LEROY SOMER

3927 en - 12.2007 / c

CE

This manual is to be given to the end user

UNIDRIVE SP

Positioning

Installation and commissioning manual

UNIDRIVE SP
Universal speed drive

The LEROY-SOMER offer

Operation
4 quadrants

- Brake resistor

RFI filters - Line choke

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

UNIDRIVE SP

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
  - SMV UM

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 ⏚).

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 certainty 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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General information

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General information

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UNIDRIVE SP
General information

A1 - General principle

The SM-POS module (Positioning programmable application module) integrated into a Unidrive SP variable speed drive, when used with an SM-IO Plus additional input/output module, allows a mobile assembly to be positioned linearly or angularly on an axle (up to 32 positions).
The drive manages the positioning using the speed and position feedback generated by an encoder mounted on the self-controlled asynchronous or synchronous motor (closed loop flux vector control or Servo control).
The positioning solution incorporates a scan timer function, which allows automatic selection of each position
(P1 -> P2 -> P3, etc), and the length of time between each selection is determined by the user.

In certain applications, an additional encoder is mounted on the slow shaft (machine encoder). In this case, the encoder mounted on the motor gives the speed information, and the encoder mounted on the slow shaft gives the position information. To process this information, an optional SM-Universal-Encoder Plus speed feedback module must be added.
For other cases, the SM-POS module also makes it possible to change from positioning mode to synchronisation, or to manage a rotary system.

Manual for use with the positioning software versions equal to or greater than 32000610

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 situation, the maximum transient current of the drive (transient I_{max}) is of 150 % I_{sp} in open loop or of 175 % I_{sp} in closed loop or servo.
I_{sp} is available for all speed range.

Maximum transient overload

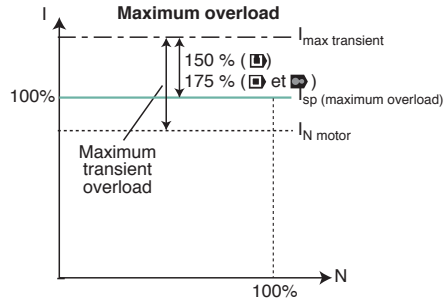
$$= \frac{I_{sp}}{I_{N\ motor}} \times 1.5 \times 100.$$

Maximum transient overload and

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

Example :
- LS MV 132 SM Motor - 4 poles - 5.5 kW - 400V Y
$I_{N\ motor}$ = 10.4A.
- Constant torque application - open loop vector control - maximum overload.
- Drive selection --> **UNIDRIVE SP 8T**, I_{sp} with maximum overload : 13A.

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

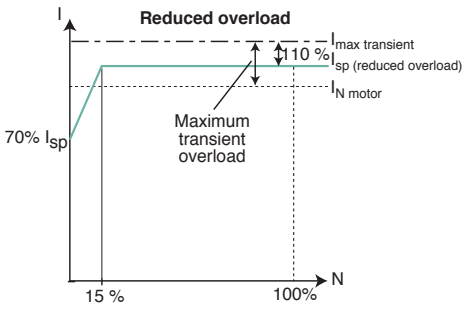


Reduced overload : If the operating conditions are not severe, the output current may be increased and it may allow a higher power motor to be driven. On the other hand, the maximum transient current is limited to 110 % I_{sp}.
Below 15 % of the rated speed, the permanent output current is reduced as indicated in the curve below.

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

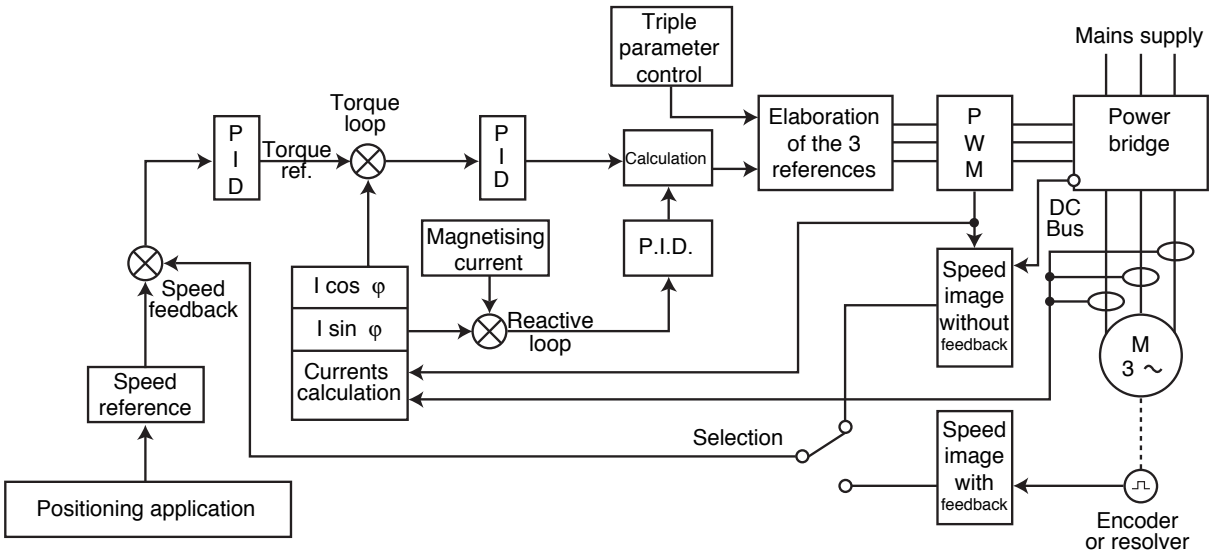
Example :
- LS MV 132 SM motor - 4 poles - 5.5 kW - 400V Y
$I_{N\ motor}$ = 10.4 A.
- Constant torque application - open loop vector control - reduced overload and minimum speed > 15 % rated speed.
- Drive selection --> **UNIDRIVE SP 5.5T**, I_{sp} with reduced overload : 11A

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



UNIDRIVE SP
General information

A3 - Control principle



A4 - Operating principle

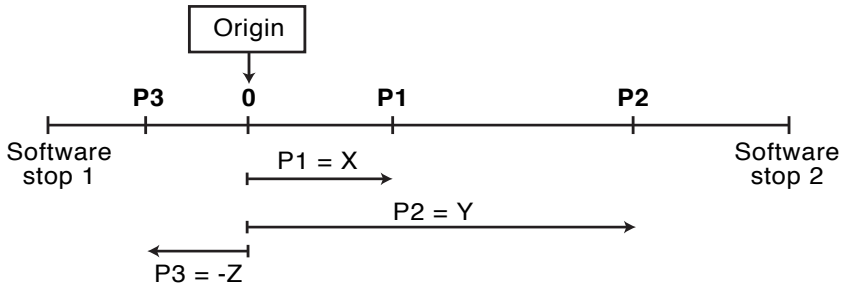
Starting from an origin stored when powering up the system, the mobile moves on either side of this origin and it takes its position according to the automation commands.
Following the applications, the positioning may be ABSOLUTE or RELATIVE. For absolute positioning, the point of origin of the axle must be set by the user; this is the origin cycle. During factory setup, the origin cycle is performed using a reference sensor. However, by modifying the drive configuration, the origin cycle can be set up to be when stopped, on sensor, on Top 0, on sensor and Top 0, on on-the-fly sensor or on active current threshold.
Positioning can be managed using the motor encoder or the machine encoder in the various operating modes of the drive (open or closed loop flux vector or servo control).

Position management can be 16-bit or 32-bit, according to the level of accuracy required.
The SM-POS application can be used to move the mobile in forced run mode (manual movement), and to declare zones of passage at reduced speed and software limit stops.

The SM-POS application can also be used to change from positioning operation to synchronisation or vice versa.

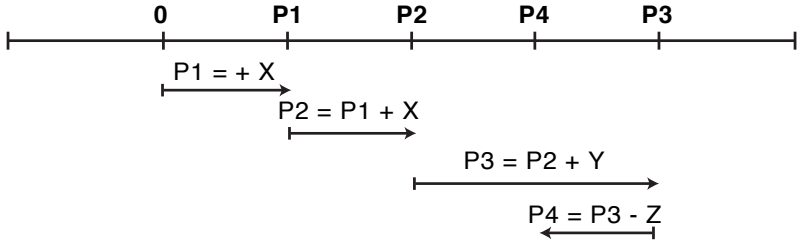
A4.1 - Absolute positioning

The absolute positioning is a movement to stop positions of which are referenced to an origin which is generally the " 0 " position of the installation.
A position will always be placed in relation to the origin.
The software limit stops set the maximum travel of the mobile.



A4.2 - Relative positioning

The relative positioning is a movement the origin of which is the previous position.
The mobile advancing is made step by step.
In relative positioning, the software stops establish the minimum or maximum value of the authorised steps :
Software stop 1 ≤ step ≤ Software stop 2.



A4.3 - Origin cycle

In relative positioning, there is no need of mechanical stop for the system. If the stop is necessary for certain specific applications, the use of a pulse sensor is enough.
Meanwhile, it is really necessary to access the system (see A4.3.1).

CAUTION :
All position requests may be managed by the drive only when the ref. OK reference is validated.

A4.3.1 - When stopped

In this case the mobile is positioned by manual movement (using the I_+ and I_- inputs) to its origin position. The origin is confirmed by external information (digital input I_0).
This type of origin cycle is used for relative mode with no reference sensor, for which it is nevertheless necessary to initialise the system.

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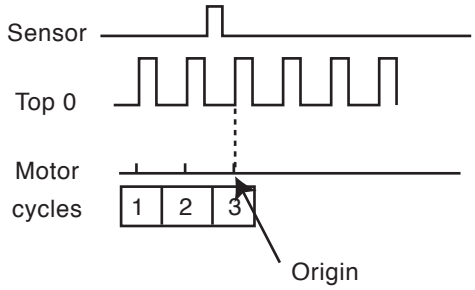
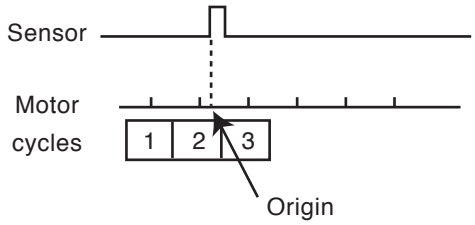
A4.3.2 - On reference sensor and Top 0

A reference sensor must be set on the installation including the mobile to be positioned.
Top 0 is used to place the origin in a motor revolution.
The mobile moves up to the sensor, then the drive automatically stops the system origin on Top 0 of the encoder (path C or Z).



A4.3.3 - On reference sensor

A reference sensor must be mounted on the installation including the mobile to be positioned, and the rising edge of the sensor will be used to place the origin of the installation.

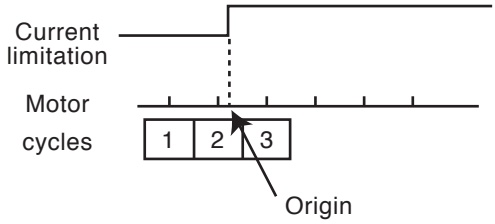


A4.3.4 - On reference sensor with origin cycle on the fly

A reference sensor must be mounted on the installation including the mobile to be positioned. It will be used to place the origin of the application on an origin cycle request, and then during a movement into position (even at high speed).
- In standard positioning mode, stop on sensor detection + possible origin shift (for example, makes it possible to take the origin on an object carried by the mobile).
- In scan timer mode, on sensor detection, linking of the next position from its new origin (for example, makes it possible to define a movement on detection of the mobile).
- In rotary system mode, recalibration on the next position request after detection of the sensor (for example, makes it possible to avoid accumulation of errors due to the accuracy of the system).

A4.3.5 - On current limitation

The system origin is taken on a fixed threshold of the motor active current.
The origin is validated when the motor active current is higher than this threshold established by the user (corresponding to the torque level).

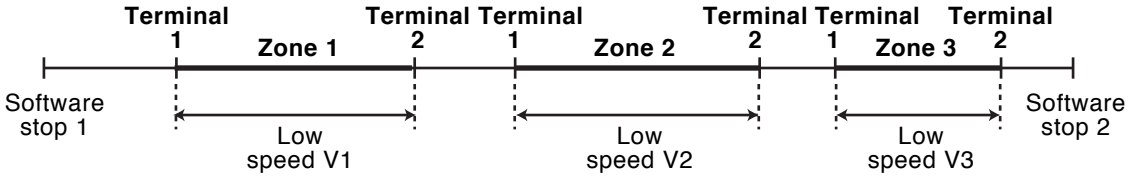


A4.4 - High speed or low speed forced run

Two inputs I_+ and I_- are provided in order to control the mobile movement in either direction.
The action on these inputs has priority and sets the drive into servo control on a high speed or low speed movement, which has been set.
This is used for manual operation or programming reference points.

A4.5 - Zones of passage at reduced speed

Three zones of passage at "reduced speed" can be delimited on the movement axle of the mobile.
The "terminal" of each zone, the speed in the zone and the direction of passage at reduced speed are configurable.
The terminal of the zones can intersect (in that case the lowest speed is the one used), and "presence in zone" data can be generated when the mobile passes.



A4.6 - Limit stops

Two software limit stops can be configured to limit the travel of the mobile in absolute mode. In relative mode, the limit stops limit the minimum and maximum steps made by the mobile.
In rotary mode, the limit stops are disabled.

• For safety, end stop switches (or overtravel detectors) must be installed between the software limit stops and the mechanical limits of the system.
These end stop switches must act directly on the mechanical brake set on the motor or on the machine. They may also control the drive locking . The position of the end stop switches must take into account the mobile inertia and the brake reaction time.

A4.7 - Mechanical brake

A safety brake must be set on the motor or on the machine. The dynamic brake during each positioning is provided by the drive, if necessary, with a brake resistor.
If the motor is provided with forced ventilation, the drive maintains the torque at zero speed with the motor stopped. So it is not necessary in this situation to brake after each positioning. So the brake will be used only for an emergency stop or for mains supply failure.

A4.8 - Positions parameter setting

In absolute positioning, it is necessary to set a rating in relation to the origin while in relative positioning, the speed is set.
In certain cases, the positions may be stored after an automatic scaling procedure.

A4.9 - Positioning commands

The drive has 4 digital inputs I1 to I4 (using the SM-I/O Plus module) in order to receive the automation positioning commands.
An additional input I5 may be assigned by the user (allocation of a digital input). These inputs allow three types of control: direct, encoded with parity and encoded without parity.

A4.9.1 - Direct control

Each input corresponds to a preset position or step. This mode can therefore be used to manage a maximum of 4 positions (5 if input I_5 is used). The mobile moves as soon as the input corresponding to the desired position is enabled (the drive must be enabled and the run command enabled).
CAUTION :
When 2 inputs are simultaneously validated, the movement is interrupted.
The movement starts again when one of the two inputs is cancelled.
The mobile will stop at the position corresponding to the validated input.

A4.9.2 - Encoded control without parity bit

Each binary combination of inputs corresponds to a preset position or step. This mode can therefore be used to manage a maximum of 16 positions (32 if input I5 is used).
The mobile moves to the position corresponding to the combination selected when the validation input I_{val} is activated.
This " validation " input avoids the untimely movement of the mobile during the combination selection.
CAUTION :
The input I val must be maintain activated during the entire mobile movement stage. If input I_{val} is cancelled, the movement is interrupted.

A4.9.3 - Encoded control with parity bit

In this case, the 4 inputs (I_1 to I_4) are used for position control. The fifth input (I_5) is used as a parity bit. The use of a parity bit allows the drive to check the consistency of control commands (for example, when a wire on an input is broken).

Principle : the input " parity bit " must be validated when the number of inputs validated for the position control is even (0 or 2). It must be devalidated in the other situations.
This mode allows a maximum of 16 positions. The mobile moves to the position corresponding to the combination selected when the validation input I_{val} is activated and if the status of the input " parity bit " corresponds to the number of inputs selected.

CAUTION :
• The input I_{val} must be maintained activated during the entire mobile moving stage. If the input I val is cancelled, the movement is interrupted.
• The movement does not begin or it is interrupted if the status of the input " parity bit " does not correspond to the number of validated position control inputs registered by the drive.

A4.10 - Report

A4.10.1 - Ref OK

This output is validated when the origin cycle has been correctly set and the variable speed drive has stored the origin. It allows authorisation of the positioning orders.

A4.10.2 - O val

This output is validated when the mobile is located in a "window " around the position requested.
It allows indication to the automation that the positioning has been correctly made.
The width of the window may be set.

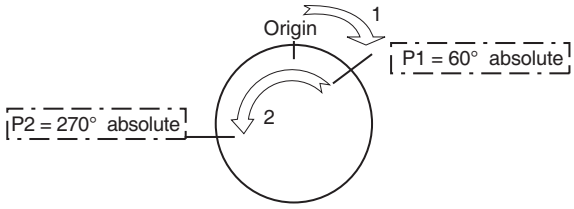
A4.11 - Rotary positioning

At each revolution of the mobile, the position counter is reset to zero. If necessary, an on-the-fly origin cycle sensor will be enabled to recalibrate the system each revolution.

In this mode, the dynamic characteristics must be defined:
• The reduction ratio (to determine the number of motor revolutions for 1 revolution of the rotary system) in the form of a numerator and a denominator.
• The distance travelled for 1 revolution of the system.

A4.11.1 - Shortest rotary positioning

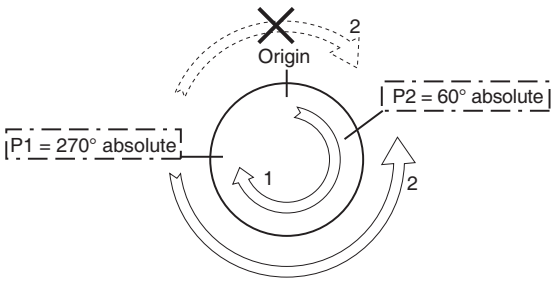
When an absolute position in the revolution is requested, the shortest path will be taken.
Example:



Movement = origin, P1 then P2

A4.11.2 - Rotary positioning with origin in the revolution

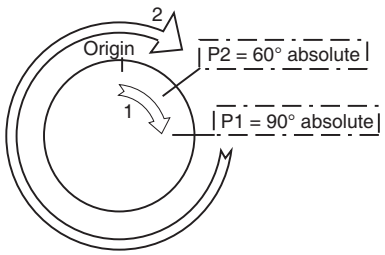
Allows relative or absolute positioning in the revolution.
To reach the requested position, the origin used corresponds to the origin of the revolution in which the mobile is situated.
Example:



Movement = origin, P1 then P2

A4.11.3 - Rotary positioning with a single direction of rotation

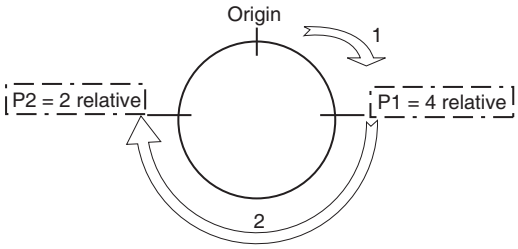
With the axle stopped, when an absolute position is requested, the path taken to go to the position will be in the forward direction of rotation only.
Example:



Movement = origin, P1 then P2

A4.11.4 - Rotary positioning by index numbers

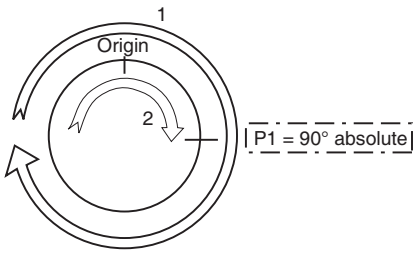
The operation is the same as rotary positioning in the revolution, except that encoding of the position value is no longer done by a position in customer units but by an index number.
Example:



Movement = origin, P1 then P2
P1 = 4 = rotation/4 = 360/4 =90°
P2 = 2 = rotation/2 = 360/2 =180°

A4.11.5 - Rotary positioning with pin indexing function

Upon a position request, the system starts rotating at the speed defined by that position. Upon release of this position request, the system slows and comes to a standstill at the angle defined by the position.



Movement = origin,
On enabling P1 (speed control),
On release P1 (positioning at 90°)

A4.12 - Synchronisation

If synchronisation is enabled, it is possible to synchronise with a master axle, then change to positioning in order to reposition the axle.
The synchronisation information can be sent from the master to the slave via the encoder channels (SM-ENCODER PLUS or SM-UNIVERSAL ENCODER PLUS module on the slave drive) or by CTSYNC communication if both axles have an SM-POS module.

Note: Further information on CTSYNC communication can be obtained from your usual LEROY-SOMER contact.

UNIDRIVE SP
General characteristics

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UNIDRIVE SP
General characteristics

B1 - Environment characteristics

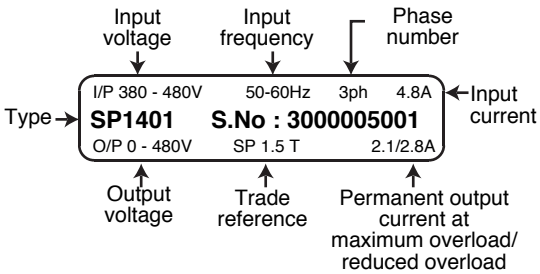
• Drives shall be installed on a control panel in order to protect them from conductive dust and condensation. The access of non authorised persons is denied.

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.

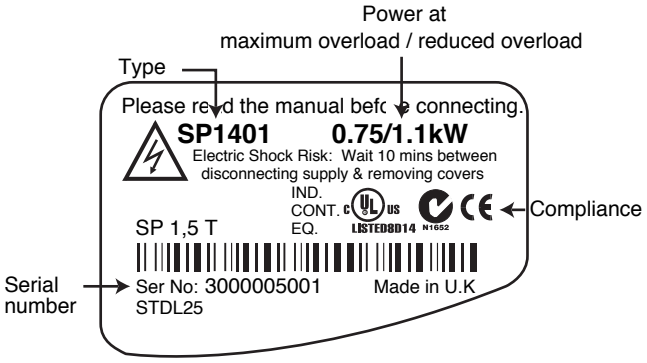
B2 - Product Name

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	CE	Europe
N1652	C Tick	Australia
c UL us	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 switching frequency

Caution:
• With the factory settings, the drive operates with a 3 kHz switching frequency at a 40°C ambient temperature. In case of higher switching 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 switching 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
	5.5T	1406	4	9.5	5.5	11
2	8T	2401	5.5	13	7.5	15.3
	11T	2402	7.5	16.5	11	21
	16T	2403	11	25	15	29
3	22T	3401	15	32	18.5	35
	27T	3402	18.5	40	22	43
	33T	3403	22	46	30	56
4	40T	4401	30	60	37	68
	50T	4402	37	74	45	83
	60T	4403	45	96	55	104
5	75T	5401	55	124	75	138
	100T	5402	75	156	90	168
6	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
	60TH	4606	45	52	55	62
5	75TH	5601	55	62	75	84
	100TH	5602	75	84	90	99
6	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 switching frequency

UNIDRIVE SP			Temp.	Three-phase permanent output current below 220V at a switching 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	11.5
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 switching 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**				5.6	4.4	**8.8**				7.4	5.7
			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**			10	7.4	5.7
			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	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

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

UNIDRIVE SP			Temp.	Three-phase permanent output current below 575V/690V at a switching 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
4	22TH	4601	40°C	**19**				x	x	**22**				x	x
			50°C	19				x	x	22				x	x
	27TH	4602	40°C	**22**				x	x	**27**				x	x
			50°C	22				x	x	27			25	x	x
	33TH	4603	40°C	**27**				x	x	**36**			34	x	x
			50°C	27				x	x	36		31	25	x	x
	40TH	4604	40°C	**36**			34	x	x	**43**		41	34	x	x
			50°C	36		31	25	x	x	43	40	31	25	x	x
	50TH	4605	40°C	**43**		41	34	x	x	**52**		41	34	x	x
			50°C	46	40	31	25	x	x	43	40	31	25	x	x
	60TH	4606	40°C	**52**		45	36	x	x	**62**	61	48	40	x	x
			50°C	52	45	35	28	x	x	52	45	35	28	x	x
5	75TH	5601	40°C	**62**				x	x	**84**				x	x
			50°C					x	x					x	x
	100TH	5602	40°C	**84**				x	x	**99**				x	x
			50°C					x	x					x	x
6	120TH	6601	40°C	**100**			x	x	x	**125**			x	x	x
			50°C				x	x	x				x	x	x
	150TH	6602	40°C	**125**			x	x	x	**144**			x	x	x
			50°C				x	x	x				x	x	x

B

B4 - Electromagnetic compatibility (CEM)

B4.1 - Compatibility tabel

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**	**Compliance conditions**							
			Drive / motor cable length	**RFI Filter**						
				Size 1	**Size 2**	**Size 3**	**Size 4**	**Size 5**	**Size 6**
EN 61800-3	Speed drive standard	2nd envir. 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			
		2nd envir. 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						
		1st envir. with non restricted distrib. **(R)**	≤ 20 m	ext. filter, fd≤6kHz		ext. filter, fd=3 kHz			
		1st envir. with ristricted distrib. **(I)**	≤ 20 m	ext. filter, fd≤16kHz		ext. filter, fd≤12 kHz			
			≤ 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.

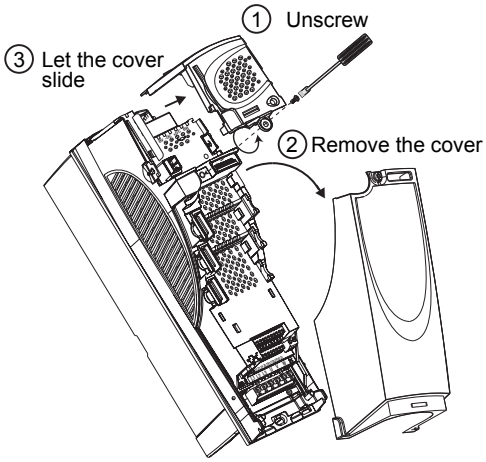
CAUTION:

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),

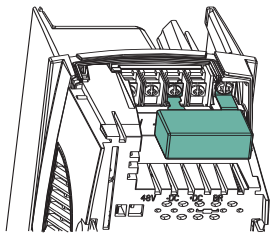
- from a 3 to 6 size drive connected to a mains supply. If an external RFI filter or an additional motor earth is used, it is not necessary to remove the internal RFI filter.

• Terminal access

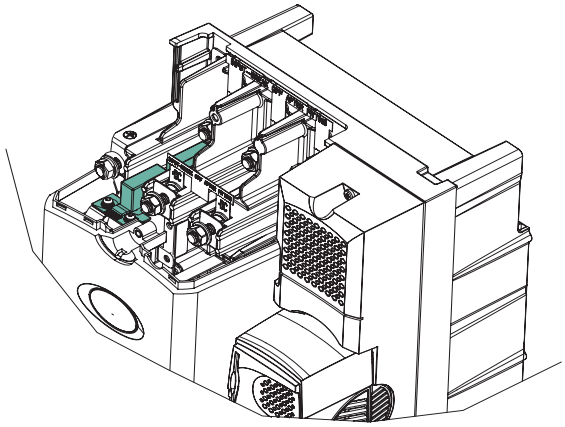


• Installation

- 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

Contents

Notes

UNIDRIVE SP
Mechanical installation

C1 - Warning

⚠ • It is the owner or the user responsibility to make sure that the installation, operation, maintenance of the drive and its options are realised in compliance with the legislation relating to the goods and personnel safety, and with the provisions in force in the country in which it is used.

• The UNIDRIVE SP has to be installed in a location free from conductive dust, steam, gas and corrosive fluids and from condensation (for example class 2 following UL 840 and CEI 664.1). The drive must not be installed in an area likely to be at risk but in a location fit for purpose. In this situation, the installation shall be guaranteed.

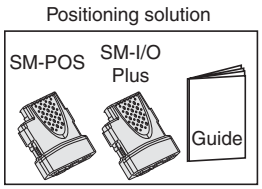
• In an atmosphere subject to condensation, install a heating system that operates when the drive is not used and switched off when the drive is operating. Il is preferable to control the reheating system automatically.

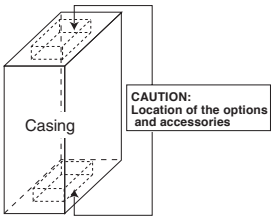
•The UNIDRIVE SP casing is inflammable; if necessary, use an fire protection cabinet.

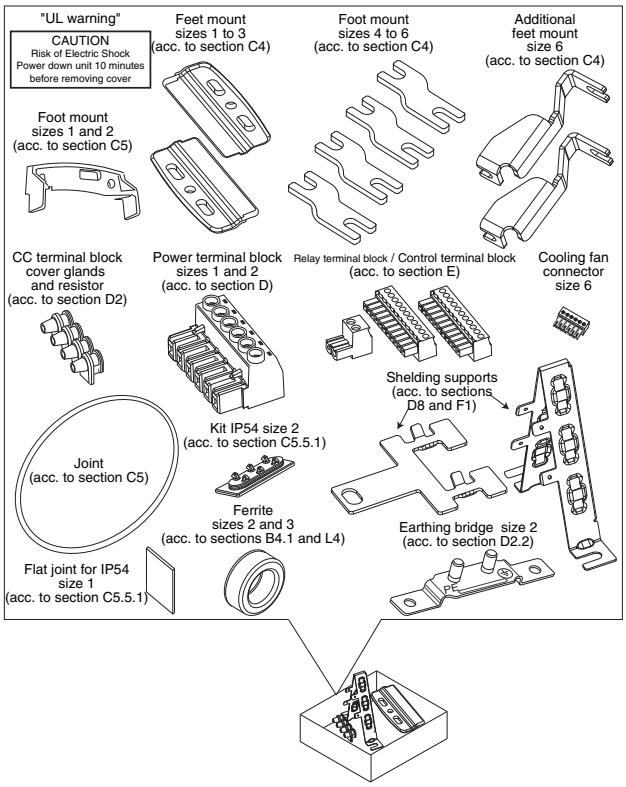
• In order to respect the UL conformity, the variable speed drive has to be installed in a type 1 minimum cabinet, as defined by the UL50 standard.

C2 - Checks upon receipt

Before starting the drive installation, make sure that :
-the drive was not damaged during the transportation,
-the accessories, the general manual and the CD Rom are included in the drive casing,
-the name plate corresponds to the mains supply.







C3 - Mounting types

The drive may be mounted in 2 ways…

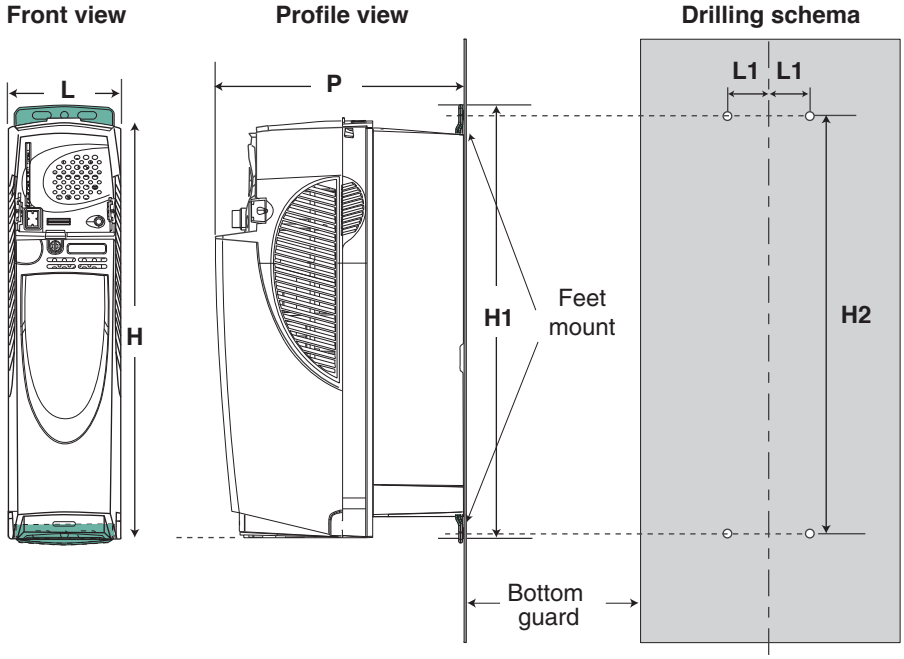
- Heater inside the cabinet :
In this configuration, it is necessary to take into consideration the drive losses for cabinet sizing .

- Heater outside the cabinet :
Mounting the heater outside the cabinet allows the dissipation of most of the heat losses. Consequently, the cabinet sizes may be significantly reduced.
If it is necessary, the drive may be modified in order to keep the IP54 protection of heater outside the cabinet (see section C5.5).

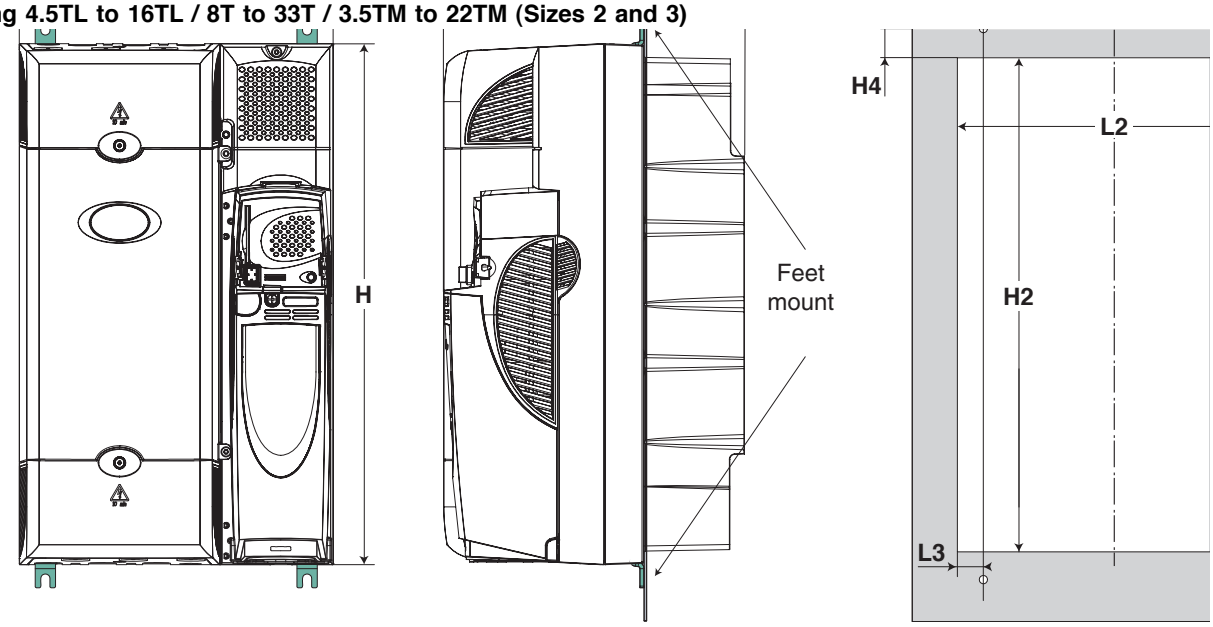
C4 - Heater mounting inside the cabinet

C4.1 - Sizes and weights

• **Rating 1.5TL to 3.5TL / 1.5T to 5.5T (Size 1)**



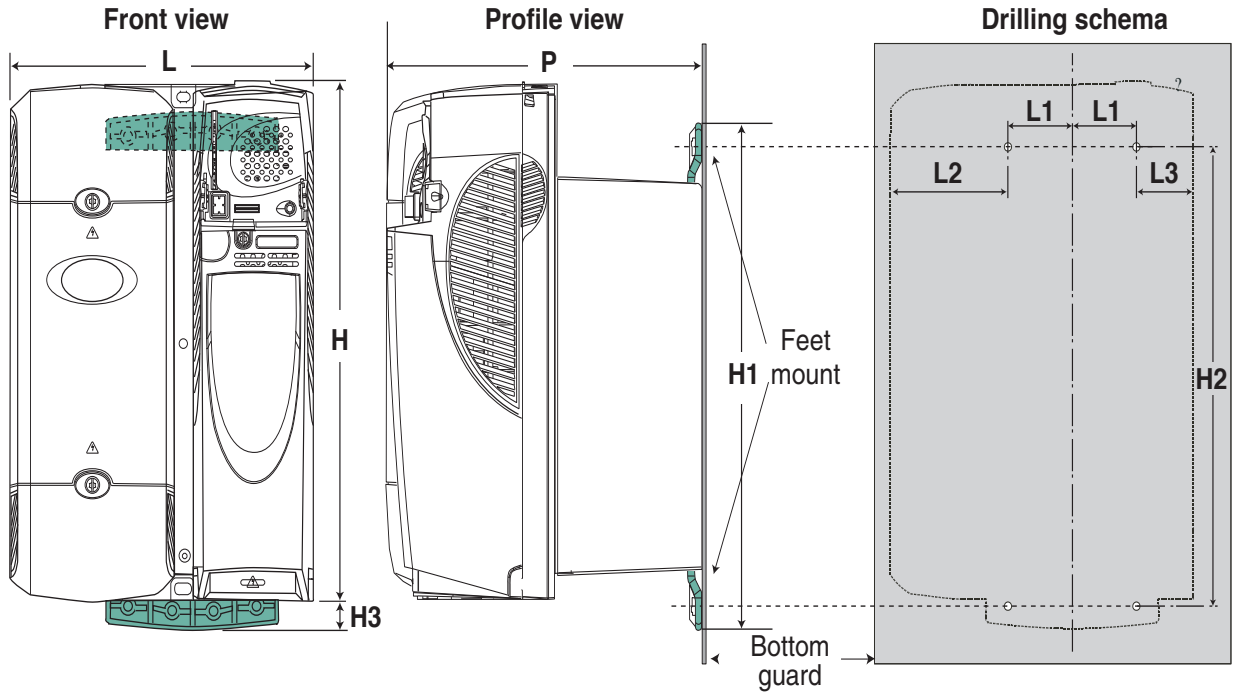
• **Rating 4.5TL to 16TL / 8T to 33T / 3.5TM to 22TM (Sizes 2 and 3)**

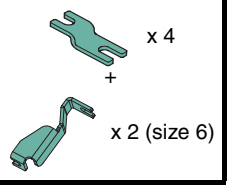


UNIDRIVE SP		Dimension (mm)									Screw (mm)	Weight (kg)	Mounting
Size	Type	L	L1	L2	L3	H	H1	H2	H3	P			
1	1.5TL to 3.5TL 1.5T to 5.5T	100	20 ± 2.5	-	-	368	386	370 ± 1	-	219	4 x Ø6.5	5 (4.5T & 5.5T : 5.8)	x 2
2	4.5TL to 8TL 8T to 16T	155	53 ± 0.5	24.5	24.5	368	371.6	337.5 ± 1	21	219	4 x Ø6.5	7	x 2
3	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

• **Rating 22TL to 33TL / 40T to 150T / 22TH to 150TH (Sizes 4 to 6)**



UNIDRIVE SP		Dimension (mm)							Screw (mm)	Weight (kg)	Mounting
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	
5	75T and 100T 75THand 100TH	310	129.3 ± 0.25	820	857.3	839.3 ± 0.5	18.4	298	4 x ØM8	55	
6	120T and 150T 120THand150T	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 the drive losses at the rated current, according to the carrier frequency. The values correspond to normal operation for ambient temperatures of 40°C and 50°C.

UNIDRIVE SP		Temp.	Losses (W)											
			Maximum overload						Reduced overload					
Size	Type		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		78	82	89	97		
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	
	5.5TL	40°C	**170**	176	190	203	229	256	**210**	218	234	250	282	314
		50°C	170	176	190				190					
	8TL	40°C	**245**	254	263	261	259	258	**272**	282	302	320		315
		50°C	190						190					
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

C

UNIDRIVE SP		Temp.	Losses (W)											
			Maximum overload						Reduced overload					
Size	Type		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		62	69	83		97	
	4.5T	40°C	**72**	82	101	121	123	125	**83**	94	117	139	156	157
		50°C	72	82	97				83	94	97			
	5.5T	40°C	**91**	103	123			125	**106**	120	147	158	156	157
		50°C	91	97					97					
2	8T	40°C	**164**	178	206	229		231	**186**	202	234	266	283	282
		50°C	164	178	190				186	190				
	11T	40°C	**201**	218	230	229		231	**248**	269	291	286	283	281
		50°C	190						190					
	16T	40°C	**272**	282	279	278	279	282	**313**	320			315	316
		50°C	190						190					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)											
			Maximum overload						Reduced overload					
Size	Type		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)											
			Maximum overload						Reduced overload					
Size	Type		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
		50°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

C4.3 - Ventilation

• The drive is ventilated by an internally mounted two-speed forced ventilation (low speed/over speed).
UNIDRIVE SP controls the change from one speed to another.

• High speed air flow :

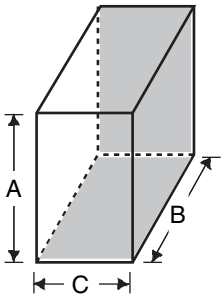
UNIDRIVE SP	Flow (m^3/h)
Size 1	75
Size 2	85
Size 3	200
Size 4	200
Size 5	Consult LEROY-SOMER
Size 6	

•Sound levels :

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

C4.4 - Cabinet volume calculation

The installation of a drive inside the cabinet demands specific calculation of the volume according to the location of the drive. One must check that the thermal dissipation is enough.
Taking worst case example :
IP54 cabinet (without forced ventilation), the bottom and the underside in contact with other surfaces.



The minimum required heat exchange surface is the following:

$$S = \frac{Pi}{k(Tj - Tamb)}$$

where :
Pi = loss of all heat producing elements (ex. : 400 W).
Tj =maximum operation internal ambient temperature (ex : 40°C).
Tamb = maximum external ambient temperature (ex : 25°C).
k = thermal transmission margin (ex : 5.5).
S = 4.85 m^2.
The exchange surfaces are : 2(AB) + AC + BC = S.
A = 2.2 m (height),
B = 0.6 m (depth).
==> C = 0.8 m.

In case of a ventilated cabinet, the volume may be reduced. Considering the same example, the flow of the V.F. is calculated according to the following formula :

$$V = \frac{3kp}{Tj - Tamb} = 83\ m^3/h$$

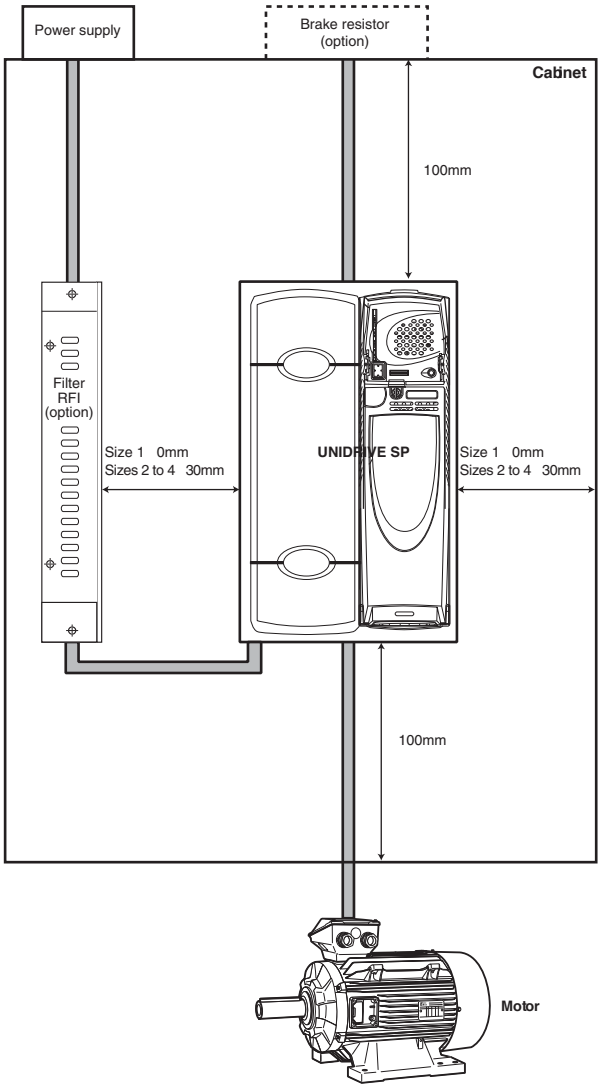
where :
kp : $\frac{P_0}{P_1}$

P_0 : Atmospheric pressure at sea level.
P_1 : Atmospheric pressure of the installation.

(Generally, $\frac{P_0}{P_1}$ corresponds to a margin of 1.2 to 1.3).

C4.5 - Advice on installation inside a cabinet

Mount the drive vertically respecting the spacings between the drive and the other options or equipment described below.



• Make sure that the air flow necessary to the drive and to the external optional RFI filter circulates normally.
• The external optional RFI filtre has to be placed as close as possible to the drive respecting the minimum spacings required (on the drive or under the drive).
• The external optional brake resistor has to be located outside, as close as possible or on the cabinet.
• Do not place on another heat source or on another variable speed drive.
•Do not obstruct the drive ventilation outlets.

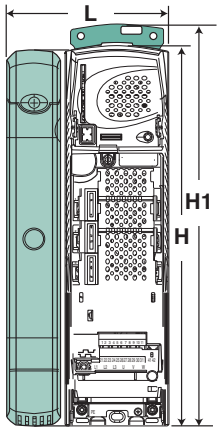
C5 - Heater mounting outside the cabinet

C

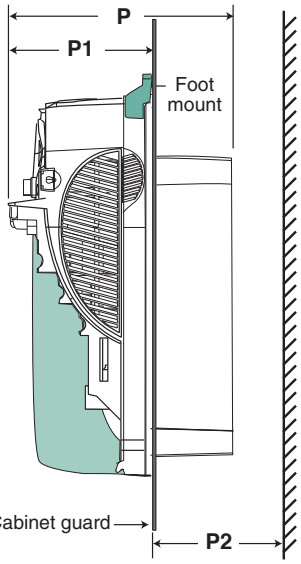
C5.1 - Sizes and weights

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

Front view

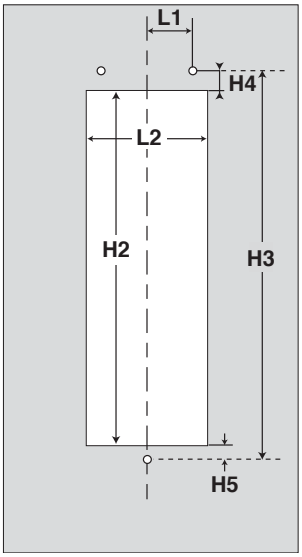


Profile view

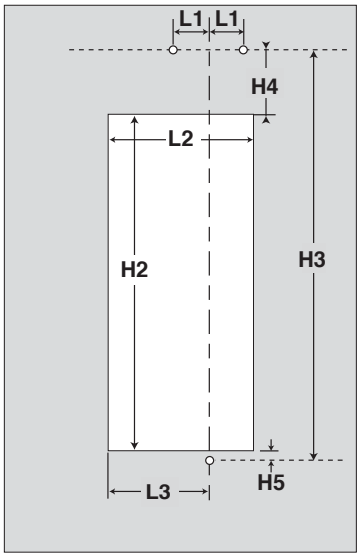


Drilling scheme

Size 1

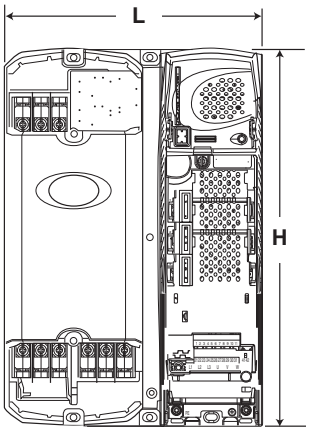


Size 2

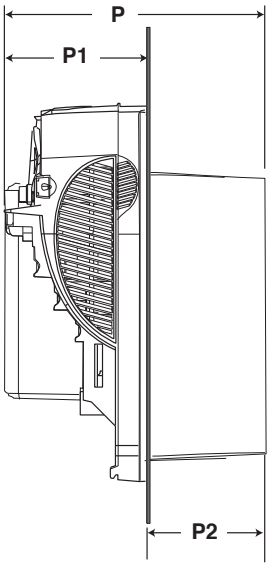


• Rating 11TL to 16TL / 22T to 33T / 3.5TM to 22TM (Size 3)

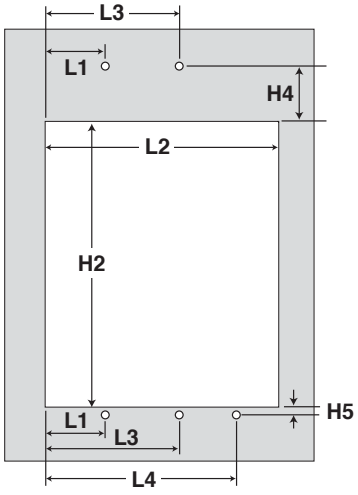
Front view



Profile view



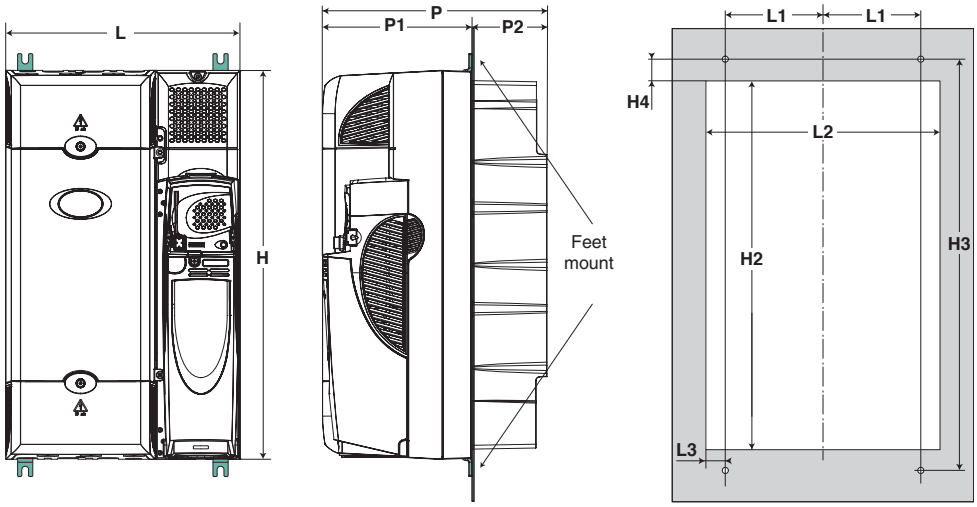
Drilling scheme



UNIDRIVE SP		Dimensions (mm)														Screw	Weight	Mounting
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	11TLand16TL 22T to 33T 3.5TMto 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

• **Rating 22TL to 33TL / 40T to 150T / 22TH to 150TH (Sizes 4 to 6)**



UNIDRIVE SP		Dimensions (mm)												Screw (mm)	Weight (kg)	Mounting
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 120THand150T	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

- Make the cut out and the drilling in the rear panel of the cabinet. If an optional resistor is integrated into the drive heater (see section L8), take into consideration the cut out represented in section C5.4, necessary for the cable run.
- Unscrew the front screw of the drive in order to remove the control terminal block cover. For the drives size 3, also unscrew the lower and upper covers of the power part (if it is necessary, see section D2.3) in order to get to the mounting holes.
- Place on the flange the sealing joint delivered with the drive.

Note : For sizes 4 to 6, assemble the mount foot as follows :
- insert the long part of the left upper and lower feet, then bolt together,
- Insert the long side of the right lower and upper feet. Do not screw, the feet remain held by compression (internal to the drive).

- Install the drive into the cut out of the rear panel, and mount it by the upper and lower elements.
- Replace the drive cover(s).

CAUTION :
Make sure there is sufficient air flow at the rear of the cabinet.

C5.3 - Losses inside the cabinet

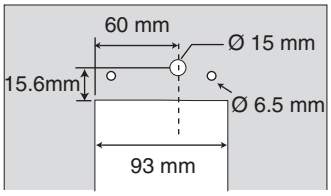
The main losses related to the power being dissipated outside the cabinet, the only things to take into consideration are the losses from the control card or from the integral option modules.

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	

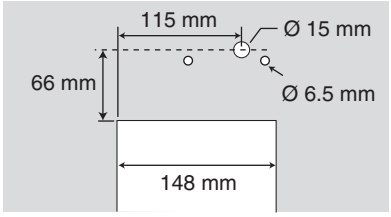
C5.4 - Cut out for integral resistors

For the ratings sizes 1 and 2, optional brake resistors may be directly installed in the drive heater.
For a heater mounting outside the cabinet, one must proceed to a further cut out for the resistor(s) cables run.
(For more details on this type of resistor, refer to section L8).

Size 1



Size 2



C

C5.5 - Heater IP54 protection

When the drive is mounted in the IP54 cabinet with the heater mounted outside, the heater has a IP20 protection. For the drives sizes 1 and 2, the heater protection index may reach IP54.

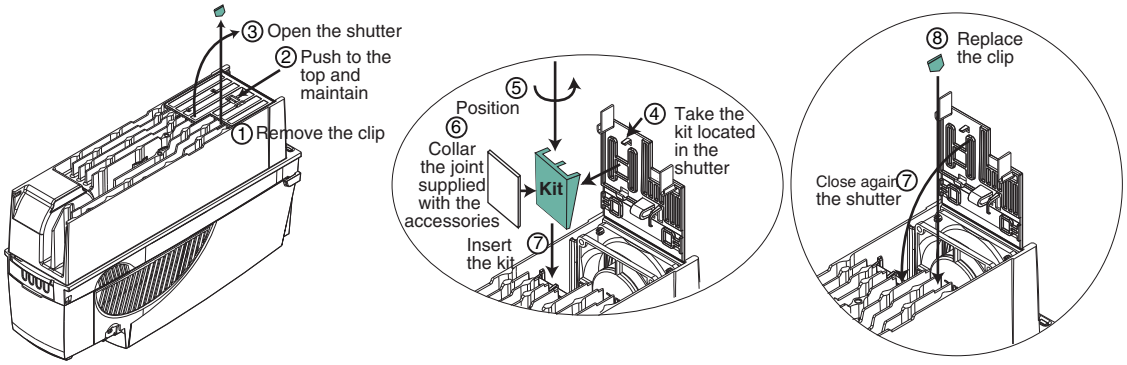
CAUTION :

• Regular cleaning of the heater and of the ventilation is then necessary.

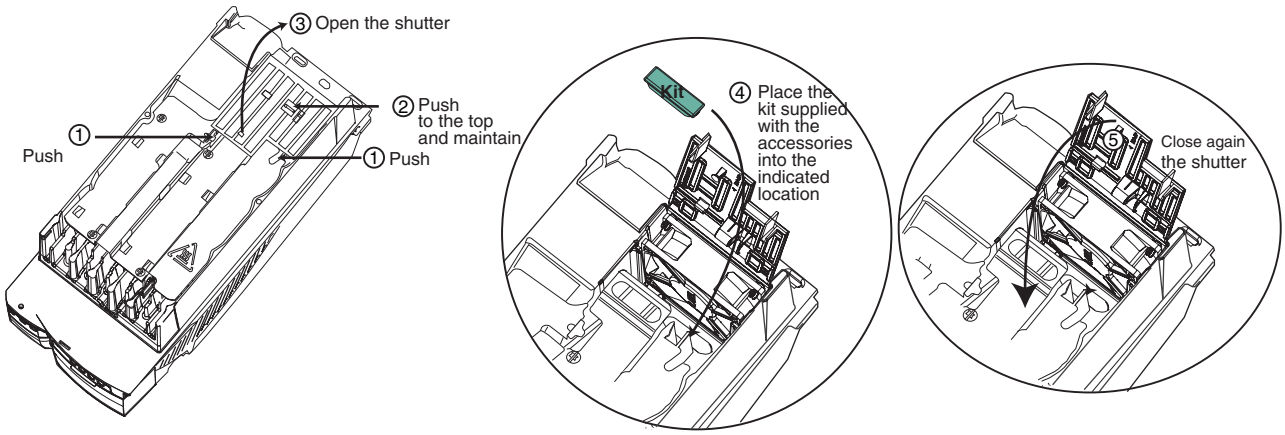
• In an environment that needs a IP54 protection, the standard ventilation may be kept, but its life will be diminished in relation to standard use. In order to increase the ventilation reliability, replace it by an equivalent ventilation but IP54 protection (for the mounting instructions and references, contact your ordinary LEROY-SOMER representative).

C5.5.1 - Mounting instructions

• Size 1



• Size 2



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

C5.5.2 - Derating of the permanent output current

• The IP54 kit installation requires a derating of the current capacity.

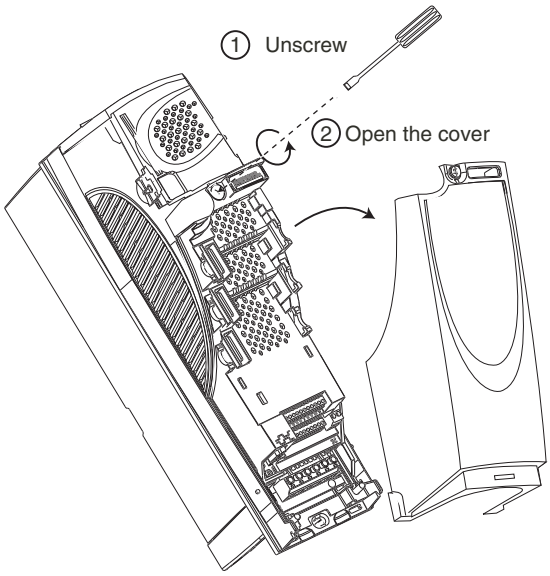
UNIDRIVE SP	Permanent out put current with IP54 kit (standard ventilation) at 40 °C											
	Maximum overload						Reduced overload					
	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz	3 kHz	4 kHz	6 kHz	8 kHz	12 kHz	16 kHz
1.5TL	.4.3						5.2					
2TL	5.8						6.8					
2.5TL	7.5					7.3	9..6			9.3	8.2	7.3
3.5TL	10.6	10.5	9.7	9	7.7	6.6	11	10.6	9.7	9	7.7	6.6
4.5TL	12.6						15.5					
5.5TL	17					15.5	22			20.7	18	15.7
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	3.8					2.9
2.5T	4.2				3.9	2.9	5				3.9	2.9
3.5T	5.8			5.4	3.9	2.9	6.9		6.5	5.4	3.9	2.9
4.5T	7.6	7.3	5.8	4.7	3.2	2.3	8.3	7.3	5.8	4.7	3.2	2.3
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			12.6	9.4	7.3	15.3			13.3	10.1	7.9
11T	16.5		14.9	12.3	9.3	7.2	20.1	18.4	15.6	13.4	10.1	7.9
16T	21.6	19.6	16.4	13.8	10.2	7.7	21.7	19.7	16.4	13.9	10.2	7,7

C6 - SM modules installation

C6.1 - Access to locations

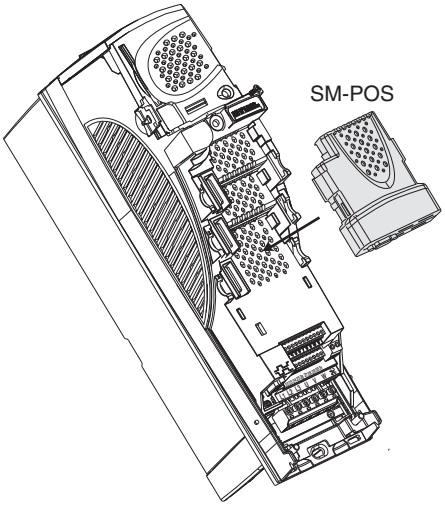
⚠ • In order to insert a module, power down the drive (including the power supplies +24V and +48V), and wait for 10 min. Otherwise, the option may be damaged.

