations on the powered up drive, the operator must stay on an insulated surface, not connected to earth.

• During the works on a motor or on its power supply cables, check that the drive power supply is disconnected and locked.

• During the tests, all the protective covers must be left in place.

The drive maintenance and fixing operations to be carried out by the user are significantly reduced. Hereinafter are presented the current servicing operations as well as the simple methods destined to the check-up of the drive operation.

M2 - Servicing - Measurements - Tests

M2.1 - Servicing

All drives may encounter problems as result of the exposure to a too high temperature, to humidity, oil, dust or after any intrusion of foreign bodies.

The built-in circuits and their components usually do not need any maintenance. Contact your vendor or the closest certified repairer in case of damage.

DO NOT DISMANTLE THE BUILT-IN CIRCUITS DURING THE WARRANTY. IT BECOMES IMMEDIATELY INVALID.

Do not touch the built-in circuits or the micro-processor with the fingers or with loaded or powered up materials. Connect yourself to earth and connect also the bench or the iron to be welded for any intervention on circuits.

If the drive storage exceeds 12 months, the drive must be powered up for 24 hours, then this operation must be repeated all 6 months.

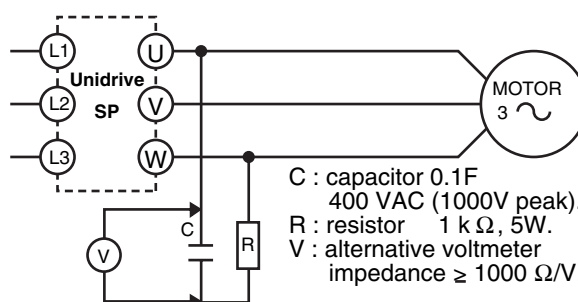
Periodical check-ups:

Ambient temperature	Check that the temperature inside the cabinet is correct.
Dust	Check that the heater and the drive fan are not obstructed by dust. The drive length of life will be reduced if it operates in dusty environments.
Humidity	Check that there is no condensation inside the cabinet.
Cabinet door filters	Check that the air flows normally through the filters.
Tightening	Check that all terminals remain correctly screwed.
Crimped terminals	Check that crimping does not change the colour; this may indicate an abnormal overheating.
Cables	Check that the cables are not damaged.

M2.2 - Voltage, current and power measurements

• Voltage measurement on drive output

The harmonics due to the drive make impossible a correct measurement of the voltage on the motor input, by means of a classic voltmeter. However, you can obtain a value close to the efficient voltage of the fundamental wave (the one influencing the torque) by using a classic voltmeter and the mounting described in the figure below.



• Motor current measurement

The current consumed by the motor and the drive input current may be measured similarly due to classic mobile frame ampermeter.

• Drive input and output power measurement

The drive input and output powers may be measured by using an electrodynamic device.

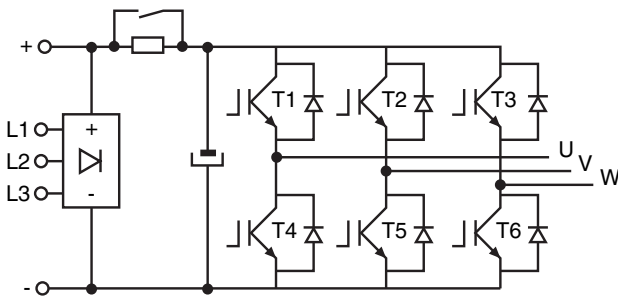
UNIDRIVE SP Maintenance

M2.3 - Power stage tests

• Preliminary remarks :

The tests presented below are destined to make a qualitative test of the power stage status. Use a multimeter in diode test and make the measurements after having powered down the drive and after having waited for full unload of the filtering capacitor (about 10 min). Each measurement must last at least 10 seconds in order to avoid the false readings due to the loads that may be still present in the drive circuits. In case of doubt regarding the power stages, visually check the status of the basic command modules that may have been damaged due to the above-mentioned.

The figure below shows the diagram of the general principle of the drive undulating device with transistors.



• Test by means of the terminal block

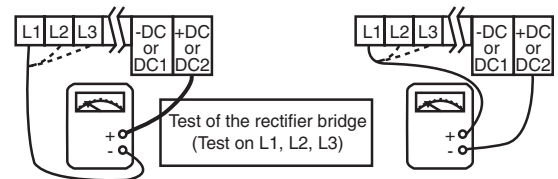
This test is quite brief. A positive response does not necessarily mean that the power stages are correct. However, a negative response generally shows that these are damaged.

Use terminals L1, L2, L3 and U, V, W and terminals -DC, +DC (size 1) or DC1, DC2 (sizes 2 and 3) of the power terminal blocks.

CAUTION :

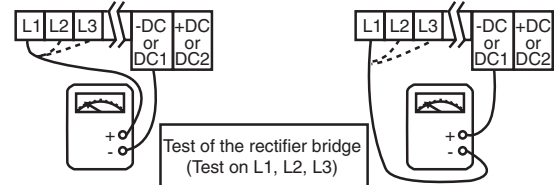
For sizes 2 and 3 do not make measurements on the current terminal block, make +DC, -DC.

The continuous power bus may be found on the terminal block DC1, DC2, BR.



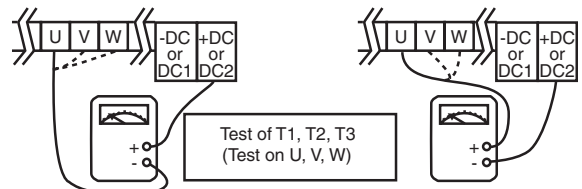
• Sizes 1 to 3 : reading ∞

• Sizes 1 and 2: reading 0.3V to 0.6V
• Size 3 : reading L2, L1 ∞
reading L3 0.3V to 0.6V



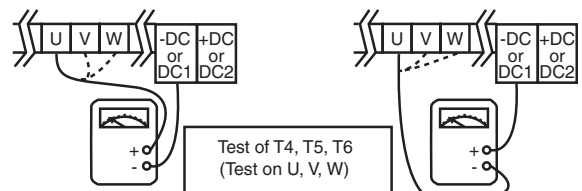
• Sizes 1 to 3 : reading ∞

• Sizes 1 to 3 : reading 0.3V to 0.6V



• Sizes 1 to 3 : reading ∞

• Sizes 1 to 3 : reading 0.3V to 0.6V



• Sizes 1 to 3 : reading ∞

• Sizes 1 to 3 : reading ∞

M3 - Repairing - Spare parts

• List of spare parts

Consult LEROY-SOMER

• Change of products

CAUTION :

The products must be returned in their original package or, if impossible, in a similar package, in order to avoid their damaging. Otherwise, the guarantee can be refused.



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