• Check the condition of the option : a damaged module must not be inserted in the drive.

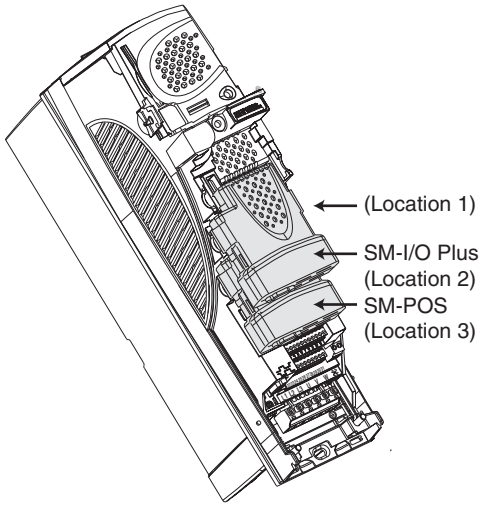


C6.2 - Installation of modules in the drive

First of all, install the SM-POS module in the lowest location and gently press on the module, until a click is heard.

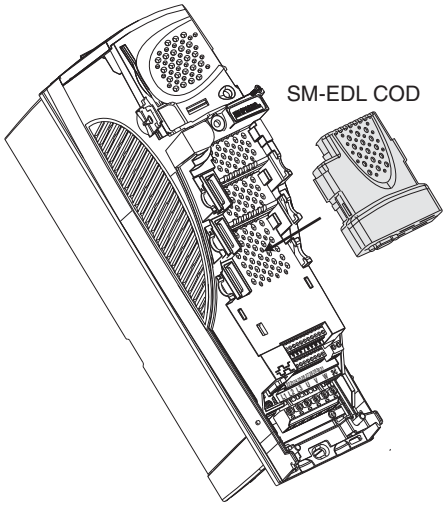


Proceed in the same way to insert the SM-I/O Plus module in the environment location.
Replace the cover.



Note : If the application needs a further module (ex. : SM-Universal-Encoder Plus module), install it in the last one.

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



C

Notes

UNIDRIVE SP
Power connection

Contents

Notes

UNIDRIVE SP
Power connection

D1 - Warning

• All connection works must be perfomed 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.

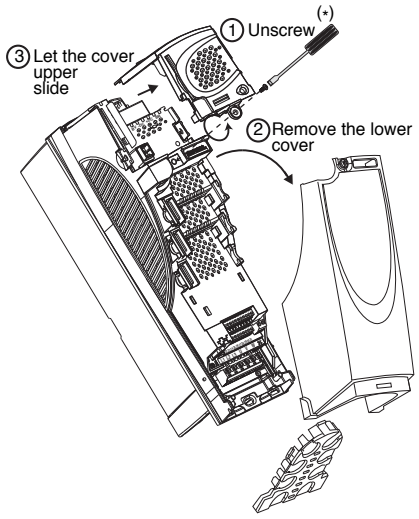
• For UL complaince and in order to avoid any fire risks, the grip torque specified in this section must be observed.

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.

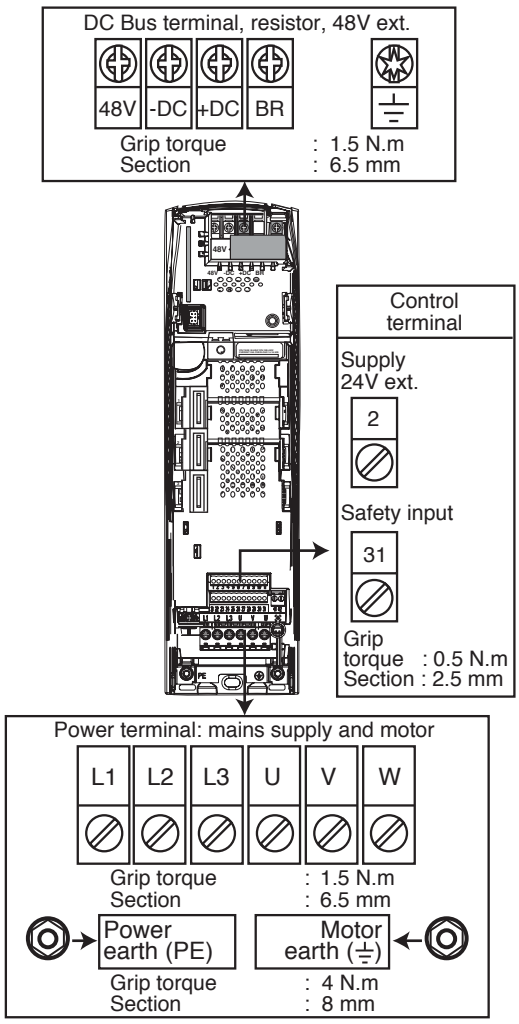
• Installment of terminals

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).

• 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

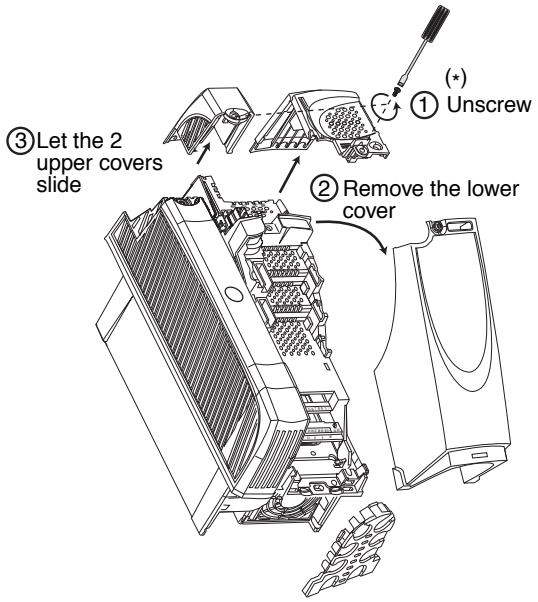


UNIDRIVE SP
Power connection

D

D2.2 - Size 2 drive

• **Access to terminals**



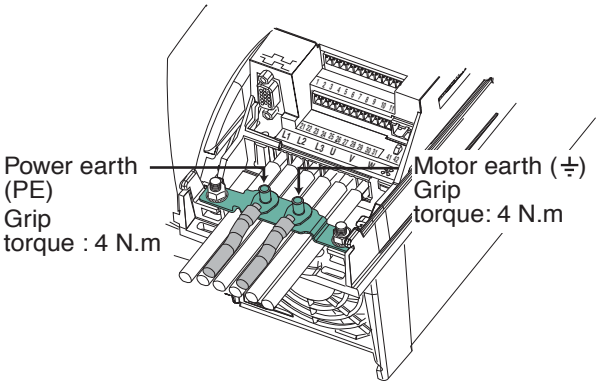
(*) To rescrew, observe the 1 N.m grip torque.

• **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:

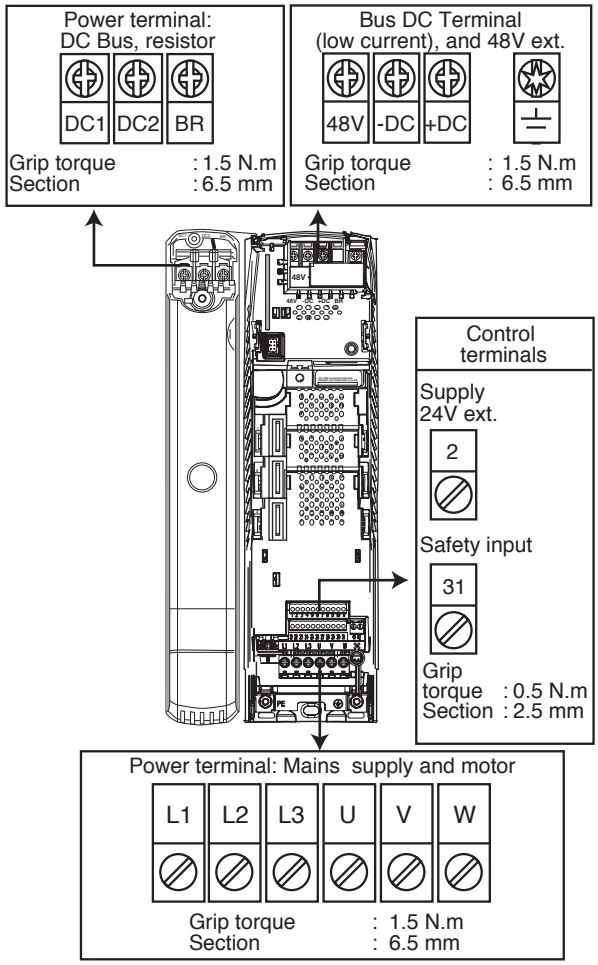
• In order to avoid additional handling, place the shielding support (described insections E3 and F), then the bridge on the two drive earth terminal.

• According to the used earth cables section, it can be possible to make the connection directly to the drive terminals.

• **Installement 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 :

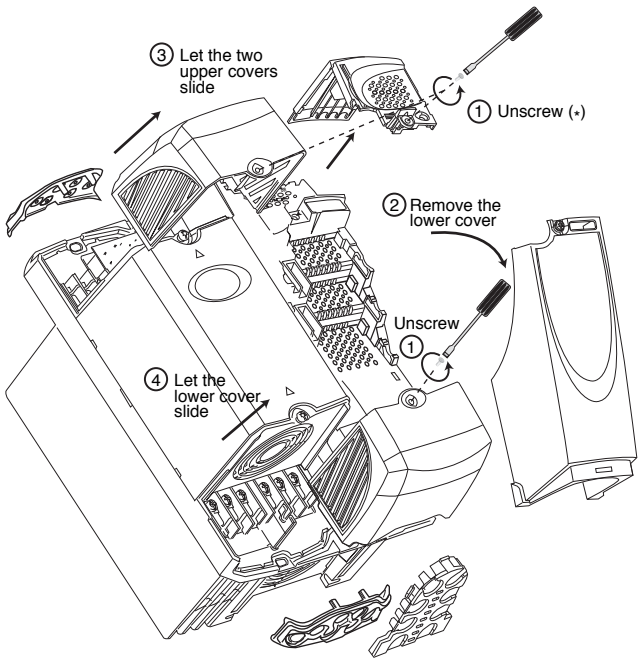
Use the DC Bus power cable to connect the brake resistor (DC2 and BR), the drive suppy by DC, or the connection in parallel of DC buses of several drives (DC1, DC2).

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



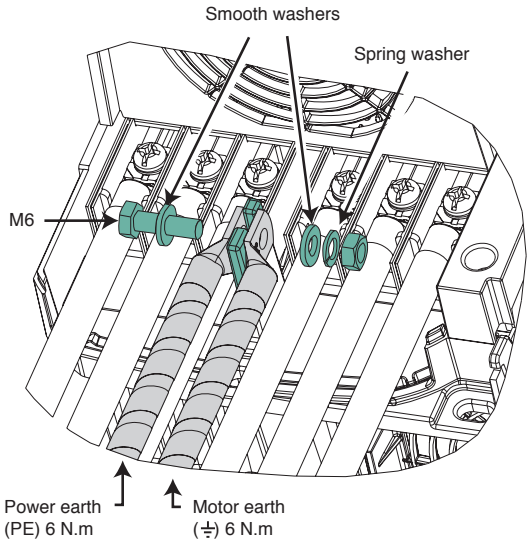
(*) To rescrew, observe the 1 N.m grip torque.

• 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

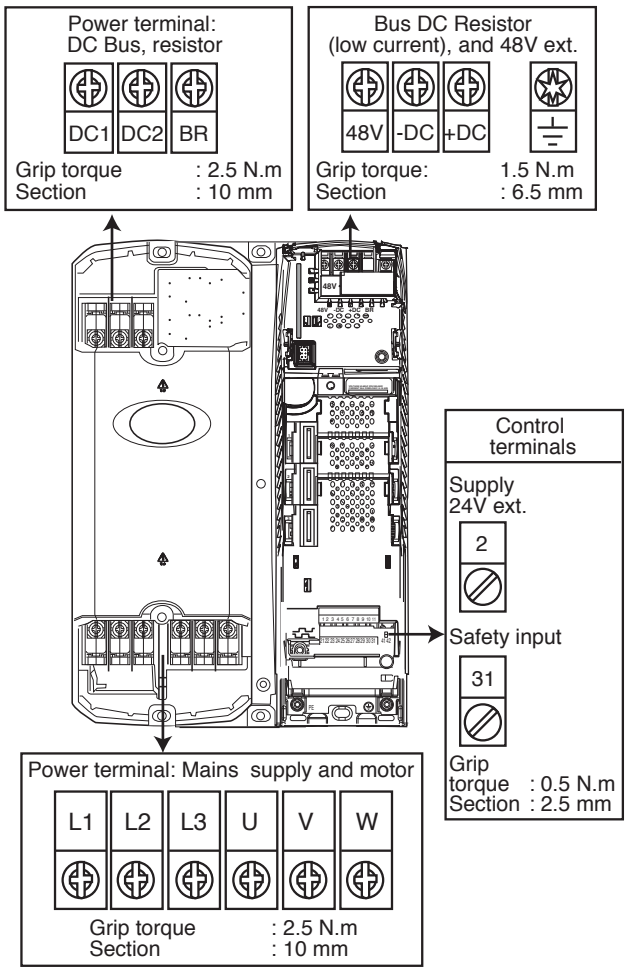
Connect the mains supply (PE) and motor earth cables (⏚) to the heater as specified.



• Installement 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 :

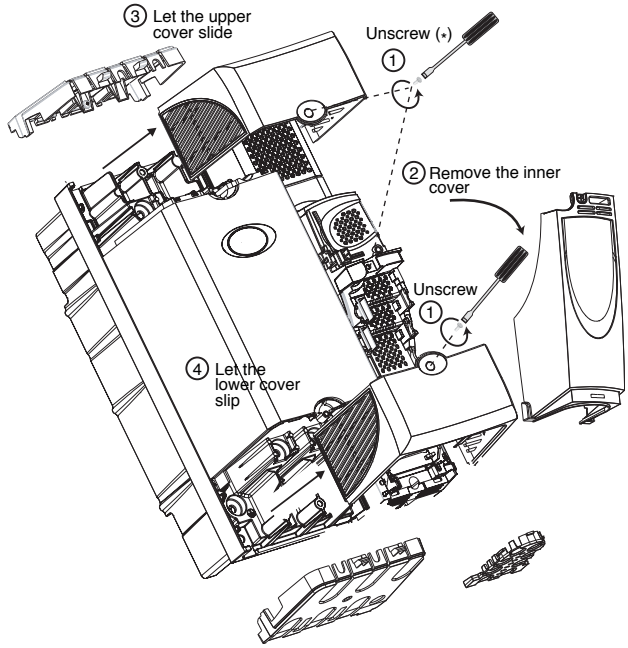
Use the DC Bus power cable to connect the brake resistor (DC2 and BR), the drive suppy by DC, or the connection in parallel of DC buses of several drives (DC1, DC2).

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.

• 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).

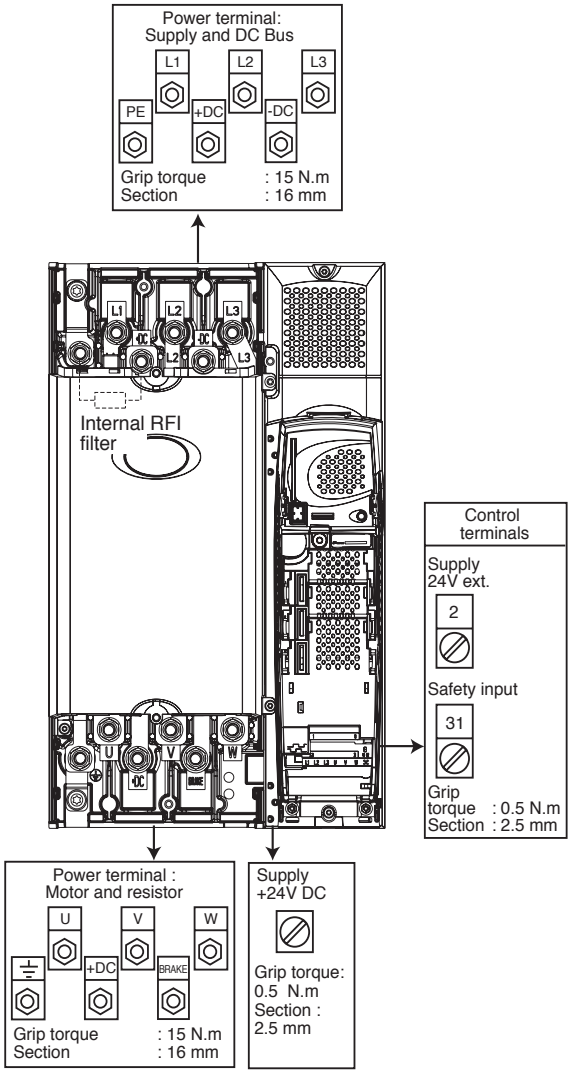
• Earthing

The power earth (PE) and the motor earth (⏚) are internally linked by a copper conductor (section 19.2 mm^2).
This internal link is sufficient if the phase power supply cables has a section below or equal to 38.4 mm^2 (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.

• Installement 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



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.

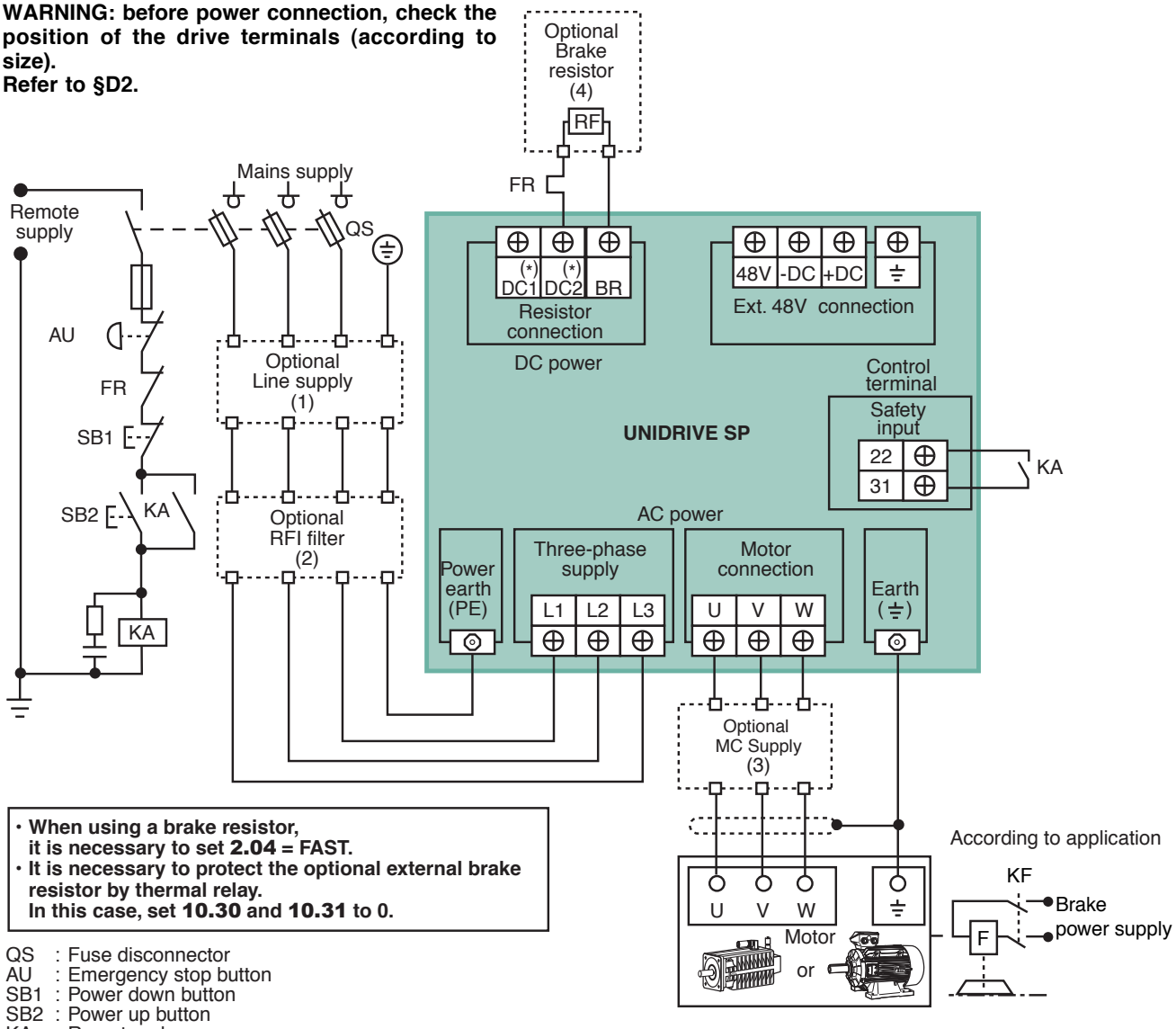
• The safety input, when open, disables the drive and prevents the dynamic braking function. If a brake function is required before the drive safety disabling, a timing safety relay must be installed in order to automatically control the disabling after brake.
If the brake is a machine safety function,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

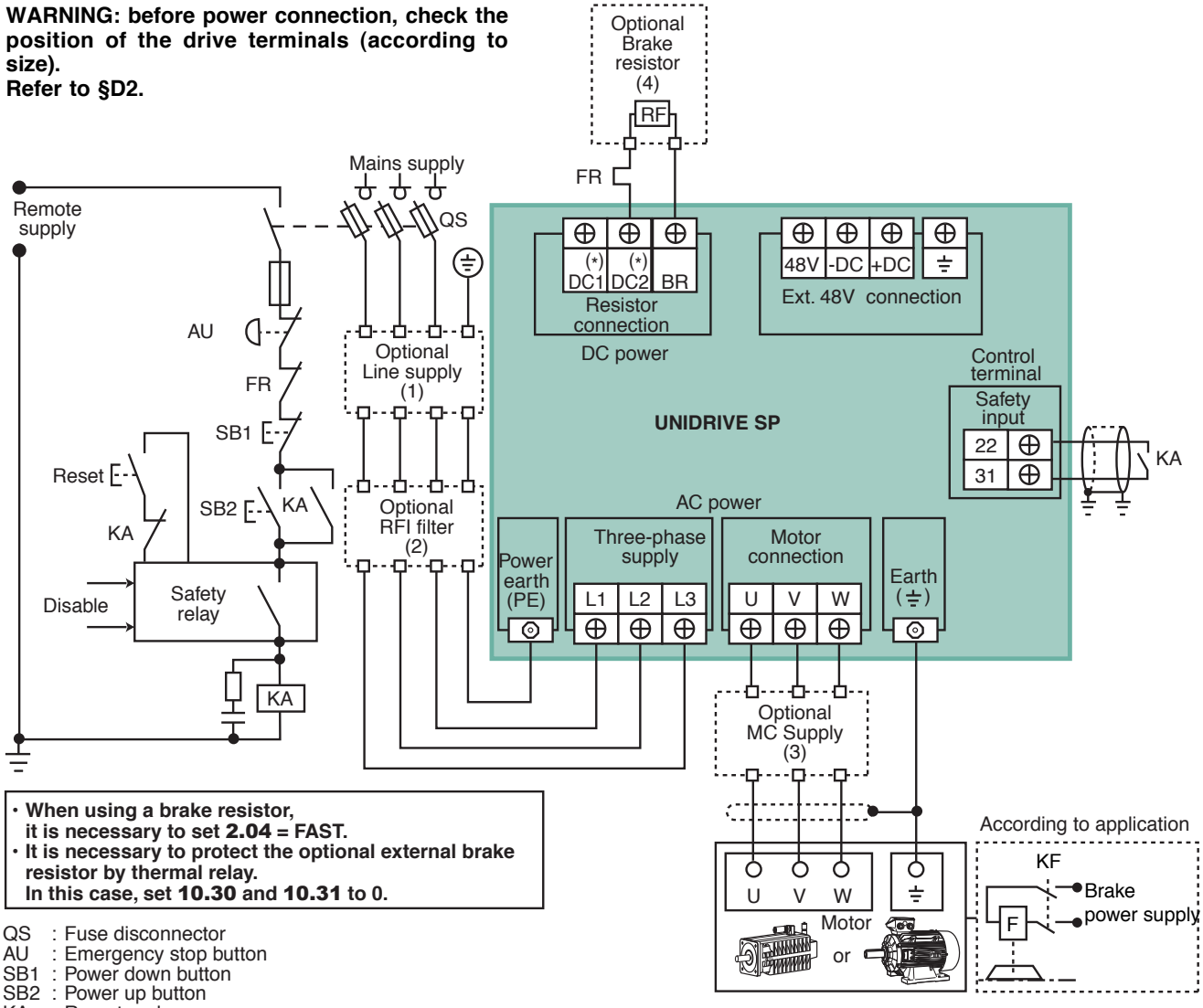
(*) For drives size 1, the DC1 terminal is replaced by -DC, and the DC2 terminal is replaced by + DC (there is no risk of confusion taking into account that there is only one continuous bus terminal for size 1).

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.

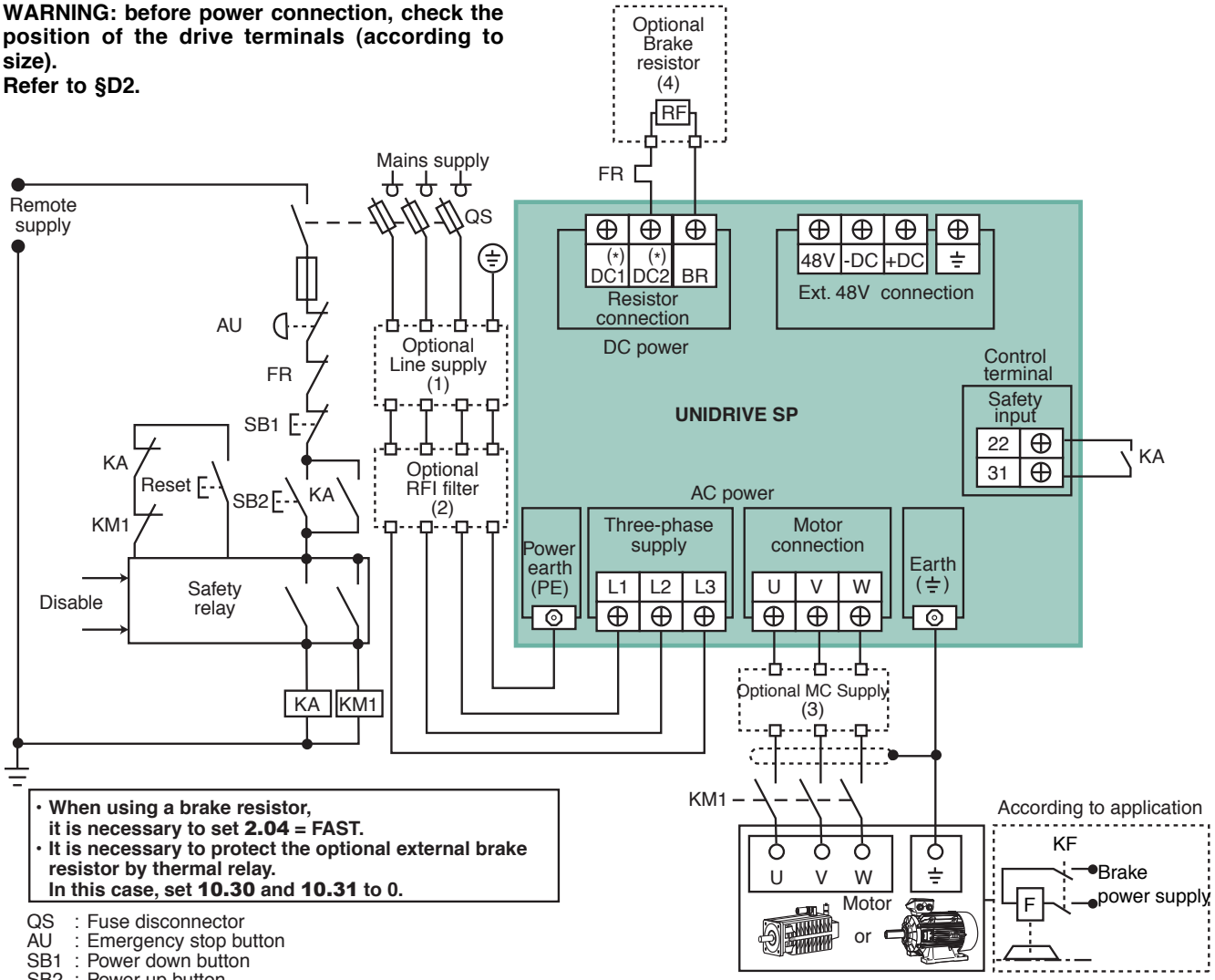
WARNING: In this case, the cable used for the safety input connection must be isolated from other cables, either by introducing it into a metal or a separate pipe, or by using a special shielded cable.

(*) 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).

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 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.

• 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 disactivated.

(*) 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)	I_{max}	Fuses		Cable section* & **		I_{sp}*	Cable section* & **		Max. motor cable length (m)					
			IEC (gG)	USA	EN60204	UL508C		EN60204	UL508C						
	(A)	(A)	(A)	(A)	(mm^2)	(AWG)	(A)	(mm^2)	(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)	I_{max}	Option 1: fuse IEC (gR)	Option 2 : series semiconductor with HRC fuse or circuit breaker		Cable section * & **		I_{sp}*	Cable section * & **		Max. motor cable lentgh (m)					
				HRC UL (clas. J) IEC (gG)	Semi-conductor IEC (aR)	EN60204	UL508C		EN60204	UL508C						
	(A)	(A)	(A)	(A)	(A)	(mm^2)	(AWG)	(A)	(mm^2)	(AWG)	3kHz	4kHz	6kH	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						
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						

* and **: see the following page.

* 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 switching 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. lenght 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 switching 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 ≤ 16 mm^2: use an earth cable of the same section,
- 16 mm^2 < phase cable section ≤ 35 mm^2: the earth cable section is 16 mm^2,
- phase cable section > 35 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).

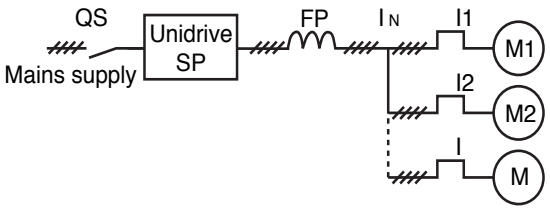
WARNING:
• In order to limit the leakage current it is recommended to use cables with a capacity lower than 260pF/m. If cables of higher capacity are required, reduce to half the maximum length of motor cables specified on the above page.

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 controle 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 rating and the used switching 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 rating:

IN drive > I1 + I2 + … + I

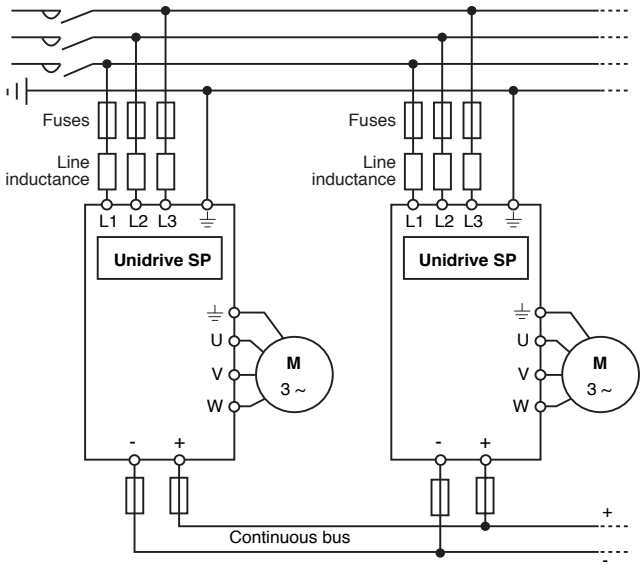
In order to avoid accidental starting of thermal relays, a specific supply of the Low Loss type may be proposed as an option (see section L). The determination of this supply depends on the drive rating and the cable length between the drive and the motor. Contact LEROY-SOMER.

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 ratings or close ratings, they can be powered up simultaneously.
If the ratings are highly different, in order to avoid that the lowest rating 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 rating (refer to section L7 for details).
In addition, each modulator continous 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 rmsfor 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).

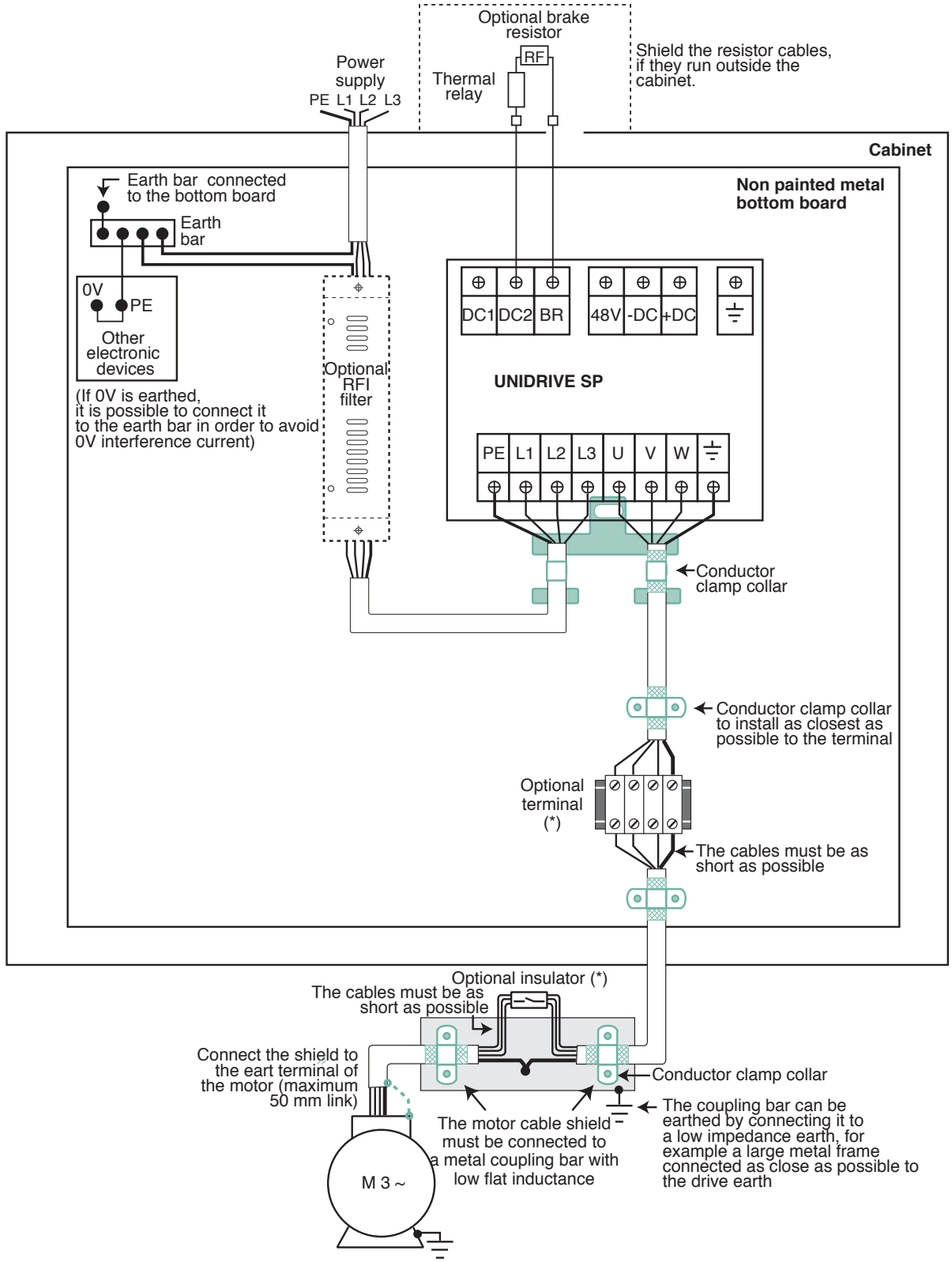
D7.3 - Fuses
The UL compliance is observed if the fuses are rapid and Ul UL listed (class DC up to 30A, and class J below) and the symetric short-circuit current does not exceed 5 kA up to ratings 16TL, 33T and 22TM.
Example of rapid fuses:
- Bussman Limitron KTK,
- Gould Amp - trap ATM.

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 EMC 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

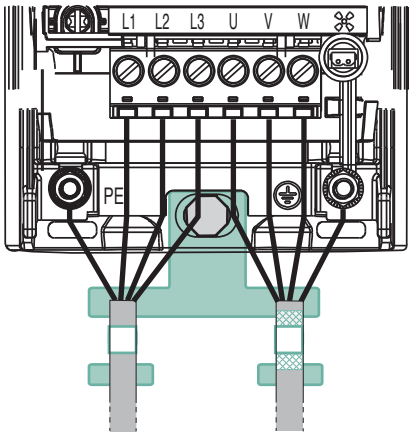
• The earth loop must comply with the recommendations of the local security regulation.
• The earth connections must be tested and inspected periodically.

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 (unshielded wires, control circuits, encoder cables, etc.) at less than 300 mm around the drive, the motor cables, the cables of the (optional) RFI filter and the cables of the (optional) braking resistor.
• 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).

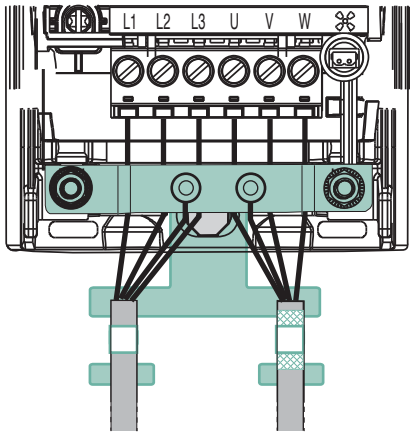
The power earth (PE) must be connected to an earth bar (or a low impedance earth terminal) in the cabinet. This bar must correspond to a commun bar of all the cabinet components. In addition, if the power earth (PE) connection is made by separated cable, il must run in parallel with the other mains cables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

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

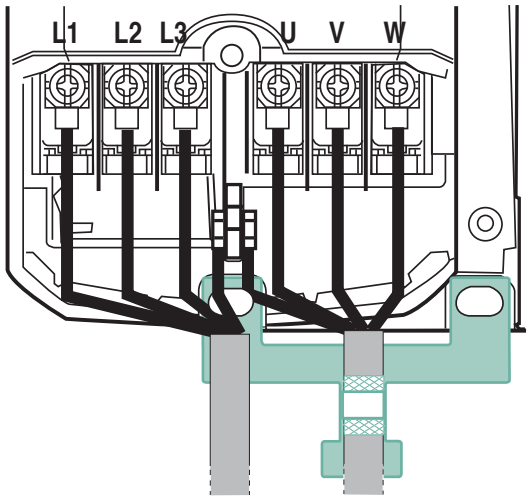
• Size 1



• 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.

Notes

UNIDRIVE SP
Control connections

Contents

Notes

UNIDRIVE SP
Control connections

E1 - Warning

⚠ • For the factory settings, UNIDRIVE SP is configured in positive logic. Associating a variable speed drive with a different control logic, may cause the inadvertent starting of the motor.

• In the variable speed drive, the control circuits are insulated from the power circuits by a simple insulation (CEI 664-1). The installer must make sure that the external control circuits are insulated against any human contact .

• If the control circuits must be connected to circuits complying with the SELV safety requirements, a further insulation must be inserted in order to maintain the SELV classification.

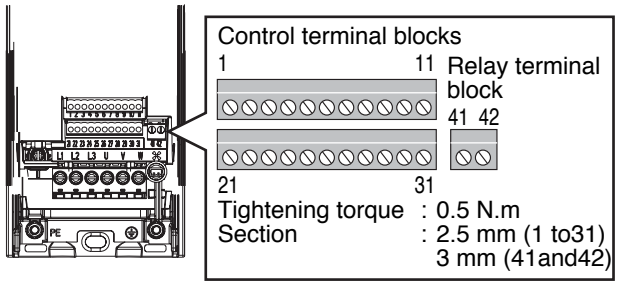
• The software integrated into the SM-POS module automatically configures the terminal blocks of the drive and the optional modules according to the requirements of the "Positioning" application.

E

E2 - Location and characteristics

E2.1 - Drive terminal blocks

E2.1.1 - Location



E2.1.2 - Terminals characteristics

1	Common 0V

2	+24V for external power supply of the drive control circuit	
Rated voltage		+24 Vdc
Minimum operating voltage		+19.2 Vdc
Maximum operating voltage		+30 Vdc
Minimum starting power supply voltage		+21.6 Vdc
Recommended power supply		60 W, 24Vcc rated
Recommended fuse		4A Gg, 50Vdc
•This 24V power supply may be used as fail safe supply which protects against overload, for example, during the simultaneous use of many 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 ".		
• It may be used as fail safe supply of the control card, in case of loss of the mains supply, that allows the programmable modules (with or without field bus) or to the encoder module, to continue operating.		
For the UL conformity, the external power supply must belong to the class 2 UL.		

3	Common 0V

4	+10V analogue internal source	
Voltage tolerance		± 1 %
Rated output current		10 mA
Protection		Overload and thermal (trip at 30mA)

5	Analogue input 1 of accuracy (+)	Allocatable
6	Analogue input 1 of accuracy (-)	
Characteristics		Differential bipolar inputs connected to voltage (operation in common mode: connect terminals 6 and 3)
Resolution		16 bits plus sign
Maximum offset		70 μV
Sampling		250 μs for a speed reference in closed loop, 4ms for other functions
Full scale voltage range		±9.8 V ±1 %
Maximum voltage in common mode		±13 V/0V
Maximum absolute voltage		±36 V/0V
Input impedance		100 kΩ, ± 1 %

7	Analogue input 2 (allocatable)	
Characteristics		Analogue bipolar voltage (common mode) or unipolar current
Resolution		10 bits + sign
Sampling		250μs for a speed reference connected to voltage, or a torque reference in closed loop, 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 at 20 mA

UNIDRIVE SP
Control connections

8	Analogue input 3	Motor thermal probe
Characteristics		Analogue bipolar voltage (common mode), unipolar current or motor probe input
Resolution		10 bits + sign
Sampling		250μs for a speed reference connected to voltage, 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
Maximum absolute voltage		- 36 Vmax
Maximum absolute current		70 mA
Input impedance		≤ 200 Ω at 20 mA
Motor probe input		
Internal voltage		< 5V
Default start threshold		3.3kΩ ± 10 %
Drive reset threshold		1.8kΩ ± 10 %
Short-circuit detection		50Ω ± 30 %

CAUTION :
Terminal 8 is internally connected to pin 15 of the connector HD-15. When the motor probe is connected to pin 15, terminal 8 is not available anymore.

9	Analogue output 1	Allocatable
10	Analogue output 2	
Characteristics		Analogue bipolar voltage (common mode) or unipolar current
Resolution		10 bits (+ sign connected to voltage)
Refresh		4ms
Sampling		250 μs if the output has as source **4.02** or **4.17** or **3.02** or **5.03** 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 ranges		0-20mA ±10 % 4-20mA ±10 %
Maximum offset		600 μA
Open circuit maximum 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	Ref. OK
25		O_{val}
26		I_o
Characteristics		Digital inputs in positive or negative logic, or outputs in negative logic open commutator or push-pull
Threshold		Positive logic: 0 : < 5V 1 : >15V Negative logic : 1 : < 5V 0 : > 15V
Voltage range		0 to +24V
Sampling/ Refresh		200μs if the output has as source **6.35** or **6.36**, 4ms in the other cases
Digital input		
Maximum absolute voltage		±30V
Load		> 2mA at 15Vdc
Input threshold		10.0V ± 0.8V
Digital output		
Maximum output current		200mA (totally, all digital outputs + terminal 22)
Overload current		240mA (totally, all digital outputs + terminal 22)

27	Digital inputs	Origin cycle sensor
28		Run/Stop
29		I_{val}
Characteristics		Negative or positive digital inputs
Thresholds		Positive logic: 0 : < 5V 1 : >15V Negative logic : 1 : < 5V 0 : > 15V
Sampling / Refresh		200μs if the output has as source **6.35** or **6.36**, 4ms in the other cases
Voltage range		0 to +24V
Maximum absolute voltage		±30V
Load		> 2mA to 15Vdc
Input threshold		10.0V ± 0.8V

30	Common 0V

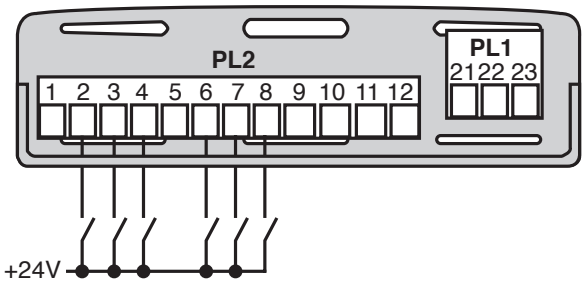
31	Safety input/ variable speed drive unlocking (see section D3)
Characteristics	Positive digital input
Sampling period	Variable speed drive locking (Hardware) : < 100 µs Drive disable (software) : 4 ms
Voltage range	0 to +24V
Maximum absolute voltage	±30V
Thresholds	18.5V ± 0.5V

41 42	Relay output	Default relay
Characteristics	240Vac	
Refresh period	4ms	
Maximum contact current	• 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 : powered up and operating variable speed drive	
	Open contact : powered down or stopped drive	

Note :
• According to the safety standard EN954-1 for category 2 or 3, the safety input must be isolated from other cables, either by running it into a metallic duct , or by being cabled by means of a shielded cable.
• The digital circuits cables will be shielded or not, according to the variable speed drive environment and of the communication interfaces used (see section E3).

E2.2 - SM-I/O Plus module terminal blocks

E2.2.1 - Terminal block location



E2.2.2 - Terminal block PL2 characteristics

1	Common 0V (digital)	
2	Digital input or output (F1)	I_1
3	Digital input or output (F2)	I_2
4	Digital input or output (F3)	I_3
5	Common 0V (digital))	
6	Logic input (F4)	I_4
7	Logic input (F5)	I_+
8	Logic input (F6)	I_-
Control logic		Positive, according to the CEI61131standard (only for the digital inputs : negative logic accessible by parameter setting of **16.29**)
Insulation		Not insulated from the control electronics
Input		
Maximum absolute voltage		± 30V
Load		> 2mA at +15Vcc
Thresholds		10V ± 0.8V
Output		
Maximum current		250 mA

9	Analogue input 4	
10	Analogue input 5	
11	Common 0V (analogue)	
Characteristics		Analogue bipolar voltage
Full scale rated voltage		± 9.8 V
Maximum absolute voltage		± 36 V in relation to 0V
Input impedance		>20 kΩ
Resolution		10 bits plus sign
Insulation		Not insulated from the control electronics

12	Analogue output 3	
Characteristics		Analogue bipolar voltage
Full scale rated voltage		± 10 V
Maximum current		± 20 mA protected against short-circuits
Load resistor		1 kΩ at ∞
Resolution		10 bits plus sign
Insulation		Not insulated from the control electronics

Note : If the total consumption exceeds 240mA at 24V, it is then necessary to use an external power supply +24V, available to terminals 1 and 2 of the variable speed drive control terminal block.

E2.2.3 - Terminal block PL1 characteristics

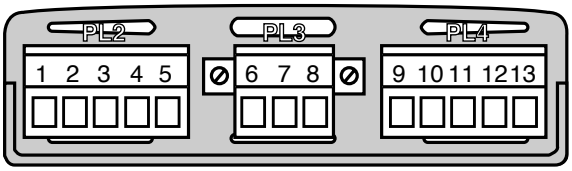
21	Relay 1 (F7)	
22	Common relay	
23	Relay 2 (F8)	
Contact voltage		240 Vac
Contact maximum current		2 Aac 240V/4Acc 30V resistive load
Minimum level of the recommended contact		12V, 100 mA
Configuration		Contact normally open

E2.2.4 - Sampling

Sampling interval for the inputs, outputs and relays:
8 ms for 1 SM-I/O Plus module,
16 ms for 2 SM-I/O Plus modules,
24 ms for 3 SM-I/O Plus modules.

E2.3 - SM-POS module terminal blocks

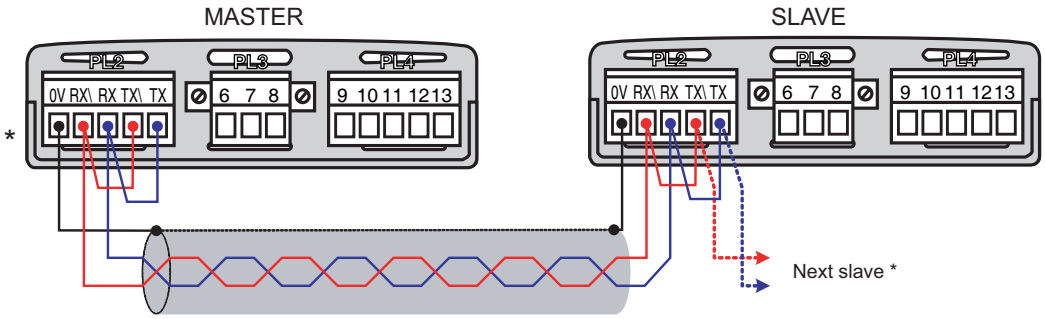
E2.3.1 - Terminal block location



E2.3.2 - Terminal block characteristics

Terminal blocks	Functions	Description
1	0V SC	0 V connection for the RS485 port
2	RX\	RS485 negative receive line (input)
3	RX	RS485 positive receive line (input)
4	TX\	RS485 negative transmit line (output)
5	TX	RS485 positive transmit line (output)
6	CTNet-	CTNet data line (negative)
7	CTNet Shielding	Connection of the shielding for CTNet
8	CTNet+	CTNet data line (positive)
9	0 V	0 V connection for the digital I/O
10	DI0	Digital input 0 (DIGIN0)
11	DI1	Digital input 1 (DIGIN1)
12	DO0	Digital output 0 (DIGOUT0)
13	DO1	Digital output 1 (DIGOUT1)

E2.3.3 - Example of connection for synchronisation with CTSYNC communication

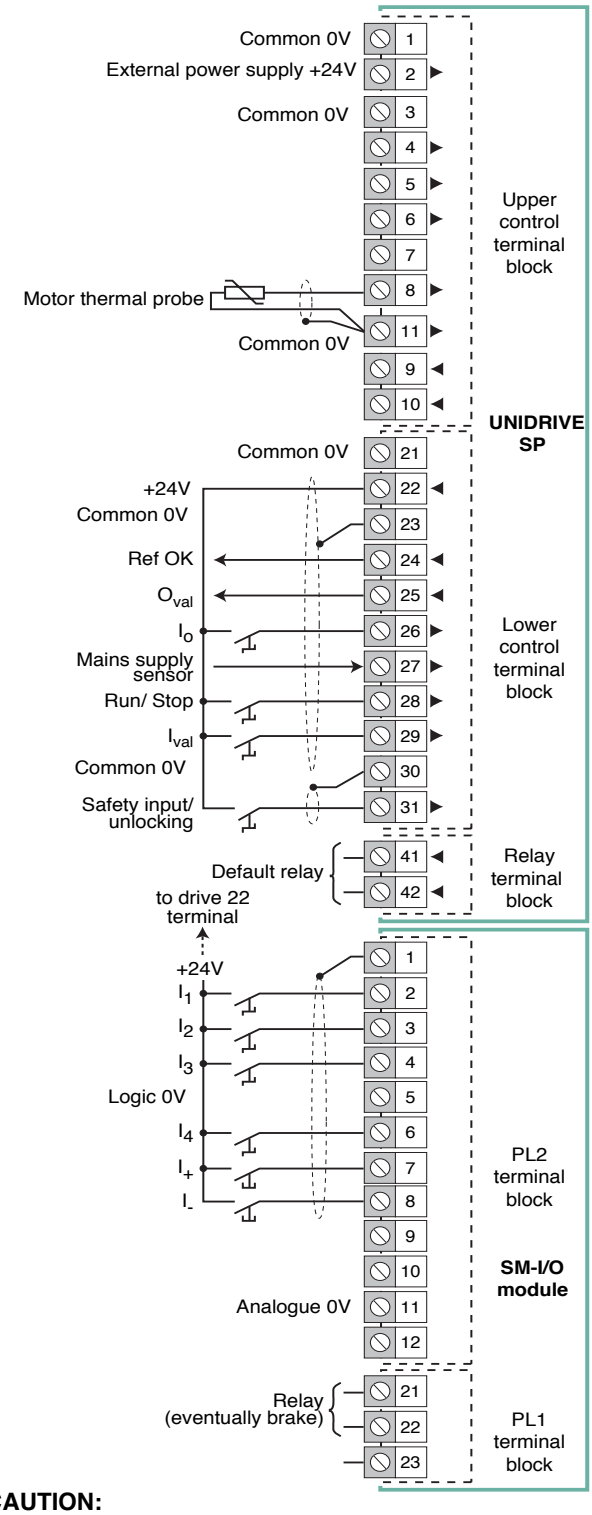


* : Termination resistor: 120Ω/0.25W
(Termination resistor to be connected at each end between Rx and Rx\)

Earthing: It is recommended to connect the shielding of the communication cable to earth, at a single connection point.

E3 - Cabling diagrams

E3.1 - Connection of variable speed drive and SM-I/O Plus module



CAUTION:
If the motor sensor is connected to pin 15 of connector HD-15 (see encoder connection in Section F), terminal 8 of the drive is no longer available.

Legend :

x ▶ : input

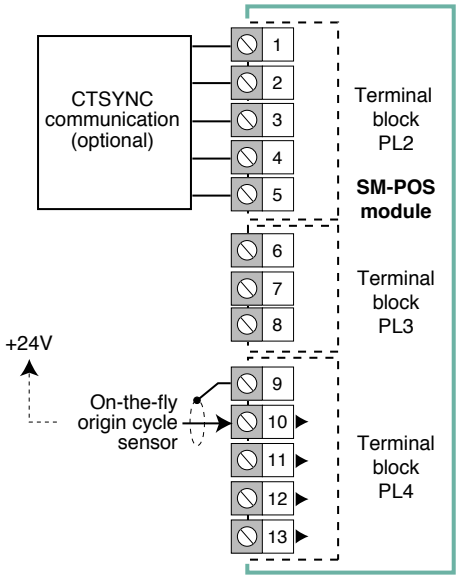
x ◀ : output

Note:

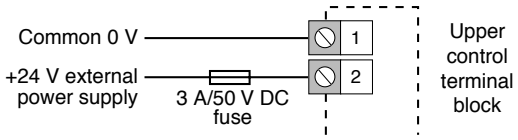
• In accordance with safety standard EN954-1 for category 2 or 3, the safety input must be isolated from the other cables, either by being routed through a metal duct, or by being wired with a shielded cable.

• The cables for the logic circuits will be shielded or not, depending on the environment of the drive and the communication interfaces used.

E3.2 - SM-POS module connection



E3.3 - Connection of +24 V external mains supply



E3.4 - Negative logic connection

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

Note: To configure the drive for negative logic, modify the configuration (refer to Section H, menu 8, parameter **29**). To configure the SM-I/O Plus module for negative logic, modify the configuration by **16.29** = On (1).

• In the factory settings, the UNIDRIVE SP is configured for positive logic. Using a drive with a control system which has a different control logic may cause unwanted starting of the motor.

E3.5 - Fieldbus use

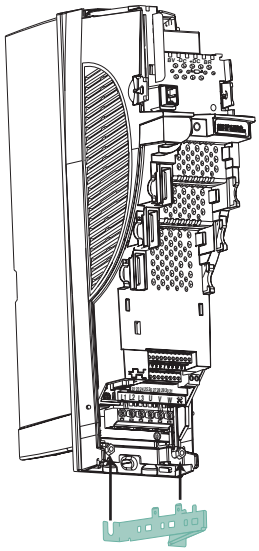
Where an SM-Fieldbus module is used (SM-PROFIBUS DP, SM-DeviceNet, SM-INTERBUS, SM-CANopen or SM-Ethernet), refer to the manual for the bus option used.

E4 - EMC electromagnetic compatibility

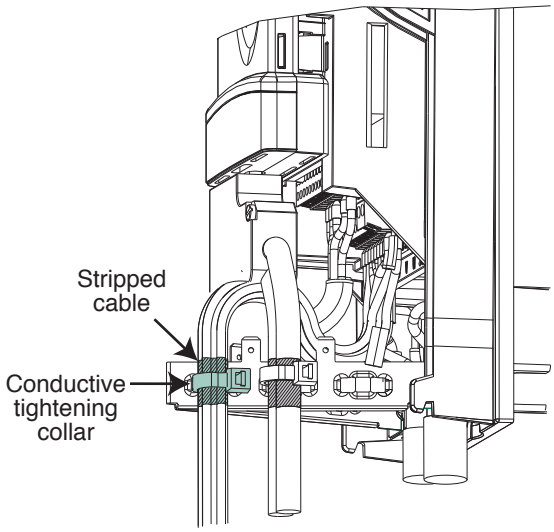
E4.1 - Precautions for control cables outside the cabinet

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

• **Shielding support installation (control)**
Screw the support on the 2 earth terminals.



• **Shielding connection**

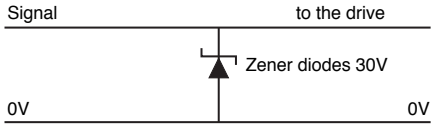


E4.2 - Immunity to overvoltage

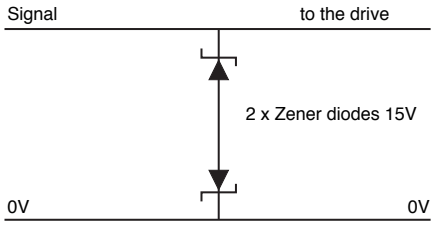
Immunity to overvoltage of the control circuits or high length of cables and connection outside a building.

The different input and output circuits of the variable speed drive are in compliance with the overvoltage standard EN61000-6-2 (1kV).
There are exceptional situations, when the installation may be exposed to overvoltage peaks that exceed the levels established by the standard. This may be the case of lightning or of earth faults associated with high length of cables (>30 m). In order to limit the risks of damage of the variable speed drive, the following precautions may be taken into account:
- Galvanic isolation of the inputs/ outputs. In this situation, make sure that the 0V is not connected to earth, and avoid the loops,
- double the cable shielding and use an earth wire of 10mm^2 minimum. The cable shielding and the earth wire must be connected together at each end and they must be connected to the ground by the shortest possible connection. This method allows the high currents to pass through the earth wire, rather than through the shielding,
- Increase the protection of the digital and analogue inputs/ outputs by adding a zener diode or a peak limiter

Suppression of the unipolar digital Inputs/ Outputs overvoltage



Suppression of the bipolar analogue Inputs/ Outputs overvoltage



These circuits are available in modules (rail mounting), for ex. at Phoenix Contact (unipolar : TT UKK5 D/24 DC, bipolar: TT UKK5 D/24 AC).
These circuits are not fit for encoder signals or for fast digital data networks, because the diodes may affect the signal. Most of the encoders have a galvanic isolation between the motor casing and the encoder circuit, and in this situation, no precaution is necessary. For data networks, follow the recommendations specific to the network.
If a digital output is subject to high overvoltage, the variable speed drive defaults to " O.Ld1 ".

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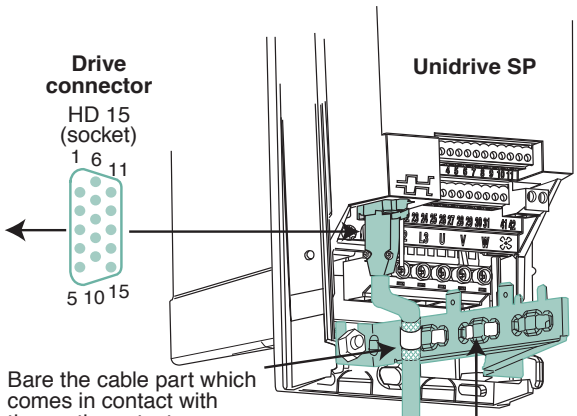
F1 - Incremental encoders

• **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**	



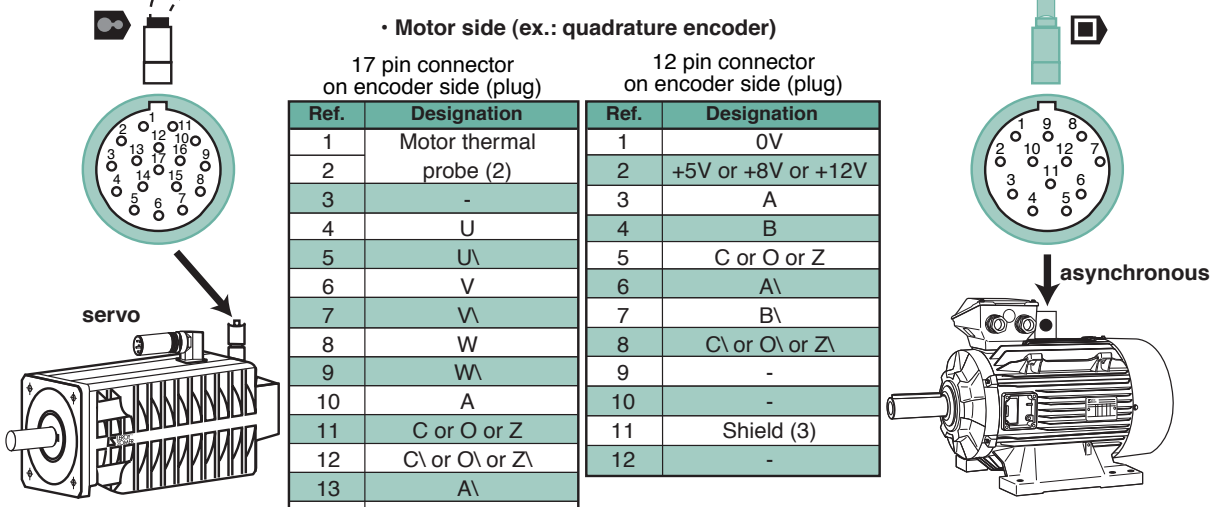
• **Motor side (ex.: quadrature encoder)**

17 pin connector on encoder side (plug)

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

12 pin connector on encoder side (plug)

Ref.	Designation
1	0V
2	+5V or +8V or +12V
3	A
4	B
5	C or O or Z
6	A\
7	B\
8	C\ or O\ or Z\
9	-
10	-
11	Shield (3)
12	-



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

F2 - 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	-	Shield	Clock\
10	0V	0V	0V
11	-	-	Shield
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

F3 - Encoder input/output characteristics

• Quadrature incremental encoders, Frequency/Direction, Forward / Reverse
• Sincos encoders 5 to 12 terminal 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	410 kHz for terminals 1 to 4 512 kHz for terminals 5 to 12
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 -9 to 14V/0V for terminals 5 to 12
Maximum absolute differential voltage	± 25V for terminals 1 to 4 -9 to 14V/0V for terminals 5 to 12

• SinCos, absolute SinCos encoders with Hiperface link, and EnDat link

1	Path Cos
2	Path Cosref
3	Path Sin
4	Path Sinref

Characteristics	Differential voltage
Maximum signal	1.25V peak to peak (Sin/SinRef or Cos/Cos Ref)
Maximum input frequency	115 KHZ
Maximum differential voltage	± 4V

• Absolute SinCos encoder with Hyperface, SSI or EnDat link, 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 absolute voltage	± 14V/0V
Maximum absolute differential voltage	± 14V

• EnDat, absolute SinCos encoders with EnDat or SSI link and SSI encoders

11	Clock
12	Clock\

Characteristics	RS 485 differential voltage
Maximum input frequency	2 MHz
Line load	1 drive
Operation range	-7 to +12V
Maximum absolute voltage	± 14V/0V
Maximum absolute differential voltage	± 14V

7	Output path A_{out} or F_{out} (■)
8	Output path A_{out}\ or F_{out}\ (■)
9	Output path B_{out} or D_{out} (■)
10	Output path B_{out}\ or D_{out}\ (■)

Characteristics	RS 485 differential voltage
Maximum output frequency	512 kHz
Maximum absolute voltage	± 14V / 0V
Maximum absolute differential voltage	± 14V

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 probe
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).

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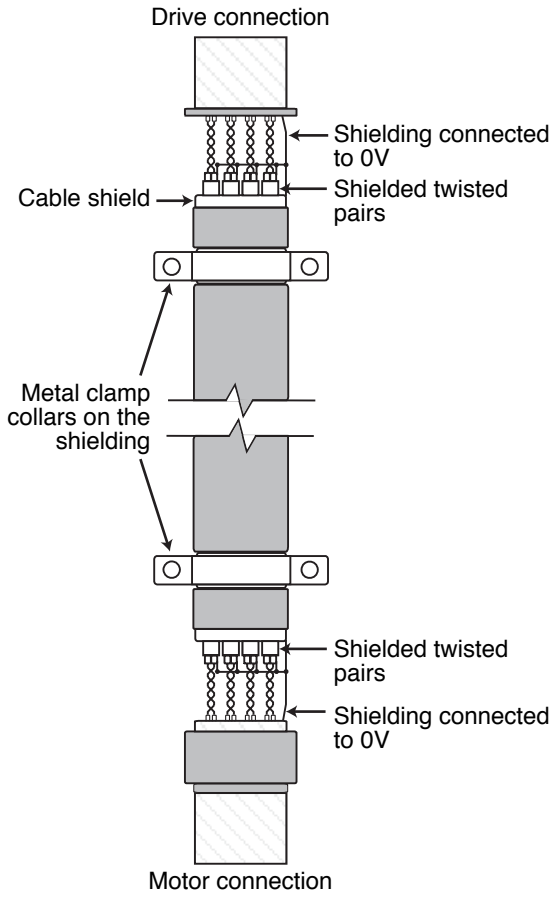
UNIDRIVE SP
Encoder connections

F4 - EMC recommendations for encoder cabling

The sensor cable shielding in 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.

Note: It is preferable to use a cable which has an appropriate number of wires for the selected sensor. If some conductors are unused, they must be connected to the shielding and to 0 V at both ends of the cable.

UNIDRIVE SP
Setting

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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:

02.04

Menu number: 2 - Ramps

Number of parameter in the menu 04 - Deceleration mode

• 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.

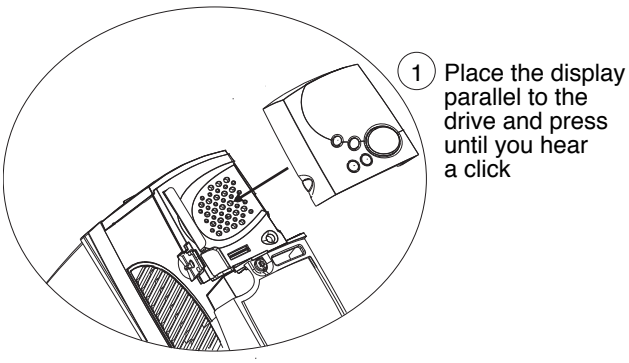
- Elaborated commissioning by using menus 1 to 22 (menu diagram) :
used to configure the variable speed drive according to the variable speed drive needs, by accessing all the variable speed drive functions.

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.

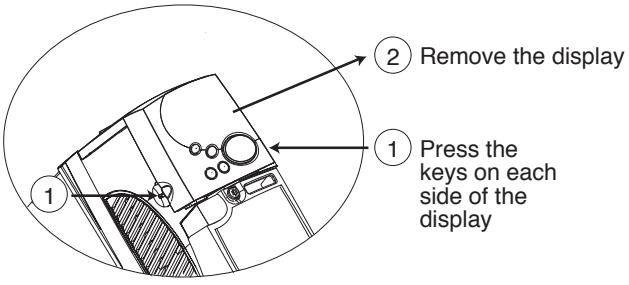
G3 - Installation of LED display

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.

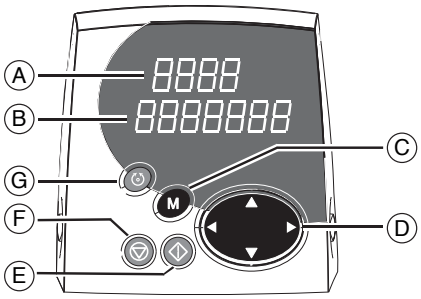
- Display installation



- Display dismantling



G4 - Use of LED display

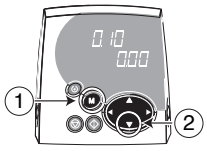
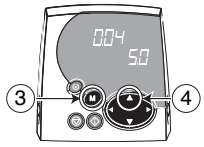
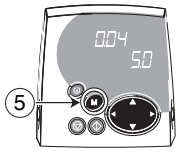
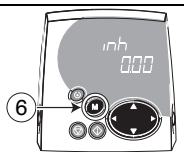


Command	Ref.	Function
8888	A	Upper display made of 4 displays 7 segments allowing the display of: - the variable speed drive operating status, - the adjustment parameters, made of menu and of parameter
8888888	B	Lower display made of 7 displays 7 segments used to display: - the operating mode, - the parameter content, - the default code.
M	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 keboard mode, these keys allow the foll. commands: - Run, - Stop, default deletion, - Inversion of the direction of rotation.

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.

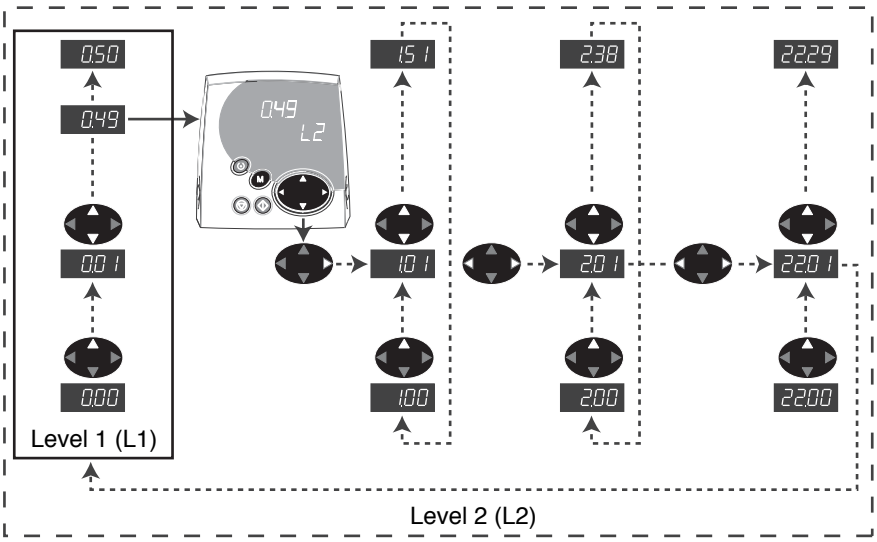
G6 - Control of the drive by means of the keyboard

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.



G

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.

G11 - List of modified parameters

Parameter	Setting	Description
xx.00 (parameter 0 of any menu)	**12000**	All the factory set parameters are no loger 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 M key, the display displays "CodE".
By means of the arrows, enter the security code, then press again M.
- 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 M key, the display shows "CodE".
By means of the arrows, enter the security code, then press again M.
Select **0.34**, enter 0 value and press again M.

• **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.

Notes

UNIDRIVE SP
Commissioning

Contents

Contents (continued)

H1 - Quick commissioning

Powered down drive, make sure that…

- The drive is disabled (terminal 31 open)
- The run command is not validated
- The motor and the encoder are connected

Power up the drive

- The drive displays "inh"
- If the drive stops, see section K "diagnostics"

Operating mode selection

- **0.00** : Enter the value 1253 for an European configuration (50 Hz mains supply) or enter the value 1254 for an USA configuration (60Hz mains supply)

0.48 : Enter the OPEn.LP mode (1) or CL.VECt (2) for asynchronous motor or SerVO (3) for servo motor

Press the Reset key

Control logic

In the factory settings, the drive is configured for positive logic.
To control the drive using negative logic, set **8.29** to On (1) (drive) and **16.29** to On (1) (SM-I/O Plus module).
Take care with the control connections (Section E3).

SM-POS program initialisation

- **0.29** : Enter the value 2047 (after initialisation, **0.29** changes back to 0).

Enter the motor parameters indicated on the name plate

- **0.42** : Poles [Auto (0), 2POLE (1), 4POLE (2), 6POLE (3) etc...]
- **0.43** : Power factor (cos φ) +
- **0.44** : Motor rated voltage (V) +
- **0.45** : Rated on-load speed (min^{-1}) + or motor thermal time constant (see the motor catalogue)
- **0.46** : Motor rated current (A) + / Stall current (A)
- **0.47** : Motor rated frequency (Hz) +

Pay attention to motor coupling (star or delta)

Incremental encoder :
- in quadrature, 5V
- 1024 points/turn
or 4096 points/turn ?

NO → (B) In order to enter the encoder characteristics see page 6

YES → (A)

UNIDRIVE SP
Commissioning

A

Possibility to disconnect the motor?

YES

NO

Auto-tuning with rotation

Measurement of the motor characteristics (stator resistor, voltage offset, magnetising current, leakage inductance and cos φ). This mode is used to obtain optimum performances, but for this test, the motor must be without load.

• Check that the motor is stopped and disconnected from the load, then proceed to the auto-tuning.
• If there is a brake, make sure of its disengagement (re-activate the brake after the auto-tuning).
• Check that there is no danger for personnel or equipment.
• Once the procedure ends, the motor will automatically stop in free wheel.
• The procedure may be interrupted at any moment by a stop command, by pressing the stop button on the keyboard, or by opening the disabling circuit.
• Irrespective of the reference and the direction of rotation required, the auto-tuning procedure drives the motor clockwise at 2/3 of its rated speed.
• Irrespective of the required reference and direction of rotation, the motor performs 2 electrical rotations at low speed.

: Full measurement of the motor characteristics and adjusment of the current loop gains.

: Measurement of the phase angle of the slave encoder (**0.43**), and adjustment of the current loop gains.
Note: If the drive is over-rated with respect to the motor used, set **0.40** = 1 for the phase angle measurement only.
•**0.40** : Set to 2.
•Enable the drive.
•Give a run command.
•The motor starts rotating. Wait until it has completely stopped.
Disable the drive again, and suppress the run command.
Connect the motor to the load.

Auto-tuning without rotation

: Reduced measurement of the motor characteristics and adjustment of the current loop gains.
Check that the motor is stopped before proceeding to auto-tuning.

•**0.43** : Set the phase angle of the servo motor .
•**0.40** : Set to 1 , or to 4 .
•Enable the drive.
•Give a run command.
The drive displays alternately "AutO" then "tunE" during the auto-tuning phase.
•Disable the drive again and suppress the run command.

CAUTION , :
The auto-tuning does not check if the encoder and motor connections are correct (no reverse detection or phase loss).

Inertia measurement (and only)

• Check that the motor is stopped.
• Check that there is no danger for personnel or equipment.
• Once the procedure ends, the motor will automatically stop in free wheel.
• The procedure may be interrupted at any moment by a stop command, by pressing the stop button of the keyboard or by opening the disabling circuit.
• The load must not increase with the speed.

• **0.40** : Set to 3.
• Enable the drive.
• Give a run command.
The motor makes several rotations of 1/3 to 2/3 of the rated speed.
Wait until it has completely stopped.
Disable the drive again, and suppress the run command.
Note: To optimise the gains of the speed loop, inertia measurement is necessary. For further explanations, refer to the parameter explanation manual ref. 3655 (parameter **3.17**) available on the CD Rom supplied with the drive.

0.49 = L2 (1)

Origin cycle

a) Without a sensor:
Even without a sensor, the origin cycle must be carried out.
• Set **0.20** = 3, then enable the drive.
FG ive a run command.
• Activate input I_o. The origin cycle is completed.
• Check that **0.14** "Ref OK" indicates On (1). If **0.14** = OFF (0), start the procedure again.

b) With sensor:
Manual movement:
This manual operation is used to control the mechanics and releasing of the brake.
• Enable the drive.
• Activate input I_+ or I_-: the mobile moves in the motor clockwise (I_+) or motor counter-clockwise (I_-) direction at the reduced speed set in **0.16**. (factory setting = 150 min^{-1})
Controlling the direction of movement of the mobile for the origin cycle:
During the origin cycle, the search for the sensor will take place in the same direction as that used when input I_+ is active.
If the mobile does not move in the correct direction (moving away from the sensor), enter On (1) in **18.32**.

Origin cycle:
• Give a run command.
• Activate input I_o: the mobile moves towards the reference-taking sensor, decelerates as soon as the rising edge of the sensor is detected, reverses slightly and stops on the falling edge of the sensor. The origin cycle is completed.
• Deactivate the run command and I_o.
• To make sure that the origin cycle has been performed correctly, check that **0.14** " Ref. OK " indicates On (1). If **0.14** = OFF (0), start the procedure again.

C

UNIDRIVE SP
Commissioning

C

Linear or Rotary Positioning

Linear

Rotary

Automatic scaling

This scaling allows the drive to define the ratio between the customer unit and the rotation of the motor.
- Move the mobile to a known position using I_+ or I_-.
- Enable the start of the scaling procedure by entering On (1) into **0.53**.
- Move the mobile to another position using I_+ or I_-.
- Enter into **0.28** the value of the movement in customer units (e.g. the value 100 to express 100 cm or 100 mm).
- Enter **0.53** = OFF(0) to end the scaling procedure.

All positions will be expressed in the user unit defined by this procedure.
Note: This method is not recommended in relative mode.
Enter the scaling manually using parameters **0.27** and **0.28** (see Section H2.3).

Rotary mode

- Select rotary mode using **0.51**:
  - **0.51** = 5 : shortest
  - **0.51** = 6 : origin in the revolution
  - **0.51** = 7 : a single direction of movement
  - **0.51** = 8 : the movement step is defined by an index number
  - **0.51** = 9 : pin indexing
- Give the reduction ratio, in the form of a numerator **0.27**, and a denominator **0.28**, between the position encoder and the rotary system. The position counter is reset to zero at each revolution performed by the mobile.

Position setting

- **0.21**: Selection of the position to be set, for example position n°1 (P1), if **0.21** = 1.
- **0.22**: enter the value of the position or the index number,
- **0.23**: enter the type of positionning (OFF (0): absolute mode, On (1): relative mode) in order to reach P1,
- **0.24**: enter the maximum speed of travel in order to reach P1 (min^{-1}),
- **0.25**: enter the acceleration ramp in order to reach P1 (1/100s for 1000 min^{-1}),
- **0.26**: enter the deceleration ramp in order to reach P1 (1/100s for 1000 min^{-1}).

Select a new position using **0.21**, and restart the settings for each position.

⚠ **• Check that the motor and the machine can support the maximum selected speed.**

Software stops setting

- The software stops are activated in factory settings. If they are not necessary (relative mode), enter OFF (0) in **19.34**.
- When the stops are necessary (check that **19.34** is at On (1)), enter limit A in **19.27** and limit B in **19.28** (expressed with respect to the origin).

Mémorisation

- **0.00** : Enter the value 1000
- Press the reset key

YES

Direct mode?

NO

Direct mode

- Give a run command.
- Activate an input in order to give a positive command to the mobile:

I_4	I_3	I_2	I_1	Position
0	0	0	0	**0 (none)**
0	0	0	1	**1**
0	0	1	0	**2**
0	1	0	0	**3**
1	0	0	0	**4**

Note:
- When all inputs I_1 to I_4 are deactivated, no position is selected.
- To stop the system, deactivate I_1 to I_4, then remove the run command.

Encoded mode (without parity)

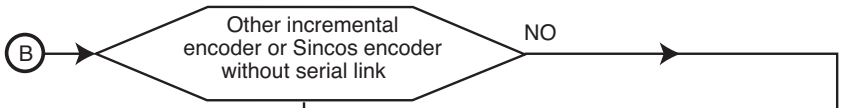
- **19.40**: enter On (1), to select the encoded mode.
- Store: **0.00** = 1000 + Reset
- Select a position by I_1 à I_4, then activate I_{val} in order to validate the position command.

I_4	I_3	I_2	I_1	Position
0	0	0	0	**1**
0	0	0	1	**2**
0	0	1	0	**3**
0	0	1	1	**4**
0	1	0	0	**5**
0	1	0	1	**6**
0	1	1	0	**7**
0	1	1	1	**8**
1	0	0	0	**9**
1	0	0	1	**10**
1	0	1	0	**11**
1	0	1	1	**12**
1	1	0	0	**13**
1	1	0	1	**14**
1	1	1	0	**15**
1	1	1	1	**16**

- To stop the system, deactivate I_{val} and remove the run command.

Disable the drive

If the encoder is not a standard LEROY-SOMER incremental encoder, follow the instructions below:



0.49 = L2 (1)

Enter the encoder characteristics

- **3.34** : **ELPR (0 to 50000)**
  Quadrature: enter the number of points per revolution.
  Frequency/direction or forward/reverse: enter the number of points per revolution divided by 2.
  Sincos: enter the number of sine waves per revolution.
- **3.36** : **Voltage**
  Enter the mains supply voltage of the encoder: 5V (0) or 8V (1) or 15V (2)
  CAUTION:
  Supplying an encoder with an excessive voltage can damage it.
- **3.38** : **Type**
  Enter the type of encoder used: Ab (0): quadrature encoder
  Fd (1): frequency-direction
  Fr (2): foward-reverse
  Ab.SErvo (3): quadrature encoder + communication channels
  Fd.SErvo (4): frequency-direction + switching channels
  Fr.SErvo (5): foward-reverse + switching channels
  SC (6): SinCos encoder without serial link

A

In order to proceed to commissioning, resume it at page 4

0.49 = L2

Enter the encoder characteristics

SinCos encoder with serial link Hiperface or EndAt or EnDat encoder	Sincos encoder with SSI link or SSI encoder
• **3.41** : **Auto-configuration** Enter the value On (1) for an auto-configuration of the encoder parameters when powering up (**3.33**, **3.34** and **3.35**). • **3.36** : **Voltage** Enter the encoder mains supply voltage: 5V (0) or 8V (1) or 15V (2). **CAUTION:** **Supplying an encoder with an excessive voltage can damage it.** • **3.37** : **Transmission speed** Enter the serial link speed (except for 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** : **Type** Enter the type of encoder used: SC.Hiper (7): SinCos with Hiperface, EndAt (8): EndAt, SC.EndAt (9): SinCos with EnDat link. • **0.00** : Enter the value 1000. • Press the Reset key. • Power down the drive, then power it up again (necessary for the settings of the encoder characteristics to be taken into account).	• **3.41** : **Selection of SSI format** Enter the value OFF (0) to select the Gray SSI code format. Enter the value On (1) to select the SSI binary format. • **3.33** : **Number of turns (number of bits)** Enter the maximum number of encoder turns, eg: if **3.33** = 5, the maximum number of turns will be 2^5. • **3.34** : **number of increments/turn (ELPR)** (SinCos encoder only) Enter the number of sinus wavers per turn. • **3.35** : **Resolution (number of bits)** Enter the resolution of the serial link (number of bits used to represent an encoder turn). • **3.36** : **Voltage** Enter the encoder mains supply voltage: 5V (0) or 8V (1) or 15V (2). **CAUTION:** **Supplying an encoder with an excessive voltage can damage it.** • **3.37** : **Transmission speed** Enter the link speed: 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** : **Type** Enter the type of encoder used: SSI (10): SSI encoder, SC.SSI (11): SinCos with SSI link. • **0.00** :Enter the value 1000. • Press the Reset key. • Power down the drive, then power it up again (necessary for the settings of the encoder characteristics to be taken into account).

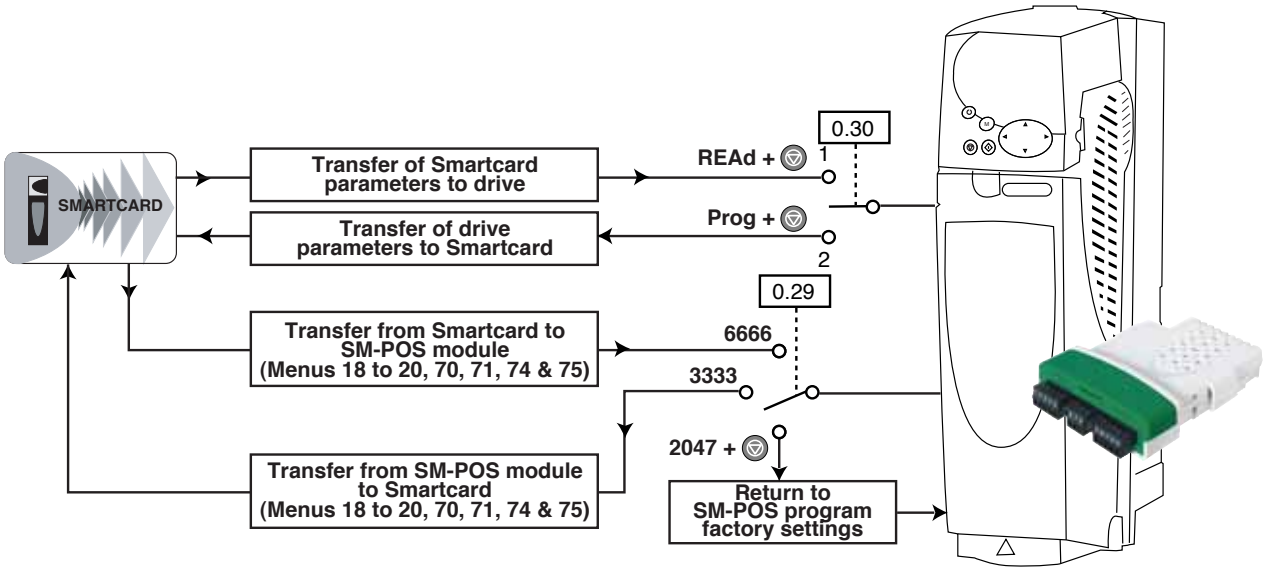
A

In order to proceed to commissioning, resume it at page 4

H2 - Menu 0: User Menu

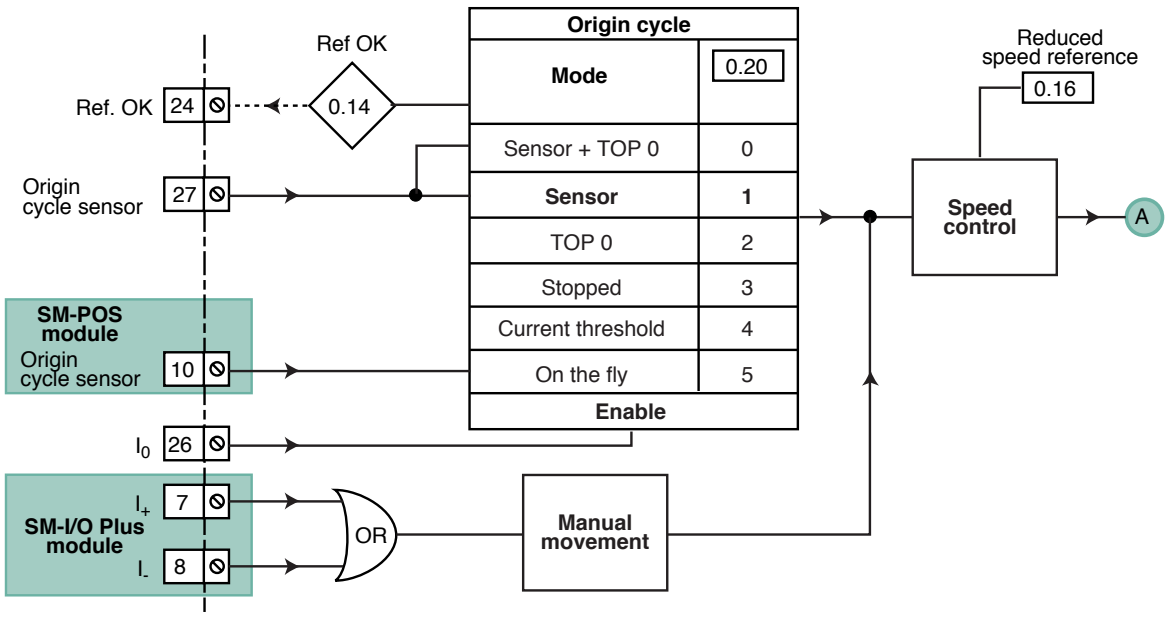
H2.1 - Diagrams

• Smartcard use



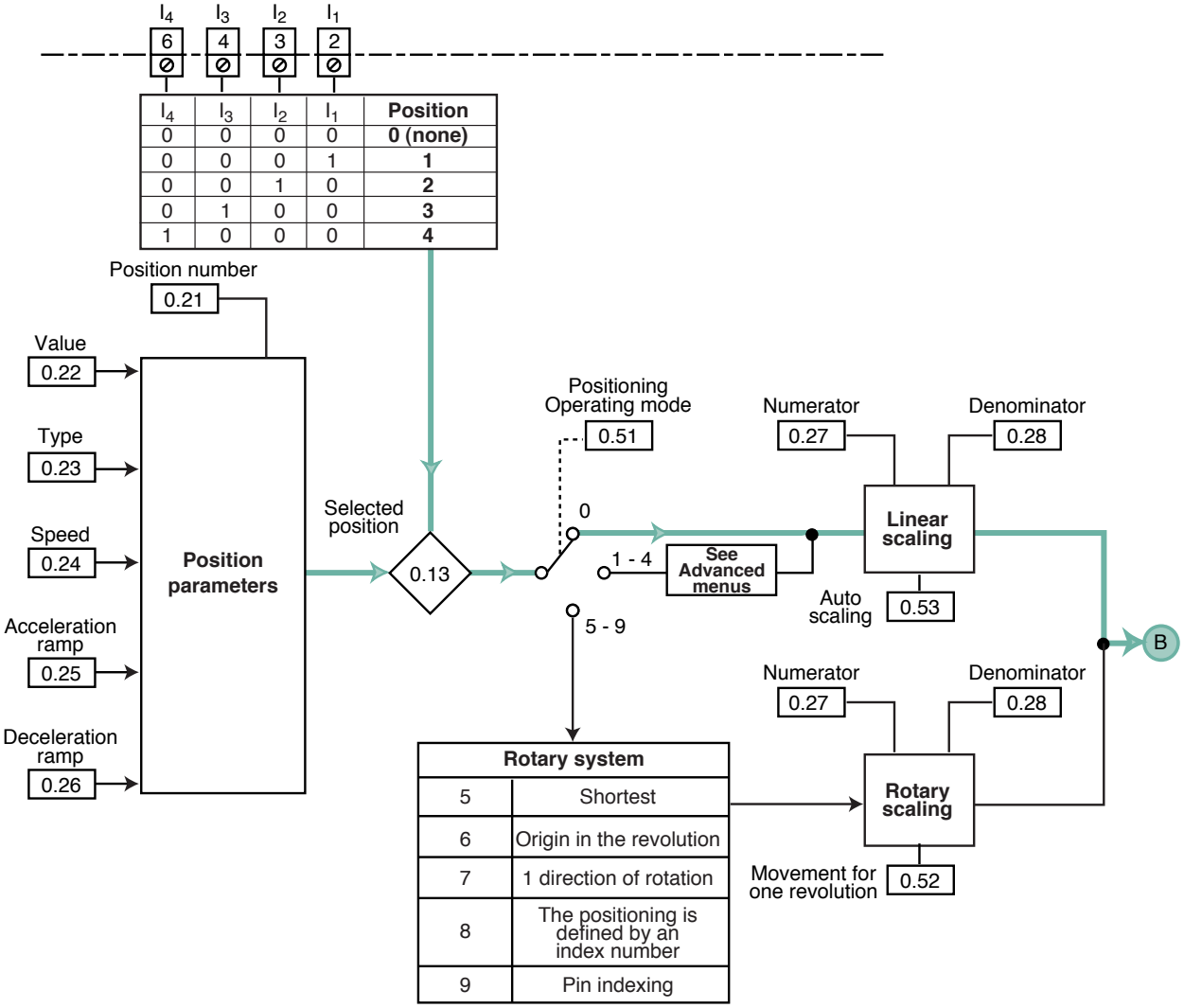
Note: It is necessary to transfer the drive parameters using parameter **0.30**, before transferring the positioning parameters using parameter **0.29** (see Section J2).

• Origin cycle and manual movement mode



Parameters	Variation range			Factory setting		
0.14	OFF (0) or On (1)			-		
0.16	0 to **0.02** min^{-1}			150 min^{-1}		
0.20	0 to 5			1		
0.29	-32768 to +32767			0		
0.30	nonE (0), rEAd (1), Prog (2), AutO (3), boot (4)			nonE (0)		

- **Positioning**

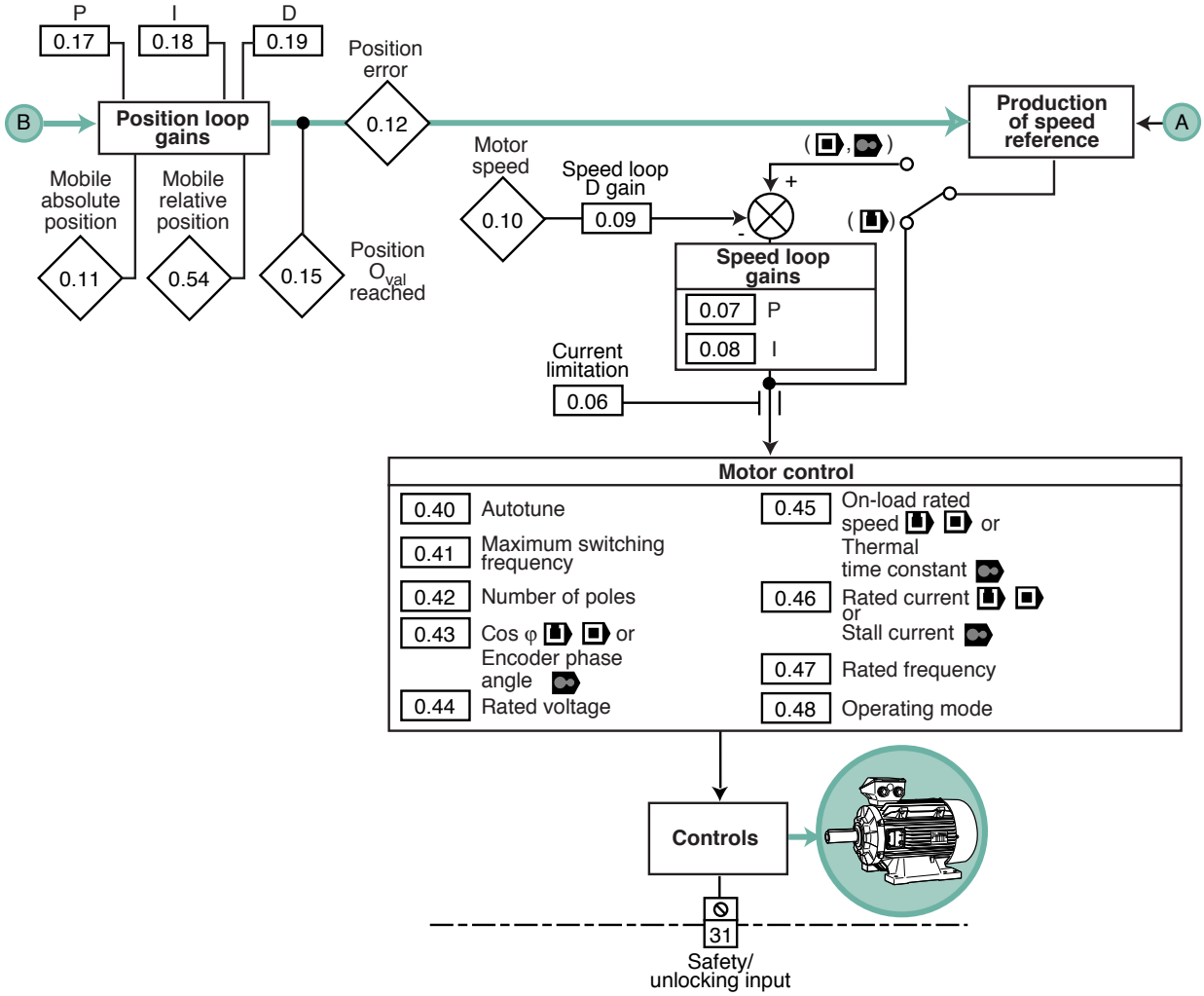


I_4	I_3	I_2	I_1	Position
0	0	0	0	**0 (none)**
0	0	0	1	**1**
0	0	1	0	**2**
0	1	0	0	**3**
1	0	0	0	**4**

Rotary system	
5	Shortest
6	Origin in the revolution
7	1 direction of rotation
8	The positioning is defined by an index number
9	Pin indexing

Parameters	Variation range			Factory setting		
0.13	0 to 32			-		
0.21	1 to 32			1		
0.22	-32768 to +32767 (customer unit)			0		
0.23	0 or 1			0		
0.24	1 to (**0.02** x 0.9) min^{-1}			1500 min^{-1}		
0.25 - **0.26**	0 to 32767 1/100 s for 1000 min^{-1}			200 1/100 s for 1000 min^{-1}		
0.27	-999999 to +9999999			65536		
0.28	1 to 9999999			10		
0.52	1 to 9999999			3600		
0.53	OFF (0) or On (1)			OFF (0)		

• **Positioning (continued)**



Parameters	Variation range			Factory setting		
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	OFF (0) or On (1)	0 to 0.65535 (s)		OFF (0)	0	
0.10	± N MAX (min^{-1})			-		
0.11 - 0.12 - 0.54	-32768 to +32767 (customer unit)			-		
0.15	OFF (0) or On (1)			-		
0.17	0 to 32767			500		
0.18	0 to 32767			0		
0.19	0 to 32767			1000		
0.40	0 to 2	0 to 4	0 to 6	0		
0.41	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz (16 kHz not available for sizes 3)			3 (0) kHz		6 (2) 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
0.44	0 to U_{AC} MOT MAX (V)			TL: 230 V; T: 400 V (EUR) / 460 V (USA); TM: 575 V; TH: 690 V		
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)	1450.00 min^{-1} (EUR) 1770.00 min^{-1} (USA)	20.0
0.46	0 to IN MAX (A)			I_{nom} DRIVE (**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), SerVO (3), REgEn (4)			OPEn LP (1)		

H2.2 - List of parameters

Menu 0 contains the most used parameters for simplified commissioning.
Each parameter in menu 0 is the image of a parameter contained in another menu (menu 1 to 21). The correspondence of parameters in Menu 0 is indicated in the "Address" column in the table below.

: RO = Read parameter

: R-W = Read/write parameter

: R-A = Read/assign parameter

: Open loop flux vector control mode
: Closed loop flux vector control mode
: Servo mode

EUR: 50 Hz mains supply
USA: 60 Hz mains supply

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.00	• Storage • Factory settings • Operating mode selection • Parameter list	-	R-W		0 to 32767	0
0.01	Frequency limit or minimum speed	**1.07**	R-W		±3000.0 Hz	0
					± LIM N MAX *	0
0.02	Frequency limit or maximum speed	**1.06**	R-W		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**	R-W		0 to 3200.0 s/100 Hz	5.0 s/100 Hz
					0 to 3200.000 s/1000 min^{-1}	2.000 s/1000 min^{-1}
					0 to 3200.000 s/1000 min^{-1}	0.200 s/1000 min^{-1}
0.04	Deceleration ramp	**2.21**	R-W		0 to 3200.0 s/100 Hz	10.0 s/100 Hz
					0 to 3200.000 s/1000 min^{-1}	2.000 s/1000 min^{-1}
					0 to 3200.000 s/1000 min^{-1}	0.200 s/1000 min^{-1}
0.05	Reference selection	**1.14**	R-W		A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), PAd (4), Prc (5)	A1.A2 (0)
0.06	Current limitation	**4.07**	R-W		0 to LIM IM1 MAX (%) *	165.0%
					0 to LIM IM1 MAX (%) *	175.0%
0.07	Control mode	**5.14**	R-W		Ur_S (0), Ur (1), Fd (2),	Ur_I (4)
	Speed loop proportional gain	**3.10**	R-W		0 to 6.5535 (1/$rads^{-1}$)	0.0100 (1/$rads^{-1}$)
0.08	Torque on starting (Boost)	**5.15**	R-W		0 to 25.0% of U_N motor	Size 1 to 3: 3.0% Sizes 4 and 5: 2.0% Size 6: 1.0%
	Speed loop integral gain	**3.11**	R-W		0 to 655.35 (1/rad)	1.00 (1/rad)
0.09	Dynamic V/F selection	**5.13**	R-W		OFF (0) or On (1)	OFF (0)
	Speed loop differential gain	**3.12**	R-W		0 to 0.65335 (s)	0
0.10	Calculated motor speed	**5.04**	RO		± 180000 min^{-1}	-
	Measured motor speed	**3.02**	RO		± N MAX (min^{-1}) *	-
0.11	Actual position of the mobile	**18.02**	RO		-32768 to +32767 (customer unit)	-
0.12	Position error	**18.03**	RO		-32768 to +32767 (customer unit)	-

* For an explanation of the parameter range, refer to section H3.5.

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.13	Selected position	**18.05**	RO		0 to 32	-
0.14	Ref. OK	**19.31**	RO		OFF (0) or On (1)	-
0.15	Position O_{val} reached	**19.33**	RO		OFF (0) or On (1)	-
0.16	Reduced speed reference	**20.22**	R-W		0 to **0.02** min^{-1}	150 min^{-1}
0.17	Position loop proportional gain	**20.10**	R-W		0 to 32767	500
0.18	Position loop integral gain	**20.11**	R-W		0 to 32767	0
0.19	Position loop differential gain	**20.12**	R-W		0 to 32767	1000
0.20	Origin cycle mode	**20.13**	R-W		0 to 5	1
0.21	Setting position number	**19.11**	R-W		1 to 32	1
0.22	Setting position value	**19.12**	R-W		-32768 to 32767 (customer unit)	0
0.23	Setting position type	**19.13**	R-W		0 or 1	0
0.24	Setting position speed	**19.14**	R-W		1 to (**0.02** x 0.9) min^{-1}	1500 min^{-1}
0.25	Setting position acceleration ramp	**19.15**	R-W		0 to 32767 1/100 s for 1000 min^{-1}	200 1/100 s for 1000 min^{-1}
0.26	Setting position deceleration ramp	**19.16**	R-W		0 to 32767 1/100 s for 1000 min^{-1}	200 1/100 s for 1000 min^{-1}
0.27	Scaling numerator	**20.23**	R-W		-999999 to 9999999	65536
0.28	Scaling denominator	**20.26**	R-W		1 to 9999999	10
0.29	Return to factory settings and copying of positioning parameters	**20.01**	R-W		-32768 to 32767	0

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.30	Parameter copy	**11.42**	R-W		nonE (0), rEAd (1), Prog (2), AutO (3), boot (4)	nonE (0)
0.31	Drive rated voltage	**11.33**	RO		200 (0), 400 (1), 575 (2), 690 (3) V	-
0.32	Drive rated current	**11.32**	RO		0 to 9999.99 A	-
0.33	Flying restart	**6.09**	R-W		0 to 3	0
	Auto-tuned rated speed	**5.16**	R-W		0 to 2	0
0.34	User security code	**11.30**	R-W		0 to 999	0
0.35	Communication type	**11.24**	R-W		AnSI (0), rtU (1), Lcd (2)	rtU (1)
0.36	Serial link transmission speed	**11.25**	R-W		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**	R-W		0 to 247	1
0.38	Current loop proportional gain	**4.13**	R-W		0 to 30000	20
					0 to 30000	200 V drive (TL): 75 400 V drive (T): 150 575 V drive (TM): 180 690 V drive (TH): 215
0.39	Current loop integral gain	**4.14**	R-W		0 to 30000	40
					0 to 30000	200 V drive (TL): 1000 400 V drive (T): 2000 575 V drive (TM): 2400 690 V drive (TH): 3000
0.40	Auto-tuning, meaurements and calculations	**5.12**	R-W		0 to 2	0
					0 to 4	
					0 to 6	
0.41	Switching frequency	**5.18**	R-W		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
0.42	Number of motor poles	**5.11**	R-W		Auto (0) to 120POLE (60)	Auto (0)
						6POLE (3)
0.43	Cos φ	**5.10**	R-W		0 to 1.000	0.850
	Encoder phase angle	**3.25**	R-W		0 to 359.9°	0

Parameter	Description	Address	Type	Mode	Variation range	Factory setting
0.44	Motor rated voltage	**5.09**	R-W		0 to U_{AC} MOT MAX (V) *	200 V drive (TL): 230 V 400 V drive (T): 400 V (EUR), 460 V (USA) 575 V drive (TM): 575 V 690 V drive (TH): 690 V
0.45	On-load motor rated speed	**5.08**	R-W		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**	R-W		0 to 400.0	20.0
0.46	Motor rated current	**5.07**	R-W		0 to I_N MAX (A) *	I_{NOM} DRIVE (**11.32**)
	Stall current					
0.47	Motor rated frequency	**5.06**	R-W		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**	R-W		OPEn LP (1), CL VECt (2), SErVO (3), rEgEn (4)	OPEn LP (1)
0.49	Level 2 access and security code storing	**11.44**	R-W		L1 (0), L2 (1), Loc (2)	L1 (0)
0.50	Drive software version	**11.29**	RO		1.00 to 99.99	-
0.51	Positioning mode	**20.34**	R-W		0 to 9	0
0.52	Movement for one rotary system revolution	**20.40**	R-W		1 to 9999999	3600
0.53	Automatic scaling	**18.31**	R-W		OFF (0) or On (1)	OFF (0)
0.54	Relative position of the mobile	**19.10**	RO		-32768 to 32767 (customer unit)	-
0.55	Menu 7x parameter selection	**20.28**	R-W		0 to 9999	0
0.56	Menu 7x parameter value	**20.29**	R-A		-999999 to +9999999	0

* For an explanation of the parameter range, refer to section H3.5.

H2.3 - Explanation of parameters

0.00 : **Parameter relating to storage, return to European and USA factory settings, operating mode modification, parameter list**

Variation range : 0 to 9999
Factory setting : 0
1000: Storage
1001: Storage, even in standby power supply mode
1070: Reset of option modules
1233: Return to European factory settings
1244: Return to USA factory settings
1253: Operating mode selection with return to European factory settings
1254: Operating mode selection with return to USA factory settings
12000: Selection of all parameters with a value different from the factory setting
12001: Selection of all destination parameters
Press the Reset key to confirm the parameter settings.

0.01 : **Frequency limit or minimum speed**

Automatic parameter setting by the SM-POS module.
Do not modify.

0.02 : **Frequency limit or maximum speed**

This is the highest operating speed or frequency (laid down for both directions of rotation). With the reference at maximum, it is the output speed or frequency.
Note: The drive incorporates overspeed detection.
CAUTION:
0.02 is a nominal value. Slip compensation and current limiting may lead to a slightly different output frequency.

0.03 : **Acceleration ramp**

Automatic parameter setting by the SM-POS module.
Do not modify.

0.04 : **Deceleration ramp**

Automatic parameter setting by the SM-POS module.
Do not modify.

0.05 : **Reference selection**

Automatic parameter setting by the SM-POS module.
Do not modify.

0.06 : **Current limitation**

Sets the maximum active current (percentage of the rated active current) delivered by the drive in motor or generator operation.
The output speed or frequency is limited in order to keep the active current less than or equal to the limit laid down by **0.06**.

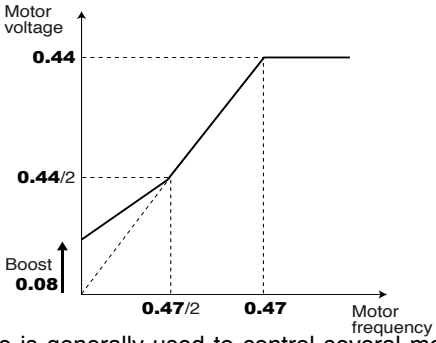
0.07 : **Control mode**
Speed loop proportional gain and
:

The difference between these modes is the method used to identify the motor parameters, in particular the stator resistance. These parameters vary with the motor temperature and therefore according to its cycle of use.
For the performance in flux vector control mode to be optimum, it is necessary for the parameters for cos φ (**0.43**), stator resistance and voltage offset to be set accurately.

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

Ur (1): The stator resistance and voltage offset are not measured.
This mode is of course the least effective. It should only be used when the other modes are incompatible with the operating cycle.
In this case, during commissioning, auto-tuning without rotation should be carried out (see **0.40**), and mode Ur should then be used in normal operation.

Fd (2): Voltage-frequency ratio with fixed boost at low speed (boost adjustable via parameter **0.08**).



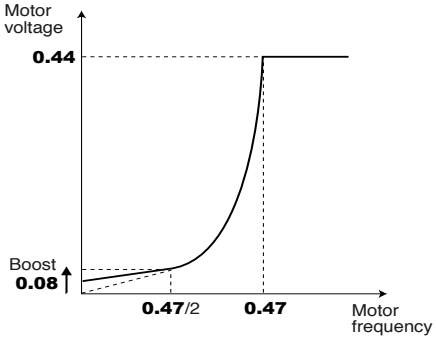
This mode is generally used to control several motors from the same drive.

Ur_Auto (3): The stator resistance and voltage offset are measured only during the first power-up, after a run command. In this case, the stator resistance and voltage offset are stored. Then, **0.07** takes the value "Ur".
CAUTION:
If the measurement fails, the stator resistance and voltage offset are not recorded, but 0.07 remains at the value Ur_Auto and the measurement will be attempted again at the next power-up.

Ur_I (4): The stator resistance and voltage offset are measured each time the drive is powered up, and after a run command.
These measurements are valid only if the machine is stopped at power-up.

• In Ur I mode, a voltage is briefly applied to the motor. For safety reasons, no electrical circuit must be accessible once the drive has been powered up.

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



and :

Sets the stability of the motor speed in the event of sudden variations in the reference.
Increase the proportional gain until vibrations occur in the motor, then reduce the value by 20 to 30%, checking that the motor remains stable for sudden variations in the speed reference, both at no load and on load.

0.08 : **Torque on starting (Boost)**
Speed loop integral gain and

:
For operation in V/F mode (**0.07** = Fd (2) or SrE (5)), parameter **0.08** is used to overflux the motor at low speed so that it delivers more torque on starting.
It is a percentage of the rated motor voltage **0.44**.
(Refer to the diagrams for **0.07**).

and :
Sets the stability of the motor speed on load impact.
Increase the integral gain so that the same speed is obtained on load and at no load in the event of load impact.

0.09 : **Dynamic V/F selection**
Speed loop differential gain and

:
OFF (0): The V/F ratio is set and adjusted by the base frequency (0.47).
On (1): Dynamic V/F ratio.
Generates a voltage/frequency characteristic which varies with the load. It is for use in quadratic torque applications (pumps/fans/compressors). It can be used in constant torque applications with low dynamics to reduce motor noise.

and :
Sets the stability of the motor speed in the event of load shedding or rapid variations in the reference. Reduces overshoots.
In general, leave the setting at 0.

0.10 : **Calculated motor speed**
Measured motor speed and

:
The motor speed is calculated from the post-ramp frequency reference (in Hz) or from the final frequency reference when operating in frequency servo-control mode (reference signal on encoder input).

and :
This parameter is used to read the actual speed of the motor, coming from the speed feedback (incremental encoder, for example).

0.11 : **Actual position of the mobile**

Indicates the position of the mobile with respect to the origin.

0.12 : **Position error**

Indicates the error in the position of the mobile compared with the requested position, and is used to define the state of output O_{val} (**0.15**).

0.13 : **Selected position**

Indicates the number of the position the mobile must reach, selected by the inputs I_1 to I_4 or I_5 according to the mode enabled (direct mode, encoded mode, or scan timer mode, see **0.51**).

0.14 : **Ref. OK**

OFF (0): The origin cycle procedure has not been performed. Start the procedure again.
On (1): The origin cycle procedure has taken place correctly. The system origin is known.

0.15 : **Position O_{val} reached**

OFF (0): The mobile has not reached the requested position.
On (1): The mobile is in position.

0.16 : **Reduced speed reference**
This parameter sets the reduced speed used for:
• The manual movement controlled by I_+ or I_-
• The origin cycle procedure, enabled by I_o.

0.17 : **Position loop proportional gain**
The value contained in this parameter adjusts the control accuracy and the stability of the position loop.

0.18 : **Position loop integral gain**
The value contained in this parameter adjusts the stability of the position loop on load transients.

0.19 : **Position loop differential gain**
The value contained in this parameter adjusts the stability of the position loop taking speed transients into consideration.

0.20 : **Origin cycle mode**
6 origin cycle modes are offered:
0: The origin is detected by the origin cycle sensor taking the encoder Top 0 into consideration.
1: The origin is detected by the origin cycle sensor only.
2: The origin is detected on encoder Top 0 only.
3: The origin cycle is performed when stopped, on change of state of input I_o.
4: The origin cycle is performed on a motor active current threshold. When the motor current reaches the current threshold laid down, the system origin cycle is initiated. (Factory setting = threshold of 2 A).
5: Origin cycle on the fly with no Top 0 (during positioning):
• If **0.51** = 0 or 4 (positioning modes), immediate stop on detection of the sensor
• If **0.51** = 1 to 3 (scan timer modes), immediate incrementing of the scan timer on sensor detection
• If **0.51** = 5 to 9 (rotary system modes), on sensor detection, new origin taken into account at the next position request.

0.21 : **Setting position number**
This parameter selects the number of the position to be set using parameters **0.22** to **0.26**.

0.22 : **Setting position value**
After selecting the position in **0.21**, enter the distance to be travelled by the mobile between the origin and the place where the mobile is to be positioned in absolute mode, or between the previous position and the place where the mobile is to be positioned in relative mode (depends on **0.23**).
The value of the position is defined by the scaling **0.27** and **0.28**.
For rotary positioning defined by an index number (**0.51** = 8), configure the index number corresponding to the number of steps in the movement defined in **0.52**.
Note: In Fieldbus control mode, the registers can be accessed directly from the advanced menus (menus 70 and 71).

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0.23 : **Setting position type**

After selecting the position in **0.21**, enter the movement mode of the mobile for reaching the required position.
OFF (0): Absolute mode; the positions are referenced with respect to the system origin.
On (1): Relative mode; the position is referenced with respect to the previous position. The mobile advances step by step.
Note: In Fieldbus control mode, the registers can be accessed directly from the advanced menus (menus 70 and 71).

0.24 : **Setting position speed**

Sets the motor speed for reaching the position selected in **0.21**.
Note: In Fieldbus control mode, the registers can be accessed directly from the advanced menus (menus 70 and 71).

0.25 : **Setting position acceleration ramp**

Sets the acceleration ramp for reaching the position selected in **0.21**.
Note: In Fieldbus control mode, the registers can be accessed directly from the advanced menus (menus 70 and 71).

0.26 : **Setting position deceleration ramp**

Sets the deceleration ramp for reaching the position selected in **0.21**.
Note: In Fieldbus control mode, the registers can be accessed directly from the advanced menus (menus 70 and 71).

0.27 : **Scaling numerator**

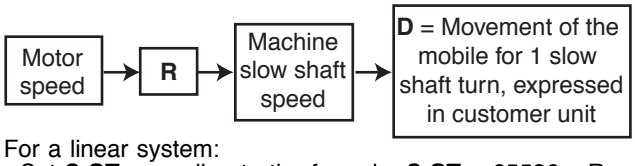
0.28 : **Scaling denominator**

If **0.51** = 0 to 4, then **0.27** and **0.28** are respectively the numerator and the denominator of the scaling for linear positioning.
If **0.51** ≥ 5, then **0.27** and **0.28** are respectively the numerator and the denominator of the reduction ratio for rotary positioning (reduction ratio - number of teeth - between the motor and the rotary system).
Note: To reverse the direction of movement into position, enter a negative value in the numerator **0.27**.

For scaling the positioning (**0.51** = 0 to 4) there are two possible methods:

• Automatic scaling:
Allows users to carry out their scaling very quickly by movement visually.
- Move the mobile to the required place using I_+ or I_-.
- Enable the start of the scaling procedure by entering On (1) into **0.53**.
- Move the mobile to another position using I_+ or I_-.
- Enter into **0.28** the value of the movement in customer units (e.g. the value 100 to express 100 cm or 100 mm).
- Enter **0.53** = OFF (0) to end the scaling procedure.
The drive then automatically calculates the scaling. **0.27** is not used in this procedure.
For certain applications, however, the scaling must be very accurate. It is then necessary to set the exact ratios of the dynamic characteristics by customer scaling.
Note: This method is not recommended in relative mode. Use the customer scaling below.

• Customer scaling:
Allows accurate values of the dynamic characteristics to be set.



For a linear system:
- Set **0.27** according to the formula: **0.27** = 65536 x R.
- Set **0.28** according to the formula: **0.28** = D.

For a rotary system:
- Set **0.27** as the numerator of the reduction ratio.
- Set **0.28** as the denominator of the reduction ratio.
- Set **20.40** according to the formula: **20.40** = D.

0.29 : **Return to factory settings and copying of positioning parameters**

• Return to positioning factory settings
This parameter initiates an automatic procedure for return to the factory settings specific to the positioning application.
To enable this return to the Positioning factory settings, follow the procedure below:

Parameter	Setting	Description	Enable
0.00	**1233** or **1244**	European factory settings configuration (50 Hz) or USA factory settings configuration (60 Hz)	Press the Reset key
0.29	**2047**	**Positioning program initialisation**	

• Check that the motor is stopped and the safety of the system is not called into question.

• Copying of positioning parameters
This parameter is used to save or load the parameters of the positioning menus using the SMARTCARD.

Parameter	Setting	Description
0.29	**3333**	Saving of menus 18 to 20, 70, 71, 74 and 75 in the SMARTCARD
0.29	**6666**	Loading of menus 18 to 20, 70, 71, 74 and 75 from the SMARTCARD into the drive

0.30 : **Parameter copy**

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

See procedures in Section J.

0.31 : **Drive rated voltage**

This parameter indicates the drive rated voltage.

0.32 : **Drive rated current**

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

0.33 : **Flying restart**
Auto-tuned rated speed

:
If this parameter is enabled (**0.33** = 1 to 3), when there is a run command or after a mains supply break, the drive executes a procedure to calculate the motor frequency and direction of rotation. It will automatically recalibrate the output frequency to the measured value and reaccelerate the motor up to the reference frequency.
0: Disable flying restart on a motor which is rotating
1: Enable flying restart on a motor which is rotating clockwise or counter-clockwise
2: Enable flying restart only on a motor which is rotating clockwise.
3: Enable flying restart only on a motor which is rotating counter-clockwise.

:
Motor slip is calculated from the rated on-load speed **0.45**, and the rated motor frequency **0.47**.
However, as slip varies with temperature, the calculation of the variable speed drive from **0.45** and **0.47** may be incorrect.
Setting parameter **0.33** to 1 or 2 is used to automatically adjust the rated on-load speed.
To keep the new value of **0.45**, store the parameters (**0.00** = 1000 + Reset).
This optimisation is active only when the speed is above 12.5% of the rated speed and when the motor load becomes greater than 62.5% of the rated load. The optimisation is no longer active when the load becomes less than 50% of the rated load.

0.34 : **User security code**
This parameter is used for entering a personal security code that disables all modification of parameters (except **0.49**).
The personal code can be read only during its editing.
Do not choose code 0.
To validate or use a code, follow the procedure described in Section G12.

0.35 : **Communication type**
AnSI (0): ANSI protocol used
RtU (1): Modbus RTU protocol used
Defines the communication protocol used by the RS485 port of the variable speed drive.
This parameter can be modified via the keyboard, by an SM option or via the serial link itself. If the modification is transmitted via the serial link, the response to the command will be transmitted using the original protocol. The master must wait 20 ms 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): Special protocol for disabling the use of a "client" console.

0.36 : **Serial link transmission speed**
Used to select the transmission speed of the protocol used.
Note: Speeds 57600 and 115200 are used only for Modbus RTU.
This parameter can be modified via the keyboard, by an SM option or via the serial link itself. If the modification is transmitted via the serial link, the response to the command will be transmitted using the original protocol. The master must wait 20 ms before transmitting a new command in the new protocol.

0.37 : **Serial link address**
Used to define the address of the drive, which is always the slave.
Modbus RTU:
For this protocol, addresses 0 to 247 can be used. Address 0 is used to communicate to all slaves on the network (Broadcast). For this reason, this address must not be entered into this parameter.
ANSI:
For this protocol, the first digit corresponds to the group, and the second to the address of the drive in the group. The maximum number of groups is 9, and the maximum number of addresses in the group is 9. Consequently, the value of **0.37** is limited to 99. In addition, address 0 is used to communicate to all the slaves on the network, and addresses x0 are used for the slaves in group x. For this reason, these addresses must not be entered into this parameter.

0.38 : **Current loop proportional gain**

0.39 : **Current loop integral gain**
Due to a number of factors internal to the drive, oscillations may occur in the following cases:
- Frequency control with current limiting around the rated frequency and on load impacts
- Torque control on machines with a low load and around the rated speed
- On a mains supply break or on a controlled deceleration ramp when control via the DC bus is requested.

To reduce these oscillations, we recommend that you first:
- Increase the proportional gain **0.38**
- Then reduce the integral gain **0.39**

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

0.40 **: Auto-tuning, meaurements and calculations**

• Make sure that the auto-tuning with rotation has no safety risks, and check that the motor is stopped before starting the procedure.

• After modifying the operating mode or motor parameters, repeat the auto-tuning.

0: No auto-tuning

1:
and :
Measurement of characteristics with motor stopped:
- Voltage offset
- Stator resistance and
- Current loop gains
- Transient inductance
Choose this mode when the load cannot be disconnected from the motor.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped
- Enable the drive (close terminal 31)
- Give a run command (close terminal 26 or 27). The display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

:
Measurement of the encoder phase angle. The motor must be disconnected.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped
- Enable the drive (close terminal 31)
- Give a run command (close terminal 26 or 27).
- The motor performs 2 electrical rotations forward, at very low speed, then stops. The display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

2:
and :
Measurement of motor characteristics with rotation:
- Voltage offset
- Stator resistance and
- Transient inductance
- cos φ and
- Current loop gains
This mode is used to obtain optimal performance levels, but the motor must have no load during the procedure.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped
- Enable the 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 performs a freewheel stop. During auto-tuning, the display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

:
Measurement of the encoder phase angle, stator resistance and transient inductance, and automatic setting of the current loop gains.
The motor must be disconnected from the load.
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped
- Enable the drive (close terminal 31)
- Give a run command (close terminal 26 or 27).
The motor performs two electrical rotations at low speed, then stops.
The display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

3:
and :
Measurement of the total inertia (load and motor). The load can remain connected to the motor during the measurement, except in the case where the load is not linear or if it increases with speed (erroneous measurement).
Procedure:
- Ensure that the motor parameters have been configured and that the motor is stopped
- Enable the drive (close terminal 31)
- Give a run command (close terminal 26 or 27).
The motor performs several rotations (3/4 of the rated on-load speed), then stops. During auto-tuning, the display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

4:
:
Calculation of current loop gains.
The values of the transient inductance and stator resistance must be entered before enabling the gain calculation. To do this, carry out an auto-tuning **0.40** = 1 or 2 (according to whether or not the motor can be disconnected) before enabling the gain calculation.
Note: When the gain calculation is complete, **0.40** changes from 4 to 0.

:
Measurements of characteristics with motor stopped:
- Stator resistance
- Stator inductance
- Loop gains of the current loop
Procedure:
- Ensure that the motor parameters and the encoder phase angle **0.43** have been configured and that the motor is stopped.
- Enable the drive (close terminal 31).
- Give a run command (close terminal 26 or 27). The display shows "Auto" and "tunE" alternately. Wait for the display to stabilise at "0.00".
Open terminal 31 and terminal 26 or 27.
The motor is then ready to operate normally.
Parameter **0.40** returns to 0 as soon as auto-tuning is complete.

5 :
Measurement of the encoder phase angle **0.43** with small rotation.
Small current pulses are applied to the motor to produce a movement of the rotor, and then return it to its initial position. Should this procedure fail, it is automatically repeated twice (if the measurement is still not satisfactory, the drive goes into the "tunE2" trip state).
Next, the drive checks whether the direction of rotation of the position sensor is correct.
The phase angle **0.43** is then updated and stored.
This test runs correctly when the load is an inertia, and as a small motor step and acceptable friction are necessary, the motor must not be heavily loaded for this test (inertia less than 0.715 x C_{nom}/5.38 kgm^2).
This test cannot be used with sensors equipped with a serial link alone; it is preferable to use another auto-tuning mode for Ab.servo and Fr.servo types.

6 :
:
Calculation of current loop gains.
This mode is not used for simple applications of menu 0. For further information, refer to the Explanations of Parameters manual ref. 3655.
Note: This value is not visible on the display which changes from 5 to 0. The return of **0.40** to 0 means that the gains calculation has been carried out.

0.41 : Switching frequency
Sets the PWM switching frequency. Frequency of sampling the digital and analog inputs.
CAUTION:
• Depending on the switching frequency and the rating of the UNIDRIVE SP, it may be necessary to derate the output current. See Section B3.3.
• A high switching frequency reduces the magnetic noise and increases the drive losses; on the other hand it increases the motor temperature rise and the level of radio-frequency interference emission, and reduces the starting torque.
• Where 0.41 is set to a value greater than 3 kHz, and when the junction temperature of the IGBT transistors reaches a certain alarm threshold, the switching frequency is automatically reduced (0.41 remains at the value set by the user). When the drive can no longer reduce the switching frequency, it goes into "O.ht1" trip state.
The drive restores the configured switching frequency as soon as the temperature of the IGBTs becomes lower than the alarm threshold.

0.42 : Number of motor poles and :
Enter the number of motor poles
e.g. **2POLE (1):** 2-pole motor (3000 min^{-1})
4POLE (2):4-pole motor (1500 min^{-1})
6POLE (3):6-pole motor (1000 min^{-1}), etc.
In the factory settings, the value of **0.42** is "**Auto (0)**", and the drive automatically calculates the number of poles according to the rated frequency (**0.47**) and the rated on-load speed (**0.45**).

:
Enter the number of poles shown on the motor plate.
In the factory settings, the value of **0.42** is "**6 POLE (3)**".

0.43 : Cos φ and Encoder phase angle and :
Cos φ is measured automatically during the auto-tuning with rotation phase (**0.40** = 2), and set in this parameter. If it is not possible to carry out this procedure, enter the value of cos φ shown on the motor nameplate.
Note: After auto-tuning **0.40** = 2 in closed loop mode, the value of cos φ can no longer be modified manually.

:
In order to control a servo motor correctly, the phase angle between the rotor flux and the encoder position must be configured.
This phase angle is set automatically during auto-tuning with **0.40** = 1, 2 or 5.
This parameter can be modified at any time, and is used immediately by the drive.
Note:
• After a return to factory settings, the value of **0.43** is not modified.
• For a UNIMOTOR motor manufactured from 2002 onwards, the encoders are calibrated in the factory (**0.43** = 0).

0.44 : Motor rated voltage
This is the rated voltage shown on the motor plate.

0.45 : On-load motor rated speed and Motor thermal time constant and :
This is the on-load speed of the motor shown on the nameplate.
Note: Slip compensation is not active if **0.45** is at 0 or at the value of the synchronism speed.

:
This parameter is used to define the motor thermal protection.
For UNIMOTOR motors, set the thermal time constant of the winding (Table B2.2 in the Technical Catalogue ref. 3863) in 0.45.

0.46 : Motor rated current and Stall current and :
This is the value of the motor rated current shown on the motor nameplate. Above this value the motor is overloaded.

:
This is the value of the stall current shown on the motor nameplate.
CAUTION:
For an ambient temperature of 50°C, check that the value of 0.46 does not exceed the value in the table in Section B3.3.
• To avoid risks of fire should the motor be overloaded, 0.46 must be configured correctly.

0.47 : Motor rated frequency and
This is the point at which motor operation changes from constant torque to constant power.
During standard operation, it is the frequency shown on the motor nameplate.

0.48 : **Operating mode selection**
Used to select the operating mode.
To modify the operating mode, follow the procedure described in Section G9.
The factory settings of the drive are automatically adjusted according to the selected operating mode.
OPEN.LP (1): Operation in open loop flux vector control or V/F mode.
CL.VECt (2): Operation in closed loop flux vector control mode with encoder.
SerVO (3): Operation in Servo mode with self-synchronous (servo) motor.
REgEn (4): Regenerative mode, not used.
Note:
• Returning to factory settings does not change the operating mode.
• The operating mode can only be changed when the drive is stopped.

0.49 : **Level 2 access and security code storing**
L1 (0): Level 1 access. Only the parameters of menu 0 (0.00) to 0.50) are accessible at the keyboard.
L2 (1): Level 2 access. The parameters of all the menus are accessible at the keyboard.
Loc (2): Used to store or reactivate a security code (refer to the procedure described in Section G12).

0.50 : **Software version**
Gives the first 2 digits of the software version installed in the drive.

0.51 : **Positioning mode**
0: Linear positioning (16 bits).
1: Automatic linear positioning with scan timer and end-of-cycle stop (with no looping).
2: Automatic linear positioning with scan timer permanently enabled (with looping).
3: Automatic linear positioning with scan timer and change of position on command (the cycle increment command must be sent in **18.35**).
4: Linear positioning (32 bits) with position synchronisation on command (the synchronisation command must be sent in **18.35**).
5: Shortest rotary positioning (position counter reset to zero each revolution).
6: Rotary positioning with origin in the revolution (position counter reset to zero each revolution).
7: Rotary positioning with a single direction of movement (position counter reset to zero each revolution).
8: Rotary positioning. The movement step is defined by a number of indexes in the revolution (position counter reset to zero each revolution).
9: Rotary positioning. Upon a position request, the mobile starts rotating at the speed defined by that position, and then, upon release of the position request, it stops at the angle defined by the position. (Pin indexing) (position counter reset to zero each revolution).
Note:
• The maximum value of the positions depends on the customer scale.
•þRefer to Section A4.11 for an explanation of rotary positioning.

0.52 : **Movement for one rotary system revolution**
Parameter valid in rotary system mode **0.51** = 5 to 9.
It is used to define the movement for one revolution of the rotary system.
Example:
If **0.52** = 3600, for one revolution the rotary system will give a position of 3600, which corresponds to a unit in tenths of a degree.

0.53 : **Automatic scaling**
This scaling allows the drive to define the ratio between the customer unit and the rotation of the motor, when **0.51** = 0 to 4.
• Move the mobile to a known position using I+ or I-.
• Enable the start of the scaling procedure by entering On (1) into **0.53**.
• Move the mobile to another known position using I+.
• Enter into **0.28** the value of the movement in customer units (e.g. the value 100 to express 100 cm or 100 mm).
• Enter **0.53** = OFF (0) to end the scaling procedure.
All positions will be expressed in the user unit defined by this procedure.

0.54 : **Relative position of the mobile**
Indicates the actual position of the mobile with respect to the previous position reached.

0.55 : **Menu 7x parameter selection**

0.56 : **Menu 7x parameter value**
It is possible to display the parameters of menus 70 to 75 of the SM-POS module by means of 2 parameters: **0.55** and **0.56**.
0.55 is used to select the parameter to be displayed (e.g. **0.55** = 7501, menu 75 parameter 01).
0.56 is used to read and/or modify the value of the parameter selected in **0.55**.
Note: These two parameters allow quick reading or easy modification of parameters of the advanced menus 7x (e.g. setting of positions greater than 16 bits).

H3 - Advanced menus

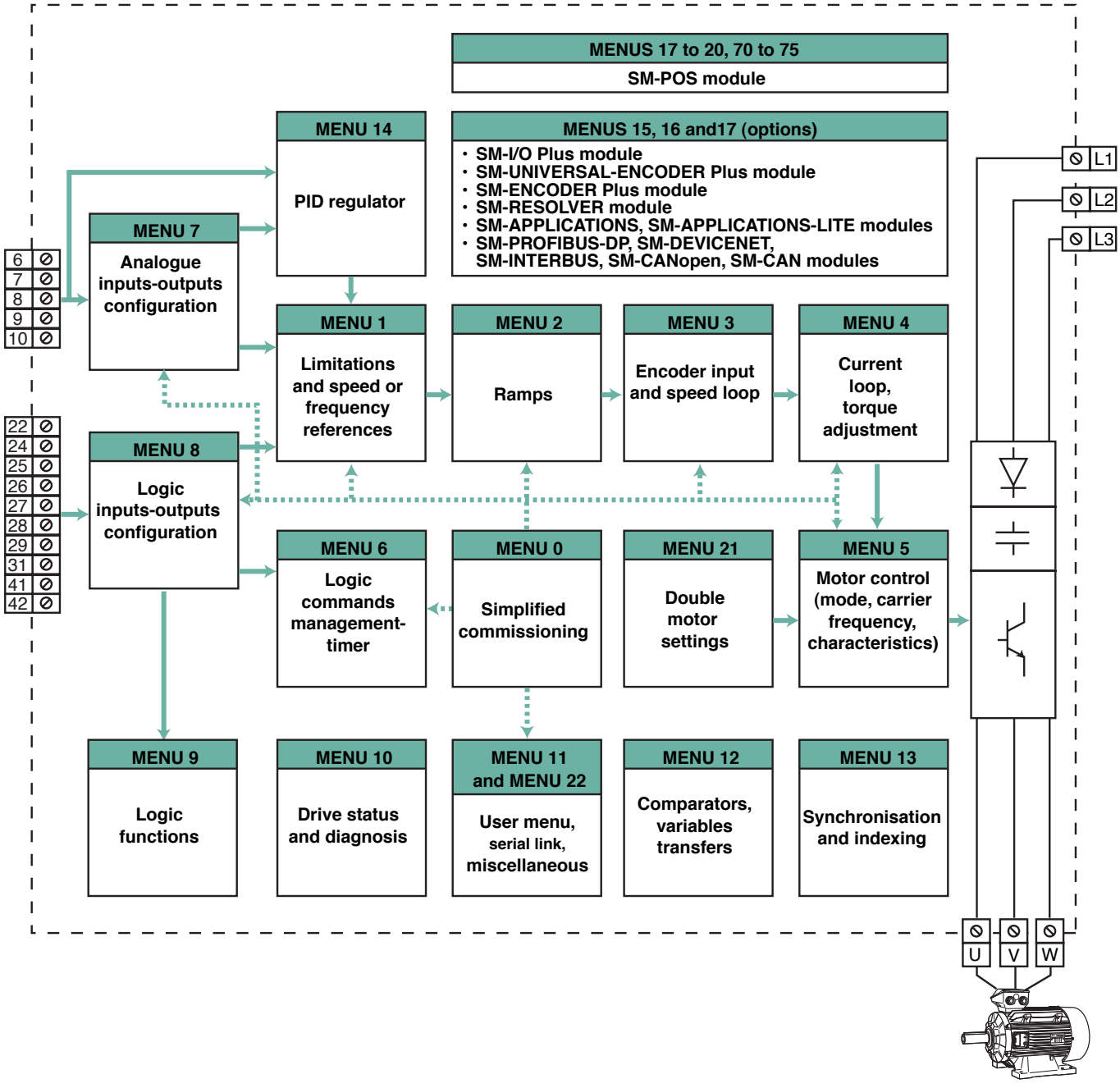
⚠ • Before setting the drive parameters using the diagrams, all instructions relating to installation, connection and commissioning of the drive contained in the previous sections must have been followed to the letter.

In addition, to ensure the safety of personnel and equipment, precautions must be taken during use of the parameters marked with the symbol ⚠.

For further details, refer to document ref. 3655 available in computer-readable version on the CD-ROM delivered with the drive.

H3.1 - Menus

Depending on the application, it is sometimes necessary to optimise the parameter settings of the variable speed drive beyond those accessible via menu 0.
For this reason, all the drive functions have been grouped together in the form of menus (22 menus).
For the positioning application, the user has special diagrams for setting parameters, plus explanations of the parameters of menus 17 to 20 and 70 to 75, related to the application.
However, all the basic functions of the drive and SM modules remain accessible via menus 1 to 17, 21 and 22 (diagrams or tables).



H3.2 - Parameter types

For each menu, a diagram shows schematically the function of the menu parameters.
The variation ranges which cannot be shown schematically are included in a table at the bottom of each diagram.
Symbols:
1.06 : A number in bold refers to a parameter.

2 / ⊘ : Refers to an input or output terminal of the drive.

• **Read/Write parameters**

1.21 : Parameters which appear in a rectangle or are identified by R-W are parameters with Read and Write access.
1.21

They can be designated as an assignment destination for connection to:
- Digital inputs for bit parameters
- Analog inputs for non-bit parameters.
- Outputs of internal functions (comparators, logical or arithmetical operations, etc.)

• **Read parameters**

1.01 : Parameters which appear in a diamond or are identified by RO are parameters with read access only.
1.01

They are used to provide information concerning operation of the drive and can be designated as an assignment source for connection to:
- Digital outputs for bit parameters
- Analog outputs for non-bit parameters
- Inputs of internal functions (comparators, logical or arithmetical operations, etc).

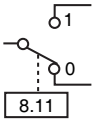
• **Read/Assignment parameters**

1.41 : Parameters which appear in a hexagon or are identified by R-A are parameters which can only be assigned to digital inputs (for bit parameters) or to analog inputs (for non-bit parameters).
1.41

This parameter type cannot therefore be modified directly.

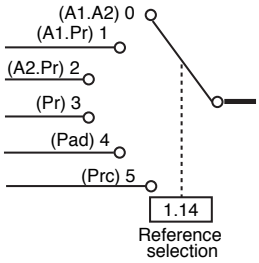
• **Binary parameters**

At the keyboard, these take the value "OFF" when they are inactive, and "On" when they are active.
Via a serial link, they take the value "0" when they are inactive, and "1" when they are active.
For easier reading of the diagrams, these parameters are represented by contacts, whose position corresponds to the factory setting.



• **Decimal parameters**

At the keyboard, these take a mnemonic value (e.g. A1.A2, Pr, etc.), and via a serial link they take a value 0, 1, 2, 3, etc.
For easier reading of the diagrams, these parameters are represented by contacts, whose position corresponds to the factory setting.



• **Numerical parameters**

A numerical parameter can be used to:
- Set a value which will be used in variable speed drive calculations (e.g. Inom motor **5.09**)
- Provide information on the drive operation (e.g. pre-ramp reference **1.03**).

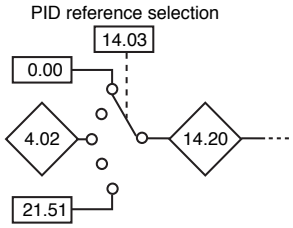
The maximum value of certain parameters may be variable depending on the drive type and the operating mode used, or depending on the effect other parameters may have.
For simplification, the maximum values of these parameters are expressed by mnemonics for which an explanation is given in Section H3.5.
Examples: REF. MAX, I MAX UTIL, U_{AC} MOT MAX, ETC.

• **"Source" parameters**

A source parameter allows the user to assign a parameter as the input of a function. After modification of a source, press Reset ⊘ for it to be recognised by the drive (or store using **0.00** = 1000 + ⊘).
The value of the source corresponds to:

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

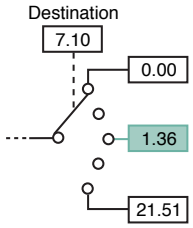
Example:



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

• **"Destination" parameter**
A destination parameter allows the user to assign a parameter as the output of a function. After modification of a destination, press Reset for it to be recognised by the drive (or store using **0.00** = 1000 +).
The value of the destination corresponds to:
- 0 or 1 if a binary parameter is assigned as a destination
- $\frac{\text{Output value x max. value of the destination parameter}}{100\ \%}$ if a non-binary parameter is assigned as a destination.

Example:



When the output of the function is at 100%, **1.36** reaches its theoretical maximum value, i.e. REF MAX.
Note: If a protected parameter is assigned as a destination, then this assignment will not be recognised.

H3.3 - Factory setting

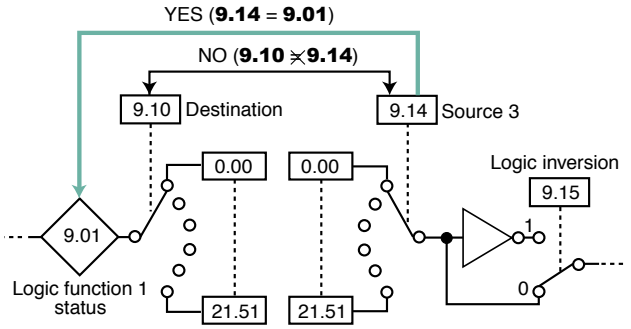
The operation of the drive using factory settings is depicted by a green line.
For sources and destinations, the parameters assigned with factory settings are depicted in green.

H3.4 - Use

• **Assignments:**
- Unknown parameter:
If an unknown parameter is assigned to a source or a destination, in that case the value 0 will be used by the drive.

- Double assignment:
A parameter cannot be assigned twice as a destination. In the event of unintentional double assignment, the drive initiates a "dESt" trip state, which will persist until the assignment problem is resolved (except for menus 15, 16 and 17).
Note: It may be necessary to check the parameters already assigned in the factory settings, depicted in green in the diagrams.

- Association:
Do not assign a destination parameter in a source parameter.



• After modification of a destination, the old destination parameter goes back to the value 0, except in the case of a return to factory settings where the old parameter takes its factory value again. In the case of a transfer by SMARTCARD to the drive, the old destination parameter keeps its old value, unless its value is modified by the SMARTCARD.

H3.5 - Definitions of maximum values

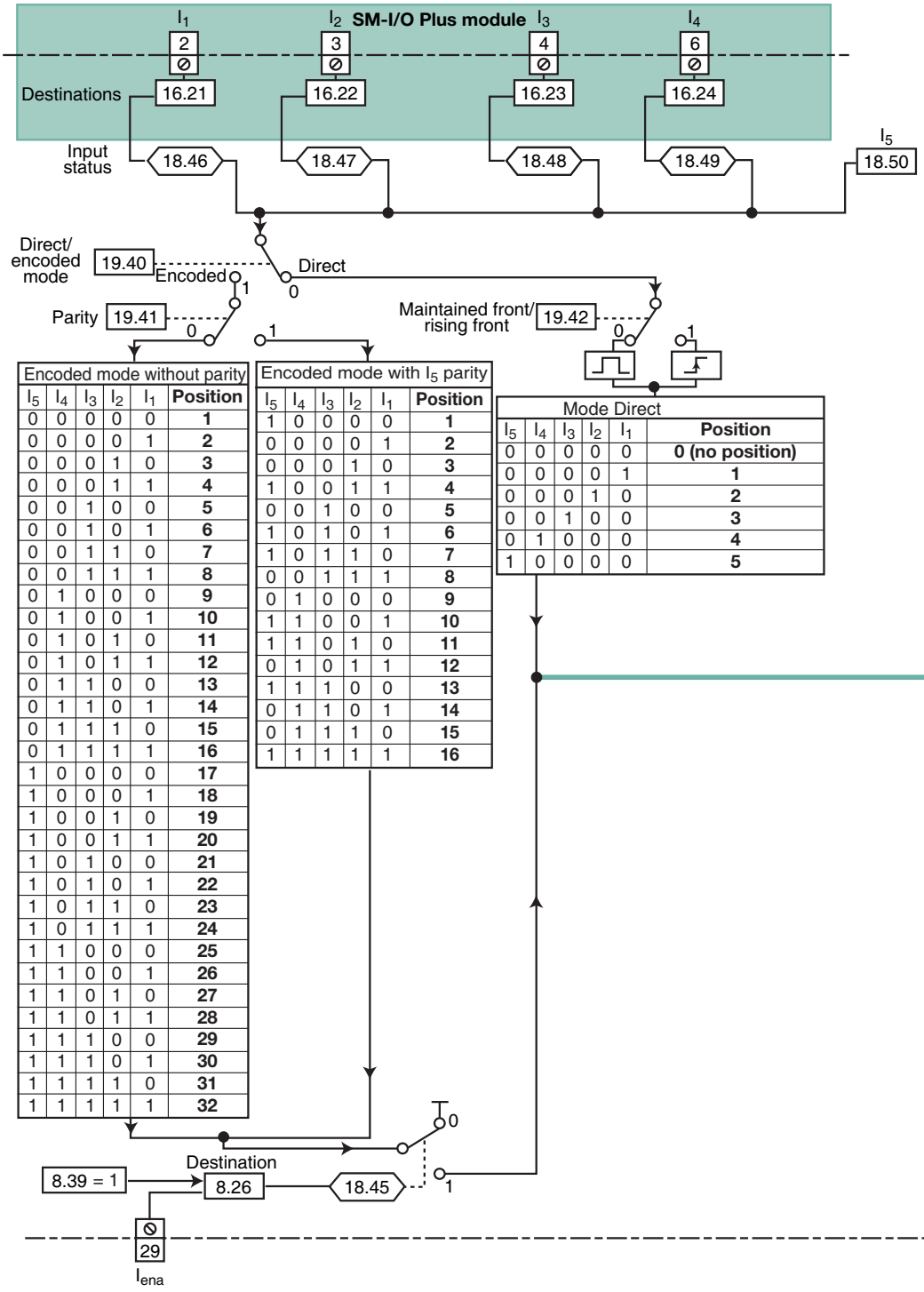
Range	Definition
REF MAX : 3000.0 Hz and : 40000.0 min^{-1}	**Maximum frequency reference ( ) or maximum speed reference (and)** • If **1.08** = 0: REF MAX = **1.06** • If **1.08** = 1: REF MAX = **1.06** or - (**1.07**) If the second motor is selected, the limits correspond to **21.01** (instead of **1.06**) and **21.02** (instead of **1.07**).
LIM N MAX 40000.0 min^{-1}	**Maximum applied to the speed reference limitations** A maximum limit may be applied to the speed reference to avoid the encoder rated frequency exceeding 500 kHz. The maximum is defined by: LIM N MAX (min^{-1}) = 410 kHz x 60/ELPR = 2.46 x 10^7/ELPR Quadrature encoder ELPR: drive encoder lines per revolution Frequency encoder ELPR/direction: drive encoder lines per revolution/2 Resolver ELPR: resolution/4 SinCos ELPR: number of sinusoids per revolution Encoder with serial link ELPR: resolution/4
N MAX 40000.0 min^{-1}	**Maximum speed** This maximum is used for certain parameters of menu 3 related to the speed. N MAX = 2 x REF MAX
I_N MAX 9999.99 A	**Maximum motor rated current** I_N MAX ≤ 1.36 x Maximum drive rated current (**11.32**).
I_{MAX} DRIVE 9999.99 A	**Maximum drive current** The maximum drive current corresponds to the "OIAC" overcurrent trip level, such that: I_{MAX} DRIVE = Maximum drive rated current (**11.32**)/0.45
LIM IM1 MAX 1000.0%	**Maximum current limit set for motor 1** and : $\text{LIM IM1 MAX} = \left[\sqrt{\left[\frac{I_{MAX}}{\mathbf{5.07}} \right]^2 + \cos\varphi^2 - 1} \;\middle/\; \cos\varphi \right] \times 100\ \%$ **Note:** I_{MAX} corresponds to 1.75 x (I_{sp} in maximum overload) if the current configured in **5.07** is less than or equal to the maximum value of the current in maximum overload given in **11.32**, otherwise I_{MAX} corresponds to 1.1 x (I_{sp} in reduced overload). Cos φ = **5.10** : $\text{LIM IM1 MAX} = \frac{I_{MAX}}{\mathbf{5.07}} \times 100\ \%$ **Note**: I_{MAX} corresponds to the drive rated current (**11.32**) x 1.75.
LIM IM2 MAX 1000.0%	**Maximum current limit set for motor 2** $\text{LIM IM2 MAX} = \left[\sqrt{\left[\frac{I_{MAX}}{\mathbf{21.07}} \right]^2 + \cos\varphi^2 - 1} \;\middle/\; \cos\varphi \right] \times 100\ \%$ **Note:** I_{MAX} corresponds to 1.75 x (I_{sp} in maximum overload) if the current configured in **21.07** is less than or equal to the maximum value of the current in maximum overload given in **11.32**, otherwise I_{MAX} corresponds to 1.1 x (I_{sp} in reduced overload). Cos φ = **21.10** : $\text{LIM IM1 MAX} = \frac{I_{MAX}}{\mathbf{21.07}} \times 100\ \%$ **Note**: I_{MAX} corresponds to the drive rated current (**11.32**) x 1.75.
I_{ACTIVE} MAX 1000.0%	This is the value of LIM IM1 MAX or LIM IM2 MAX depending on the parameter settings used (motor 1 or 2).
I_{MAX} UTIL 1000.0%	**Limiting of the current parameters by the user (4.24)** The user can select a maximum for **4.08** (torque reference) and **4.20** (load percentage) for scaling the analog I/O with **4.24**. This maximum is limited by LIM IM1 MAX or LIM IM2 MAX depending on the motor selected.

Definitions of maximum values (continued)

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

H4 - Positioning diagrams

• Position selection



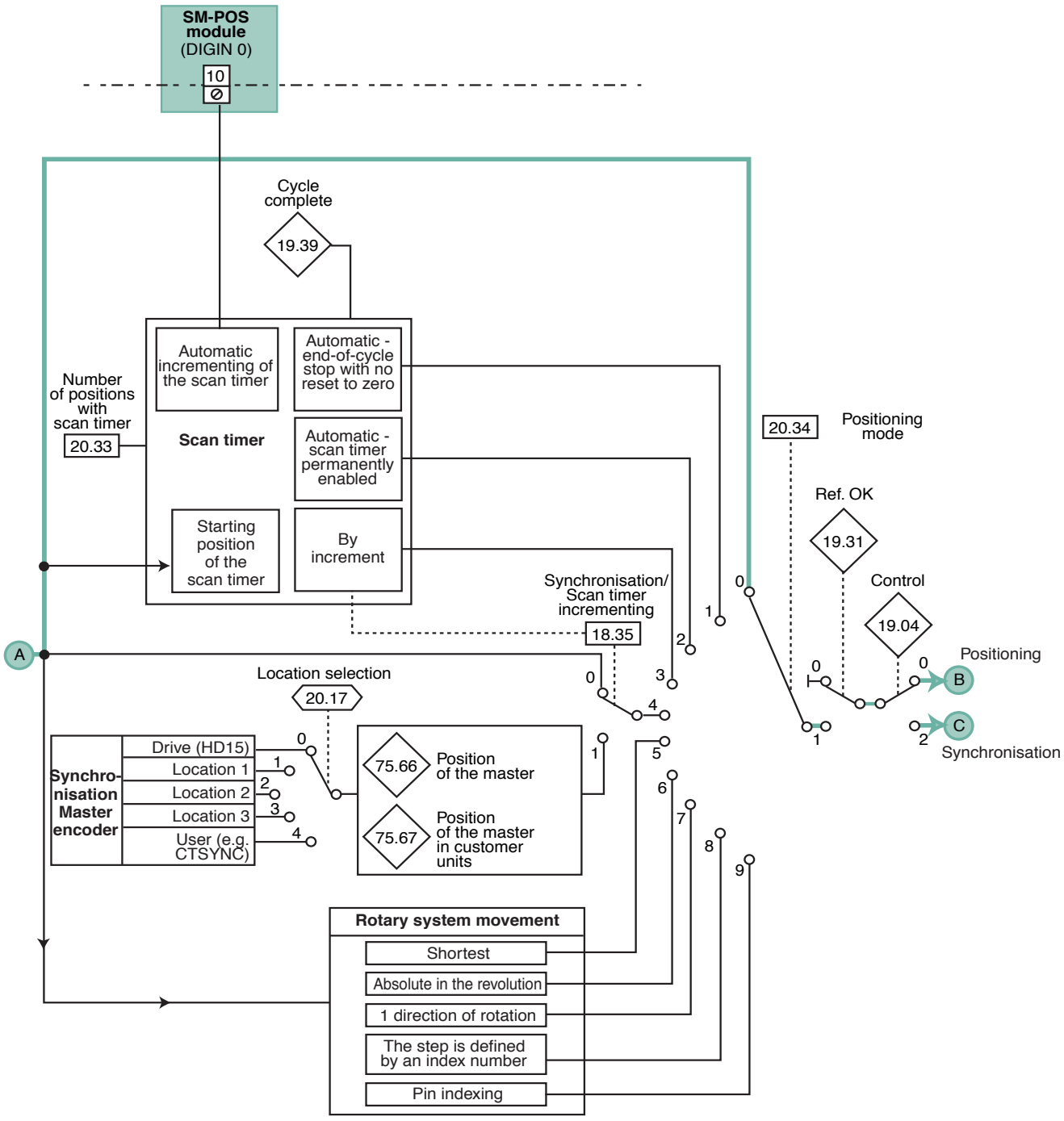
I5	I4	I3	I2	I1	Position
0	0	0	0	0	1
0	0	0	0	1	2
0	0	0	1	0	3
0	0	0	1	1	4
0	0	1	0	0	5
0	0	1	0	1	6
0	0	1	1	0	7
0	0	1	1	1	8
0	1	0	0	0	9
0	1	0	0	1	10
0	1	0	1	0	11
0	1	0	1	1	12
0	1	1	0	0	13
0	1	1	0	1	14
0	1	1	1	0	15
0	1	1	1	1	16
1	0	0	0	0	17
1	0	0	0	1	18
1	0	0	1	0	19
1	0	0	1	1	20
1	0	1	0	0	21
1	0	1	0	1	22
1	0	1	1	0	23
1	0	1	1	1	24
1	1	0	0	0	25
1	1	0	0	1	26
1	1	0	1	0	27
1	1	0	1	1	28
1	1	1	0	0	29
1	1	1	0	1	30
1	1	1	1	0	31
1	1	1	1	1	32

I5	I4	I3	I2	I1	Position
1	0	0	0	0	1
0	0	0	0	1	2
0	0	0	1	0	3
1	0	0	1	1	4
0	0	1	0	0	5
1	0	1	0	1	6
1	0	1	1	0	7
0	0	1	1	1	8
0	1	0	0	0	9
1	1	0	0	1	10
1	1	0	1	0	11
0	1	0	1	1	12
1	1	1	0	0	13
0	1	1	0	1	14
0	1	1	1	0	15
1	1	1	1	1	16

I5	I4	I3	I2	I1	Position
0	0	0	0	0	0 (no position)
0	0	0	0	1	1
0	0	0	1	0	2
0	0	1	0	0	3
0	1	0	0	0	4
1	0	0	0	0	5

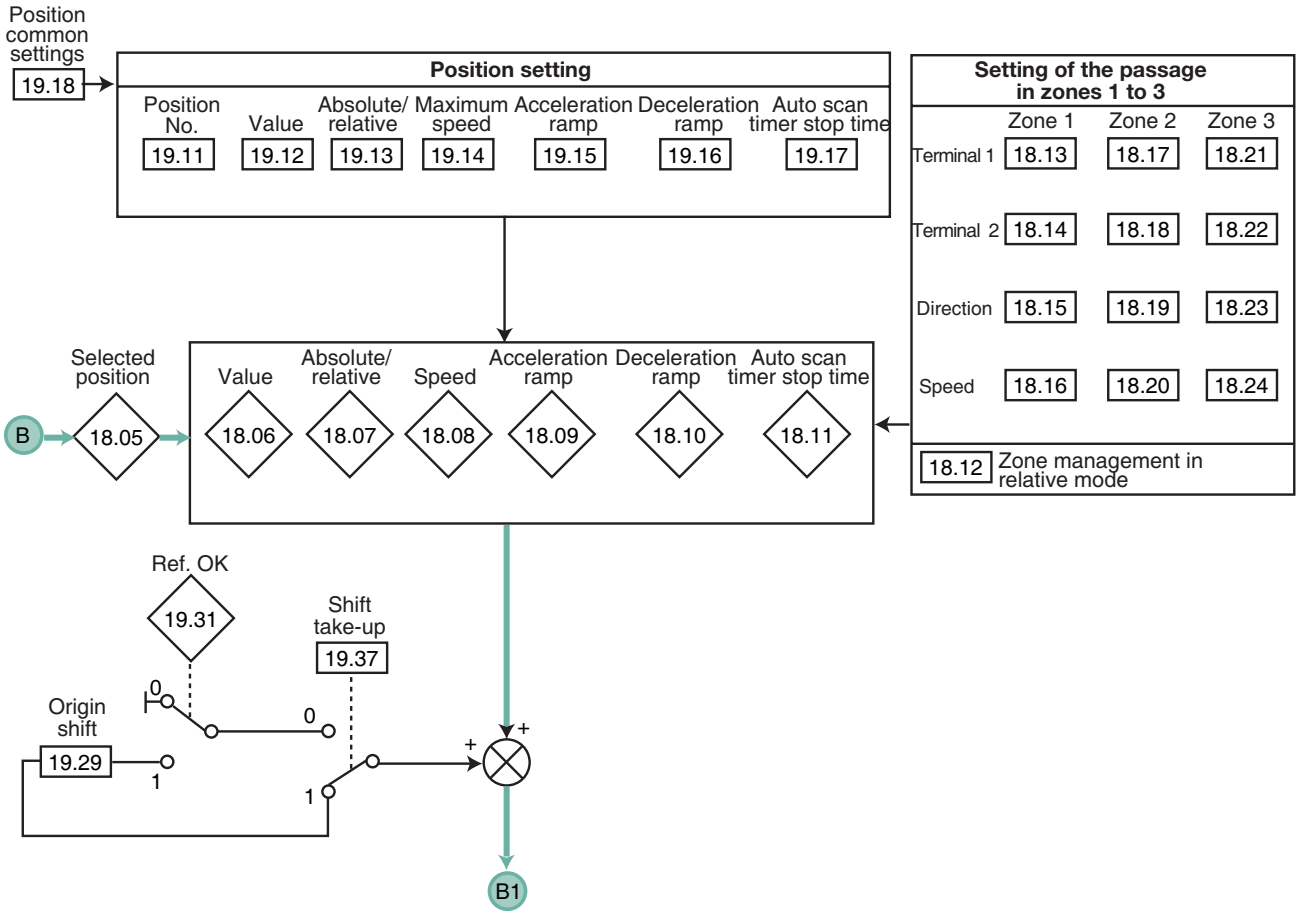
Parameters	Variation range			Factory setting		
8.26	**0.00** to **21.51**			**18.45**		
16.21	**0.00** to **21.51**			**18.46**		
16.22	**0.00** to **21.51**			**18.47**		
16.23	**0.00** to **21.51**			**18.48**		
16.24	**0.00** to **21.51**			**18.49**		
18.46 to **18.50**	OFF (0) or On (1)			-		

• **Positioning mode selection**



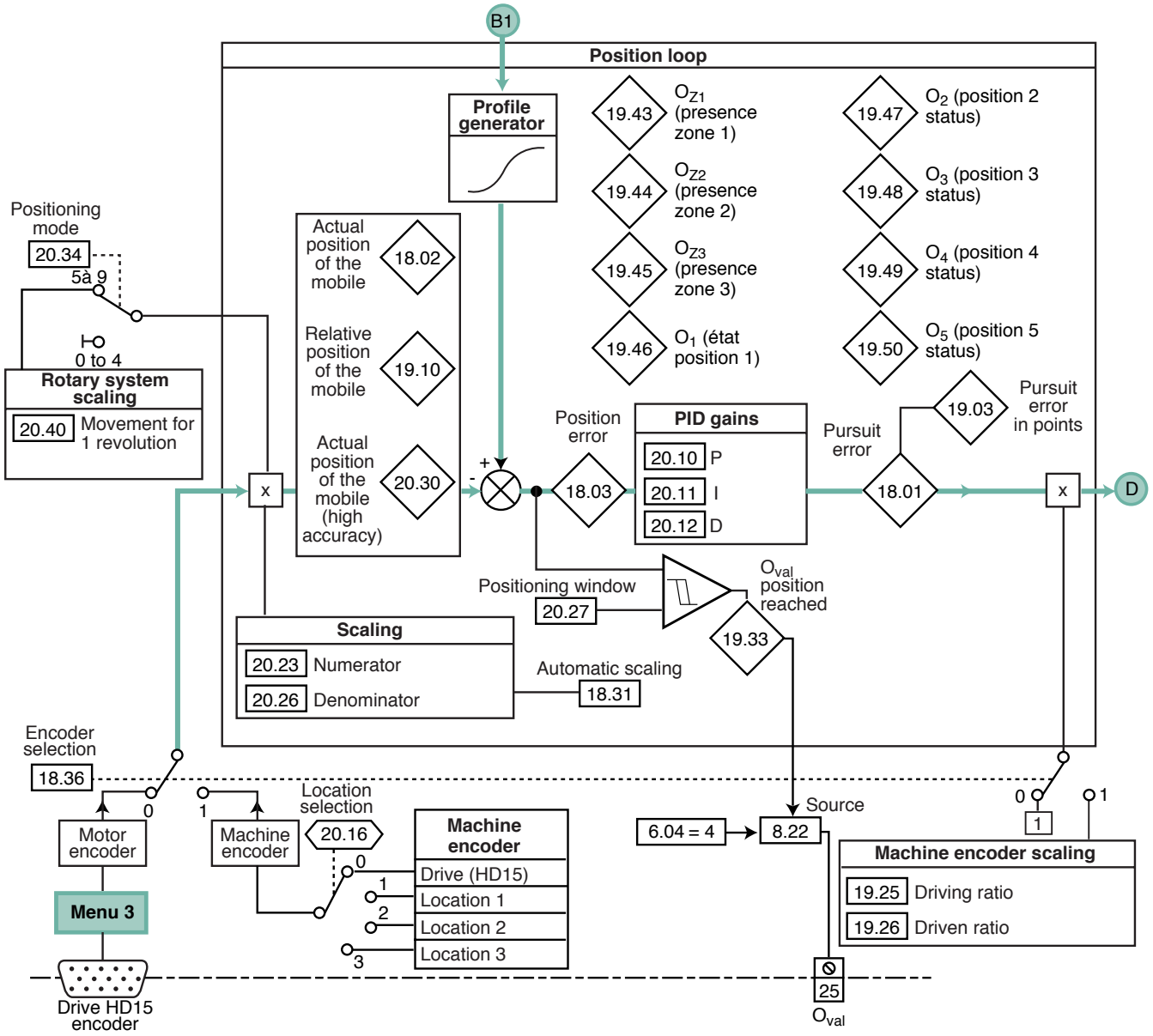
Parameters	Variation range			Factory setting		
19.39	OFF (0) or On (1)			-		
20.33	1 to 32			1		
75.66 - 75.67	± 31 bits			-		

• Positioning



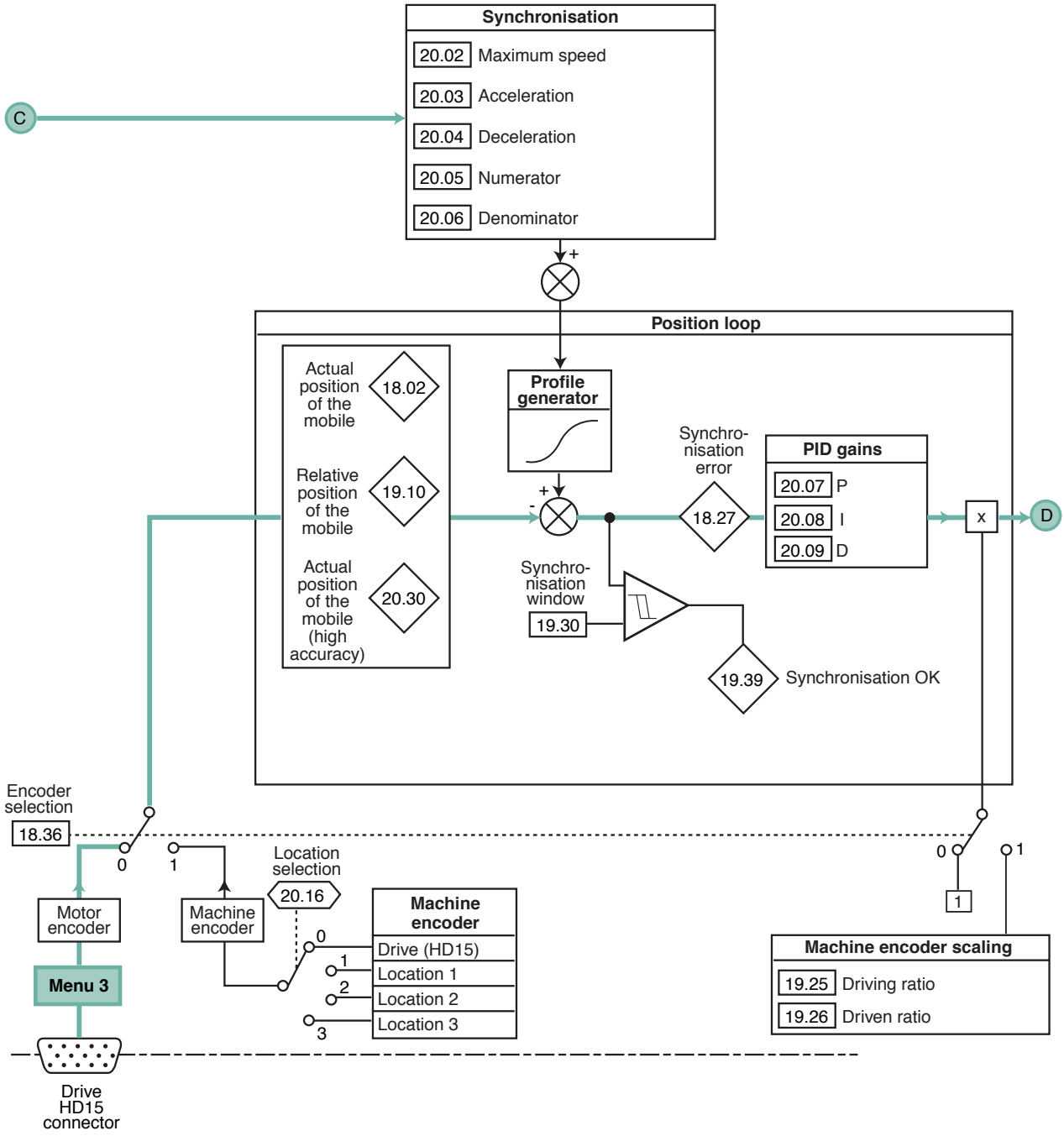
Parameters	Variation range			Factory setting		
18.06	-32768 to 32767 (customer unit)			-		
18.05	0 to 32			-		
18.07	0 or 1			-		
18.08	-32768 to 32767 min^{-1}			-		
18.09 and **18.10**	0 to 32767 1/100 s for 1000 min^{-1}			-		
18.11	0 to 32767 ms			-		
18.12 - **19.13** - **19.18**	0 or 1			0		
18.13 - **18.14** - **18.17** - **18.18** **18.21** - **18.22** - **19.10** - **19.12** **19.29**	-32768 to 32767 (customer unit)			0		
18.15 - **18.19** - **18.23**	0 to 3			3		
18.16 - **18.20** - **18.24**	1 to 32767 min^{-1}			0		
19.11	1 to 32			1		
19.14	1 to (**1.06** x 0.9) min^{-1}			1350 min^{-1}		
19.15 - **19.16**	0 to 32767 1/100 s for 1000 min^{-1}			200 1/100 s for 1000 min^{-1}		
19.17	0 to 32767 ms			0		

• **Positioning (continued)**



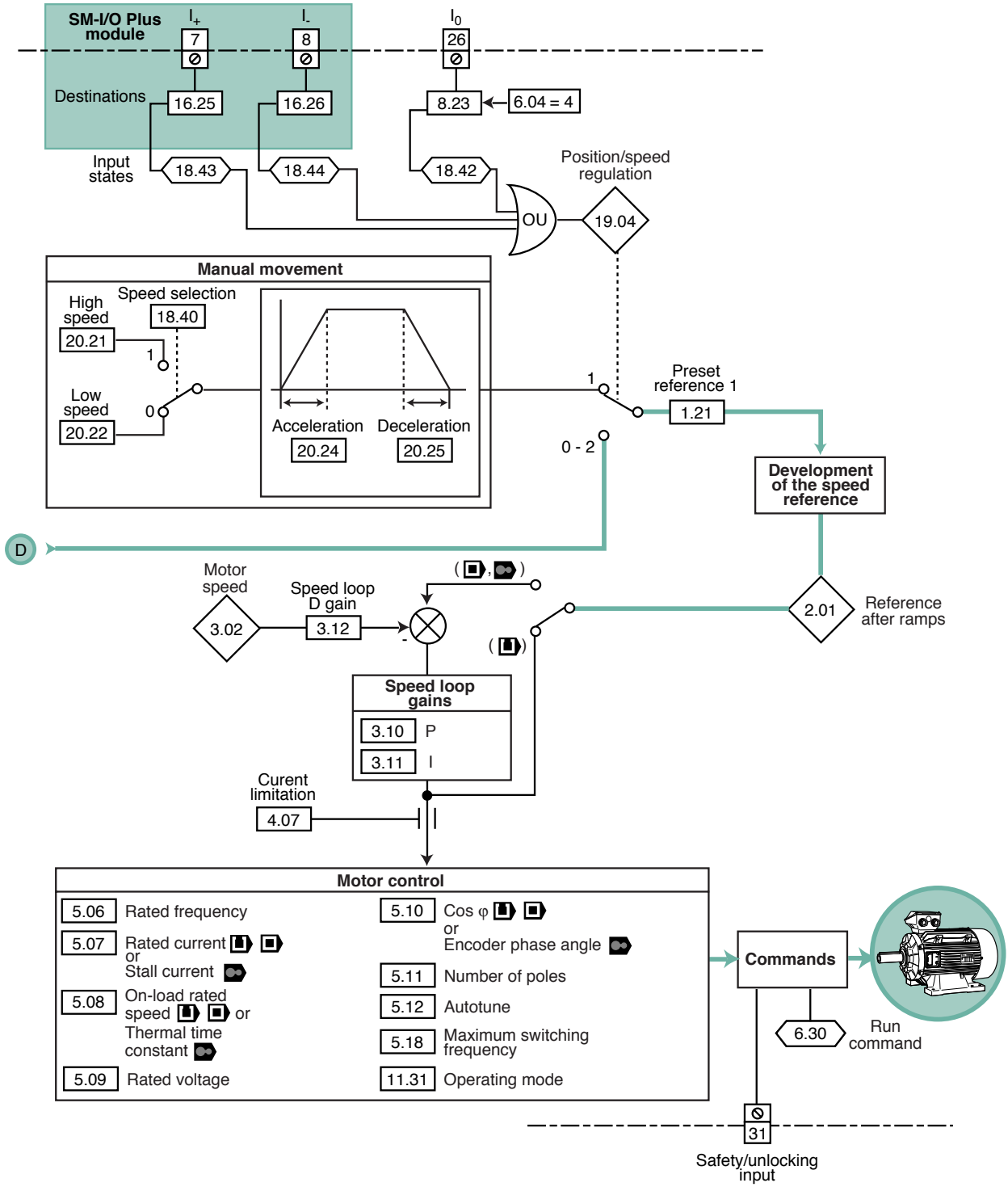
Parameters	Variation range			Factory setting		
8.22	**0.00** to **21.51**			**19.33**		
18.01 - **18.02** - **18.03**	-32768 to 32767 (customer unit)			-		
18.31	OFF (0) or On (1)			OFF (0)		
19.03	-32768 to 32767			-		
19.10	-32768 to 32767 (customer unit)			0		
19.25	-32768 to 32767			1		
19.26	1 to 32767			1		
19.33 - **19.43** to **19.50**	OFF (0) or On (1)			-		
20.10	0 to 32767			500		
20.11	0 to 32767			0		
20.12	0 to 32767			1000		
20.23	-999999 to 9999999			65536		
20.26	1 to 9999999			10		
20.27	1 to 9999999 (customer unit)			10		
20.30	-999999 to 9999999			-		
20.40	1 to 9999999			3600		

• **Synchronisation**



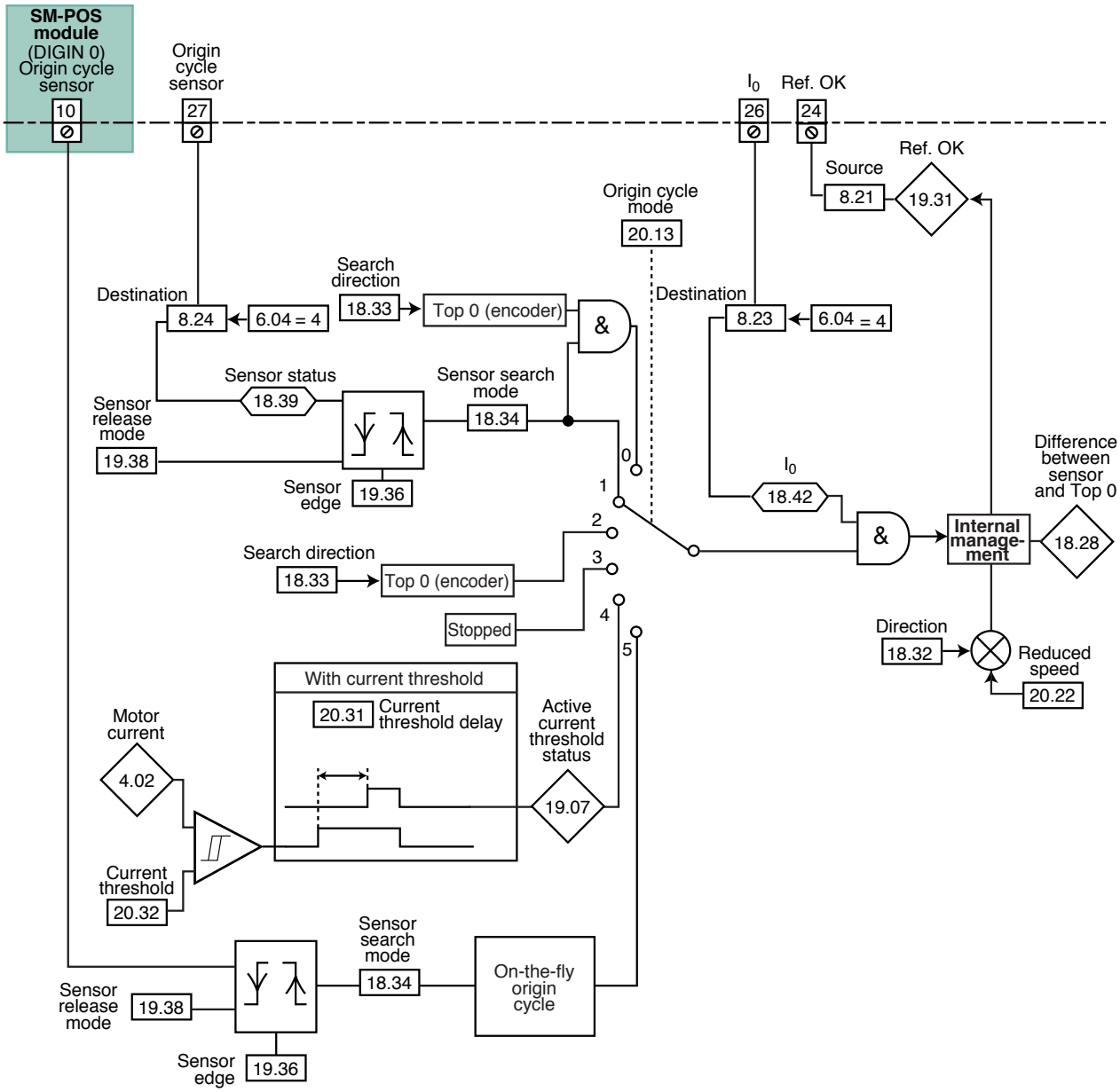
Parameters	Variation range			Factory setting		
18.02 - **18.27**	-32768 to 32767 (customer unit)			-		
19.10	-32768 to 32767 (customer unit)			-		
19.25 - **20.05** - **20.06**	-32768 to 32767			1		
19.26	1 to 32767			1		
19.30	1 to 32767 (customer unit)			10		
19.39	OFF (0) or On (1)			-		
20.02	1 to 32767 min^{-1}			**1.06** min^{-1}		
20.03 - **20.04**	0 to 32767 1/100 s for 1000 min^{-1}			0		
20.07	0 to 32767			500		
20.08	0 to 32767			0		
20.09	0 to 32767			1000		
20.30	-999999 to 9999999 (customer unit)			-		

• **Control mode**



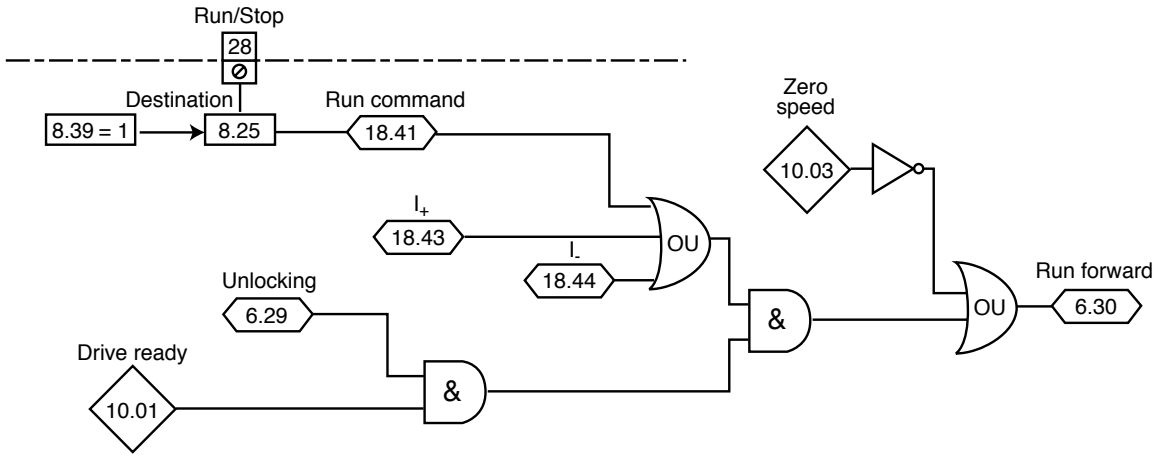
Parameters	Variation range			Factory setting		
1.21	± REF. MAX			0		
2.01	± REF. MAX			-		
3.02	± N MAX (min^{-1})			-		
3.10	-	0 to 6.5535 ($1/rads^{-1}$)		-	0.0100 ($1/rads^{-1}$)	
3.11	-	0 to 655.35 (1/rad)		-	1.00 (1/rad)	
3.12	OFF (0) or On (1)	0 to 0.65535 s		OFF (0)	0	
4.07	0 to LIM IM1 MAX (%)			165.0%	175.0%	
5.06	0 to 3000.0 Hz	0 to 1250.0 Hz		50.0 Hz (EUR) 60.0 Hz (USA)		
5.07	0 to In MAX (A)			Inom DRIVE (**11.32**)		
5.08	0 to 180000 min^{-1}	0 to 40000.00 min^{-1}		1500 min^{-1} (EUR) 1800 min^{-1} (USA)	1450.00 min^{-1} 1770.00 min^{-1}	3000.00 min^{-1}
5.09	0 to Uac MOT MAX (V)			TL: 200 V T: 400 V (EUR)/480 V (USA) TM: 575 V; TH: 690 V		
5.10	0 to 1.000		0 to 359.9°	0.850		0
5.11	Auto (0) to 120POLE (60)			Auto (0)		6POLE (3)
5.12	0 to 2	0 to 4	0 to 6	0		
5.18	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz (16 kHz not available for sizes 3)			3 (0) kHz		6 (2) kHz
6.30	OFF (0) or On (1)			OFF (0)		
11.31	OPEn LP (1), CL VECt (2), SerV (3), REgEn (4)			OPEn LP (1)		
8.23	**0.00** to **21.51**			**18.42**		
16.25	**0.00** to **21.51**			**18.43**		
16.26	**0.00** to **21.51**			**18.44**		
18.42 to **18.44**	OFF (0) or On (1)			-		
20.21	0 to **1.06** min^{-1}			1500 min^{-1}		
20.22	0 to **1.06** min^{-1}			150 min^{-1}		
20.24 - **20.25**	1 to 32000 1/100 s for 1000 min^{-1}			200 1/100 s for 1000 min^{-1}		

• **Origin cycle**

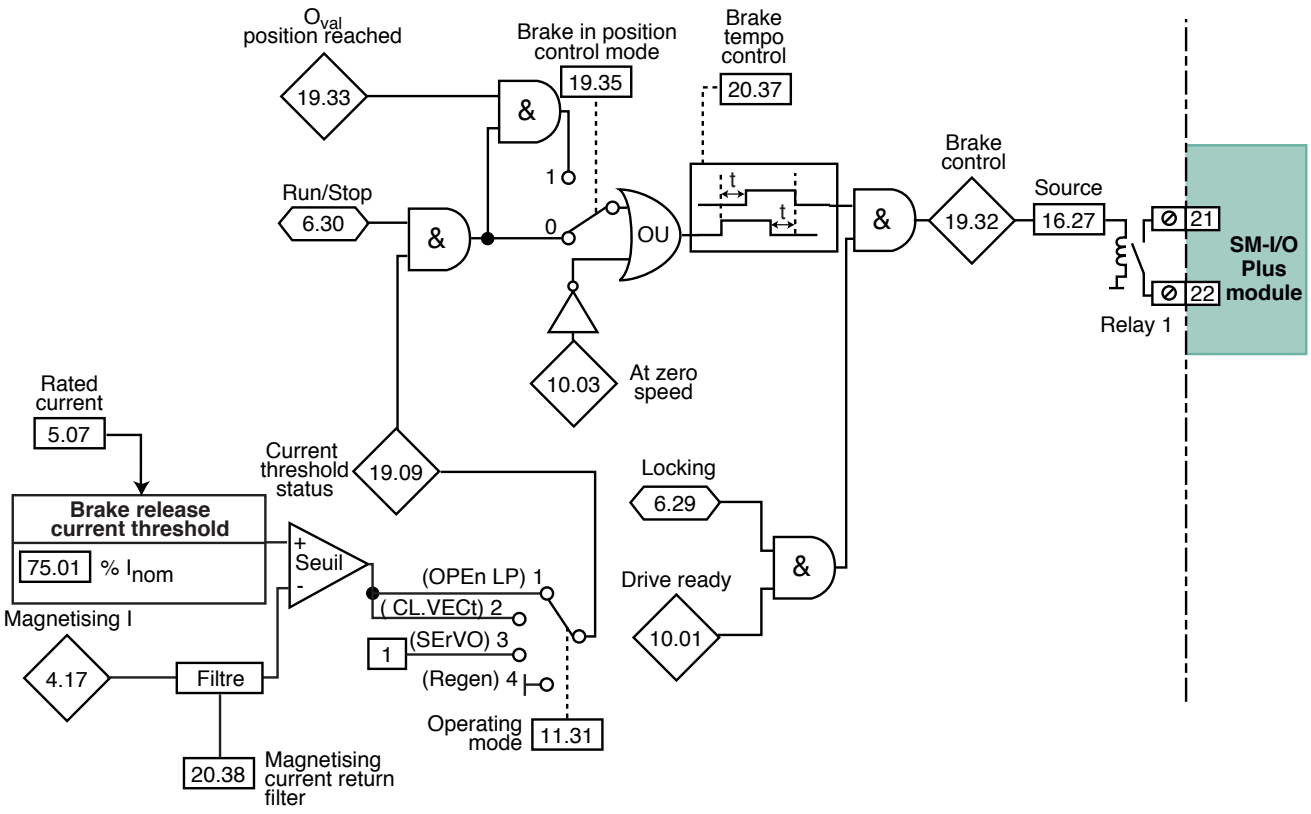


Parameters	Variation range			Factory setting		
18.39 - 18.42 - 19.31	OFF (0) or On (1)			-		
4.02	± I_{MAX} DRIVE (A)			-		
8.21	**0.00** to **21.51**			**19.31**		
8.24	**0.00** to **21.51**			**18.39**		
18.28	-32768 to 32767 (customer unit)			-		
18.32 - 18.33 - 19.38	OFF (0) or On (1)			OFF (0)		
18.34 - 19.36	OFF (0) or On (1)			On (1)		
19.07	0 to 2			-		
20.22	0 to **1.06** min^{-1}			150 min^{-1}		
20.31	0 to 9999999 ms			100 ms		
20.32	0 to 9999999 mA			2000 mA		

- **Run command management**

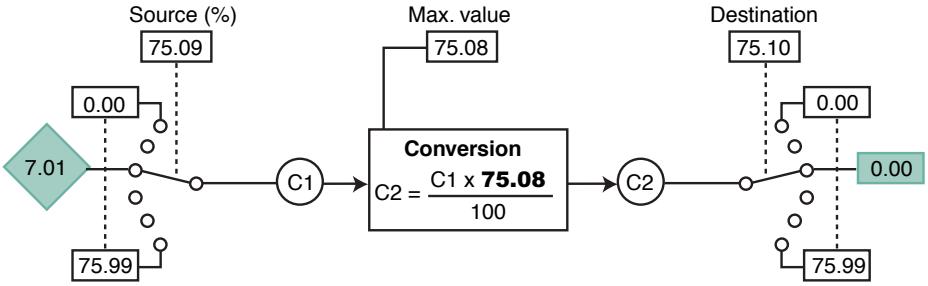


- **Brake control**



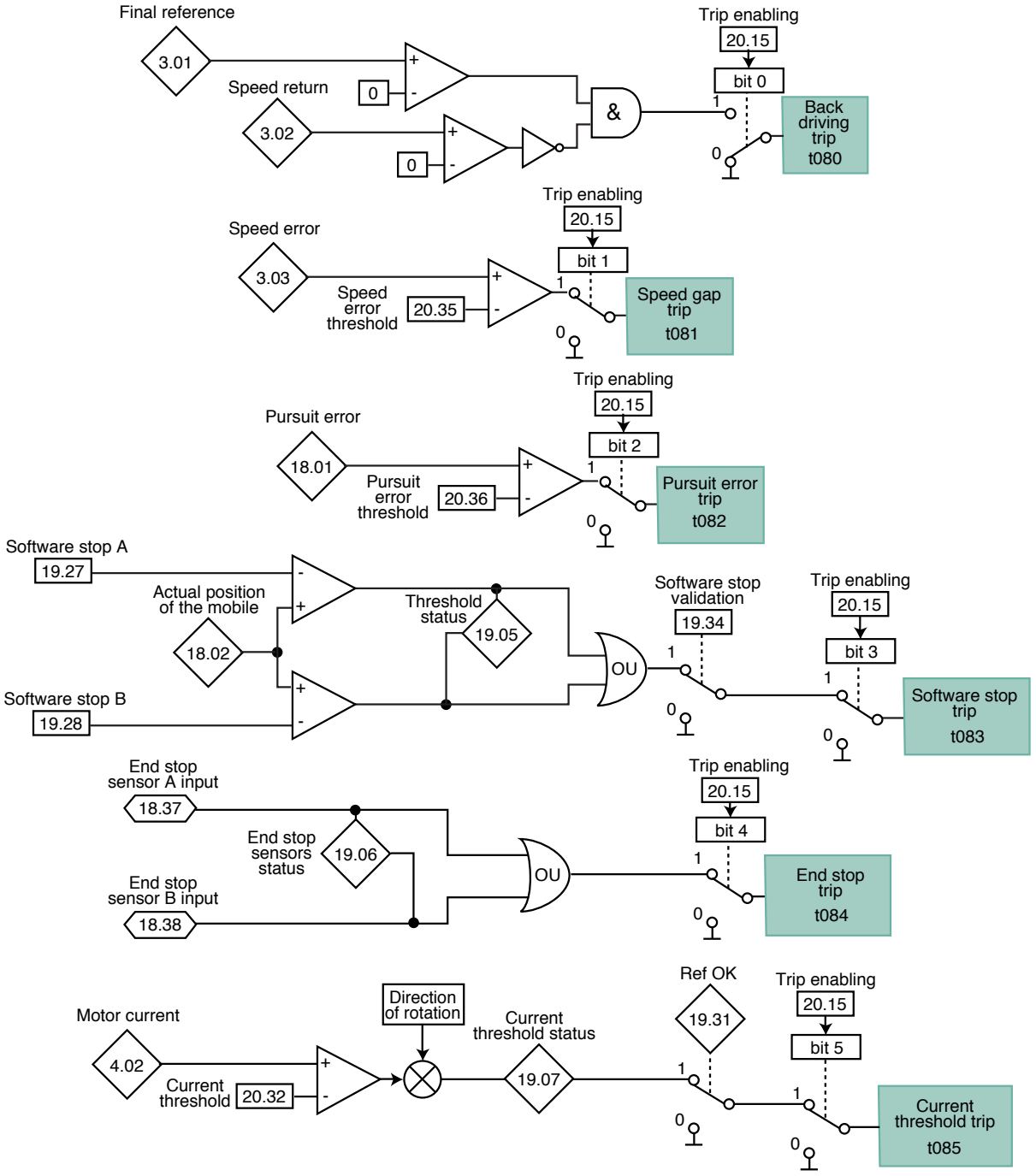
Parameters	Variation range			Factory setting		
4.17	± I_{MAX} DRIVE (A)			-		
5.07	0 to I_N MAX (A)			I_{NOM} DRIVE (A) (**11.32**)		
6.29 - **6.30** - **10.01** - **10.03** **19.32** - **19.33**	OFF (0) or On (1)			-		
16.27	**0.00** to **21.51**			**19.32**		
18.41 to **18.44**	OFF (0) or On (1)			-		
19.09	0 or 1			-		
20.37	0 to 9999999 ms			0		
20.38	0 to 9999999 ms			18 ms		
75.01	0 to 100% (% of **5.07**)			25%		

• **Conversion of a value into a percentage**



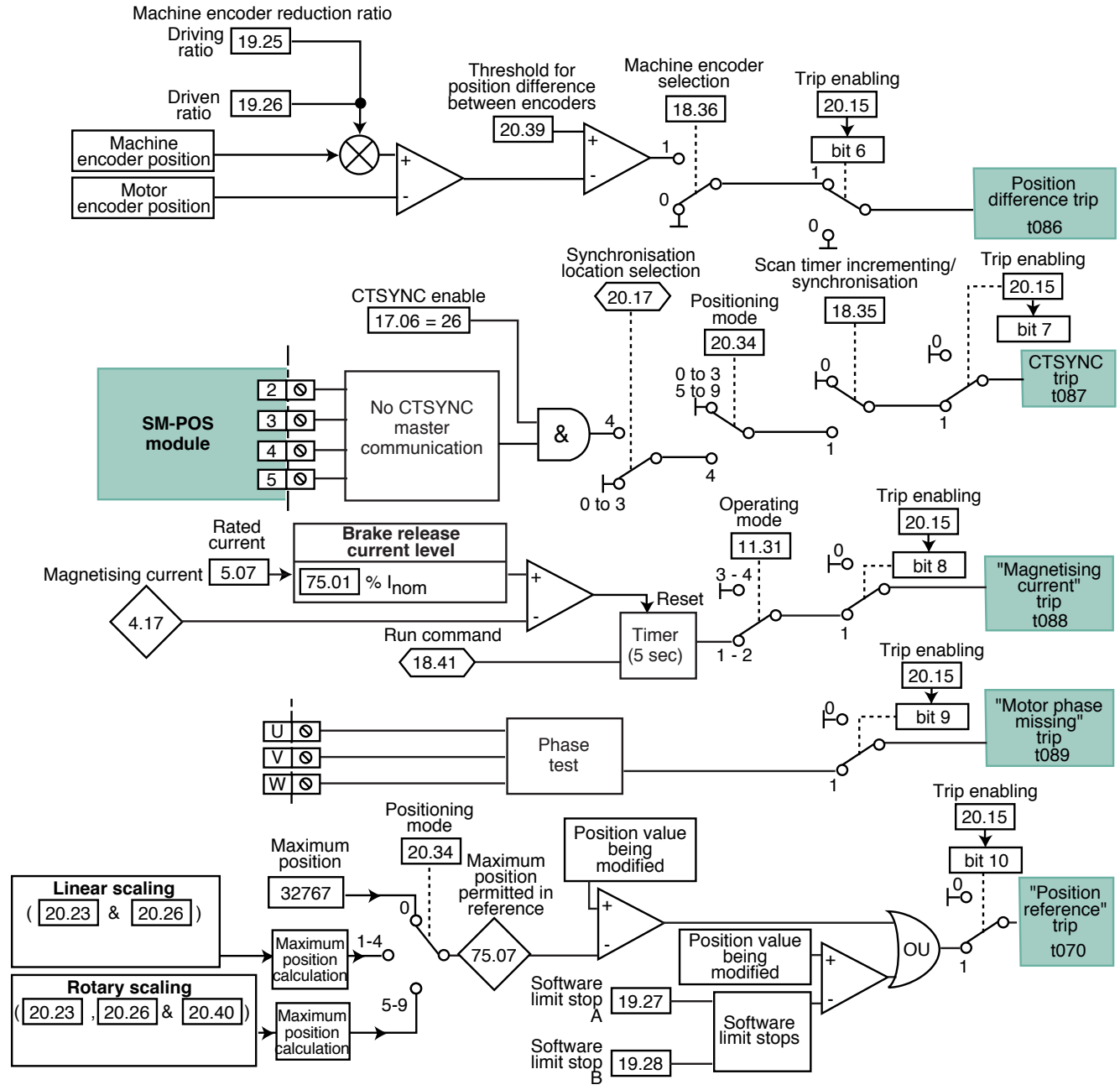
Parameters	Variation range			Factory setting		
75.08	0 to 31 bits			1350		

• Trip management



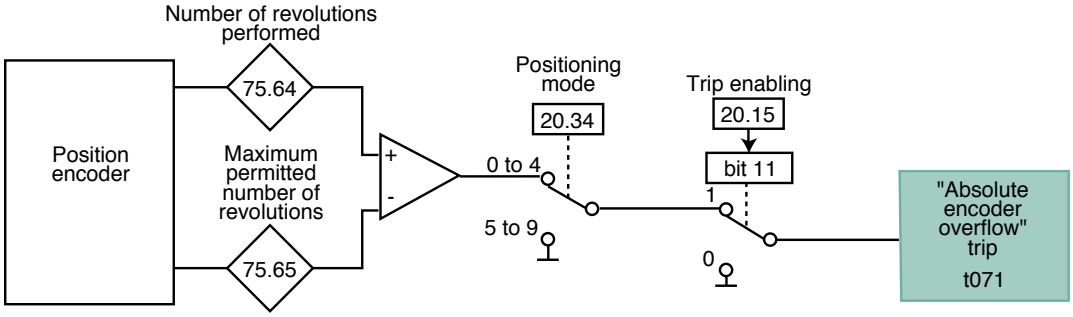
Parameters	Variation range			Factory setting		
3.01 - 3.02 - 3.03	±1000.0 Hz	±N MAX		-		
4.02	± I_{MAX} DRIVE (A)			-		
18.01 - 18.02	-32768 to 32767			-		
18.37 - 18.38	OFF (0) or On (1)			OFF (0)		
19.05 - 19.06 - 19.07	0 to 2			-		
19.27	-32768 to 32767 (customer unit)			32767		
19.28	-32768 to 32767 (customer unit)			-32767		
20.32	-999999 to 9999999 mA			2000 mA		
20.35	0 to 9999999 min^{-1}			500 min^{-1}		
20.36	0 to 9999999 (customer unit)			200		

• Trip management (continued)



Parameters	Variation range			Factory setting		
4.17	± I_{MAX} DRIVE (A)			-		
5.07	0 to I_N MAX (A)			I_{NOM} DRIVE (A) (**11.32**)		
18.41	OFF (0) or On (1)			-		
19.25	-32768 to 32767			1		
19.26	1 to 32767			1		
19.27	-32768 to 32767			32767		
19.28	-32768 to 32767			-32767		
20.23	-999999 to 9999999			65536		
20.26	1 to 9999999			10		
20.38	0 to 9999999 ms			18 ms		
20.39	0 to 9999999 (customer unit)			65536		
20.40	1 to 9999999			3600		
75.01	0 to 100% (% of **5.07**)			30%		
75.07	± 31 bits (customer unit)			-		

• Trip management (continued)



Parameters	Variation range			Factory setting		
75.64 - **75.65**	± 31 bits			-		

H5 - Explanation of positioning parameters

H5.1 - Menu 17

H5.1.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
17.01 to **17.05**	Reserved			
17.06	Configuration of the module's RS485	L-A	0 to 255	-
17.07 to **17.18**	Reserved			
17.19	Positioning module reset	L-E	OFF (0) or On (1)	OFF (0)
17.20 to **17.48**	Reserved			
17.49	Positioning program version	LS	0 to 9999	-

H5.1.2 - Explanations of parameters

17.01 to **17.05** : **Reserved**

17.06 : **Positioning module RS485 configuration**
1: ANSI slave
25: CTSYNC master
26: CTSYNC slave
Note: Automatic setting of **17.06** as CTSYNC master or slave.

17.07 to **17.18** : **Reserved**

17.19 : **Positioning module reset**
OFF (0): No reset requested or reset complete
On (1): Positioning module reset
Note: Upon a change to On (1), **17.19** quickly changes back to OFF (0) to indicate the end of the reset.

17.20 to **17.48** : **Reserved**

17.49 : **Positioning program version**

The program version is displayed by blinking.
Example: For version 32000610, 3200 and 610 are displayed alternately.

H5.2 - Menu 18

H5.2.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
18.01	Pursuit error	RO	-32768 to 32767 (customer unit)	-
18.02	Actual position of the mobile	RO	-32768 to 32767 (customer unit)	-
18.03	Position error	RO	-32768 to 32767 (customer unit)	-
18.04	Speed of the mobile	RO	-32768 to 32767 customer unit/min	-
18.05	Selected position	RO	0 to 32	-
18.06	Selected position value	RO	-32768 to 32767 (customer unit)	-
18.07	Selected position type	RO	0 or 1	-
18.08	Selected position speed	RO	-32768 to 32767 min^{-1}	-
18.09	Selected position acceleration time	RO	0 to 32767 1/100 s for 1000 min^{-1}	-
18.10	Selected position deceleration time	RO	0 to 32767 1/100 s for 1000 min^{-1}	-
18.11	Selected position auto scan timer stopping time	RO	0 to 32767 ms	-
18.12	Zone management in relative mode	L-E	0 or 1	0
18.13	Terminal 1 of zone 1	R-W	-32768 to 32767 (customer unit)	0
18.14	Terminal 2 of zone 1	R-W	-32768 to 32767 (customer unit)	0
18.15	Direction of passage in zone 1	R-W	0 to 3	3
18.16	Speed in zone 1	R-W	1 to 32767 min^{-1}	0
18.17	Terminal 1 of zone 2	R-W	-32768 to 32767 (customer unit)	0
18.18	Terminal 2 of zone 2	R-W	-32768 to 32767 (customer unit)	0
18.19	Direction of passage in zone 2	R-W	0 to 3	3
18.20	Speed in zone 2	R-W	1 to 32767 min^{-1}	0
18.21	Terminal 1 of zone 3	R-W	-32768 to 32767 (customer unit)	0
18.22	Terminal 2 of zone 3	R-W	-32768 to 32767 (customer unit)	0
18.23	Direction of passage in zone 3	R-W	0 to 3	3
18.24	Speed in zone 3	R-W	1 to 32767 min^{-1}	0
18.25 and **18.26**	Not used			
18.27	Synchronisation error	RO	-32768 to 32767 (customer unit)	-
18.28	Difference between sensor and Top 0	RO	-32768 to 32767 (customer unit)	-
18.29	Bus control word	R-W	-32768 to 32767	-
18.30	Status word via bus	RO	-32768 to 32767	-
18.31	Automatic scaling	R-W	OFF (0) or ON (1)	OFF (0)
18.32	Origin cycle movement direction	R-W	OFF (0) or ON (1)	OFF (0)
18.33	Top 0 search direction	R-W	OFF (0) or ON (1)	OFF (0)
18.34	Sensor search mode	R-W	OFF (0) or On (1)	On (1)
18.35	Scan timer incrementing and synchronisation enable	R-W	OFF (0) or On (1)	OFF (0)
18.36	Machine encoder selection	R-W	OFF (0) or On (1)	OFF (0)
18.37	End stop sensor A input	R-W	OFF (0) or On (1)	OFF (0)
18.38	End stop sensor B input	R-W	OFF (0) or On (1)	OFF (0)
18.39	Origin cycle sensor input	R-W	OFF (0) or On (1)	-
18.40	Manual movement speed selection	R-W	OFF (0) or On (1)	OFF (0)
18.41	Run command	R-A	OFF (0) or On (1)	-
18.42	Input I_o, origin cycle enable	R-A	OFF (0) or On (1)	-
18.43	Input I_+, manual movement	R-A	OFF (0) or On (1)	-
18.44	Input I_-, manual movement	R-A	OFF (0) or On (1)	-
18.45	Input I_{val}, encoded position enable	R-W	OFF (0) or On (1)	-
18.46	Input I_1, position selection	R-W	OFF (0) or On (1)	-
18.47	Input I_2, position selection	R-W	OFF (0) or On (1)	-
18.48	Input I_3, position selection	R-W	OFF (0) or On (1)	-
18.49	Input I_4, position selection	R-W	OFF (0) or On (1)	-
18.50	Input I_5, position selection	R-W	OFF (0) or On (1)	-

H5.2.2 - Explanations of parameters

18.01 : Pursuit error

The position loop determines an ideal "profile" for the movement depending on the maximum motor speed, the acceleration time and the deceleration time. The pursuit error reading is an expression of the difference in position between the actual position of the mobile **18.02** and the ideal profile.

18.02 : Actual position of the mobile

Indicates the position of the mobile with respect to the origin.

18.03 : Position error

Indicates the error in the position of the mobile compared with the requested position, and is used to define the state of output O_{val} (**19.33**).

18.04 : Speed of the mobile

Indicates the linear or angular speed of the mobile during positioning.

18.05 : Selected position

Indicates the number of the position the mobile must reach, selected by the inputs I_1 to I_4 or I_5 according to the mode enabled (direct mode, encoded mode, or scan timer mode, see **20.34**).

18.06 : Selected position value

Indicates the value of the selected position.

18.07 : Selected position type

Indicates the selected position mode.
0: Absolute mode (with respect to the origin)
1: Relative mode (with respect to the previous position)

18.08 : Selected position speed

Reading of the maximum speed of the motor for reaching the selected position.

18.09 : Selected position acceleration time

Reading of the acceleration time for reaching the selected position.

18.10 : Selected position deceleration time

Reading of the deceleration time for reaching the selected position.

18.11 : Selected position auto scan timer stopping time

In automatic scan timer mode (enabled by **20.34**), reading of the stopping time at the selected position before moving to the following position.

18.12 : Zone management in relative mode
0: Management of zones of passage in absolute mode with respect to the origin.
1: Management of zones of passage in relative mode with respect to the previous requested position.

18.13 : Terminal 1 of zone 1
Zone 1 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 1 (delimiting of the zone).

18.14 : Terminal 2 of zone 1
Zone 1 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 1 (delimiting of the zone).

18.15 : Direction of passage in zone 1
Detemines in which direction the mobile must travel in zone 1.
0: The speed is limited in zone 1 when the mobile moves from terminal 1 (**18.13**) towards terminal 2 (**18.14**).
1:The speed is limited in zone 1 when the mobile moves from terminal 2 (**18.14**) towards terminal 1(**18.13**).
2: The speed is limited in zone 1 when the mobile moves in both directions.
3: Disabling of zone 1 (zone 1 at reduced speed is disabled).

18.16 : Speed in zone 1
Sets the speed of the mobile when it is situated in zone 1.
Note: This speed is active only if it is lower than the speed set in **19.14**.

18.17 : Terminal 1 of zone 2
Zone 2 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 2 (delimiting of the zone).

18.18 : Terminal 2 of zone 2
Zone 2 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 2 (delimiting of the zone).

18.19 : Direction of passage in zone 2
Detemines in which direction the mobile must travel in zone 2.
0:The speed is limited in zone 2 when the mobile moves from terminal 1 (**18.17**) towards terminal 2 (**18.18**).
1:The speed is limited in zone 2 when the mobile moves from terminal 2 (**18.18**) towards terminal 1(**18.17**).
2: The speed is limited in zone 2 when the mobile moves in both directions.
3: Disabling of zone 2 (zone 2 at reduced speed is disabled).

18.20 : Speed in zone 2
Sets the speed of the mobile when it is situated in zone 2.
Note: This speed is active only if it is lower than the speed set in **19.14**.

18.21 : Terminal 1 of zone 3
Zone 3 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 3 (delimiting of the zone).

18.22 : **Terminal 2 of zone 3**

Zone 3 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 3 (delimiting of the zone).

18.23 : **Direction of passage in zone 3**

Detemines in which direction the mobile must travel in zone 3.
0: The speed is limited in zone 3 when the mobile moves from terminal 1 (18.21) towards terminal 2 (18.22).
1:The speed is limited in zone 3 when the mobile moves from terminal 2 (**18.22**) towards terminal 1(**18.21**).
2: The speed is limited in zone 3 when the mobile moves in both directions.
3: Disabling of zone 3 (zone 3 at reduced speed is disabled).

18.24 : **Speed in zone 3**

Sets the speed of the mobile when it is situated in zone 3.
Note: This speed is active only if it is lower than the speed set in **19.14**.

18.25 and **18.26** : **Not used**

18.27 : **Synchronisation error**

The synchronisation error is an expression of the difference in position between the actual position of the mobile (**18.02**) and the position of the master to be synchronised.

18.28 : **Difference between sensor and Top 0**

When origin cycle on sensor and Top 0 is enabled (**20.13** = 0), this parameter indicates the difference between the encoder top 0 and the pulse from the origin cycle sensor.

18.29 : **Bus control word**

Control of the drive via fieldbus. Used to send commands to the drive via a single parameter. If necessary, refer to Section I.

Bit N°	18.29 =	Parameter activated	Description
Bit 0	1	**10.33**	Drive reset
Bit 1	2	**18.41**	Run command
Bit 2	4	**18.43**	I_+ (manual movement)
Bit 3	8	**18.44**	I_- (manual movement)
Bit 4	16	**18.42**	I_0 (origin cycle enable)
Bit 5	32	**18.45**	I_{val} (encoded position enable)
Bit 6	64	**18.46**	I_1 (input 1, position selection)
Bit 7	128	**18.47**	I_2 (input 2, position selection)
Bit 8	256	**18.48**	I_3 (input 3, position selection)
Bit 9	512	**18.49**	I_4 (input 4, position selection)
Bit 10	1024	**18.50**	I_5 (input 5, position selection)
Bit 11	2048	**18.40**	Manual movement speed selection
Bit 12	4096	**18.35**	Scan timer incrementing/ Position or synchro enable

Note:
• The control word enabling depends on the value of the control word mask **20.19**.
• Bit 12:
- Scan timer incrementing, if **20.34** = 1 to 3
- Position or synchronisation enabling, if **20.34** = 4

18.30 : **Status word via bus**

Control of the drive via fieldbus. Used to obtain information on the status of the drive via a single parameter. If necessary, refer to Section I.

Bit N°	18.30 =	Parameter activated	Description
Bit 0	1	**10.01**	Drive healthy
Bit 1	2	**10.02**	Drive output activated
Bit 2	4	**10.03**	Zero speed
Bit 3	8	**10.04**	Minimum speed
Bit 4	16	**19.31**	Ref. OK
Bit 5	32	**19.33**	O_{val} (position reached)
Bit 6	64	**19.46**	O_1 (position 1 status)
Bit 7	128	**19.47**	O_2 (position 2 status)
Bit 8	256	**19.48**	O_3 (position 3 status)
Bit 9	512	**19.49**	O_4 (position 4 status)
Bit 10	1024	**19.50**	O_5 (position 5 status)
Bit 11	2048	**19.43**	O_{Z1} (presence in zone 1)
Bit 12	4096	**19.44**	O_{Z2} (presence in zone 2)
Bit 13	8192	**19.45**	O_{Z3} (presence in zone 3)
Bit 14	16384	**19.39**	Cycle complete

18.31 : **Automatic scaling**

This scaling allows the drive to define the ratio between the customer unit and the rotation of the motor, when **20.34** = 0 to 4.
• Move the mobile to a known position using I_+ or I_-.
• Enable the start of the scaling procedure by entering On (1) into **18.31**.
• Move the mobile to another known position using I_+.
- Enter into **20.26** the value of the movement in customer units (e.g. the value 100 to express 100 cm or 100 mm).
- Enter **18.31** = OFF (0) to end the scaling procedure.
All positions will be expressed in the user unit defined by this procedure.

18.32 : **Origin cycle movement direction**

During the origin cycle, this parameter is used to change the direction of movement of the mobile should it not be moving in the correct direction for reaching the sensor or the fixed limit stop.

18.33 : **Top 0 search direction**

This concerns the origin cycle on sensor and Top 0 (**20.13** = 0).
OFF (0): The search for the encoder Top 0 is performed in the direction opposite to that used for the search for the origin cycle sensor.
On (1): The search for the encoder Top 0 is performed in the same direction as that used for the search for the origin cycle sensor.

18.34 : **Sensor search mode**

This concerns the origin cycle on sensor (**20.13** = 0, 1 or 5).
OFF (0): When the mobile passes over the origin cycle sensor, the rising edge of the sensor sets the position counter of the mobile **18.02** to 0.
On (1): When the mobile passes over the origin cycle sensor (rising edge), the mobile stops and then reverses (at very reduced speed) in order to detect the falling edge, for which the pulse will set the position counter 18.02 of the mobile to 0.

18.35 : Scan timer incrementing and synchro enable
In "scan timer by increment" mode (**20.34** = 3), a pulse on **18.35** (via a digital input for example) inititates the change from one position to another.
In Synchro/Position mode (**20.34** = 4), **18.35** is used to select:
OFF (0): Positioning mode
On (1): Synchronisation mode

18.36 : Machine encoder selection
This parameter selects the encoder that will be used for positioning (independently of the speed control of the variable speed drive).
OFF (0): The positioning encoder is mounted on the motor.
On (1): The positioning encoder is not mounted on the motor, but on the slow shaft of the machine (the motor encoder provides the speed information). To use another encoder, the drive must be fitted with an SM-Universal-Encoder module.
Note: This parameter is automatically set to On (1) if the drive is in open loop flux vector control mode.

18.37 : End stop sensor A input
This parameter can be assigned to a digital input to which the right (or top) end stop detection sensor will be connected.
It generates trip t084 (enabled in the factory settings by **20.15**).
To determine the location, activate input I- and the mobile must move towards end stop A.
Note: Invert the digital input to obtain an open contact on end stop tripping.

18.38 : End stop sensor B input
This parameter can be assigned to a digital input to which the left (or bottom) end stop detection sensor will be connected.
It generates trip t084 (enabled in the factory settings by **20.15**).
To determine the location, activate I- and the mobile must move towards end stop B.
Note: Invert the digital input to obtain an open contact on end stop tripping.

18.39 : Origin cycle sensor input
This parameter is activated by the terminal 27 digital input, to which the origin cycle detection sensor is connected.

18.40 : Manual movement speed selection
Selects the speed for movements carried out when I_+ or I- is activated.
OFF (0): The manual movement speed corresponds to the speed preset in 20.22 (reduced speed).
ON (1): The manual movement speed corresponds to the speed preset in **20.21** (high speed).

18.41 : Run command
This parameter is controlled by the terminal 28 digital input (or via the fieldbus), and gives the system run command.

18.42 : Input I_o origin cycle enable
This parameter is controlled by the terminal 26 digital input (or via the fieldbus), and gives the command to carry out an origin cycle.
If an origin cycle is carried out when stopped, it is the change of state of this parameter which is used for the detection (and not the origin cycle sensor).

18.43 : Input I_+ manual movement
This parameter is controlled by the terminal 7 digital input (or via the fieldbus) of the SM-I/O Plus module, and gives the command to carry out a manual movement.
The movement corresponds to the motor clockwise direction.

18.44 : Input I- manual movement
This parameter is controlled by the terminal 8 digital input (or via the fieldbus) of the SM-I/O Plus module, and gives the command to carry out a manual movement.
The movement corresponds to the motor counter-clockwise direction.

18.45 : Input I_{val} encoded position enable
This parameter is controlled by the terminal 29 digital input (or via the fieldbus). During operation in encoded mode, this input enables the combination of inputs I_1 to I_5.

18.46 : Input I_1 position selection
Input used for position selection.
This parameter is controlled by the terminal 2 digital input (or via the fieldbus) of the SM-I/O Plus module.

18.47 : Input I_2 position selection
Input used for position selection.
This parameter is controlled by the terminal 3 digital input (or via the fieldbus) of the SM-I/O Plus module.

18.48 : Input I_3 position selection
Input used for position selection.
This parameter is controlled by the terminal 4 digital input (or via the fieldbus) of the SM-I/O Plus module.

18.49 : Input I_4 position selection
Input used for position selection.
This parameter is controlled by the terminal 6 digital input (or via the fieldbus) of the SM-I/O Plus module.

18.50 : Input I_5 position selection
Input used for position selection.
This is not assigned to a digital input in the factory settings, and remains free to be assigned by the user.

H5.3 - Menu 19

H5.3.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
19.01	Not used			
19.02	Reserved			
19.03	Pursuit error in encoder lines	RO	-32768 to 32767	0
19.04	Position/speed/synchronisation control	RO	0 to 2	-
19.05	Software limit stops A or B threshold status	RO	0 to 2	-
19.06	End stop sensors A and B status	RO	0 to 2	-
19.07	Active current threshold status	RO	0 to 2	-
19.08	Limit stop and threshold management status	RO	0 or 1	-
19.09	Brake control current threshold status	RO	0 or 1	-
19.10	Relative position of the mobile	RO	-32768 to 32767 (customer unit)	-
19.11	Setting position number	R-W	1 to 32	1
19.12	Setting position value	R-W	-32768 to 32767 (customer unit)	0
19.13	Setting position type	R-W	0 or 1	0
19.14	Setting position speed	R-W	1 to (**1.06** x 0.9) min^{-1}	1350 min^{-1}
19.15	Setting position acceleration ramp	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
19.16	Setting position deceleration ramp	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
19.17	Setting position stopping time	R-W	0 to 32767 ms	0
19.18	Position common settings	R-W	0 or 1	0
19.19 to 19.24	Not used			
19.25	Machine encoder driving ratio	R-W	-32768 to 32767	1
19.26	Machine encoder driven ratio	R-W	1 to 32767	1
19.27	Software limit stop A	R-W	-32768 to 32767 (customer unit)	32767
19.28	Software limit stop B	R-W	-32768 to 32767 (customer unit)	-32767
19.29	Origin shift	R-W	-32768 to 32767 (customer unit)	0
19.30	Synchronisation window	R-W	1 to 32767 (customer unit)	10
19.31	Ref OK	RO	OFF (0) or On (1)	-
19.32	Brake control	RO	OFF (0) or On (1)	-
19.33	Position Oval reached	RO	OFF (0) or On (1)	-
19.34	Software limit stops A and B enable	R-W	OFF (0) or On (1)	On (1)
19.35	Brake in position control mode	R-W	OFF (0) or On (1)	OFF (0)
19.36	Sensor edge	R-W	OFF (0) or On (1)	On (1)
19.37	Shift take-up mode	R-W	OFF (0) or On (1)	On (1)
19.38	Sensor release mode	R-W	OFF (0) or On (1)	OFF (0)
19.39	Cycle complete/synchronisation OK	RO	OFF (0) or On (1)	-
19.40	Direct/encoded mode	R-W	OFF (0) or On (1)	OFF (0)
19.41	Parity mode selection	R-W	OFF (0) or On (1)	OFF (0)
19.42	Maintained/rising edge command	R-W	OFF (0) or On (1)	OFF (0)
19.43	O_{Z1} (presence in zone 1)	RO	OFF (0) or On (1)	-
19.44	O_{Z2} (presence in zone 2)	RO	OFF (0) or On (1)	-
19.45	O_{Z3} (presence in zone 3)	RO	OFF (0) or On (1)	-
19.46	O_1 (position 1 status)	RO	OFF (0) or On (1)	-
19.47	O_2 (position 2 status)	RO	OFF (0) or On (1)	-
19.48	O_3 (position 3 status)	RO	OFF (0) or On (1)	-
19.49	O_4 (position 4 status)	RO	OFF (0) or On (1)	-
19.50	O_5 (position 5 status)	RO	OFF (0) or On (1)	-

H5.3.2 - Explanation of parameters

19.01 and **19.02** : **Not used**

19.03 : **Pursuit error in encoder lines**

Used to check how well the mobile is following compared with the reference coming from the profile generator.
The position of the mobile can therefore be seen compared with the reference over one encoder revolution, broken down into 65536 lines.

19.04 : **Position/speed/synchronisation control**

0: Positioning control.
1: Manual movement or origin cycle with speed control. **19.04** remains at 1 until the origin cycle has been performed.
2: Synchronisation control enabled.

19.05 : **Software limit stops A or B threshold status**

Used to determine the situation of the mobile with respect to software limit stops A (**19.27**) and B (**19.28**).
0: The mobile has not gone past software limit stop A or B.
1: The mobile has gone past software limit stop A, and the drive goes into trip state t083 (if **19.34** and bit 3 of **20.15** are enabled).
2: The mobile has gone past software limit stop B, and the drive goes into trip state t083 (if **19.34** and bit 3 of **20.15** are enabled).

19.06 : **End stop sensors A and B status**

Indicates the status of end stop sensor A (**18.37**) or B (**18.38**) which generate trip t084.
0: The mobile has not activated sensor (or end stop) A or B.
1: The mobile is activating end stop A.
2: The mobile is activating end stop B.
It is desirable for the mobile to permanently activate the end stop when it has been passed.

19.07 : **Active current threshold status**

Indicates the status of the active current threshold, necessary in the origin cycle on current threshold procedure.
The current threshold is set in **20.32**.
It also indicates the direction of the torque (or direction of the mobile).
The change of state of this parameter can be delayed (setting via **20.31**).
0: The current limit has not been reached.
1: The current limit has been reached in the forward direction.
2: The current limit has been reached in the reverse direction.

19.08 : **Limit stop and threshold management status**

When this parameter displays On (1), it indicates:
- That the mobile is current limited (see **19.07**), except during the origin cycle with **20.13** = 4, **or**
- That the mobile is activating an end stop sensor (see **19.06**), **or**
- That software limit stop A or B has been reached (see **19.05**).

19.09 : **Brake control current threshold status**

Indicates the status of the threshold controlling the magnetising current of the motor for releasing the brake.
The level of the threshold is determined from the motor current on the plate (**05.07**).
When a servo motor is used, the threshold is disabled and **19.09** indicates 1 as a matter of course.

19.10 : **Relative position of the mobile**

Indicates the actual position of the mobile with respect to the previous position reached.

19.11 : **Setting position number**

This parameter selects the number of the position to be set using parameters **19.12** to **19.16**.

19.12 : **Setting position value**

After selecting the position in **19.11**, enter the distance to be travelled by the mobile between the origin and the place where the mobile is to be positioned in absolute mode, or between the previous position and the place where the mobile is to be positioned in relative mode (depends on **19.13**).
The value of the position is defined by the scaling **20.23** and **20.26**.
For rotary positioning defined by an index number (**20.34** = 8), configure the index number corresponding to the number of steps in the movement defined in **20.40**.
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.13 : **Setting position type**

After selecting the position in **19.11**, enter the movement mode of the mobile for reaching the required position.
OFF (0): Absolute mode; the positions are referenced with respect to the system origin.
On (1): Relative mode; the position is referenced with respect to the previous position. The mobile advances step by step.
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.14 : **Setting position speed**

Sets the motor speed for reaching the position selected in **19.11**.
If **19.18** = 1, the speed set in **19.14** is used for all positions.
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.15 : **Setting position acceleration ramp**

Sets the acceleration ramp for reaching the position selected in **19.11**.
If **19.18** = 1, the ramp set in **19.15** is used for all positions.
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.16 : **Setting position deceleration ramp**

Sets the deceleration ramp for reaching the position selected in **19.11**.
If **19.18** = 1, the ramp set in **19.16** is used for all positions.
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.17 : **Setting position stopping time**

Setting of the stopping time at the position before moving to the following position, when the scan timer is enabled (see **20.34**).
Note: In Fieldbus control mode, the registers can be accessed directly from menus 70 and 71.

19.18 : **Position common settings**
0: The settings for the speed and the acceleration and deceleration ramps are independent for each position.
1: The settings for the speed and the acceleration and deceleration ramps are identical for all positions.
Example: When **19.18** = 1, configure the speed and ramps for position P1 (see **19.11** and **19.14** to **19.16**) and these values will be used for all the other positions.

19.19 to **19.24** : **Not used**

19.25 : **Machine encoder driving ratio**

19.26 : **Machine encoder driven ratio**
These 2 parameters define the ratio between the speed of the machine encoder and the speed of the motor encoder. The reduction ratio thus calculated automatically adjusts the speed reference coming from the position loop in order to avoid instabilities.
Values to be set:
- **19.25**: Enter the speed of the motor encoder (or gearbox input speed).
- **19.26**: Enter the speed of the machine encoder (or gearbox output speed).
For this ratio to be active, **18.36** must be = On (1).
Example: For a gearbox of 1/50, 50 min^{-1} driving is necessary for 1 min^{-1} driven.
19.25 will therefore be set to 50 and **19.26** will be set to 1.

19.27 : **Software limit stop A**

19.28 : **Software limit stop B**
These are internal safety mechanisms acting as "virtual end stops". On a defined path, the limit A position will be set in **19.27** and the limit B position in **19.28**, these being the positions the mobile can reach with respect to the origin.
When the mobile reaches and goes past this limit stop, the drive goes into t083 trip state (if this is enabled by bit 3 of **20.15**).
During the origin cycle **18.42** = On (1), software limit stops A and B are disabled.
• The software limit stops do not remove the need for the "end stop" mechanical limit stops of the installation, which must act directly on the mechanical brake mounted on the motor or on the machine.

19.29 : **Origin shift**
Used to obtain an origin different from the origin cycle sensor, which avoids mechanical repositioning of the sensor for example.
The shift is taken into account as a matter of course when the origin cycle is OK (**19.31** = On (1)).
Taking up the shift is also enabled during the origin cycle when **19.37** = On (1).

19.30 : **Synchronisation window**
This parameter sets the trip threshold of the synchro OK output (**19.39**) with respect to the measured error in **18.27**. When the error is less than the level set by **19.30**, **19.39** goes to On (1).

19.31 : **Ref. OK**
OFF (0): The origin cycle procedure has not been performed. Start the procedure again.
On (1): The origin cycle procedure has taken place correctly. The system origin is known.

19.32 : **Brake control**
This parameter is assigned to relay 1 of the SM-I/O Plus module (terminals 21 and 22).
The change of state is timed (on-delay and off-delay) by **20.37**.
19.32 indicates the status of the brake control logic.

19.33 : **Position O_{val} reached**
OFF (0): The mobile has not reached the requested position.
On (1): The mobile is in position (the position error is less than the level set by **20.27**).

19.34 : **Software limit stops A and B enable**
When this parameter is at On (1), software limit stops A (**19.27**) and B (**19.28**) are enabled.
Note: In rotary mode (**20.34** > 4), **19.34** is at OFF (0).

19.35 : **Brake in position control mode**
When this parameter is at On (1), the output O_{val} "position reached" must be enabled in order to control releasing of the brake.

19.36 : **Sensor edge**
This relates to the origin cycle sensor.
OFF (0): It is the falling edge of the pulse which identifies the origin position.
On (1): It is the rising edge of the pulse which identifies the origin position.

19.37 : **Shift take-up mode**
OFF (0): The mobile does not take up the origin shift (**19.29**) during the origin cycle.
On (1): The mobile takes up the origin shift (19.29) during the origin cycle.

19.38 : **Sensor release mode**
The origin cycle sensor must not be activated before enabling by the input I_o (**18.42**). For this reason, an automatic release of the mobile is provided.
OFF (0): The mobile sets off in order to release itself and then returns to detect the sensor.
On (1): The mobile sets off directly to search for the sensor.

19.39 : **Cycle complete/synchronisation OK**
• If **20.34** = 4 (pos/synchro mode), then:
OFF (0): The synchronisation error **18.27** is not situated in the window set in **19.30**.
On (1): The synchronisation error **18.27** is situated in the window set in **19.30**.
• If **20.34** = 1 to 3 (scan timer mode), then:
OFF (0): Position selection by the scan timer is not complete.
On (1): Position selection by the scan timer is complete.

19.40 : **Direct/encoded mode**

OFF (0): Direct mode is selected; 6 positions are possible (positions 1 to 6).

On (1): Encoded mode is selected; up to 32 positions are possible, depending on the parity **19.41**.

19.41 : **Parity mode selection**

This parameter is used to enable encoded mode with parity.

OFF (0): Parity mode is not enabled; digital inputs I_1 to I_5 are used to obtain 32 positions.

On (1): Parity mode is enabled. The input used as "parity" (I_5) must be enabled when the number of position request inputs enabled is even. In this way the drive can check that the position request commands are consistent with the state of the parity bit. 16 positions can therefore be managed.

19.42 : **Maintained/rising edge command**

OFF (0): The inputs must be maintained for the position selection to be enabled.

On (1): The position is enabled on the rising edge of the inputs.

(Used only in direct mode **19.40** = OFF (0)).

19.43 : **O_{Z1} (presence in zone 1)**

Changes to On (1) when the mobile is in deceleration zone 1 (between terminals **18.13** and **18.14**).

19.44 : **O_{Z2} (presence in zone 2)**

Changes to On (1) when the mobile is in deceleration zone 2 (between terminals **18.17** and **18.18**).

19.45 : **O_{Z3} (presence in zone 3)**

Changes to On (1) when the mobile is in deceleration zone 3 (between terminals **18.21** and **18.22**).

19.46 : **O_1 (Position 1 status)**

In direct mode **19.40** = OFF (0), this parameter indicates that the mobile has reached position 1 requested by I_1.
In encoded mode **19.40** = On (1), the states of O_1 to O_5 (**19.46** to **19.50**) give the position reached (the position error is less than the level set by **20.27**).

19.47 : **O_2 (Position 2 status)**

In direct mode **19.40** = OFF (0), this parameter indicates that the mobile has reached position 2 requested by I_2.
In encoded mode **19.40** = On (1), the states of O_1 to O_5 (**19.46** to **19.50**) give the position reached (the position error is less than the level set by **20.27**).

19.48 : **O_3 (Position 3 status)**

In direct mode **19.40** = OFF (0), this parameter indicates that the mobile has reached position 3 requested by I_3.
In encoded mode **19.40** = On (1), the states of O_1 to O_5 (**19.46** to **19.50**) give the position reached (the position error is less than the level set by **20.27**).

19.49 : **O_4 (Position 4 status)**

In direct mode **19.40** = OFF (0), this parameter indicates that the mobile has reached position 4 requested by I_4.
In encoded mode **19.40** = On (1), the states of O_1 to O_5 (**19.46** to **19.50**) give the position reached (the position error is less than the level set by **20.27**).

19.50 : **O_5 (Position 5 status)**

In direct mode **19.40** = OFF (0), this parameter indicates that the mobile has reached position 5 requested by I_5.
In encoded mode **19.40** = On (1), the states of O_1 to O_5 (**19.46** to **19.50**) give the position reached (the position error is less than the level set by **20.27**).

H5.4 - Menu 20

H5.4.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
20.01	Return to factory settings and copying of positioning parameters	R-W	-32768 to 32767	0
20.02	Synchronisation maximum speed	R-W	1 to 32767 min^{-1}	**1.06**
20.03	Acceleration in synchronisation	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	0
20.04	Deceleration in synchronisation	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	0
20.05	Numerator of the kinematic ratio in synchronisation	R-W	-32768 to 32767	1
20.06	Denominator of the kinematic ratio in synchronisation	R-W	-32768 to 32767	1
20.07	Position loop proportional gain during synchronisation	R-W	0 to 32767	500
20.08	Position loop integral gain during synchronisation	R-W	0 to 32767	0
20.09	Position loop differential gain during synchronisation	R-W	0 to 32767	1000
20.10	Position loop proportional gain	R-W	0 to 32767	500
20.11	Position loop integral gain	R-W	0 to 32767	0
20.12	Position loop differential gain	R-W	0 to 32767	1000
20.13	Origin cycle mode	R-W	0 to 5	1
20.14	Not used	R-W	-32768 to 32767	0
20.15	Trip enabling	R-W	0 to 32767	4095
20.16	Machine encoder location	R-A	0 to 3	-
20.17	Synchronisation encoder location (master encoder)	R-A	0 to 4	-
20.18	Additional function enabling	R-W	0 to 1111	0
20.19	Bus control word mask	R-W	0 to 32767	0
20.20	Not used	R-W	-32767 to 32767	0
20.21	High speed reference in manual movement	R-W	0 to **1.06** min^{-1}	1500 min^{-1}
20.22	Reduced speed reference in manual movement	R-W	0 to **1.06** min^{-1}	150 min^{-1}
20.23	Scaling numerator	R-W	-999999 to 9999999	65536
20.24	Acceleration ramp in manual movement	R-W	1 to 32000 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
20.25	Deceleration ramp in manual movement	R-W	1 to 32000 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
20.26	Scaling denominator	R-W	1 to 9999999	10
20.27	Positioning window	R-W	1 to 9999999	10
20.28	Menu 7x parameter selection	R-W	0 to 9999	0
20.29	Menu 7x parameter value	R-A	-999999 to +9999999	0
20.30	Actual position of the mobile	RO	-999999 to 9999999 (customer unit)	-
20.31	Current threshold delay	R-W	0 to 9999999 ms	100 ms
20.32	Current threshold reference	R-W	-999999 to 9999999 mA	2000 mA
20.33	Number of positions with scan timer	R-W	1 to 32	0
20.34	Positioning mode	R-W	0 to 9	0
20.35	Speed error threshold	R-W	0 to 9999999 min^{-1}	500 min^{-1}
20.36	Pursuit error threshold	R-W	0 to 9999999 (customer unit)	200
20.37	Brake control delay	R-W	0 to 9999999 ms	0
20.38	Magnetising current feedback filter	R-W	0 to 9999999 ms	18 ms
20.39	Threshold for position difference between encoders	R-W	0 to 9999999 (customer unit)	65536
20.40	Movement for one rotary system revolution	R-W	1 to 9999999	3600

H5.4.2 - Explanation of parameters

20.01 : Return to factory settings and copying of positioning parameters

• Return to positioning factory settings

This parameter intiates an automatic procedure for return to the factory settings specific to the positioning application.
To enable this return to the positioning factory settings, follow the procedure below:

Parameter	Setting	Description	Enable
0.00	**1233** or **1244**	European factory settings configuration (50 Hz) or USA factory settings configuration (60 Hz)	Press the Reset key
20.01	**2047**	**Positioning program initialisation**	

• Check that the motor is stopped and the safety of the system is not called into question.

• Copying of positioning parameters

This parameter is used to save or load the positioning menu parameters using the SMARTCARD.

Parameter	Setting	Description
20.01	**3333**	Saving of menus 18 to 20, 70, 71, 74 and 75 in the SMARTCARD
20.01	**6666**	Loading of menus 18 to 20, 70, 71, 74 and 75 from the SMARTCARD into the drive

20.02 : Synchronisation maximum speed

Setting of the maximum speed during synchronisation.

20.03 : Acceleration in synchronisation

Setting of the speed acceleration ramp for movements in synchronisation.
This is the time (in 1/100 s) that the motor must take to accelerate from 0 to 1000 min^{-1}.

20.04 : Deceleration in synchronisation

Setting of the speed deceleration ramp for movements in synchronisation.
This is the time (in 1/100 s) that the motor must take to decelerate from 1000 min^{-1} to 0.

20.05 : Numerator of the kinematic ratio in synchronisation

Used to set the product of the driving gears.

20.06 : Denominator of the kinematic ratio in synchronisation

Used to set the product of the driven gears.

20.07 : Position loop proportional gain during synchronisation

The value contained in this parameter adjusts the regulation accuracy and the stability of the position loop during synchronisation.

20.08 : Position loop integral gain during synchronisation

The value contained in this parameter adjusts the stability of the position loop during synchronisation on load transients.

20.09 : Position loop differential gain during synchronisation

The value contained in this parameter adjusts the stability of the position loop during synchronisation taking speed transients into consideration.

20.10 : Position loop proportional gain

The value contained in this parameter adjusts the regulation accuracy and the stability of the position loop.

20.11 : Position loop integral gain

The value contained in this parameter adjusts the stability of the position loop on load transients.

20.12 : Position loop differential gain

The value contained in this parameter adjusts the stability of the position loop taking speed transients into consideration.

20.13 : Origin cycle mode

There are 6 possible origin cycle modes:
0: The origin is detected by the origin cycle sensor taking the encoder Top 0 into consideration.
1: The origin is detected by the origin cycle sensor only.
2: The origin is detected on encoder Top 0 only.
3: The origin cycle is performed when stopped, on change of state of input I_o.
4: The origin cycle is performed on a motor active current threshold. When the motor current reaches the current threshold laid down, the system origin cycle is initiated. (Threshold set by **20.32**).
5: Origin cycle on the fly with no Top 0 (during positioning):
• If **20.34** = 0 or 4 (positioning modes), immediate stop on the origin on detection of the sensor
• If **20.34** = 1 to 3 (scan timer modes), immediate incrementing of the scan timer on detection of the sensor
• If **20.34** = 5 to 9 (rotary system modes), on sensor detection, new origin taken into account at the next position request

20.14 : Not used

20.15 : Trip enabling

Using binary conversion, this parameter is used to enable or disable trips t070, t071 and t080 to t089.
Example:
20.15 = 4095: All trips are enabled.

20.15	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6
Trips	t071	t070	t089	t088	t087	t086
Values	2048	1024	512	256	128	64

20.15	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Trips	t085	t084	t083	t082	t081	t080
Values	32	16	8	4	2	1

20.16 : Machine encoder location

The factory setting detects a configuration and assigns **20.16** but it is possible to modify the automatic selection.
0: Drive encoder (HD15)
1: Encoder connected to the module in location 1
2: Encoder connected to the module in location 2
3: Encoder connected to the module in location 3
CAUTION:
To enable the modification of 20.16, set 17.19 = On (1) (Reset of the SM-POS module) or power down the drive and then power it up again.

20.17 : **Synchronisation encoder location (master encoder)**

The factory setting detects a configuration and assigns **20.17** but it is possible to modify the automatic selection.
0: Drive encoder HD15
1: Encoder connected to the module in location 1
2: Encoder connected to the module in location 2
3: Encoder connected to the module in location 3
4: Via CTSYNC (or some other).
CAUTION:
To enable the modification of 20.17, set 17.19 = On (1) (Reset of the SM-POS module) or power down the drive and then power it up again.

20.18 : **Additional function enabling**

Digit 0 = 0: Even after a movement using I_+ or I_-, movement in relative position mode is carried out with respect to the last (calculated) position reached.
Digit 0 = 1: After a movement using I_+ or I_-, movement in relative position mode is carried out with respect to this stop.

Digit 1 = 0: Movement in relative position mode is carried out with respect to the last (calculated) position reached.
Digit 1 = 1: Movement in relative position mode is carried out with respect to the last encoder position reached.

Digit 2 = 0: In relative mode, having O_{VAL} = On (1) is essential for going to a new position.
Digit 2 = 1: In relative mode, having O_{VAL} = On (1) is not essential for going to a new position.

Digit 3 = 0: In rotary system mode, after a movement using I_+ or I_-, movement in relative position mode is carried out with respect to the last position requested.
Digit 3 = 1: In rotary system mode, even after a movement using I_+ or I_-, movement in relative position mode is carried out with respect to the last position requested, but the movement is calculated without taking account of the movement carried out in manual mode I_+ or I_-.

Digit 4 = 0: Enabling of synchronisation in non-rigid mode.
Digit 4 = 1: Enabling of synchronisation in rigid mode.

Example: **20.18** = 00101 corresponds to digit 0 = 1 and digit 2 = 1. Digit 0 corresponds to the rightmost digit of the display.

20.19 : **Bus control word mask**

The mask is used to enable the bits of the control word (**18.29**) and therefore to mix control via fieldbus or digital inputs.
Example:
20.19 = 15 = 0000 0000 0000 1111
Bit 0 = 1: Drive reset
Bit 1 = 1: Enabling of run command **18.41** by control word
Bit 2 = 1: Enabling of I_+ **18.43** by control word
Bit 3 = 1: Enabling of I_- **18.44** by control word
Bit 4 = 0: The origin cycle I_o is not controlled by control word
Bit 5 = 0: The input I_{val} **18.45** is not controlled by control word
etc.
Note: Check that the destination of the digital inputs does not correspond to the bit controlled by fieldbus.
Example:
8.25 = **18.41** (run command)
Set **8.25** = **0.00**; terminal 28 digital input is no longer used to control the run command.

20.20 : **Not used**

20.21 : **High speed reference in manual movement**

Sets the high speed in manual movement controlled by I_+ (**18.43**) or I_- (**18.44**).

20.22 : **Reduced speed reference in manual movement**

Sets the reduced speed for:
- Manual movement controlled by I_+ (**18.43**) or I_- (**18.44**)
- The origin cycle controlled by I_o (**18.42**).

20.23 : **Scaling numerator**

• If **20.34** = 0 to 4, then **20.23** is the scaling numerator
• If **20.34** ≥ 5 (rotary system mode), then **20.23** is the reduction ratio numerator (reduction ratio between the motor and the rotary system).
Note: To reverse the direction of movement into position, enter a negative value in the numerator **20.23**.
See explanation of **20.26** for automatic scaling.

20.24 : **Acceleration ramp in manual movement**

Setting of the acceleration ramp for manual movements using I_+ or I_-.
This is the time the motor must take to accelerate from 0 to 1000 min^{-1}.

20.25 : **Deceleration ramp in manual movement**

Setting of the speed deceleration ramp for manual movements using I_+ or I_-.
This is the time the motor must take to decelerate from 1000 min^{-1} to 0.

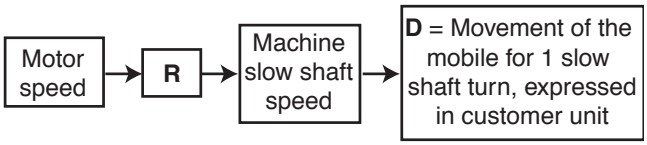
20.26 : **Scaling denominator**

• If **20.34** = 0 to 4, then **20.26** is the scaling denominator
• If **20.34** ≥ 5 (rotary system mode), then **20.26** is the reduction ratio denominator (reduction ratio - number of teeth - between the motor and the rotary system).

For scaling the positioning (**20.34** = 0 to 4) there are two possible methods:

• Automatic scaling:
Allows users to carry out their scaling very quickly by movement visually.
- Move the mobile to the required place using I_+ or I_-.
- Enable the start of the scaling procedure by entering On (1) into **18.31**.
- Move the mobile to another position using I_+ or I_-.
- Enter into **20.26** the value of the movement in customer units (e.g. the value 100 to express 100 cm or 100 mm).
- Enter **18.31** = OFF (0) to end the scaling procedure.
The drive then automatically calculates the scaling. **20.23** is not used in this procedure.
For certain applications, however, the scaling must be very accurate. It is then necessary to set the exact ratios of the dynamic characteristics by customer scaling.
Note: This method is not recommended in relative mode. Use the customer scaling below.

• Customer scaling:
Allows accurate values of the dynamic characteristics to be set.



- Set **20.23** according to the formula: **20.23** = 65536 x R.
- Set **20.26** according to the formula: **20.26** = D.

20.27 : **Positioning window**
This parameter sets the trip threshold of the position reached output O_{val} (**19.33**) with respect to the measured position error in **18.03**.
When the position error is less than the level set by **20.27**, the selected position has been reached and the output O_{val} changes to On (1).
I**18.03**I < I**20.27**I = Position reached.

20.28 : **Menu 7x parameter selection**

20.29 : **Menu 7x parameter value**
It is possible to display the parameters of menus 70 to 75 of the SM-POS module by means of 2 parameters: **20.28** and **20.29**.
20.28 is used to select the parameters to be displayed (e.g. **20.28** = **75.01**, menu 75, parameter 01).
20.29 is used to read and/or modify the value of the parameter selected in **20.28**.

20.30 : **Actual position of the mobile**
Indicates the position of the mobile with respect to the origin, expressed in customer units.
Same function as **18.02** but over a larger range.

20.31 : **Current threshold delay**
Used to delay the switching of the state of the current threshold **19.07**, during the origin cycle phase (**20.13** = 4).

20.32 : **Current threshold reference**
Used to set the level of the motor current threshold **4.02** which will initiate the origin cycle (**20.13** = 4) or the "current threshold" trip t085 if Ref OK is enabled (**19.31** = On (1)).

20.33 : **Number of positions with scan timer**
When the automatic scan timer is enabled (**20.34** = 1 to 3), this parameter sets the number of positions that will be carried out during the cycle. The starting position will be that selected by the inputs I_1 to I_4/I_5.

20.34 : **Positioning mode**
0: Linear positioning (16 bits)
1: Automatic linear positioning with scan timer and end-of-cycle stop (with no looping)
2: Automatic linear positioning, with scan timer permanently enabled (with looping)
3: Automatic linear positioning with scan timer and change of position on command (the cycle increment command must be sent in **18.35**)
4: Linear positioning (32 bits) with synchronisation in position on command (using **18.35**)
5: Shortest rotary positioning (position counter reset to zero each revolution)
6: Rotary positioning with origin in the revolution (position counter reset to zero each revolution)
7: Rotary positioning with a single direction of rotation (position counter reset to zero each revolution)
8: Rotary positioning. The movement step is defined by a number of indexes in the revolution (position counter reset to zero each revolution).
9: Rotary positioning. Upon a position request, the mobile starts rotating at the speed defined by that position, and then, upon release of the position request, it stops at the angle defined by the position. (Pin indexing) (position counter reset to zero each revolution).

Note:
• The positioning modes **20.34** = 1 to 9 can handle values from 0 to 32 bits according to the customer scale, such as the zone parameters of menu 75 (see Section H5.7).
• The maximum position reference depends on the customer scale.
• Refer to Section A4.11 for an explanation of rotary positioning.

20.35 : **Speed error threshold**
Sets the threshold that generates the "speed difference" trip t081 (if enabled by **20.15**).
This parameter sets the threshold trip level in comparison with the measured speed error in **3.03**.

20.36 : **Pursuit error threshold**
Sets the threshold that generates the "pursuit error" trip t082 (if enabled by **20.15**).
This parameter sets the threshold trip level in comparison with the measured pursuit error in **18.01**.

20.37 : **Brake control delay**
Used to delay the brake control output **19.32** (on-delay and off-delay).

20.38 : **Magnetising current feedback filter**
This relates to the current threshold for the brake control.
The current reference calculated from **5.07** x 0.3 is compared with the magnetising current **4.17** which is filtered.
The value of the filter, set by **20.38**, allows optimisation of the brake control.

20.39 : **Threshold for position difference between encoders**
Sets the threshold that generates the "position difference" trip t086 (if enabled by **20.15**).
This parameter sets the trip level of the threshold which compares the position error in the revolution between machine encoder and motor encoder.

20.40 : **Movement for one rotary system revolution**
Parameter valid in rotary system mode **20.34** = 5 to 9.
It is used to define the movement of the mobile, for one revolution of the rotary system.
Example:
If **20.40** = 3600, for one revolution the rotary system will give a position of 3600, which corresponds to a unit in tenths of a degree.

H5.5 - Menus 70 and 71 (use with fieldbus)

When the user enters information for positions using **19.11** to **19.17**, the corresponding parameters of menus 70 and 71 are automatically updated with these values. However, if the level of accuracy required is greater than 16 bits or if the values are sent via fieldbus or serial link, the parameters of menus 70 and 71 must be set directly.
Note: With a fieldbus, refer to the corresponding fieldbus module manual.

H5.5.1 - List of parameters

To make configuring easier, menus 70 and 71 allow all the positions and their characteristics to be defined directly.

Parameter	Description	Type	Variation range	Factory setting
70.00 to **70.31**	Positions 1 to 32	R-W	± 31 bits (customer unit) According to defined scale	0
70.32 to **70.63**	Type of positions 1 to 32	R-W	0 (absolute mode) 1 (relative mode)	0
70.64 to **70.95**	Speeds of positions 1 to 32	R-W	1 to (**1.06** x 0.9) min^{-1}	-
70.96 to **71.27**	Acceleration ramp of positions 1 to 32	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
71.28 to **71.59**	Deceleration ramp of positions 1 to 32	R-W	0 to 32767 (1/100 s for 1000 min^{-1})	200 (1/100 s for 1000 min^{-1})
71.60 to **71.91**	Stopping times of positions 1 to 32	R-W	0 to 32767 ms	0

H5.5.2 - Explanation of parameters

70.00 to **70.31** : **Positions 1 to 32**
For each position, enter the distance to be travelled by the mobile between the origin and the place where the mobile is to be positioned in absolute mode, or between the previous position and the place where the mobile is to be positioned in relative mode (depends on **70.32** to **70.63**).
The value of the position is defined by **20.23** and **20.26**.
Note: 19.12 is identical but with configuring in 16 bits.

70.32 to **70.63** : **Types of positions 1 to 32**
For each position, enter the movement mode of the mobile for reaching the required position.
OFF (0): Absolute mode; the positions are referenced with respect to the system origin.
On (1): Relative mode; the position is referenced with respect to the previous position. The mobile advances step by step.
Note: 19.13 is identical but with configuring in 16 bits.

70.64 to **70.95** : **Speeds of positions 1 to 32**
For each position, set the motor speed for reaching the position.
Note: 19.14 is identical but with configuring in 16 bits.

70.96 to **71.27** : **Acceleration ramps of positions 1 to 32**
For each position, set the acceleration ramp for reaching the position.
Note: 19.15 is identical but with configuring in 16 bits.

71.28 to **71.59** : **Deceleration ramps for positions 1 to 32**
For each position, set the deceleration ramp for reaching the position.
Note: 19.16 is identical but with configuring in 16 bits.

71.60 to **71.91** : **Stopping times for positions 1 to 32**
For each position, set the time for stopping at the position before moving to the following position, when the scan timer is enabled (see **20.34**).
Note: 19.17 is identical but with configuring in 16 bits.

H5.6 - Menus 72 and 73

H5.6.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
72.00 to 72.98	Not used			
72.99	Reading of encoder position in lines	RO	± 31 bits	-
73.00 to 73.98	Not used			
73.99	Writing of master encoder position (synchronisation via bus)	R-W	± 31 bits	0

H5.6.2 - Explanation of parameters

72.00 to **72.98** : **Not used**

72.99 : **Reading of encoder position in lines**

This parameter can be used via fieldbus (CTNet, Ethernet, SERCOS, etc.) to determine the actual position of the encoder in lines.

73.00 to **73.98** : **Not used**

73.99 : **Writing of master encoder position (synchronisation via bus)**

This parameter can be used to send the position of the master encoder to be synchronised by fieldbus (CTNet, Ethernet, etc.).

Note: The use of this parameter is not recommended with certain fieldbuses (slowness of the communication).

H5.7 - Menu 75

H5.7.1 - List of parameters

Parameter	Description	Type	Variation range	Factory setting
75.00	Additional origin cycle functions	R-W	± 31 bits	54
75.01	Current threshold at brake release (as a %)	R-W	0 to 100% (% of motor current **5.07**)	25%
75.02	Not used			
75.03	Destination of input DIGIN1 (SM-POS module)	R-W	0 to 9999	0
75.04	Source of output DIGIOUT0 (SM-POS module)	R-W	0 to 9999	0
75.05	Source of output DIGIOUT1 (SM-POS module)	R-W	0 to 9999	0
75.06	Number of rotations (rotary system)	RO	± 31 bits	0
75.07	Maximum permitted position	RO	± 31 bits (customer unit)	-
75.08	Value conversion maximum output value as a percentage	R-W	0 to 31 bits	1350
75.09	Value conversion source as a percentage	R-W	0 to 7599	701
75.10	Value conversion destination as a percentage	R-W	0 to 7599	0
75.11 to 75.49	Not used			
75.50	terminal 1 of zone 1 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.51	terminal 2 of zone 1 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.52	terminal 1 of zone 2 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.53	terminal 2 of zone 2 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.54	terminal 1 of zone 3 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.55	terminal 2 of zone 3 with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.56	Software limit stop A with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.57	Software limit stop B with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.58	Origin shift with configuring in more than 16 bits	R-W	± 31 bits (according to defined scale)	0
75.59	Not used	R-W	± 31 bits (according to defined scale)	0
75.60	Actual absolute position of the mobile (in 32 bits)	RO	± 31 bits (according to defined scale)	-
75.61	Actual relative position of the mobile (in 32 bits)	RO	± 31 bits (according to defined scale)	-
75.62	Configuring in 32 bits of the kinematic ratio numerator in synchronisation	R-W	± 31 bits (according to defined scale)	1
75.63	Configuring in 32 bits of the kinematic ratio denominator in synchronisation	R-W	± 31 bits (according to defined scale)	1
75.64	Number of revolutions performed	RO	± 31 bits	-
75.65	Maximum permitted number of revolutions	RO	± 31 bits	-
75.66	Position of the master in synchronisation (customer unit)	RO	± 31 bits	-
75.67	Position of the master in synchronisation	RO	± 31 bits	-
75.68	Speed of the mobile in 32 bits	RO	± 31 bits	-

H5.7.2 - Explanation of parameters

75.00 : Additional origin cycle functions

Used to modify the management of software or mechanical limit stops, and end stop sensors.
Bit 0 = 1: Enabling of reverse of direction on software limit stop
Bit 1 = 1: Enabling of reverse of direction on end stop sensor limit stop
Bit 2 = 1: Enabling of reverse of direction on mechanical limit stop
Bit 3 = 1: Enabling of management of the trip on software limit stop during origin cycle
Bit 4 = 1: Enabling of management of the trip on sensor limit stop during origin cycle
Bit 5 = 1: Enabling of management of the trip on mechanical limit stop during origin cycle
Note: In factory settings, **75.00** = 54, which corresponds to the enabling of bits 1, 2, 4 and 5.

75.01 : Current threshold at brake release (as a %)

Factory setting at 25% of I nominal.
Used to set the current threshold at which the brake will be controlled. This current level must ensure sufficient torque at the time the brake is released. It is a percentage of **5.07**.
Note: Parameter not active in servo mode.

75.02 : Not used

75.03 : **Destination of input DIGIN1 (SM-POS)**
This parameter is used to select the destination of the terminal 11 input of the SM-POS module.

75.04 : **Source of output DIGIOUT0 (SM-POS)**
This parameter is used to select the source of the terminal 12 output of the SM-POS module.

75.05 : **Source of output DIGIOUT1 (SM-POS)**
This parameter is used to select the source of the terminal 13 output of the SM-POS module.

75.06 : **Number of rotations (rotary system)**
Number of rotations since the origin cycle with I_o.

75.07 : **Maximum permitted position**
Maximum position reference calculated by the drive according to the scaling.

75.08 : **Value conversion maximum output value as a percentage**
Used to set the maximum value at the output when the value of the source **75.09** is 100%. This output value can be a position, a speed, etc.

75.09 : **Value conversion source as a percentage**
Used to select the parameter expressed as a percentage, to be converted into a position or speed value for example.

75.10 : **Value conversion destination as a percentage**
Used to define the parameter to which the conversion output will be addressed, for example a position or a speed.

75.11 to **75.49** : **Not used**

75.50 : **Terminal 1 of zone 1 with configuring in more than 16 bits**
Zone 1 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 1 (delimiting of the zone).
Note: 18.13 is identical but with configuring in 16 bits.

75.51 : **Terminal 2 of zone 1 with configuring in more than 16 bits**
Zone 1 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 1 (delimiting of the zone).
Note: 18.14 is identical but with configuring in 16 bits.

75.52 : **Terminal 1 of zone 2 with configuring in more than 16 bits**
Zone 2 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 2 (delimiting of the zone).
Note: 18.17 is identical but with configuring in 16 bits.

75.53 : **Terminal 2 of zone 2 with configuring in more than 16 bits**
Zone 2 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 2 (delimiting of the zone).
Note: 18.18 is identical but with configuring in 16 bits.

75.54 : **Terminal 1 of zone 3 with configuring in more than 16 bits**
Zone 3 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 1 of zone 3 (delimiting of the zone).
Note: 18.21 is identical but with configuring in 16 bits.

75.55 : **Terminal 2 of zone 3 with configuring in more than 16 bits**
Zone 3 requires the mobile to pass through at reduced speed. This setting fixes the position of terminal 2 of zone 3 (delimiting of the zone).
Note: 18.22 is identical but with configuring in 16 bits.

75.56 : **Software limit stop A with configuring in more than 16 bits**

75.57 : **Software limit stop B with configuring in more than 16 bits**
These are internal safety mechanisms acting as "virtual end stops". On a defined path, the limit A position will be set in **75.56** and the limit B position in **75.57**, these being the positions the mobile can reach with respect to the origin.
When the mobile reaches and goes past this limit stop, the drive goes into t083 trip state (if this is enabled by bit 3 of 20.15).
During the origin cycle **18.42** = On (1), software limit stops A and B are disabled.
• The software limit stops do not remove the need for the "end stop" mechanical limit stops of the installation, which must act directly on the mechanical brake mounted on the motor or on the machine.
Note: 19.27 and **19.28** are identical but with configuring in 16 bits.

75.58 : **Origin shift with configuring in more than 16 bits**
Used to obtain an origin different from the origin cycle sensor, which avoids mechanical repositioning of the sensor for example.
The shift is taken into account as a matter of course when the origin cycle is OK (**19.31** = On (1)).
Taking up the shift is also enabled during the origin cycle when **19.37** = On (1).
Note: 19.29 is identical but with configuring in 16 bits.

75.59 : **Not used**

75.60 : **Actual absolute position of the mobile (in 32 bits)**
Actual position of the mobile with respect to the origin.
Same information as **20.30** (in 20 bits) and **18.02** (in 16 bits).

75.61 : **Actual relative position of the mobile (in 32 bits)**
Actual position of the mobile with respect to the last stopping position.
Same information as **19.10** (in 16 bits).

75.62 : **Configuring in 32 bits of the kinematic ratio numerator in synchronisation**

Used to set the product of the driving gears.
Same information as **20.05** (in 16 bits).

75.63 : **Configuring in 32 bits of the kinematic ratio denominator in synchronisation**

Used to set the product of the driven gears.
Same information as **20.06** (in 16 bits).

75.64 : **Number of revolutions performed**

Used to display the number of revolutions performed by the position encoder.

75.65 : **Maximum permitted number of revolutions**

Used to display the maximum permitted number of revolutions by the position encoder, for retaining an absolute position.
When the number of revolutions exceeds this value, the drive goes into trip state t071.

75.66 : **Position of the master in synchronisation (customer unit)**

Indicates the position of the master to which it is necessary to synchronise, expressed in customer units.

75.67 : **Position of the master in synchronisation**

Indicates the position of the master to which it is necessary to synchronise, expressed in encoder lines.

75.68 : **Speed of the mobile in 32 bits**

Indicates the linear or angular speed of the mobile during positioning.
Note: 18.04 is identical but with configuring in 16 bits.

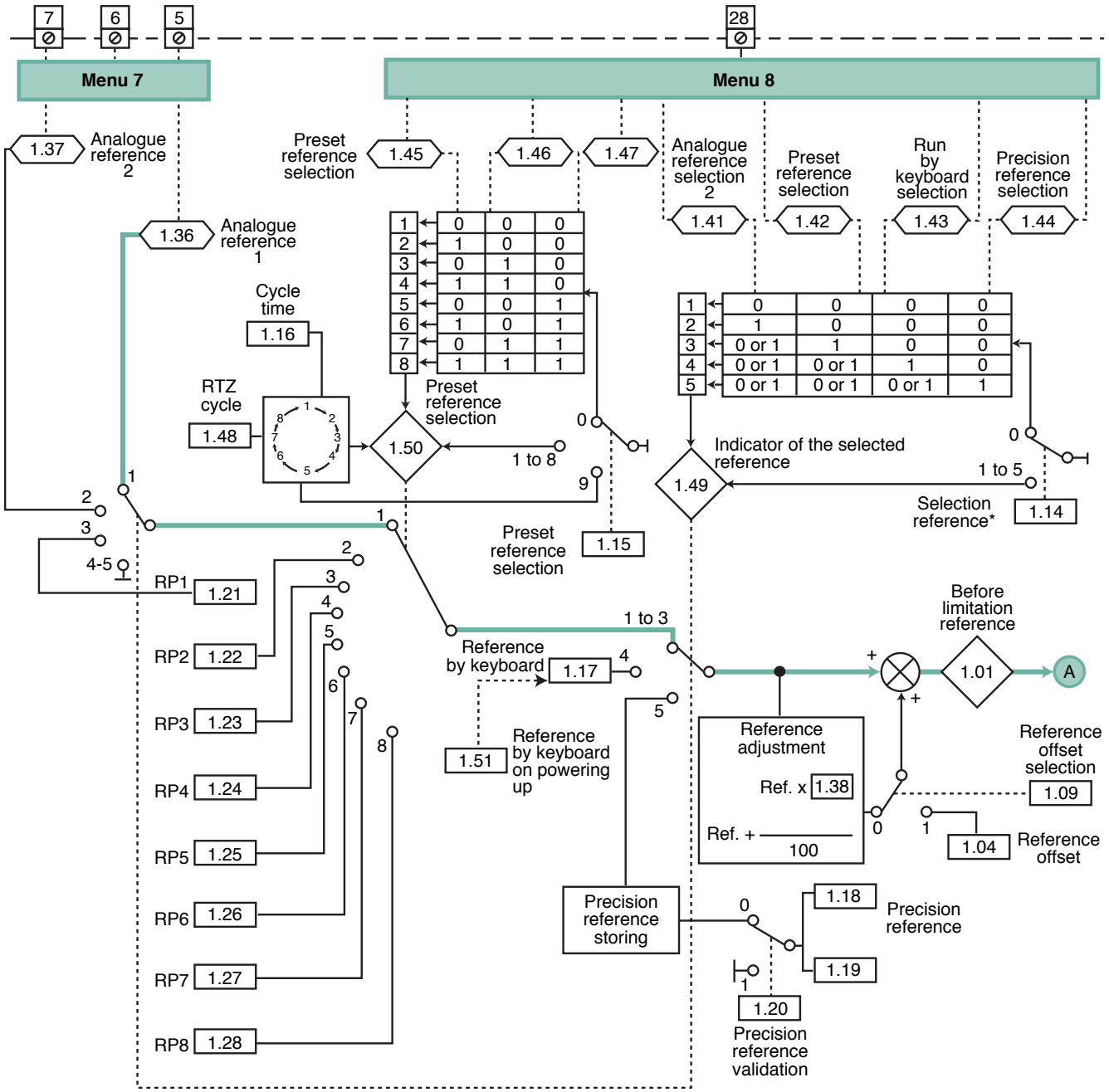
Notes

H6 - Basic menu diagrams

The basic menu diagrams in this section have been included in this manual to make commissioning of the drive easier.
The diagrams specific to the Positioning application are included in Section H4, and should be sufficient in the majority of cases.
However, the user may need to refer to the basic drive diagrams for modifying certain parameters of menus 1 to 22.

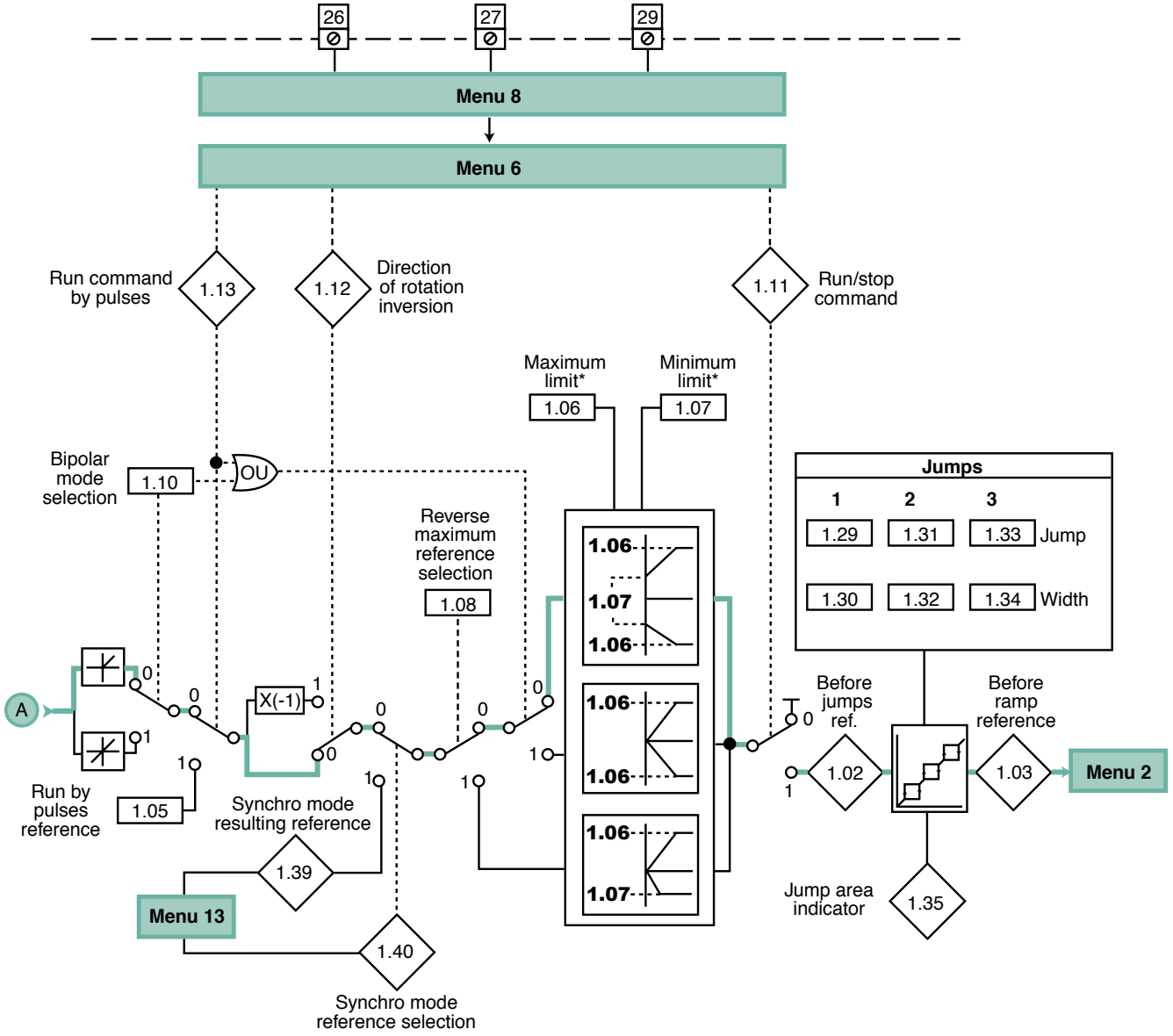
CAUTION:
These basic drive diagrams do not take into account the internal settings generated by the SM-POS module program.

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



Parameters	Variation range			Factory setting		
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)		

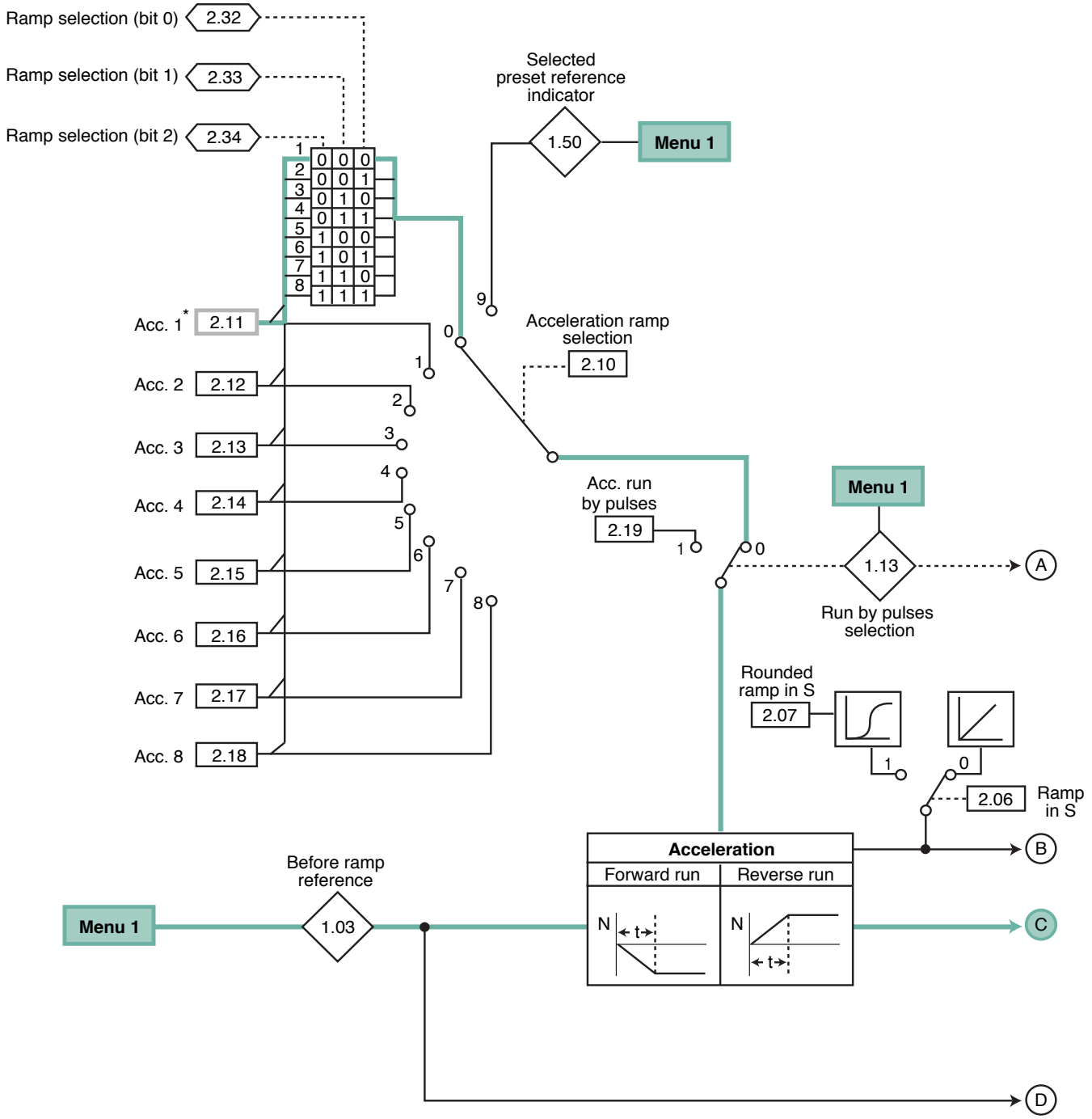
Menu 1 (continued)



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

Parameters	Variation range			Factory setting		
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}		-		

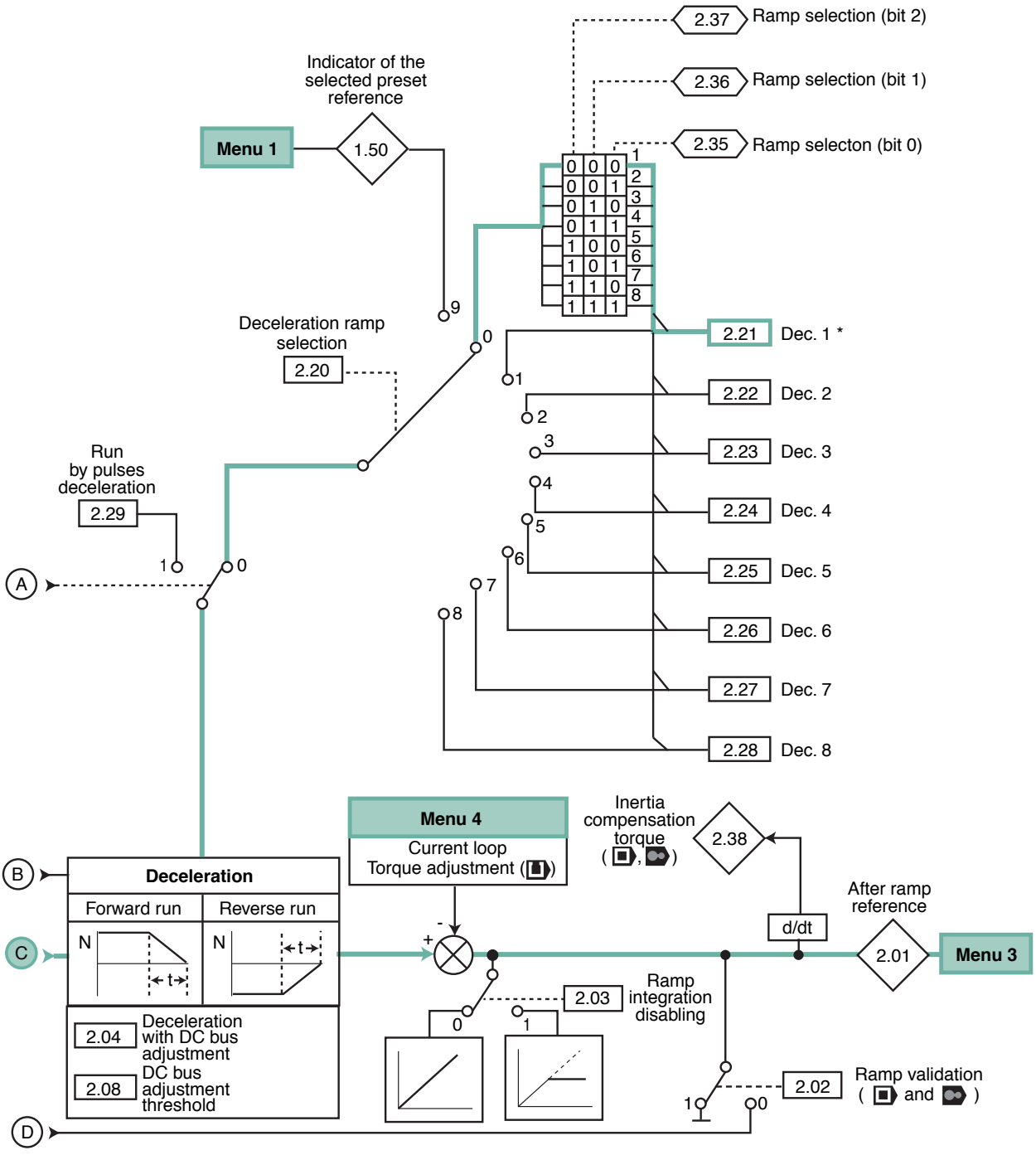
H6.2 - Menu 2: Ramps



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

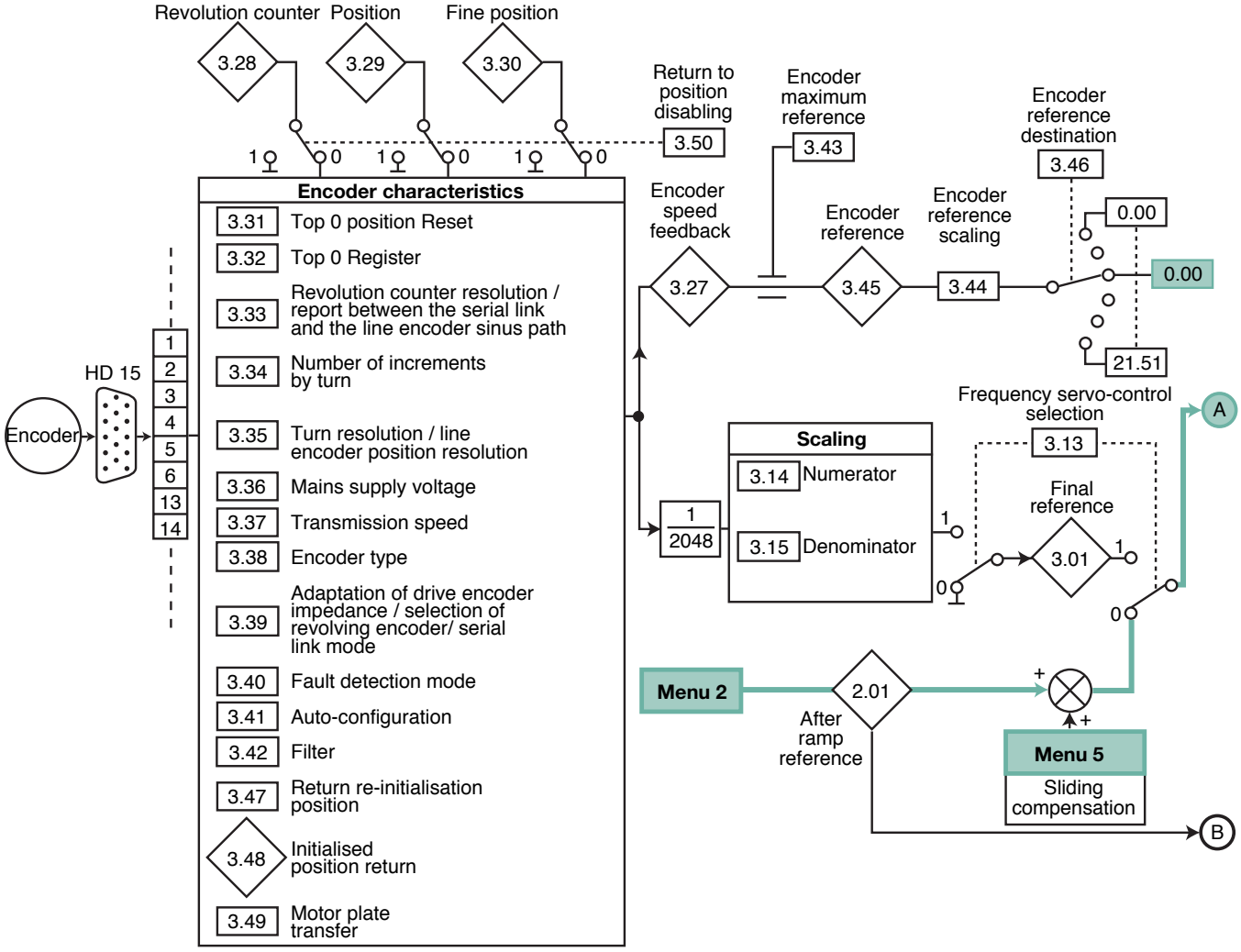
Parameters	Variation range			Factory setting		
2.07	0 to 300.0 s^2/100 Hz	0 to 100.000 s^2/1000 min^{-1}		3.1 s^2/100 Hz	1.500 s^2/1000 min^{-1}	0.030 s^2/1000 min^{-1}
2.11 to **2.18**	0 to 3200.0 s/100 Hz	0 to 3200.000 s/1000 min^{-1}		5.0 s/100 Hz	2.000 s/1000 min^{-1}	0.0200 s/1000 min^{-1}
2.19	0 to 3200.0 s/100 Hz	0 to 3200.000 s/1000 min^{-1}		0.2 s/100 Hz	0	

Menu 2 (continued)



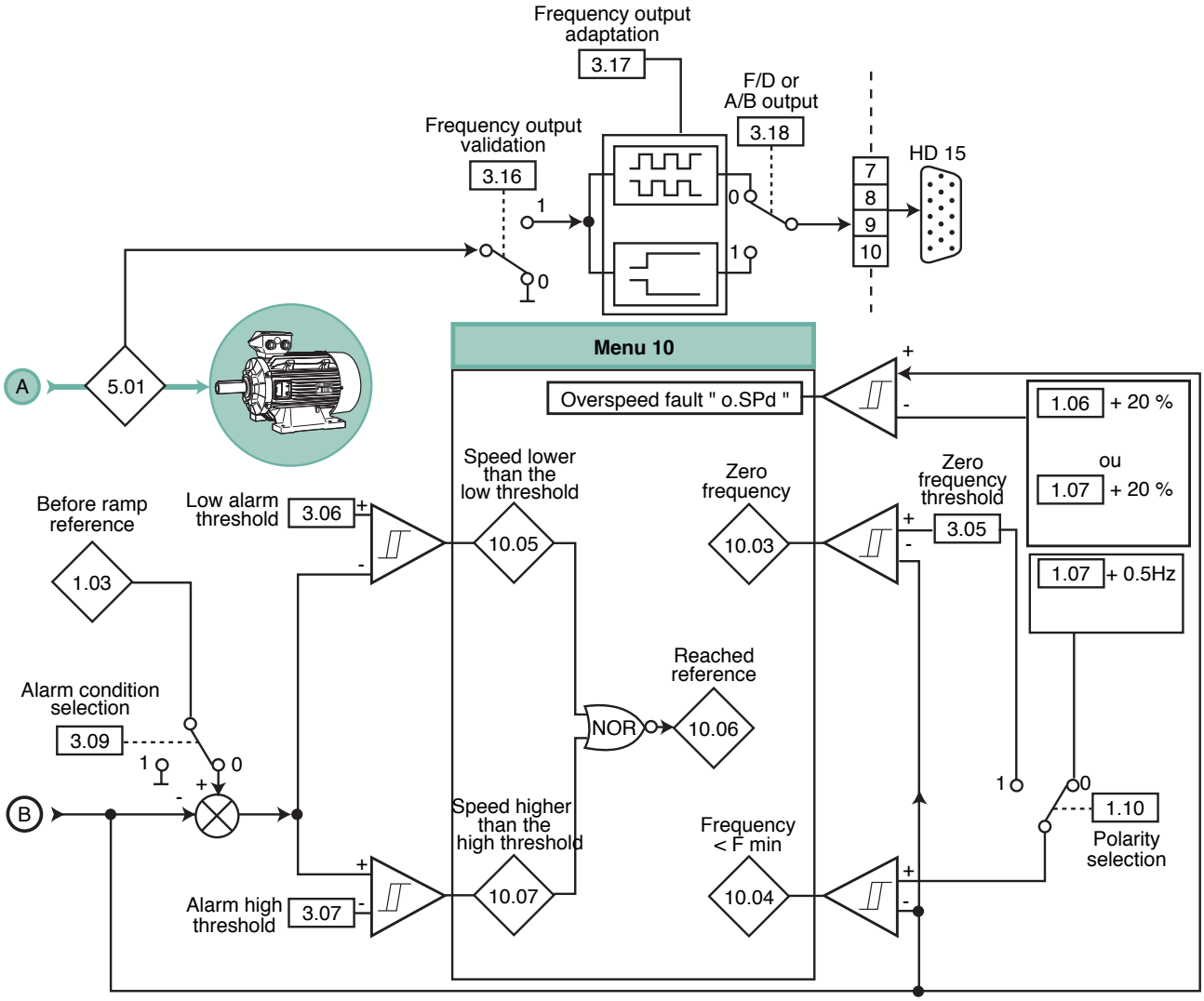
Parameters	Variation range			Factory setting		
2.01	± REF. MAX			-		
2.04	FASt (0), Std (1), Std.hV (2)	FASt (0), Std (1)		Std (1)		
2.08	0 to MAX U_{cc} THRESHOLD (V)			TL: 375 V T: EUR = 750 V / USA = 775 V TM: 895 V TH: 1075 V		
2.21 to **2.28**	0 to 3200.0 s/100 Hz	0 to 3200.000 s/1000 min^{-1}	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

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



Parameters	Variation range	Factory setting
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 revolutions	-
3.29	0 to 65535 ($1/2^{16}$ per revolution)	-
3.30	0 to 65535 ($1/2^{32}$ per revolution)	-
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	5 V (0), 8 V (1), 15 V (2)	5 V (0)
3.37	100 (0), 200 (1), 300 (2), 400 (3), 500 (4), 1000 (5), 1500 (6), 2000 (7) 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)
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)	-

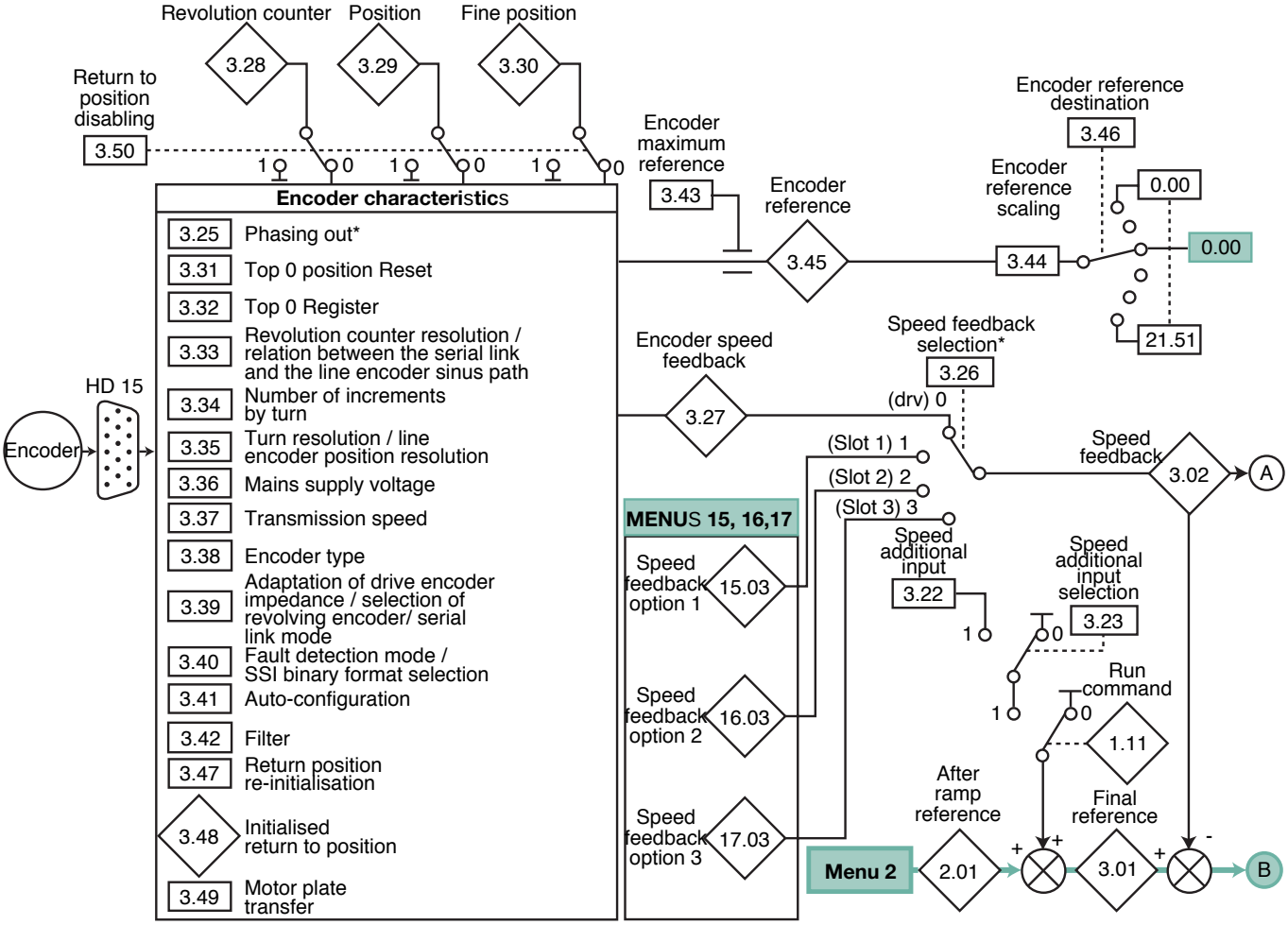
Menu 3 in open loop (continued)



According to the encoder type, fill in at least the parameters below		
Incremental encoder or Sincos without serial link	**SinCos encoder with Hiperface link or EndAt 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 for an encoder with Hiperface link) **3.38**: Type **3.41**: Auto-configuration	**3.33**: Number of revolutions **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 setting
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)

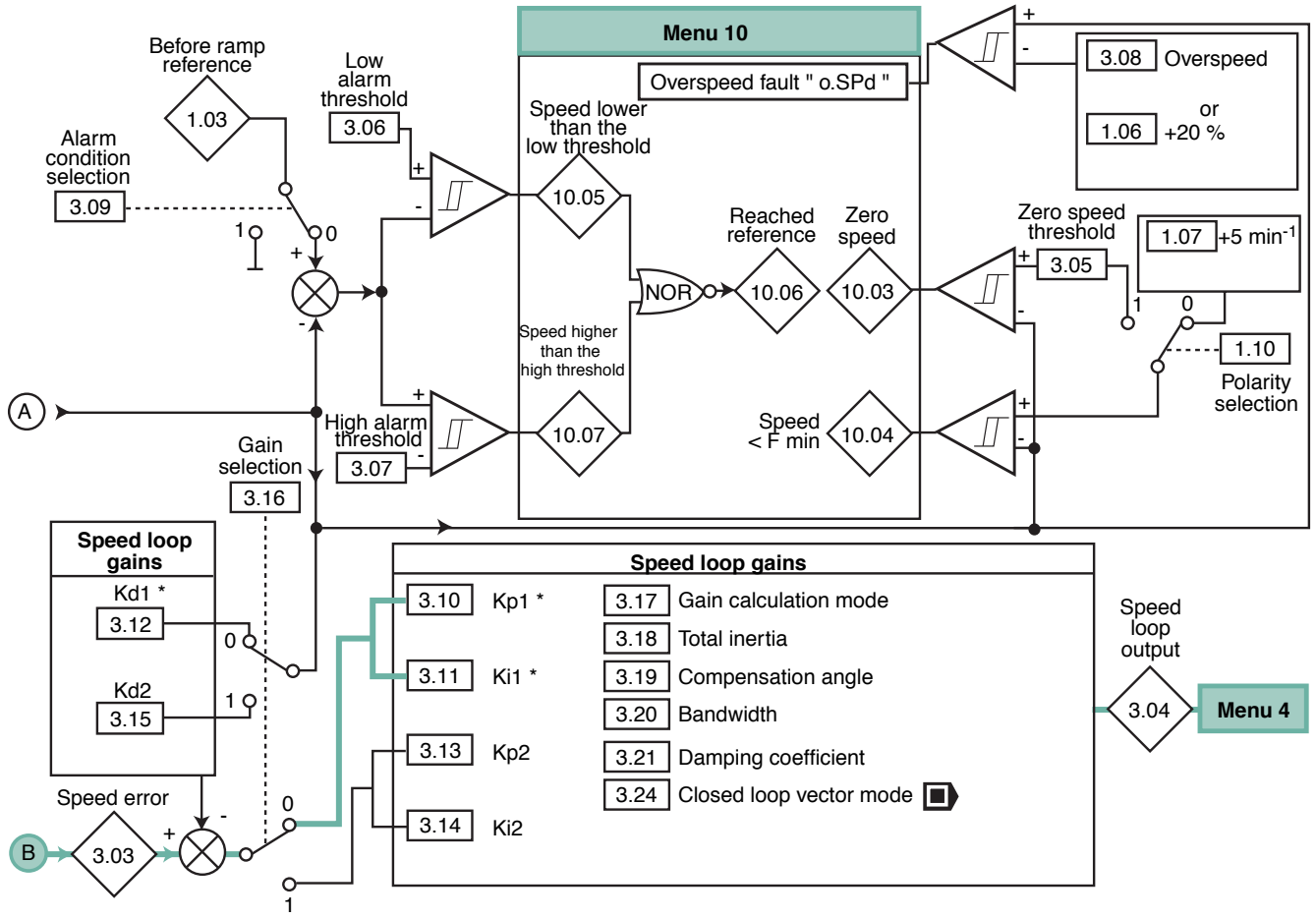
H6.4 - Menu 3: Encoder input and speed loop in closed loop and servo mode and



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

Parameters	Variation range		Factory setting	
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 revolutions		-	
3.29	0 to 65535 (1/2^{16}th revolution)		-	
3.30	0 to 65535 (1/2^{32}nd revolution)		-	
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	5 V (0), 8 V (1), 15 V (2)		5 V (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 16 ms)		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)		-	

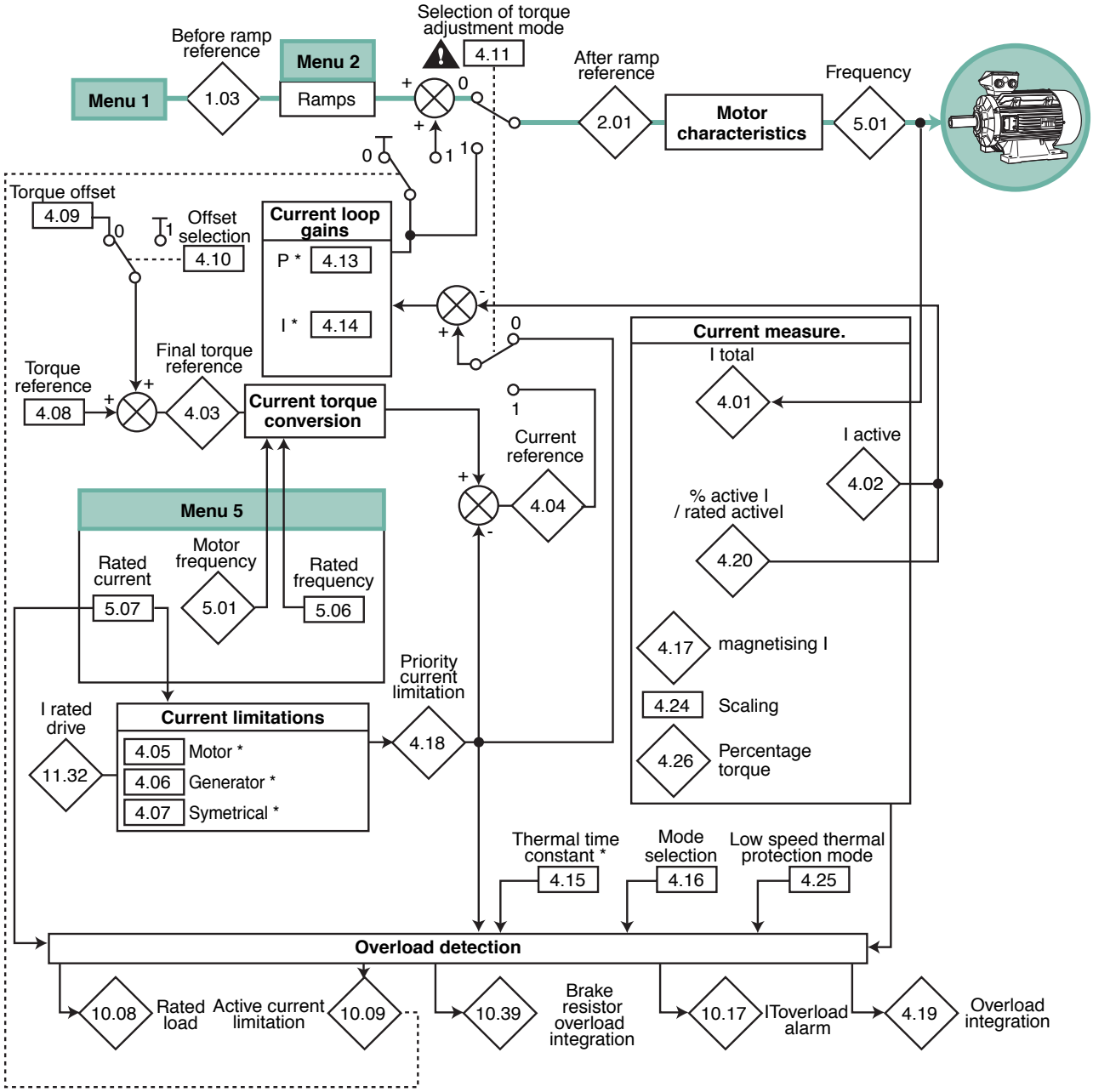
Menu 3 in open loop and servo mode (continued)



According to the encoder type, fill in at least the parameters below		
Incremental encoder or Sincos without serial link	**SinCos encoder with Hiperface link or EndAt 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 for an encoder with Hiperface link) **3.38**: Type **3.41**: Auto-configuration	**3.33**: Number of revolutions **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 setting	
	▣	⊶	▣	⊶
3.03	± N MAX		-	
3.04	± I_{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	-

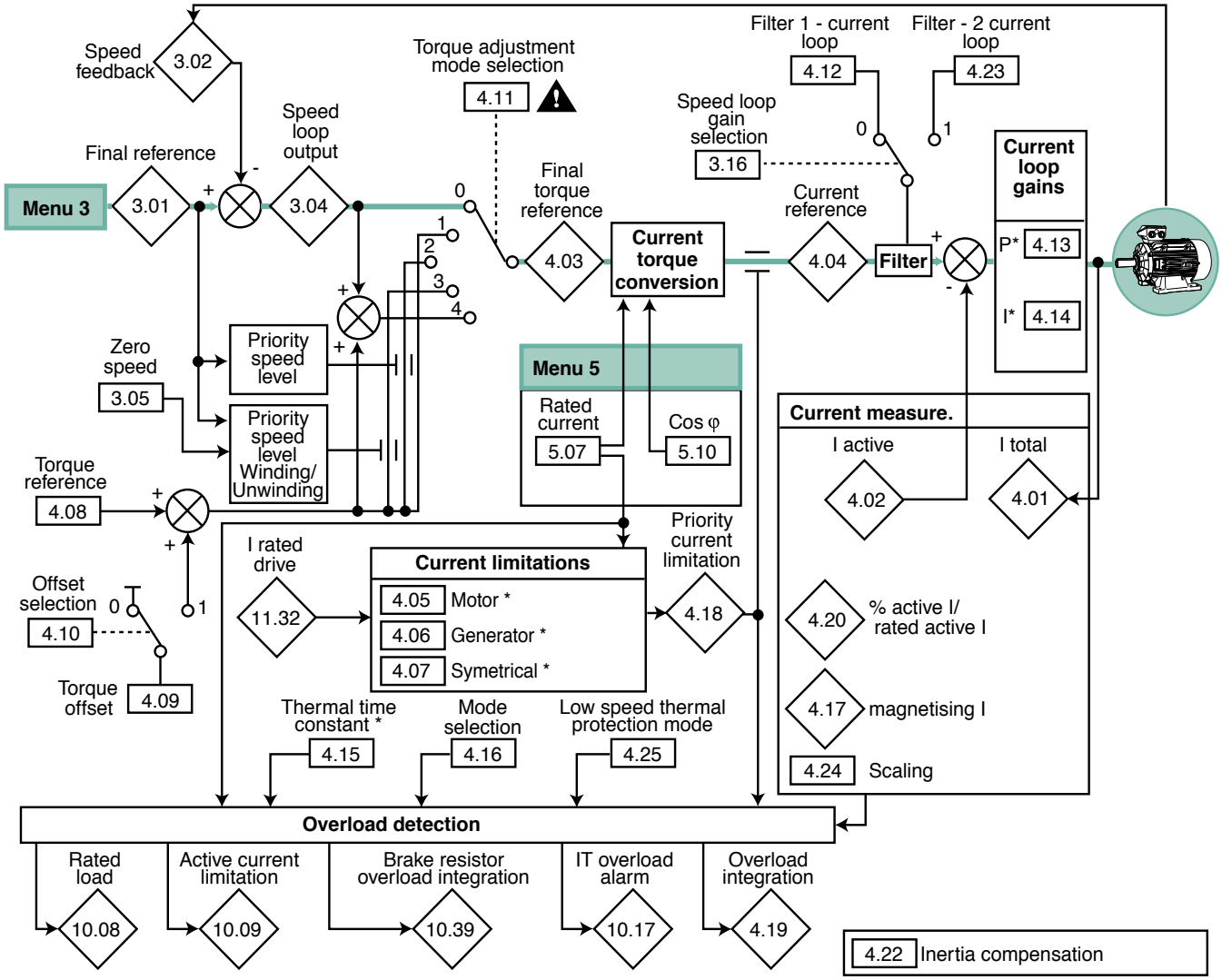
H6.5 - Menu 4: Current loop, torque control in open loop



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

Parameters	Variation range	Factory setting
4.01	0 to I_{MAX} DRIVE (A)	-
4.02 - 4.17	± I_{MAX} DRIVE (A)	-
4.03 - 4.04 - 4.18	± I_{ACTIVE} MAX (%)	-
4.05 - 4.06 - 4.07	0 to LIM. IM1 MAX (%)	165.0%
4.08 - 4.09	± 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	± I_{MAX} UTIL. (%)	-
4.24	0 to I_{ACTIVE} MAX (%)	165.0%
4.26	± I_{MAX} UTIL. (%)	-

H6.6 - Menu 4: Current loop and torque control in closed loop

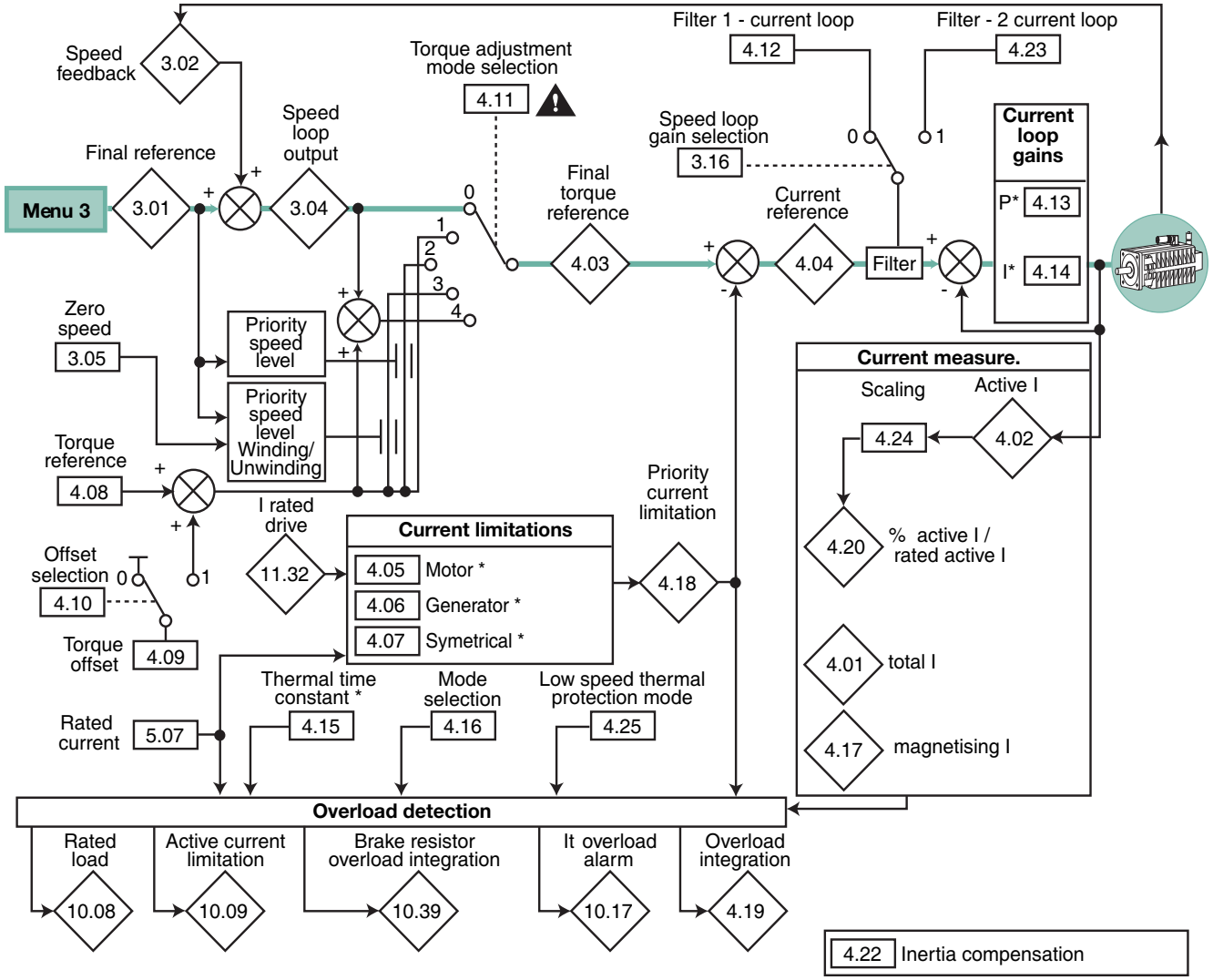


• When the torque command mode without speed control is validated (4.11 = 1) and on the zero resistant toque, the drive accelerates up to the overspeed threshold 3.08 (stop). If 3.08 is at 0, the maximum speed reached will be 1.06 + 20 %.
• When modes 2 or 3 are selected, the drive does not take into 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 are replaced by the parameters of menu 21.

Parameters	Variation range	Factory setting
4.01	0 to I_{MAX} DRIVE (A)	-
4.02 - 4.17	± I_{MAX} DRIVE (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 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	± I_{MAX} UTIL. (%)	-
4.24	± I_{ACTIVE} MAX (%)	175.0%

H6.7 - Menu 4: Current loop, torque control in servo mode

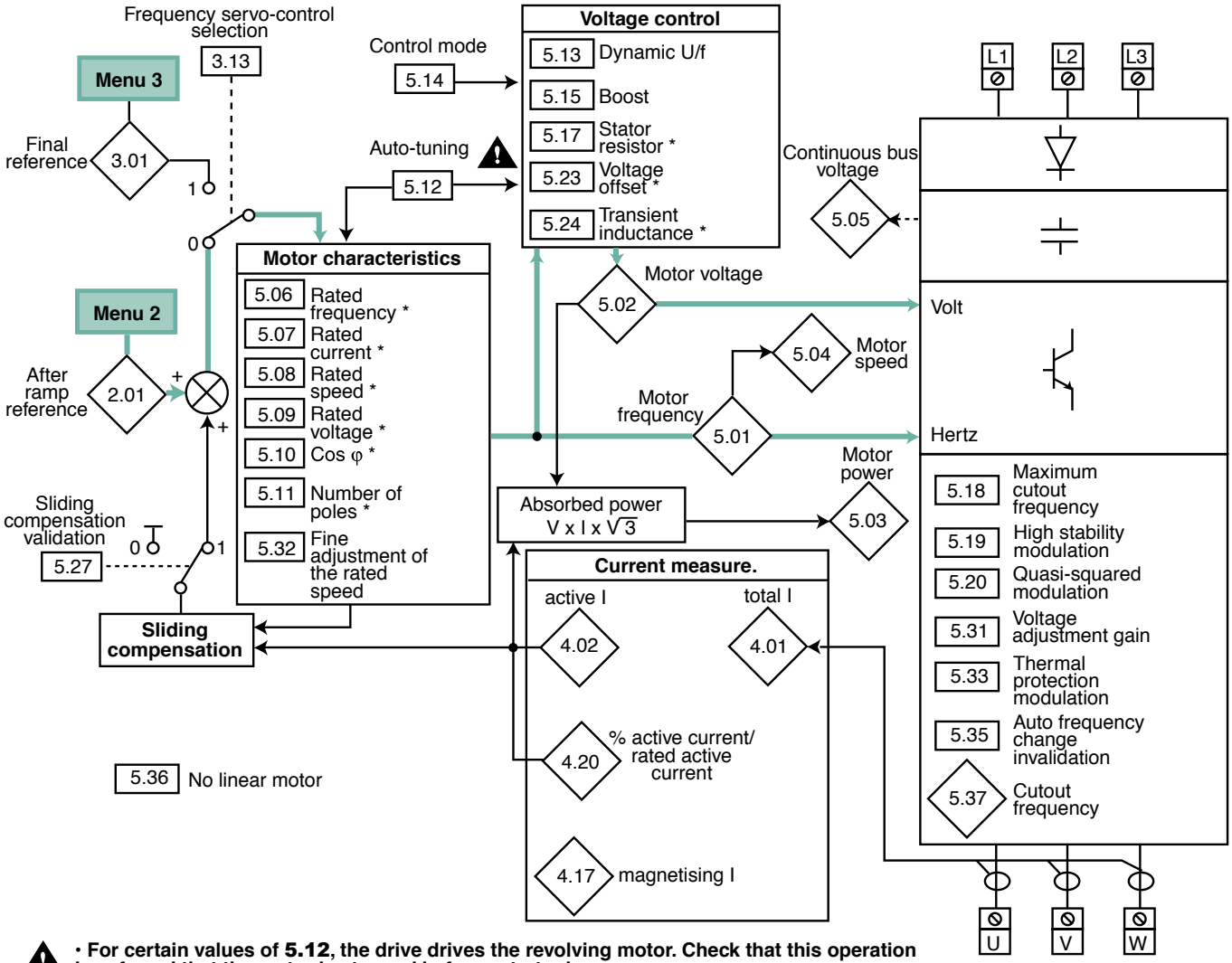


When the torque command mode without speed control is validated (4.11 = 1) and on the zero resistant toque, the drive accelerates up to the overspeed threshold 3.08 (stop). If 3.08 is at 0, the maximum speed reached will be of 1.06 + 20 %.
• When the modes 2 or 3 are selected the drive does not take 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 are replaced by the parameters of menu 21.

Parameters	Variation range	Factory setting
4.01	0 to I_{MAX} DRIVE (A)	-
4.02 - 4.17	± I_{MAX} DRIVE (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%

H6.8 - Menu 5: Open loop motor control

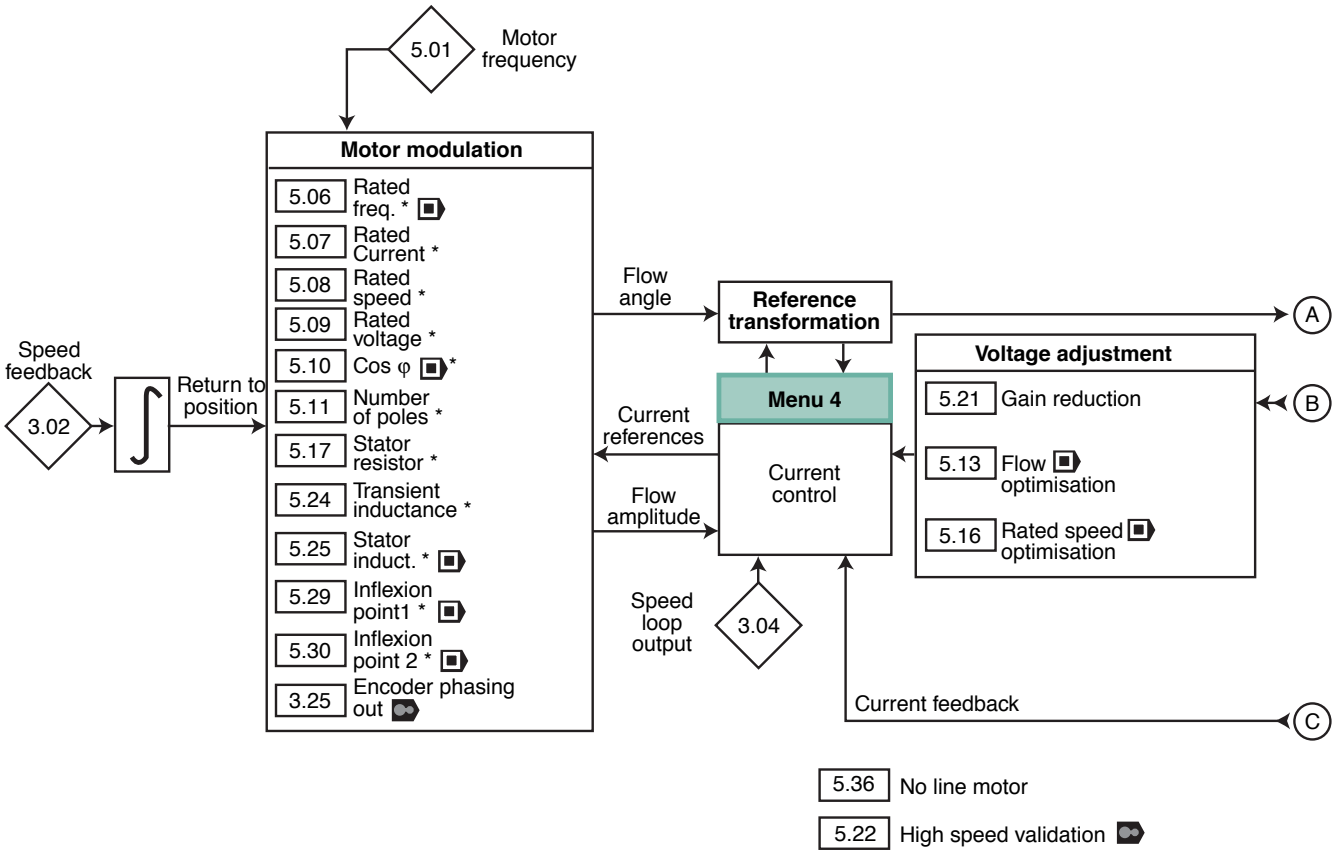


• For certain values of 5.12, the drive drives the revolving motor. Check that this operation is safe and that the motor is stopped before auto-tuning.
• After modification of the motor parameters, restart auto-tuning.

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

Parameters	Variation range	Factory setting
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_{NOM} DRIVE (**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: 200 V / T: EUR = 400 V, USA = 480 V / TM: 575 V / TH: 690 V
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% of U_{NOM} 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)	-

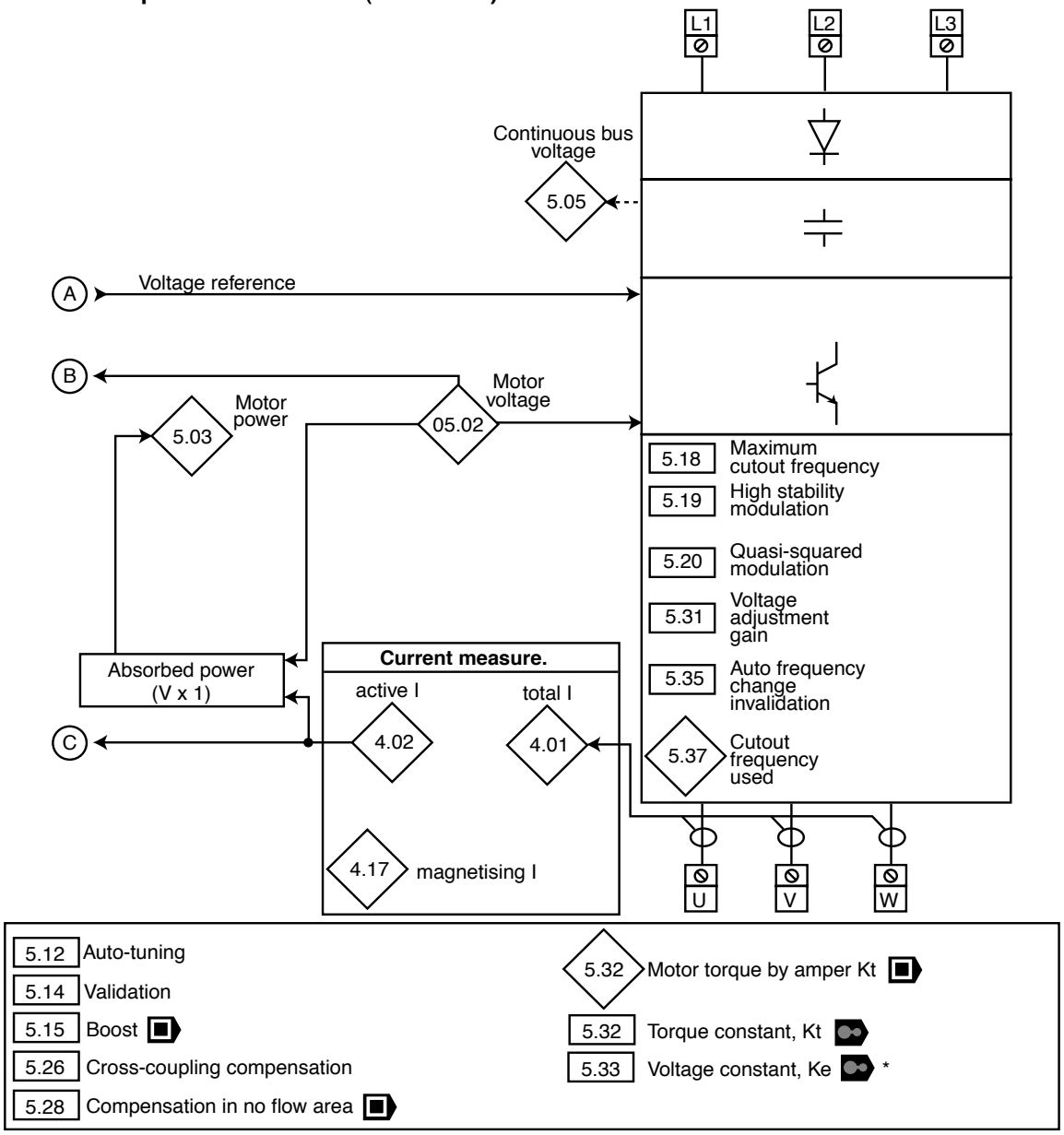
H6.9 - Menu 5: Motor control in closed loop and servo mode



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

Parameters	Variation range		Factory setting	
5.01	± 1250.0 Hz		-	
5.06	0 to 1250.0 Hz	-	EUR: 50.0 Hz / USA: 60.0 Hz	-
5.07	0 to I_N MAX (A)		I_{NOM} DRIVE (**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: 200 V / T: EUR = 400 V, USA = 480 V / TM: 575 V / TH: 690 V	
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 rated flux	-	50%	-
5.30	0 to 100% of rated flux	-	75%	-
5.36	0 to 655.35 mm		0	

Menu 5 in closed loop and servo mode (continued)

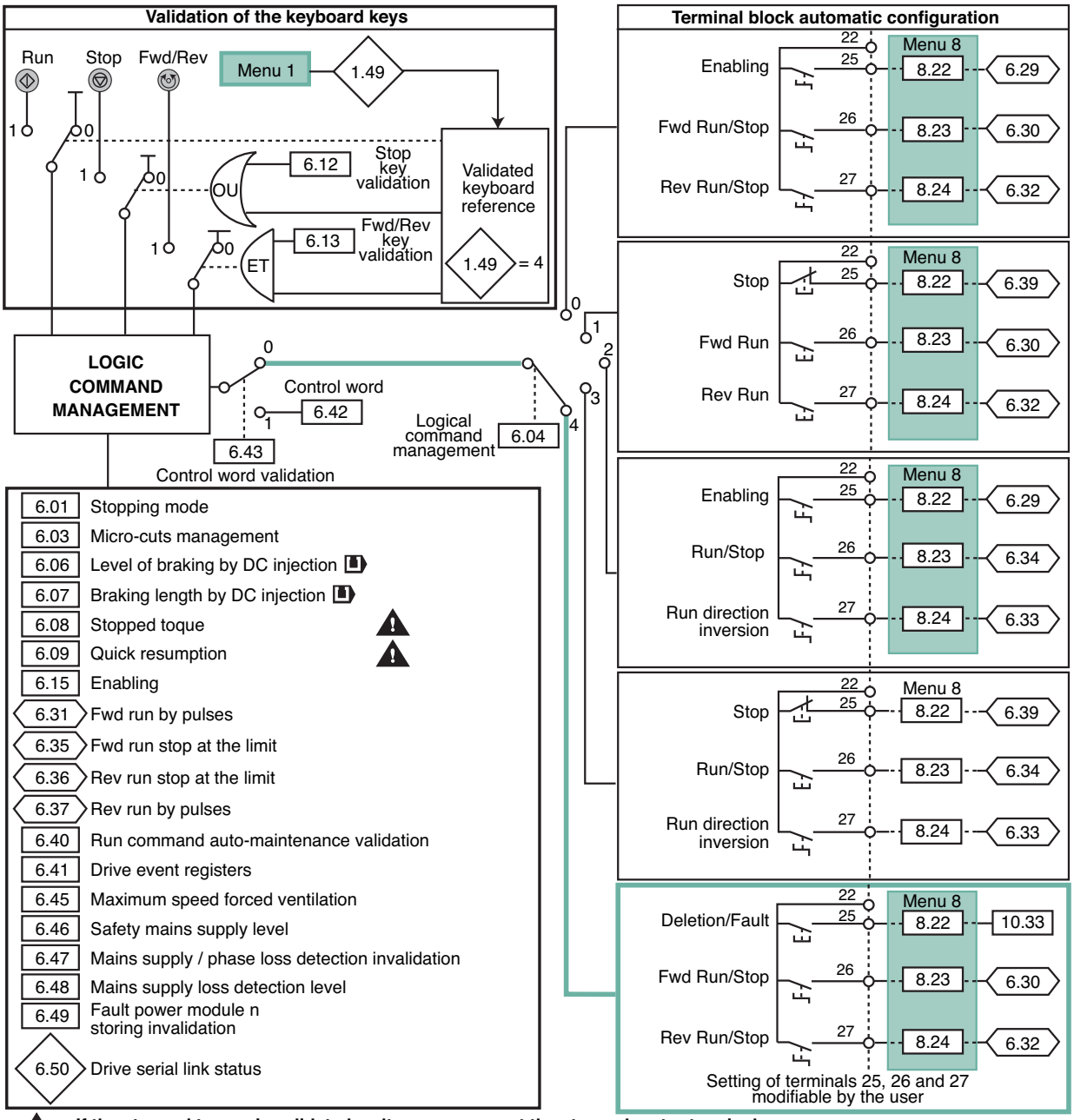


· For certain values of 5.12, the drive drives the rotating motor. Check that this operation is safe and that the motor is stopped before the auto-tuning.
· After the modification of the motor parameters, renew the auto-tuning.

Parameters	Variation range		Factory setting	
	■	⊶	■	⊶
5.02	0 to U_{AC} OUT MAX (V)		-	
5.03	± P MAX (kW)		-	
5.05	0 to U_{DC} MAX (V)		-	
5.12	0 to 4	0 to 6	0	
5.14	-	nonE (0), PhEnl (1), PhInit (2)	-	nonE (0)
5.15	0 to 25.0% U_{NOM} 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 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)		-	

H6.10 - Menu 6: Management of logic commands and counters

• Management of logic commands

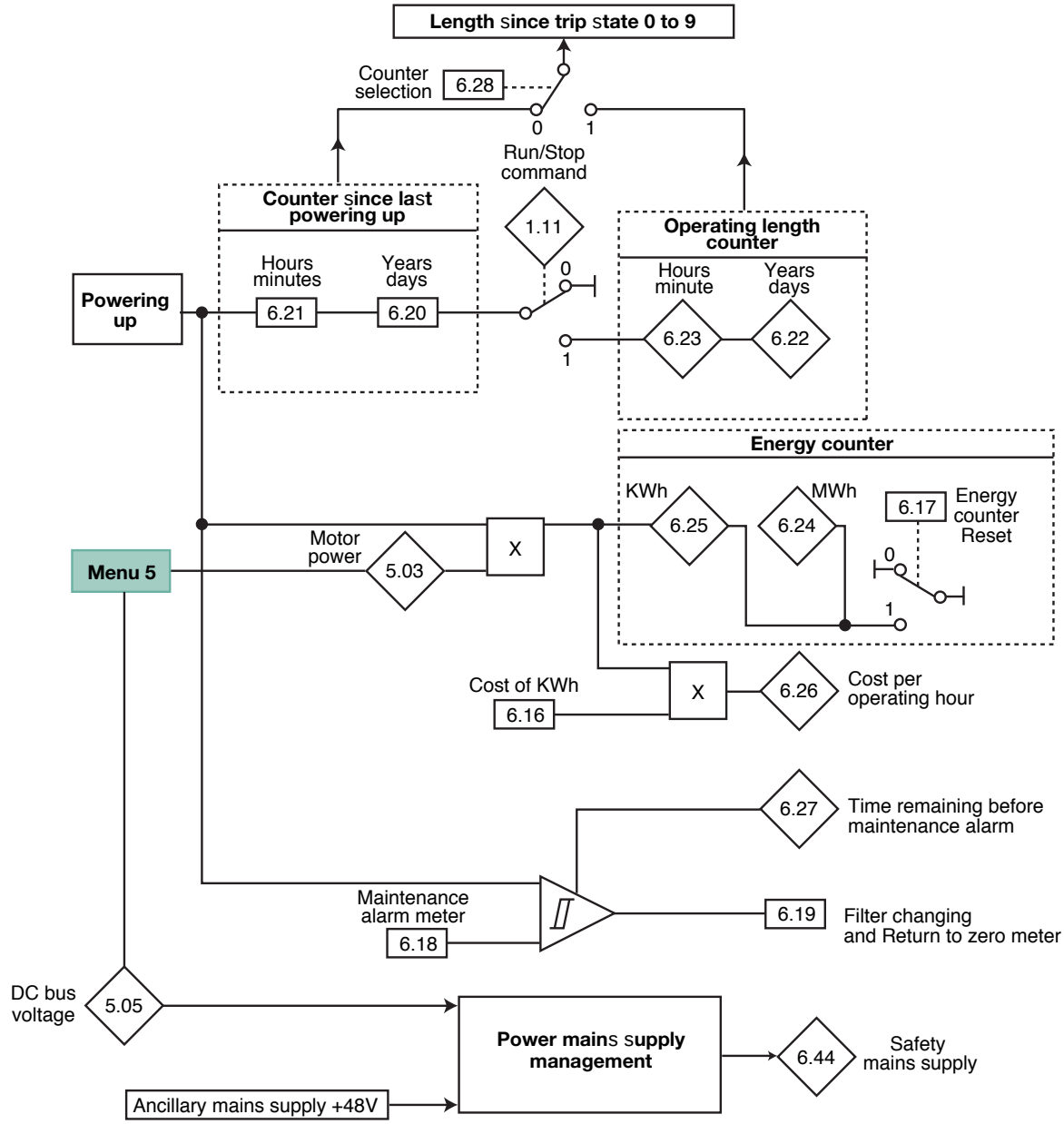


• If the stopped torque is validated, voltage presence at the stopped motor terminals.
• If the motor is just a little loaded, the quick resumption validation may cause the rotating of the machine in a non defined direction, with the motor acceleration. Make sure that there is no danger for persons and goods.

Parameters	Variation range			Factory setting		
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 to 65535			0		
6.42	0 to 32767			0		
6.46	Size 1: 48 V, sizes 2 and 3: 48 V to 72 V			48 V		
6.48	0 to MAX U_{DC} threshold (V)			TL: 205 V, T: 410 V, TM: 540 V, TH: 540 V		
6.50	Drv (0), Slot (1), Slot 2 (2), Slot 3 (3)			-		

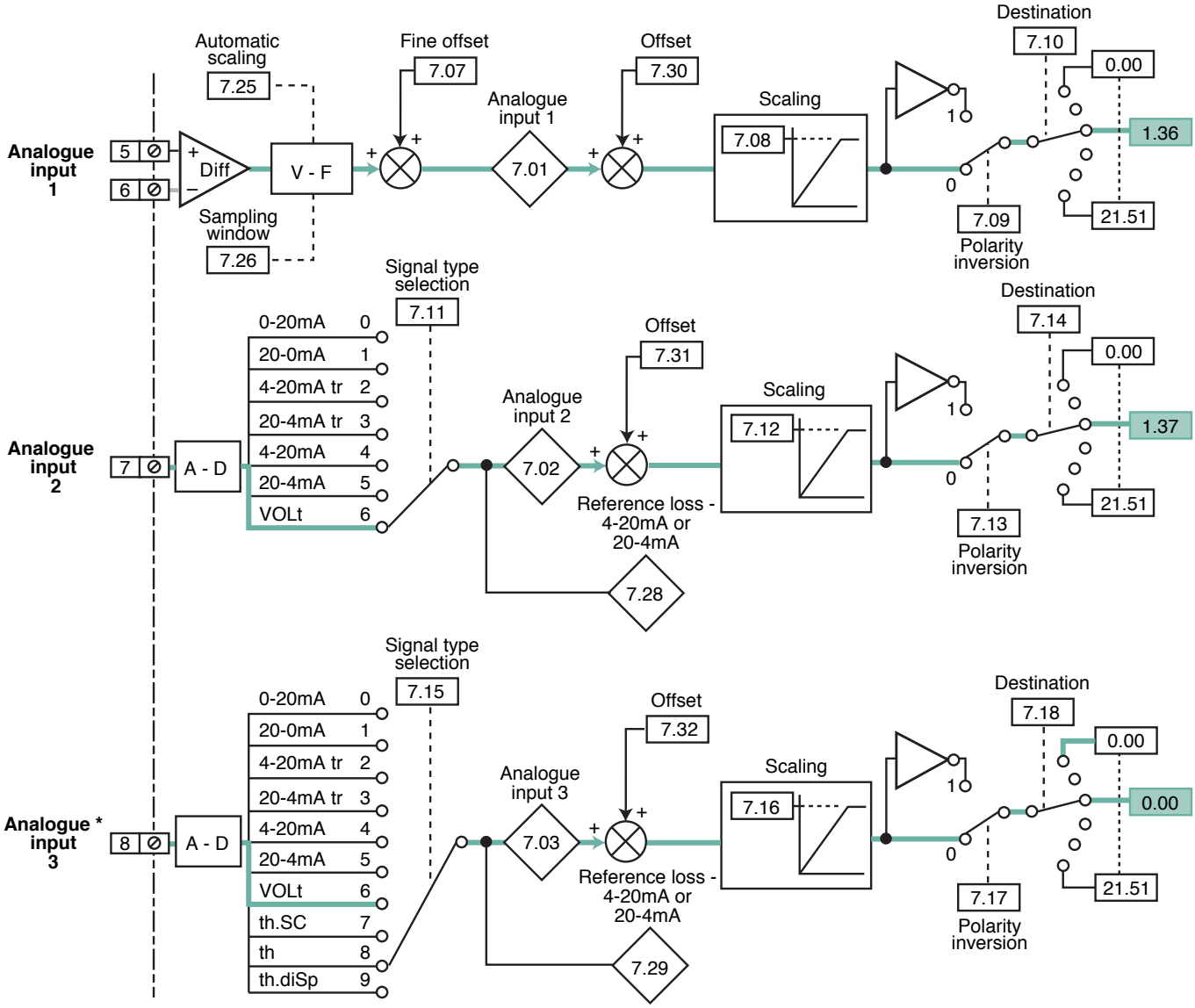
Menu 6 (continued)

• **Timers**



Parameters	Variation range			Factory setting		
6.16	0 to 600.0 currency/kWh			0		
6.19 - 6.28	OFF (0) or On (1)			OFF (0)		
6.18	0 to 30000 hrs			0		
6.20 - 6.22	0 to 9365 years, days			-		
6.21 - 6.23	0 to 23.59 hrs, min			-		
6.24	0 to 999.9 MWh			-		
6.25	0 to 99.99 kWh			-		
6.26	± 32000 currency/hour			-		
6.27	0 to 30000 hrs			-		
6.44	OFF (0) or On (1)			-		

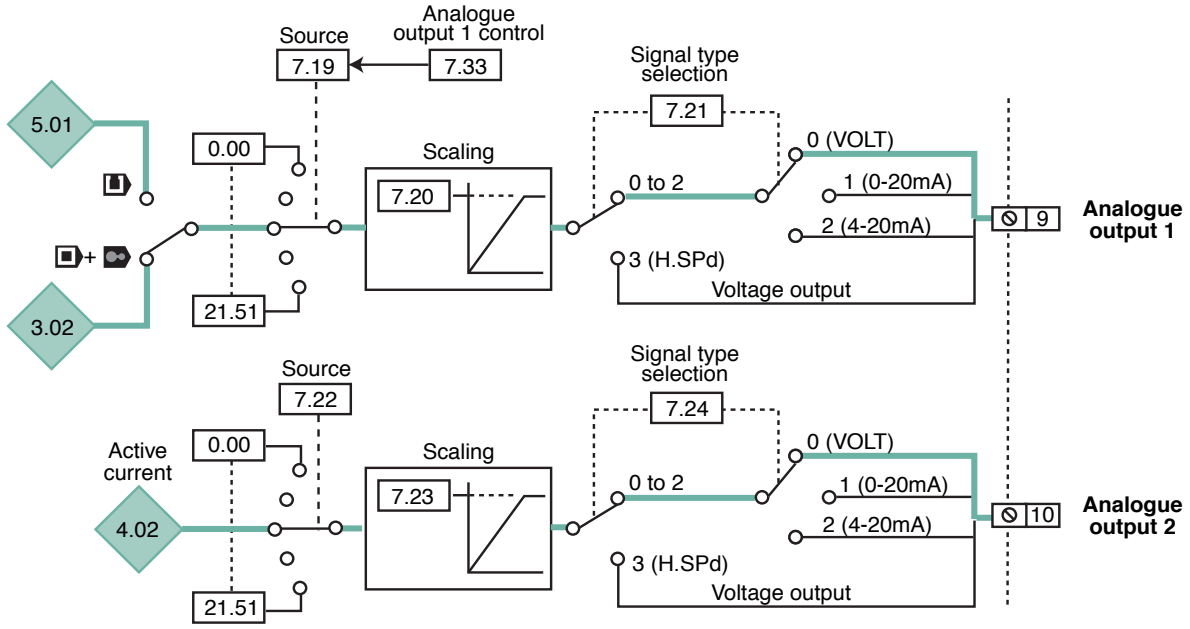
H6.11 - Menu 7: Configuration of analog I/O



* 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 setting		
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		

Menu 7 (continued)



Variable speed drive environment

7.04	Temperature1 power stage	7.06	Control card temperature
7.05	Temperature 2 power stage	7.34	IGBT junction temperature
		7.35	Drive thermal protection battery

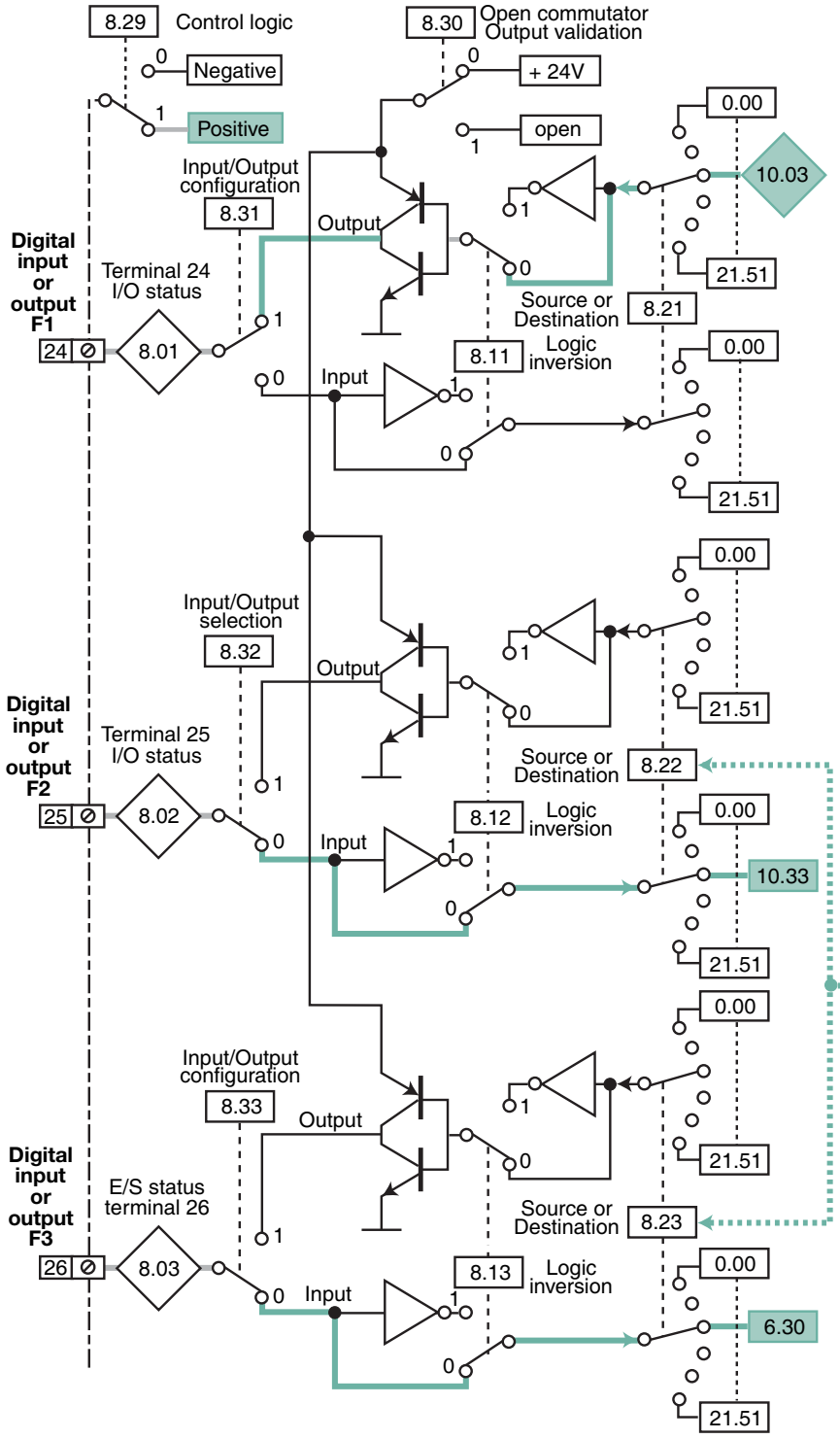
Note: Where the user wishes to obtain the image of the speed on analog output 1, the full-scale value at the output corresponds to the maximum value of the selected source parameter.
In the factory settings, (**7.21** = VOLT (0)):

- In , the selected source is **5.01** "Motor frequency", therefore the analog output will be full scale (9.8 V) when REF MAX is reached (**1.06**)

- In or , the selected source is **3.02** "Speed feeback", therefore the analog output will be full scale (9.8 V) when N MAX is reached (2 x **1.06**)

Parameters	Variation range			Factory setting		
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%			-		

H6.12 - Menu 8: Configuration of digital I/O



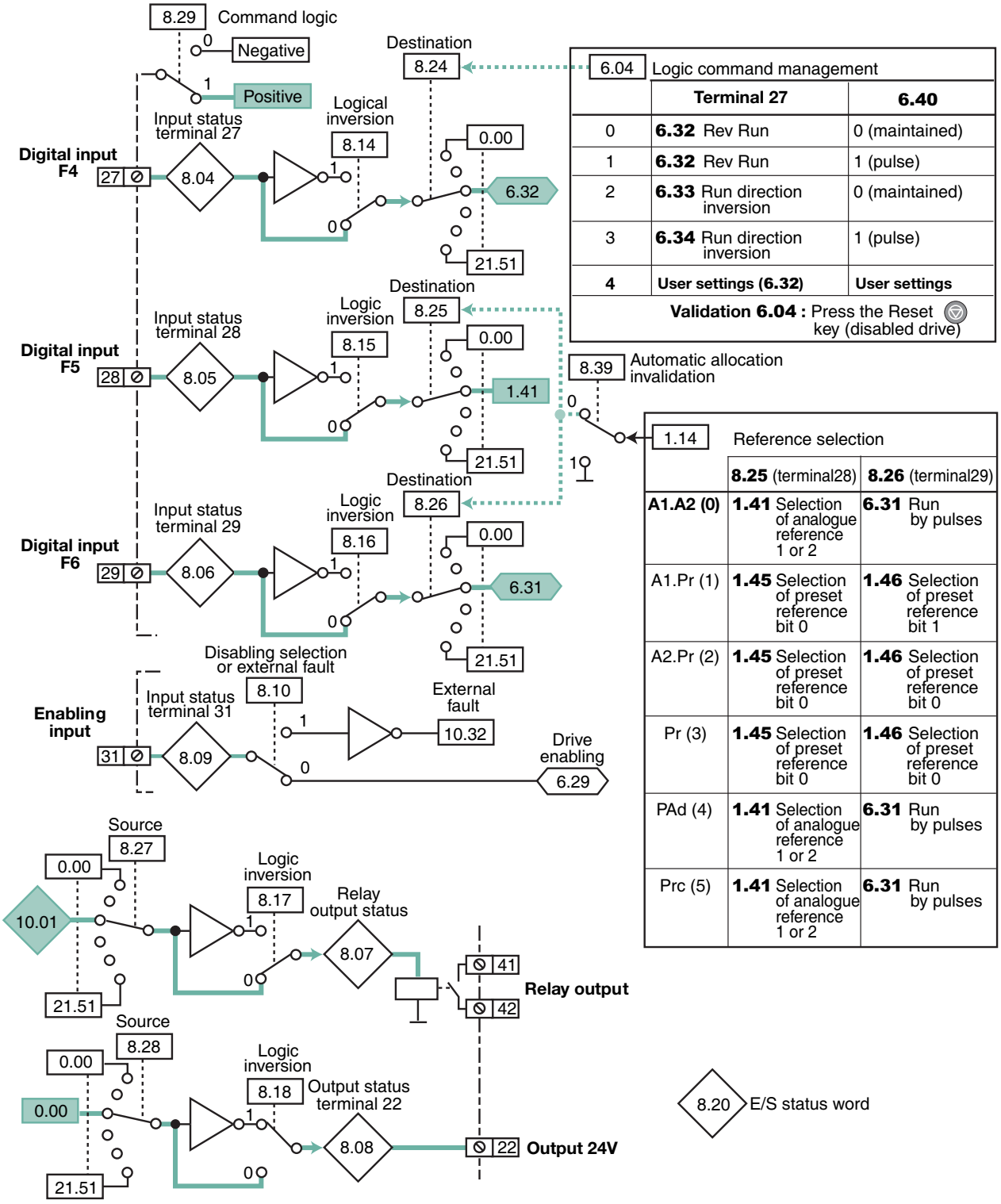
6.04	Logic command management		
	Terminal 25	**Terminal 26**	**6.40**
0	**6.29** Enabling	**6.30** Fwd Run	0 (maintained)
1	**6.39** Stop\	**6.30** Fwd Run	1 (pulse)
2	**6.29** Enabling	**6.34** Run	0 (maintained)
3	**6.39** Stop\	**6.34** Run	1 (pulse)
4	**User settings (10.33)**	**User settings (6.30)**	**User settings**

Validation 6.04 : Press the Reset key (disabled drive)

CAUTION:
If brake control is enabled by 12.41 = 1 or 2, it will act on terminal 25 (in an overriding manner on 6.04) such 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 setting		
8.01 - 8.02 - 8.03	OFF (0) or On (1)			-		

Menu 8 (continued)



6.04	Logic command management	
	Terminal 27	**6.40**
0	**6.32** Rev Run	0 (maintained)
1	**6.32** Rev Run	1 (pulse)
2	**6.33** Run direction inversion	0 (maintained)
3	**6.34** Run direction inversion	1 (pulse)
4	**User settings (6.32)**	**User settings**

Validation 6.04 : Press the Reset key (disabled drive)

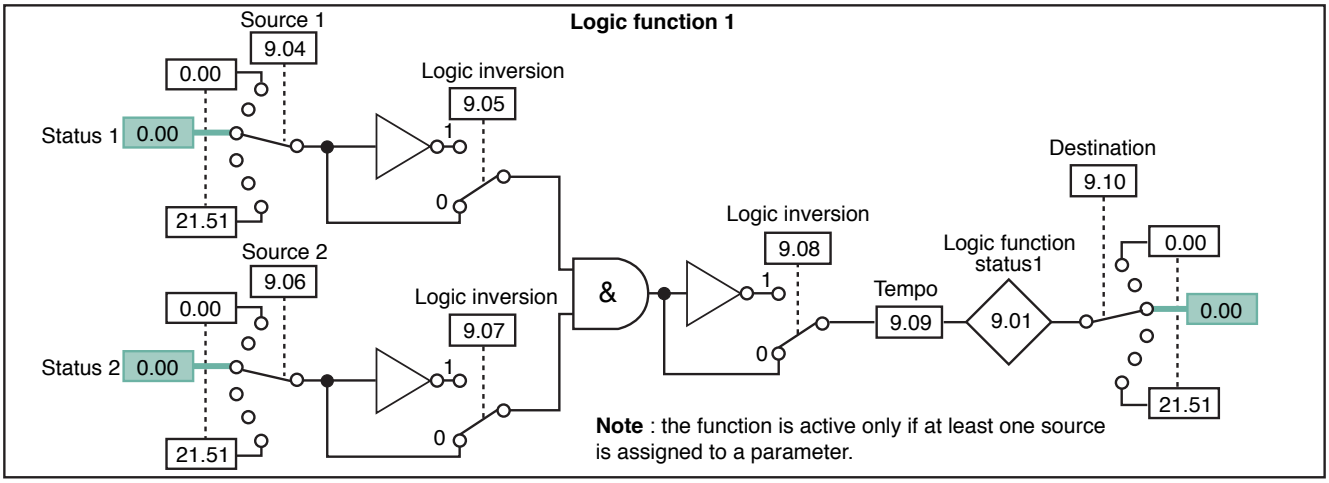
1.14 Reference selection	**8.25** (terminal28)	**8.26** (terminal29)
A1.A2 (0)	**1.41** Selection of analogue reference 1 or 2	**6.31** Run by pulses
A1.Pr (1)	**1.45** Selection of preset reference bit 0	**1.46** Selection of preset reference bit 1
A2.Pr (2)	**1.45** Selection of preset reference bit 0	**1.46** Selection of preset reference bit 0
Pr (3)	**1.45** Selection of preset reference bit 0	**1.46** Selection of preset reference bit 0
PAd (4)	**1.41** Selection of analogue reference 1 or 2	**6.31** Run by pulses
Prc (5)	**1.41** Selection of analogue reference 1 or 2	**6.31** Run by pulses

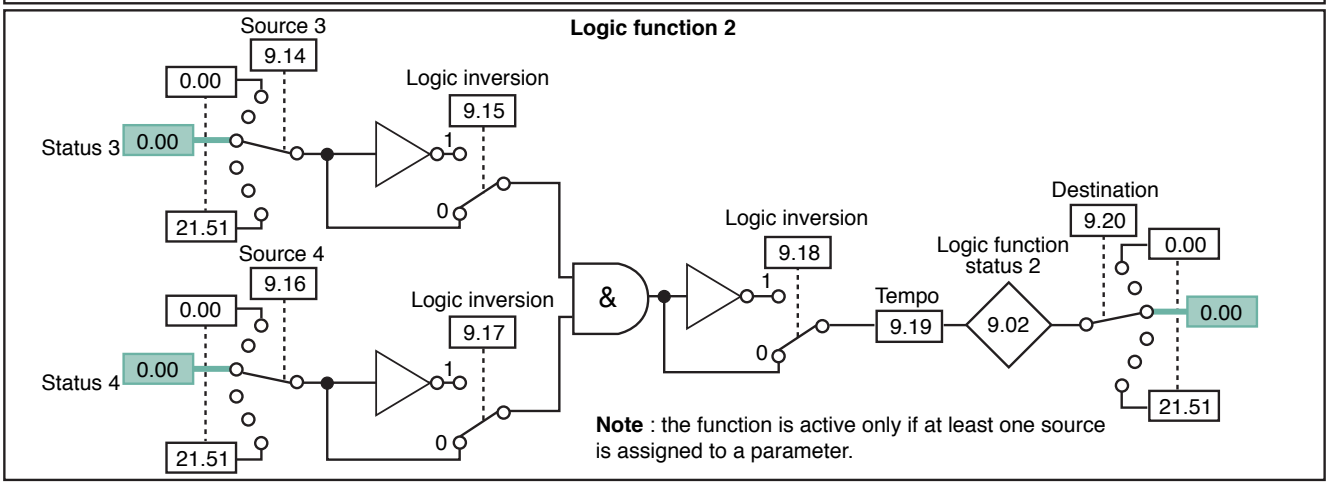
CAUTION:
If brake control is enabled by 12.41 = 1, it will act on the relay, such that 8.17 = 0 and 8.27 = 12.40.

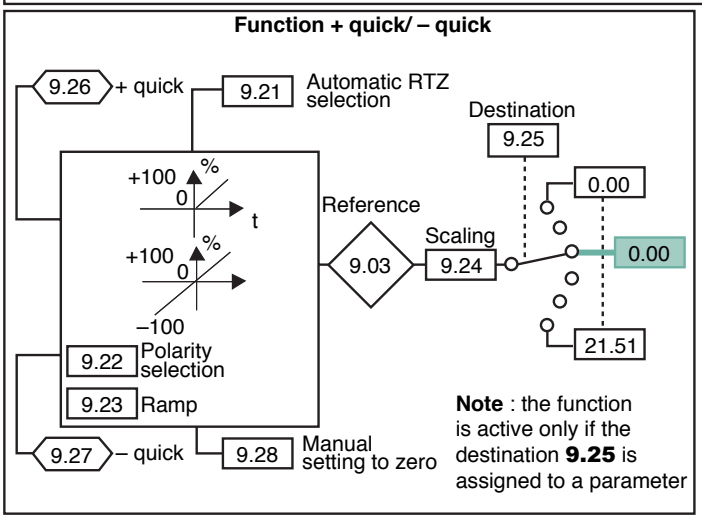
Parameters	Variation range			Factory setting		
8.04 to **8.09**	OFF (0) or On (1)			-		
8.20	0 to 511			-		

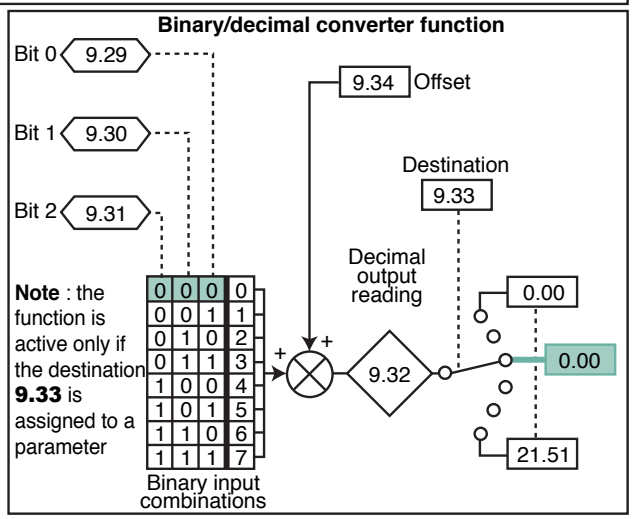
Notes

H6.13 - Menu 9: Logic functions









Parameters	Variation range			Factory setting		
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		

Notes

H6.14 - Menu 10: Drive states and diagnostics

Operating state

Parameters	Description	Variation range			Factory setting		
10.01	Drive healthy	OFF (0) or ON (1)			-		
10.02	Drive output activated	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 below low threshold	OFF (0) or ON (1)			-		
10.06	Reference reached	OFF (0) or ON (1)			-		
10.07	Frequency or speed above high threshold	OFF (0) or ON (1)			-		
10.08	Rated load	OFF (0) or ON (1)			-		
10.09	Current limiting active	OFF (0) or ON (1)			-		
10.13	Reverse rotation requested	OFF (0) or ON (1)			-		
10.14	Reverse rotation	OFF (0) or ON (1)			-		

Braking

Parameters	Description	Variation range			Factory setting		
10.10	Dynamic braking	OFF (0) or ON (1)			-		
10.11	Braking IGBT active	OFF (0) or ON (1)			-		
10.12	Braking resistor alarm	OFF (0) or ON (1)			-		
10.30	Full power braking time	0 to 400.00 s			Sizes 1 and 2 (200 V): 0.04; (400 V): 0.02 For drives of size 3 and above: 0		
10.31	Full power braking cycle	0 to 1500.0 s			2.0 s For drives of size 3 and above: 0		
10.39	Braking energy overload accumulator	0 to 100.0%			-		

Menu 10 (continued)
Trips

Parameters	Description	Variation range			Factory setting		
10.15	No mains supply	OFF (0) or ON (1)			-		
10.16	Undervoltage detection	OFF (0) or ON (1)			-		
10.17	Overload alarm	OFF (0) or ON (1)			-		
10.18	Drive over temperature alarm	OFF (0) or ON (1)			-		
10.19	Drive alarm	OFF (0) or ON (1)			-		
10.20	Trip 0	0 to 230 (value via serial link)			-		
10.21	Trip - 1	0 to 230 (value via serial link)			-		
10.22	Trip - 2	0 to 230 (value via serial link)			-		
10.23	Trip - 3	0 to 230 (value via serial link)			-		
10.24	Trip - 4	0 to 230 (value via serial link)			-		
10.25	Trip - 5	0 to 230 (value via serial link)			-		
10.26	Trip - 6	0 to 230 (value via serial link)			-		
10.27	Trip - 7	0 to 230 (value via serial link)			-		
10.28	Trip - 8	0 to 230 (value via serial link)			-		
10.29	Trip - 9	0 to 230 (value via serial link)			-		
10.32	External fault	OFF (0) or ON (1)			-		
10.33	Drive reset	OFF (0) or ON (1)			OFF (0)		
10.34	No. of auto-reset attempts	0 to 5			0		
10.35	Auto reset delay	0 to 25.0 s			1.0 s		
10.36	Hold drive healthy status on automatically reset trips	OFF (0) or ON (1)			OFF (0)		

Trips (continued)

Parameters	Description	Variation range			Factory setting		
10.37	Minor faults	0 or 3			0		
10.38	User trips	0 to 255			0		
10.40	Status word	0 to 32767			-		
10.41	Time since trip 0 (Year.days)	0 to 9.365 year.day			-		
10.42	Time since trip 0 (Hour.minutes)	0 to 23.59 Hr.min			-		
10.43	Trip module number 1, Time between trip 1 and trip 0	0 to 600.00 Hr.min			-		
10.44	Trip module number 2, Time between trip 2 and trip 0	0 to 600.00 Hr.min			-		
10.45	Trip module number 3, Time between trip 3 and trip 0	0 to 600.00 Hr.min			-		
10.46	Trip module number 4, Time between trip 4 and trip 0	0 to 600.00 Hr.min			-		
10.47	Trip module number 5, Time between trip 5 and trip 0	0 to 600.00 Hr.min			-		
10.48	Trip module number 6, Time between trip 6 and trip 0	0 to 600.00 Hr.min			-		
10.49	Trip module number 7, Time between trip 7 and trip 0	0 to 600.00 Hr.min			-		
10.50	Trip module number 8, Time between trip 8 and trip 0	0 to 600.00 Hr.min			-		
10.51	Trip module number 9, Time between trip 9 and trip 0	0 to 600.00 Hr.min			-		

H6.15 - Menu 11: Menu 0 parameter setting - serial link - drive characteristics

Menu 0 configuration

Parameters	Description	Variation range			Factory setting		
11.01	Configuration of **0.11** of menu 0	**1.00** to **21.51**			**5.01**		**3.29**
11.02	Configuration of **0.12** of menu 0	**1.00** to **21.51**			**4.01**		
11.03	Configuration of **0.13** of menu 0	**1.00** to **21.51**			**4.02**		**7.07**
11.04	Configuration of **0.14** of menu 0	**1.00** to **21.51**			**4.11**		
11.05	Configuration of **0.15** of menu 0	**1.00** to **21.51**			**2.04**		
11.06	Configuration of **0.16** of menu 0	**1.00** to **21.51**			**8.39**	**2.02**	
11.07	Configuration of **0.17** of menu 0	**1.00** to **21.51**			**8.26**	**4.12**	
11.08	Configuration of **0.18** of menu 0	**1.00** to **21.51**			**8.29**		
11.09	Configuration of **0.19** of menu 0	**1.00** to **21.51**			**7.11**		
11.10	Configuration of **0.20** of menu 0	**1.00** to **21.51**			**7.14**		
11.11	Configuration of **0.21** of menu 0	**1.00** to **21.51**			**7.15**		
11.12	Configuration of **0.22** of menu 0	**1.00** to **21.51**			**1.10**		
11.13	Configuration of **0.23** of menu 0	**1.00** to **21.51**			**1.05**		
11.14	Configuration of **0.24** of menu 0	**1.00** to **21.51**			**1.21**		
11.15	Configuration of **0.25** of menu 0	**1.00** to **21.51**			**1.22**		
11.16	Configuration of **0.26** of menu 0	**1.00** to **21.51**			**1.23**	**3.08**	
11.17	Configuration of **0.27** of menu 0	**1.00** to **21.51**			**1.24**	**3.34**	
11.18	Configuration of **0.28** of menu 0	**1.00** to **21.51**			**6.13**		
11.19	Configuration of **0.29** of menu 0	**1.00** to **21.51**			**11.36**		
11.20	Configuration of **0.30** of menu 0	**1.00** to **21.51**			**11.42**		

Serial link

Parameters	Description	Variation range			Factory setting		
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 minimum comms transmit delay	0 to 250 ms			2 ms		

* Modbus RTU only.

Menu 11 (continued)

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 on power-up	**0.00** to **0.50**			**0.10**		
11.28	Specific drive	0 to 16			-		
11.29	Software version (aa.bb)	1.00 to 99.99			-		
11.30	User security code	0 to 999			0		
11.31	Operating mode selection	OPEn LP (1), CL VECt SErVO (3), rEGEn (4)			OPEn LP (1)	CL VECt (2)	SErVO (3)
11.32	Drive rated current	0 to 9999.99 A			-		
11.33	Drive rated voltage	200 (0), 400 (1), 575 (2), 690 (3)			-		
11.34	Software version (cc)	0 to 99			-		
11.35	Number of power modules	1 to 8			-		
11.41	Time for return to the initial display	0 to 250 s			240 s		
11.43	Return to factory settings	nonE (0), Eur (1), USA (2)			nonE (0)		
11.44	Level 2 access and security code storing	L1 (0), L2 (1), Loc (2)			L1 (0)		
11.45	Selection of motor 2	OFF (0) or On (1)			OFF (0)		
11.46	Factory settings loaded previously	0 to 2000			-		
11.47	Enabling of internal program	0 to 2			2		
11.48	Internal program status	-128 to +127			-		
11.49	Internal program events	0 to 65535 s			-		
11.50	Internal program maximum execution time	0 to 65535 ms			-		
11.51	First execution of internal program	OFF (0) or ON (1)			-		

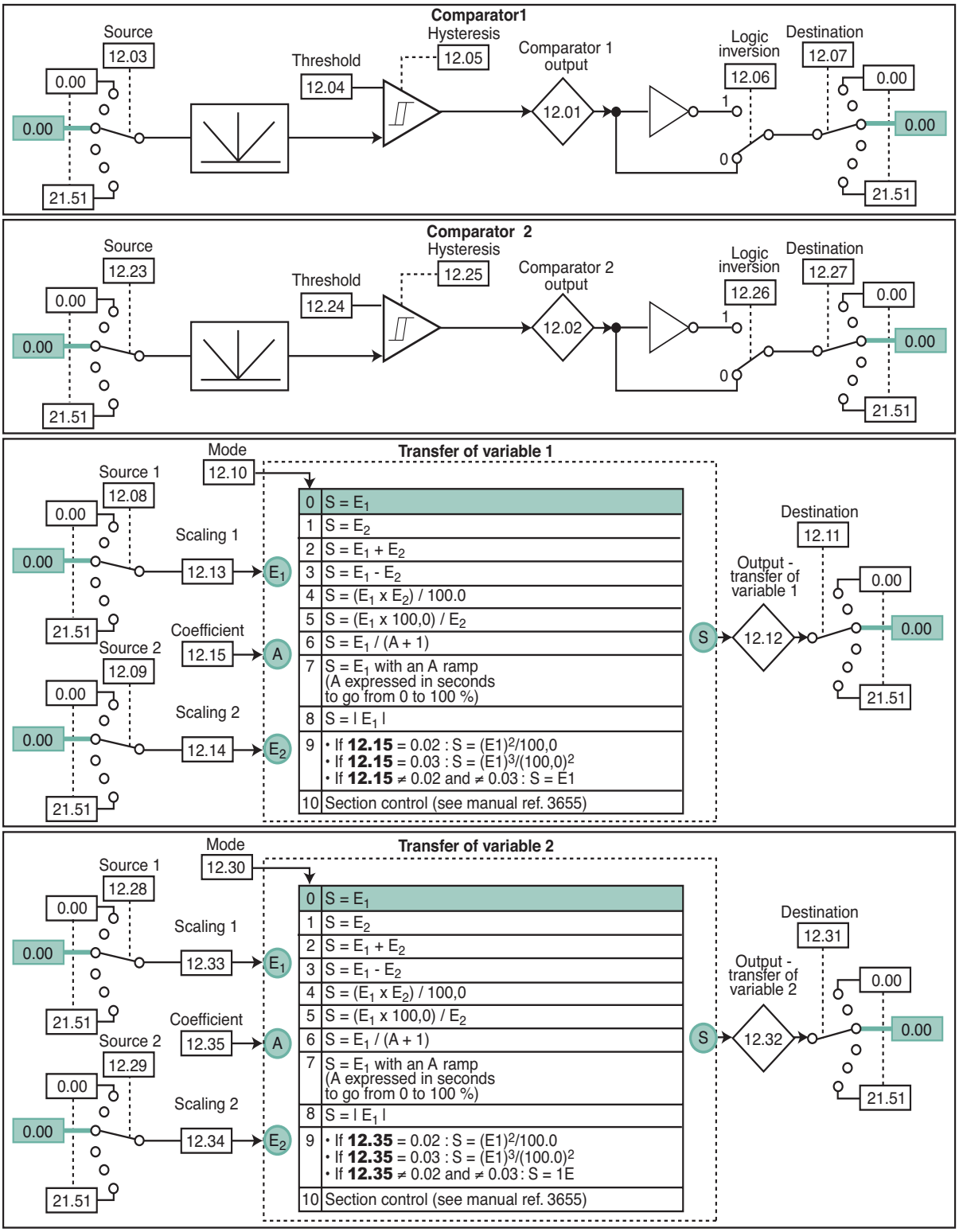
Note: • For configuration of **0.31** to **0.59**, see menu 22.
• Parameters **11.47** to **11.51** are used during execution of a "Syptlite" program produced using the Syptlite software available on the CD-ROM supplied with the drive.

Menu 11 (continued)

Transfer of parameters by SMARTCARD

Parameters	Description	Variation range			Factory setting		
11.36	Last set of parameters transferred by SMARTCARD	0 to 999			-		
11.37	Data block selection	0 to 1002			0		
11.38	Data type 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: LAdddEr, 18: Option			-		
11.39	SMARTCARD version number	0 to 9999			0		
11.40	Block checksum	0 to 65335			-		
11.42	Parameter copy	nonE (0), rEAd (1), Prog (2), Auto (3), boot (4)			nonE (0)		

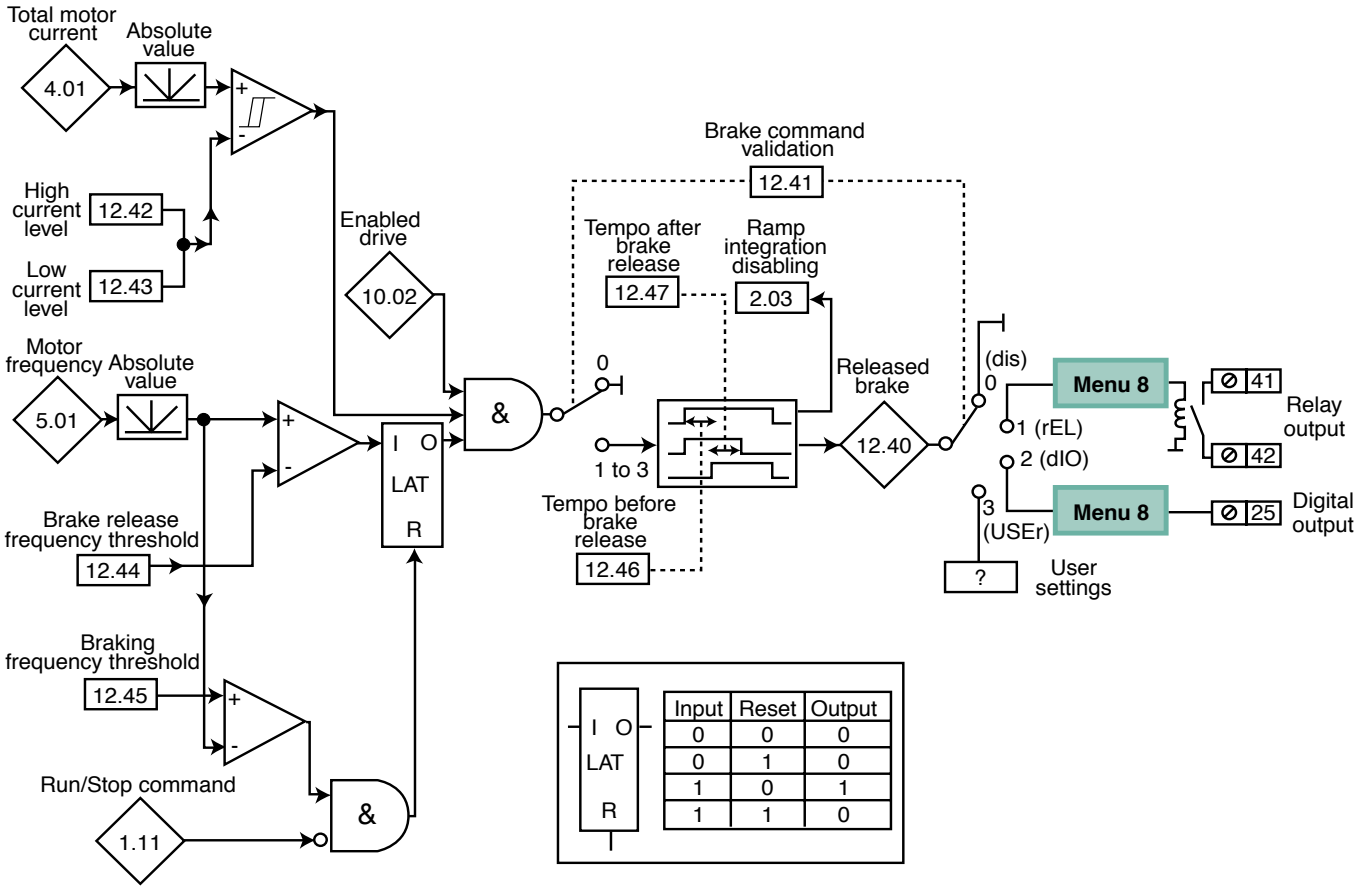
H6.16 - Menu 12: Comparators, transfers of variables



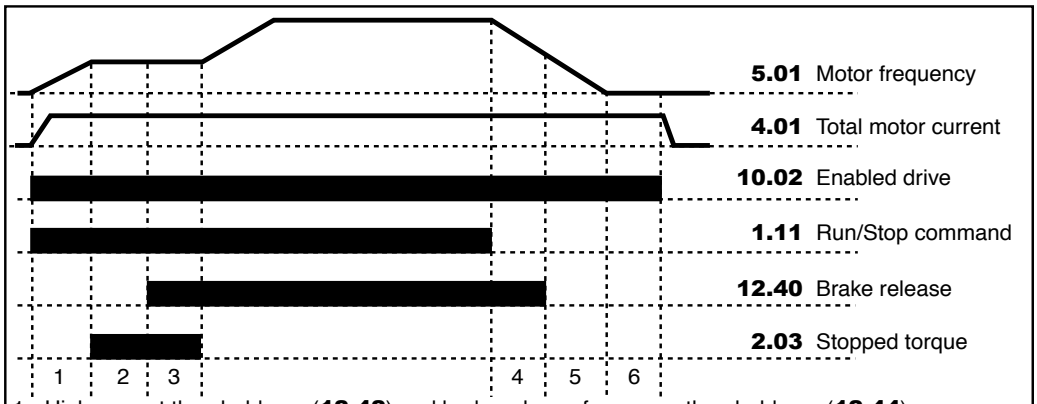
Parameters	Variation range			Factory setting		
12.01 - 12.02	OFF (0) or On (1)			-		
12.04 - 12.24	0 to 100.00%			0		
12.05 - 12.25	0 to 25.00%			0		
12.12 - 12.32	± 100.00%			-		
12.13 - 12.14 - 12.33 - 12.34	± 4.000			1.000		
12.15 - 12.35	0 to 100.00			0		

Menu 12 (continued)

• **Brake control in open loop mode**



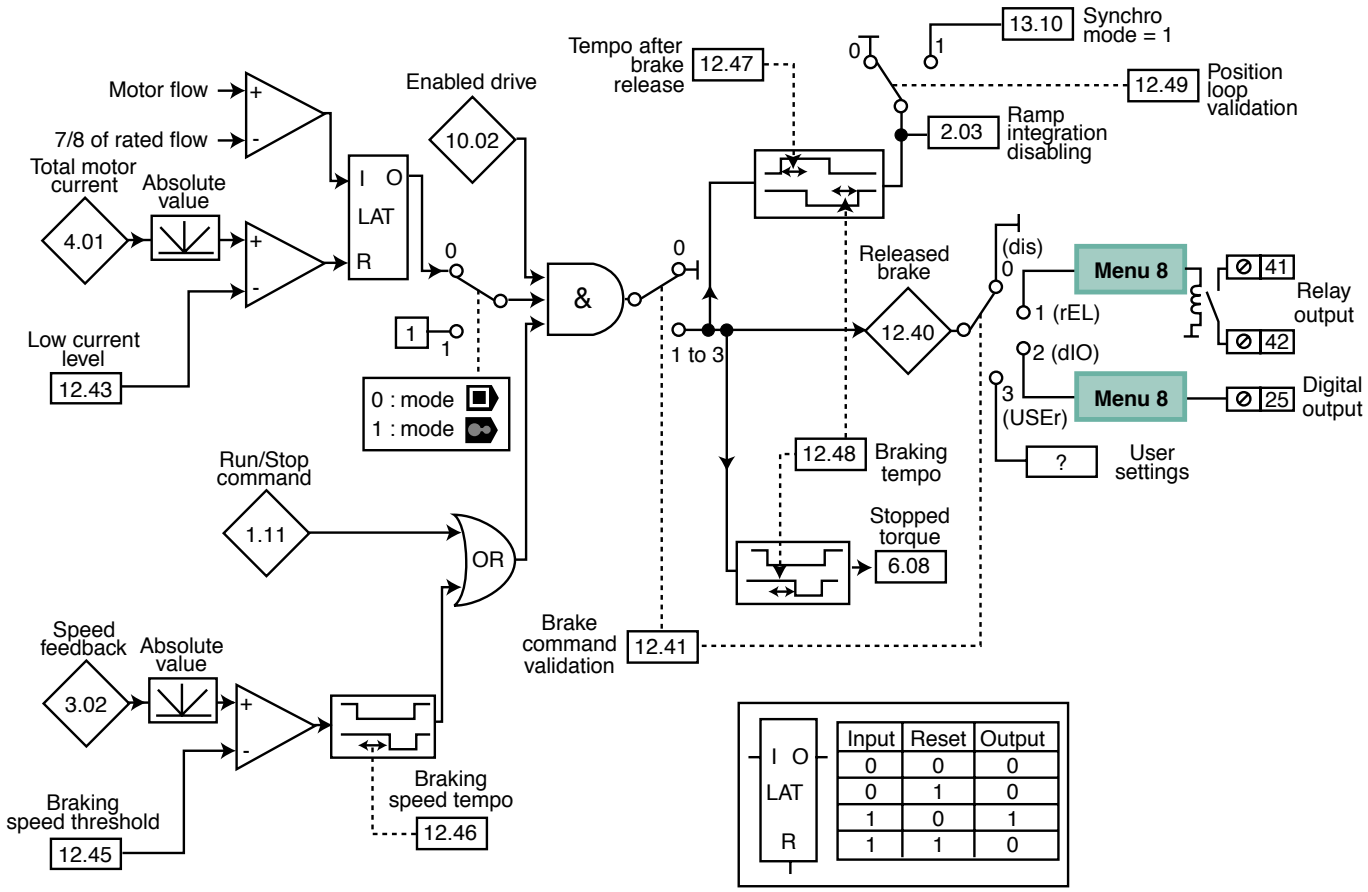
Input	Reset	Output
0	0	0
0	1	0
1	0	1
1	1	0



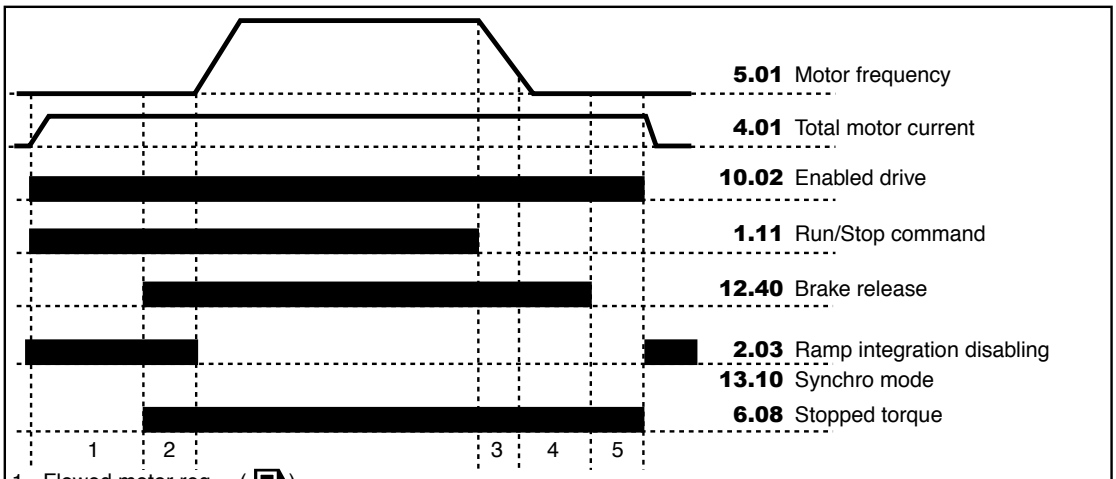
1 - High current threshold req. (**12.42**) and brake release frequency threshold req. (**12.44**)
2 - Time delay before brake release (**12.46**)
3 - Time delay after brake release (**12.47**)
4 - Braking frequency threshold req.
5 - Zero frequency req.
6 - Time relay corresponding to phase 2 of the stop mode **6.01** (only 1 to 3 modes)

Parameters	Variation range	Factory setting
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

• **Brake control in closed loop and servo mode** ▣, ⊶



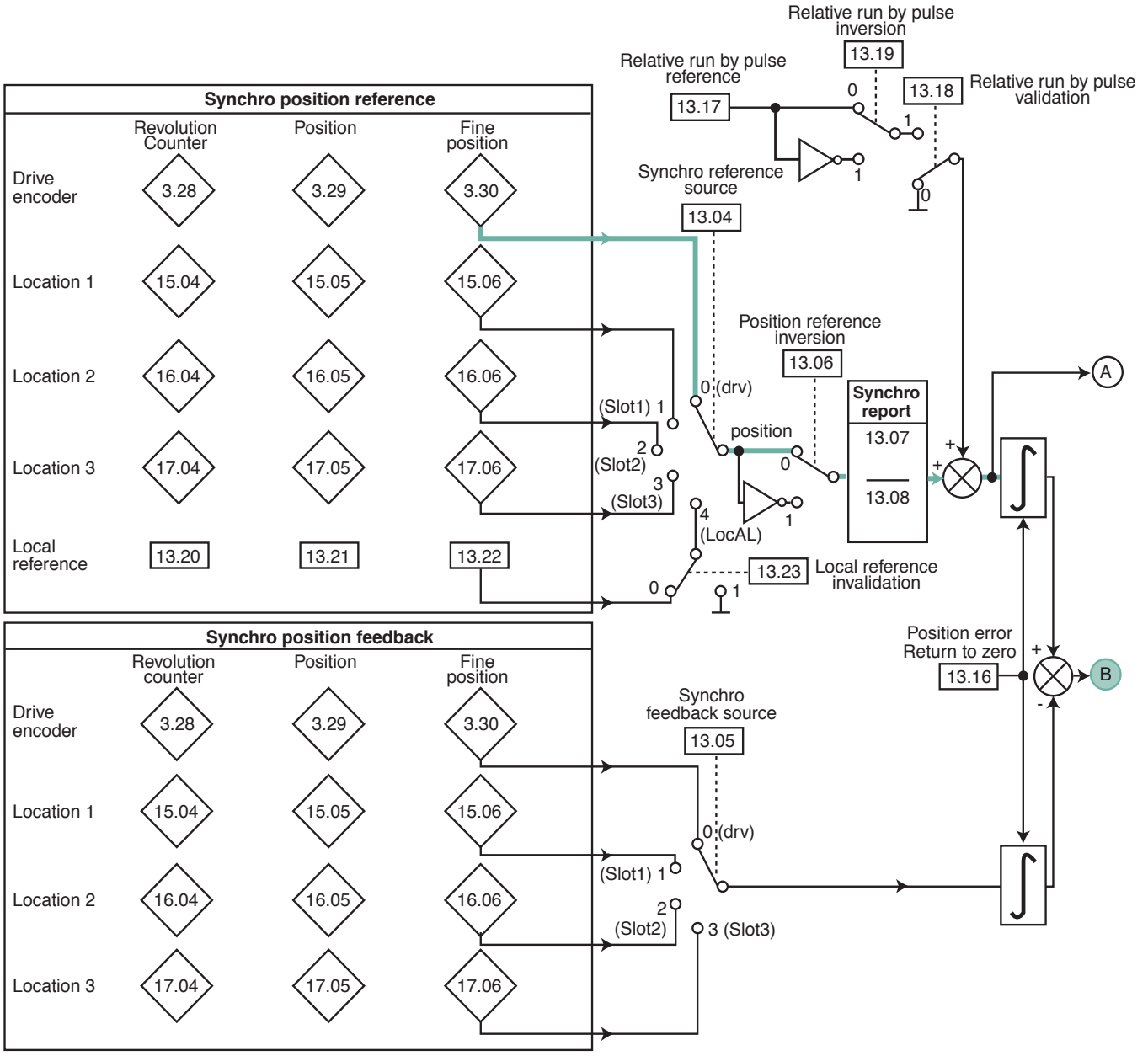
Input	Reset	Output
0	0	0
0	1	0
1	0	1
1	1	0



1 - Flowed motor req. (▣)
2 - Time delay after brake release (**12.47**)
3 - Speed threshold req.(**12.45**)
4 - Braking speed time delay req. (**12.46**)
5 - Braking time delay (**12.48**)

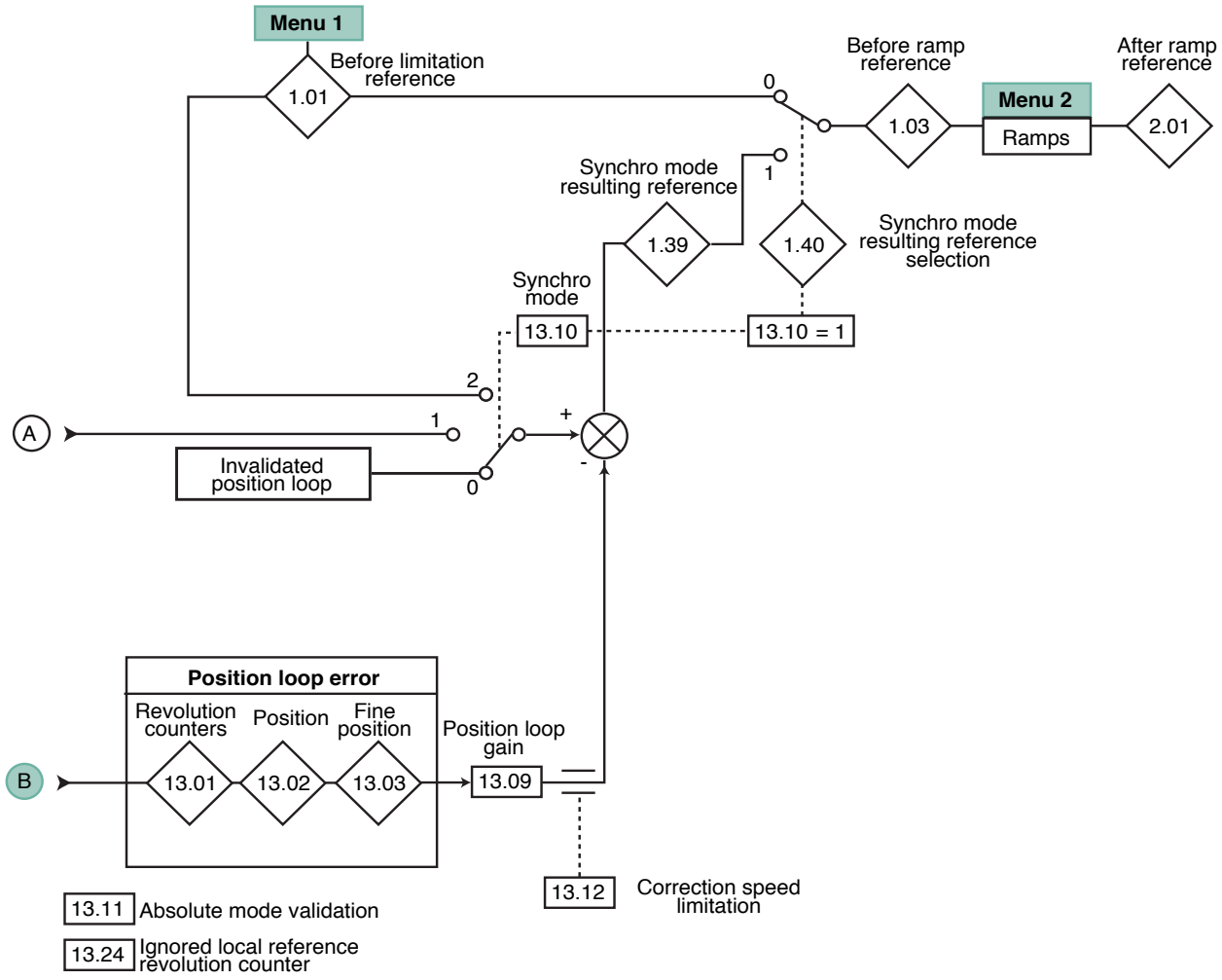
Parameters	Variation range		Factory setting	
	▣	⊶	▣	⊶
12.40	OFF (0) or On (1)		-	
12.43	0 to 200%		10%	
12.45	0 to 200 min^{-1}		5 min^{-1}	
12.46 - 12.47 - 12.48	0 to 25.0 s		1.0 s	

H6.17 - Menu 13: Synchronisation in open loop mode



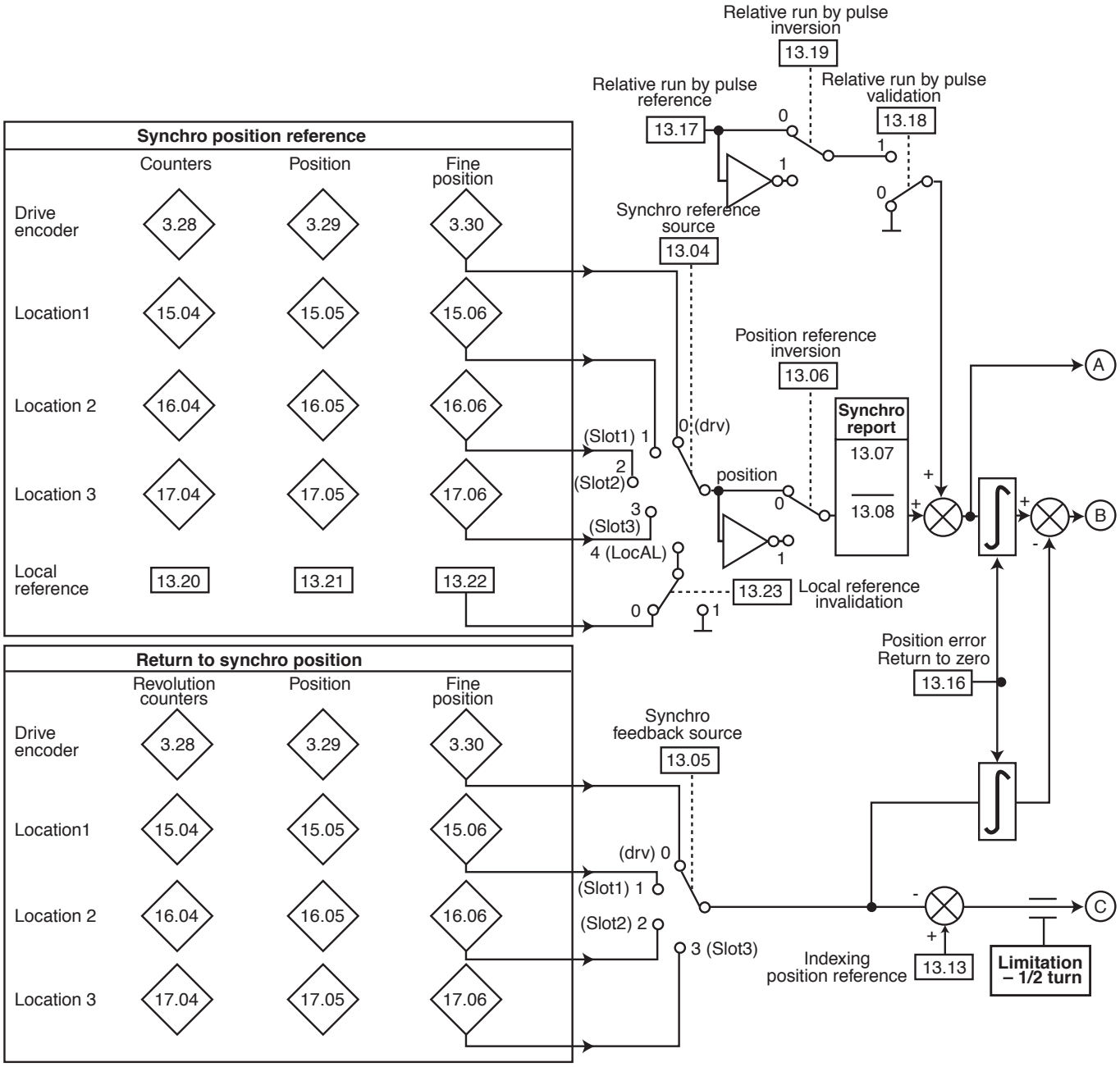
Parameters	Variation range( )	Factory setting( )
13.07	0 to 4.000	1.000
13.08	0 to 1.000	1.000
13.16	OFF (0) or On (1)	OFF (0)
13.17	0 to 4000.0 min^{-1}	0

Menu 13 in open loop mode (continued)



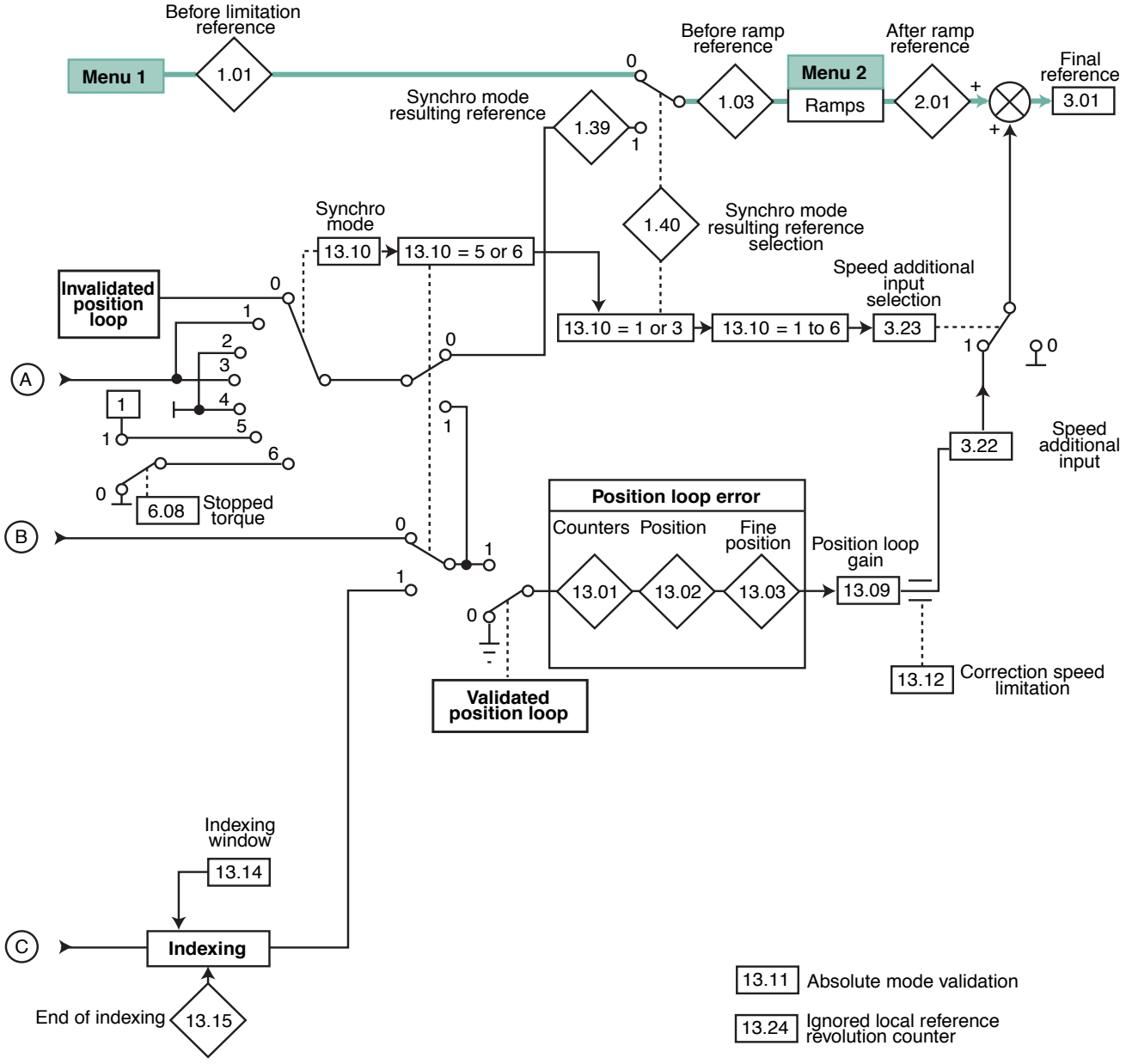
Parameters	Variation range( )	Factory setting( )
13.01 - 13.02 - 13.03	-32768 to +32767	-
13.09	0 to 100.00 rads^{-1}/rad	25.00 rads^{-1}/rad
13.10	0 to 2	0
13.11 - 13.23 - 13.18 - 13.19	OFF (0) or On (1)	OFF (0)
13.12	0 to 250	150
13.15	OFF (0) or On (1)	-
13.20 - 13.21 - 13.22	0 to 65535	0
13.24	OFF (0) or On (1)	OFF (0)

H6.18 - Menu 13: Synchronisation and indexing in closed loop and servo mode,



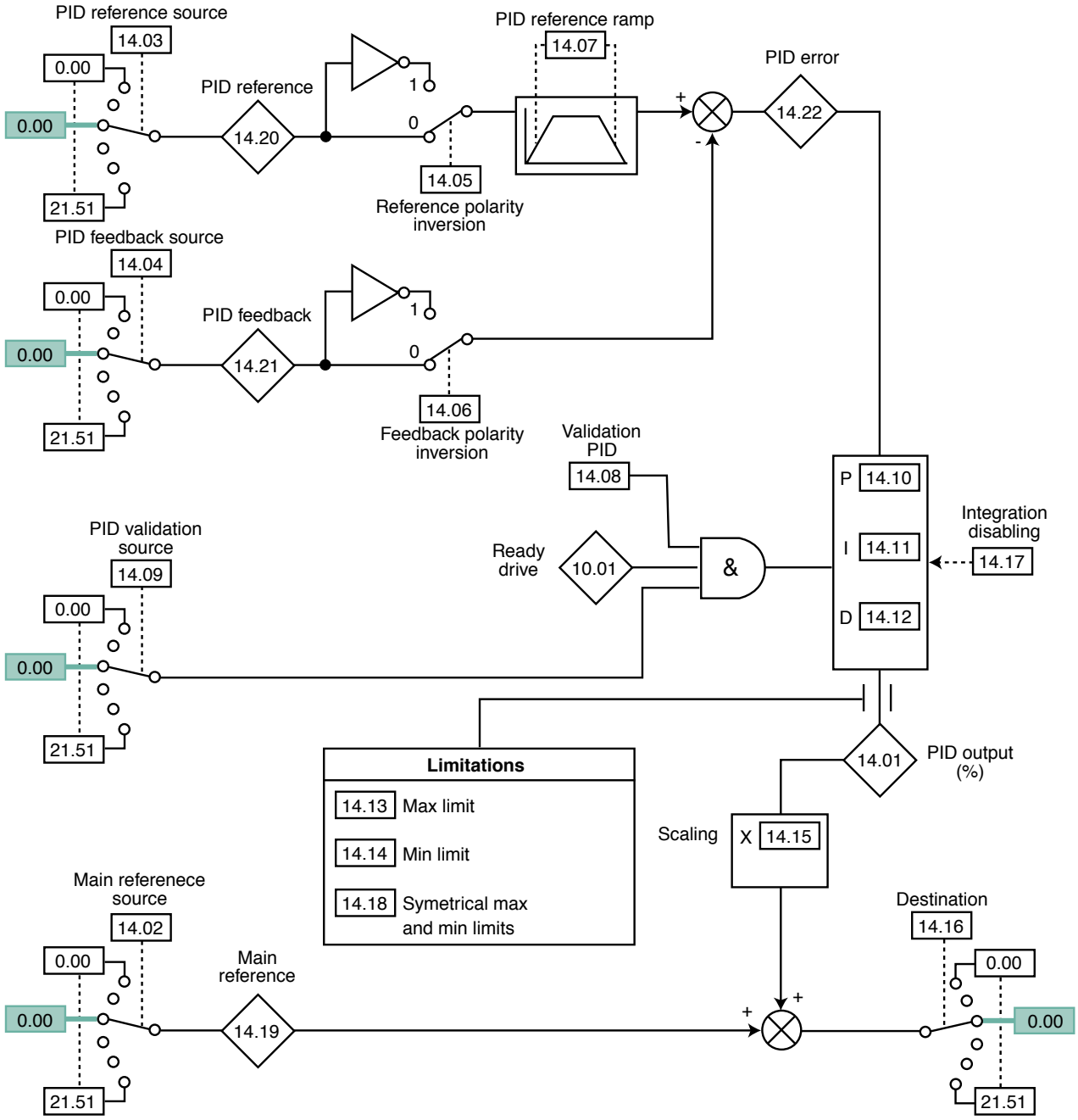
Parameters	Variation range		Factory setting	
13.07	0 to 4.000		1.000	
13.08	0 to 1.000		1.000	
13.16	OFF (0) or On (1)		OFF (0)	
13.13	0 to 65535		0	
13.17	0 to 4000.0 min^{-1}		0	
13.20 - 13.21 - 13.22	0 to 65535		0	

Menu 13 in closed loop and servo mode (continued)



Parameters	Variation range		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 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)	

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 setting		
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%		

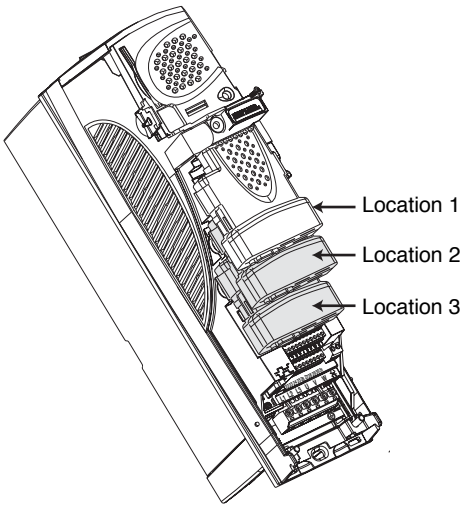
H6.20 - Menus 15, 16, 17: SM MODULES

H6.20.1 - Introduction

In certain applications, an additional SM module may be necessary (for example the
SM-Universal-Encoder Plus module that allows management of a machine 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 in the diagrams.



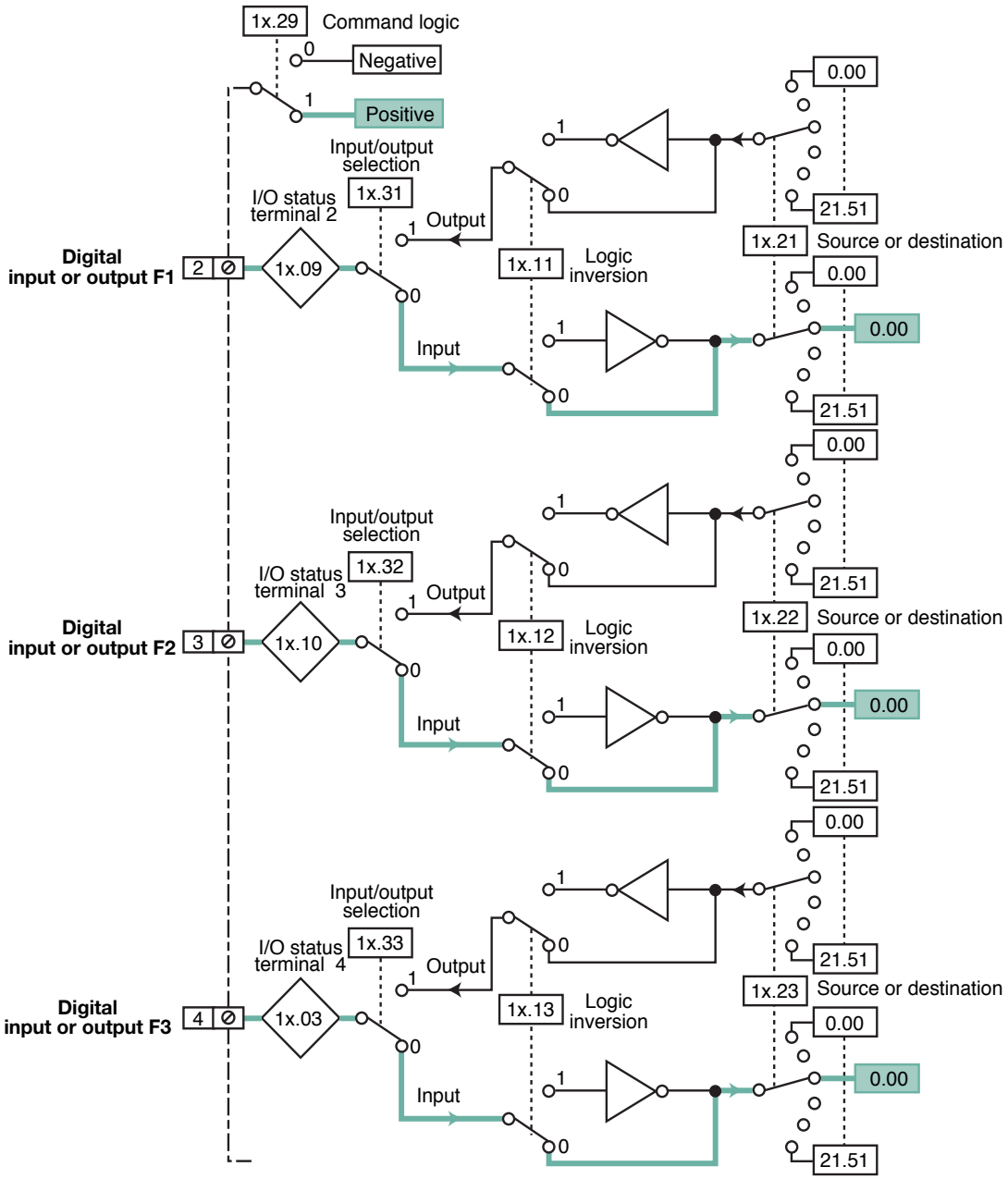
H6.20.2 - SM-I/O PLUS module

1x.01 :Module type

1x.20 :Digital I/O status word

1x.50 :Reading of fault

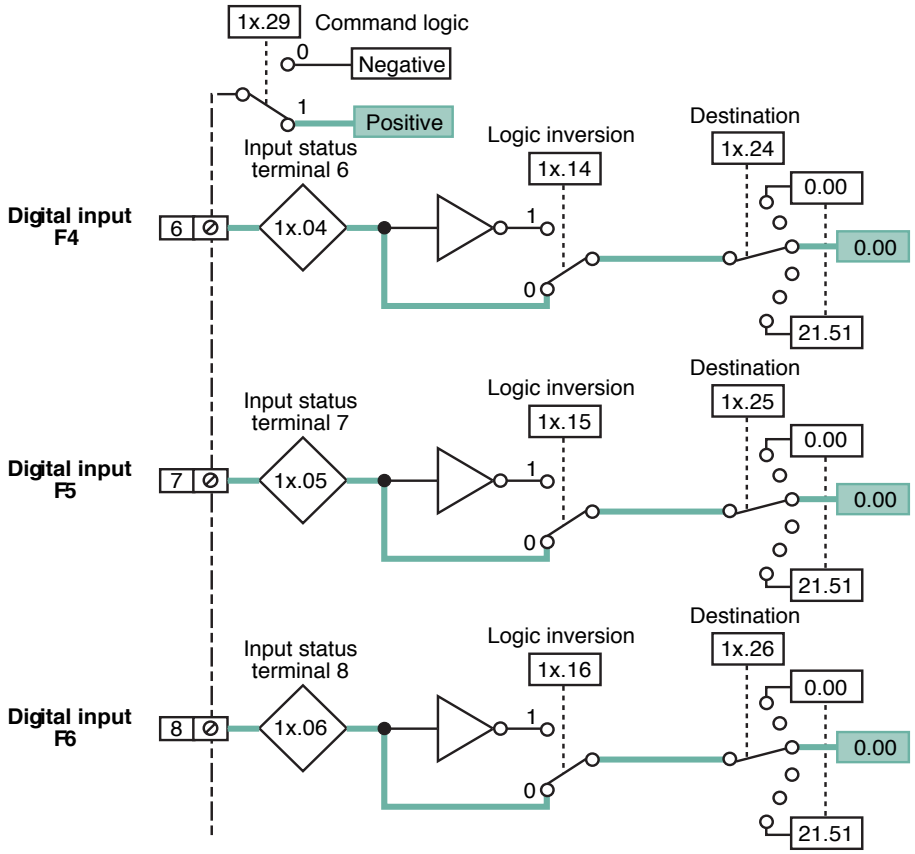
• Digital I/O



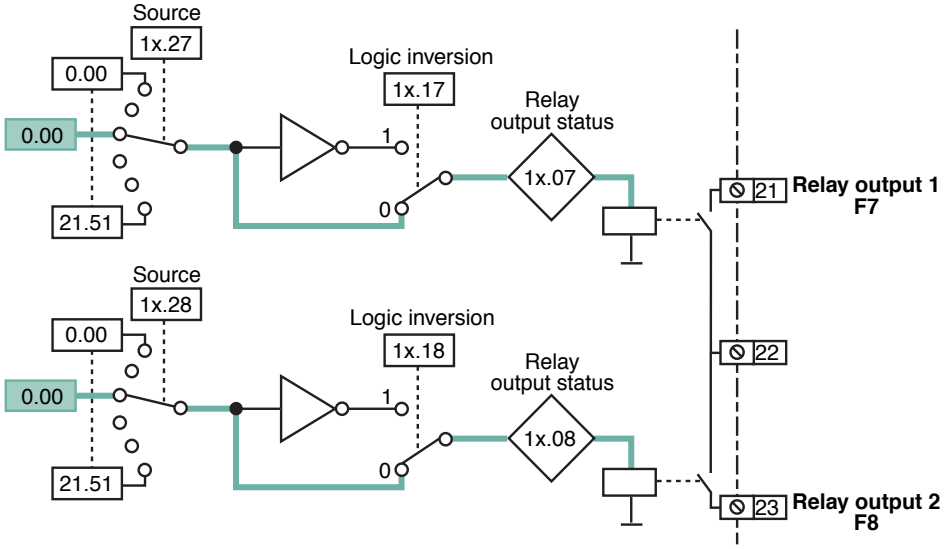
Parameters	Variation range			Factory setting		
1x.01	0 to 499			-		
1x.02	0 to 99.99			-		
1x.03 - 1x.09 - 1x.10	OFF (0) or On (1)			-		
1x.20	0 to 511			-		
1x.50	0 to 255			-		
1x.51	0 to 99			-		

SM-I/O PLUS module (continued)

• Digital inputs



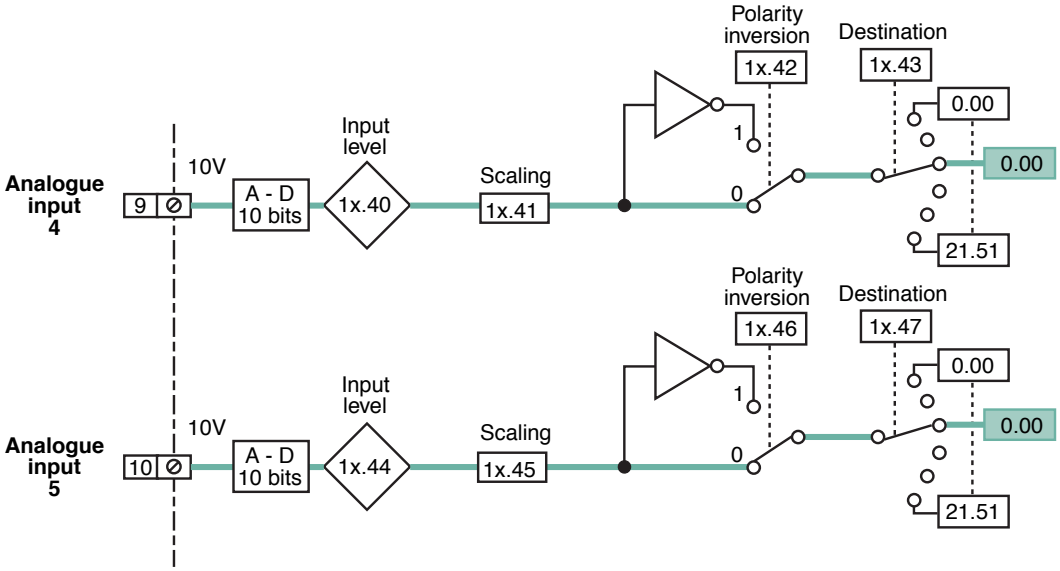
• Relay outputs



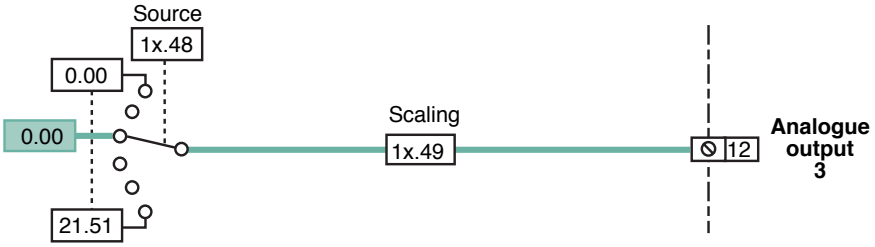
Parameters	Variation range			Factory setting		
1x.04 - 1x.05 - 1x.06 - 1x.07 1x.08	OFF (0) or On (1)			-		

SM-I/O PLUS module (continued)

• Analog inputs



• Analog output



Parameters	Variation range			Factory setting		
1x.40 - 1x.44	± 100.0%			-		
1x.41 - 1x.45 - 1x.49	0 to 4.000			1.000		

Notes

H6.20.3 - SM-I/O Lite and SM-I/O Timer module

1x.01 :Module type

1x.02 :Module software version

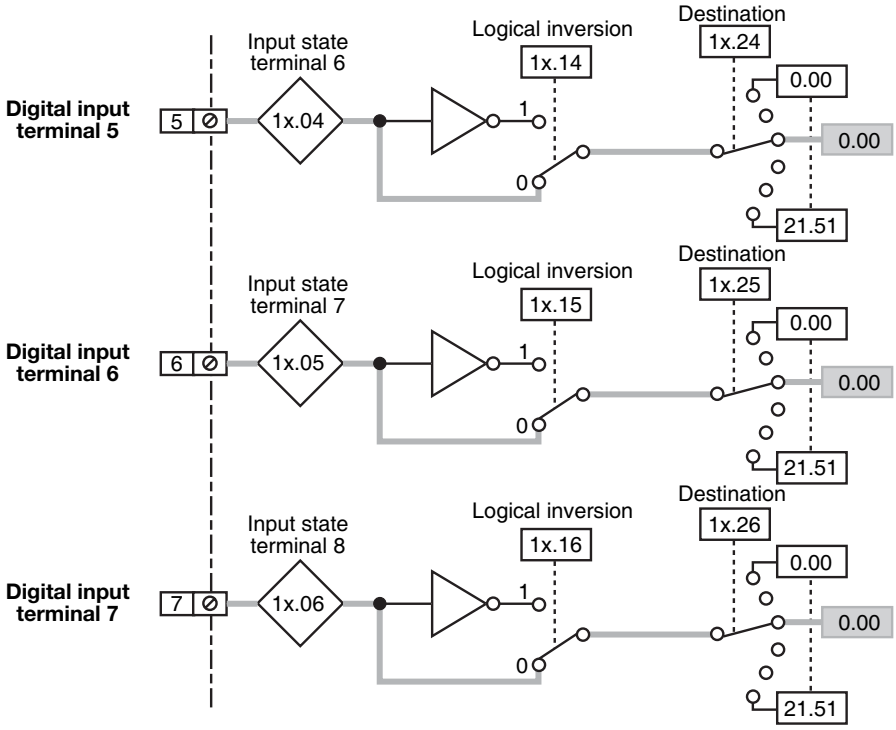
1x.03 :Current loss indication

1x.20 :Digital I/O status word

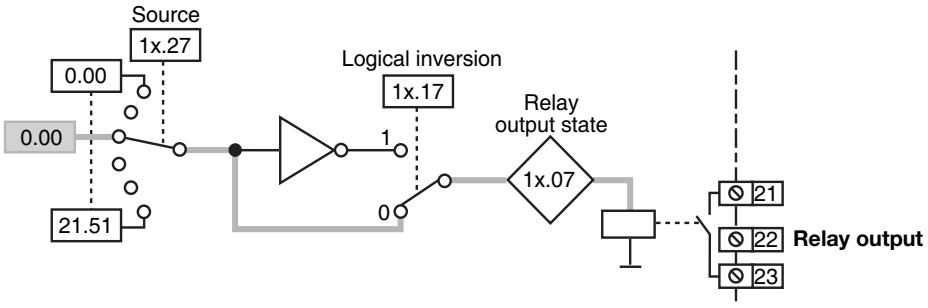
1x.50 :Reading of module safeguarding

1x.51 :Module software sub-version

• **Digital inputs**



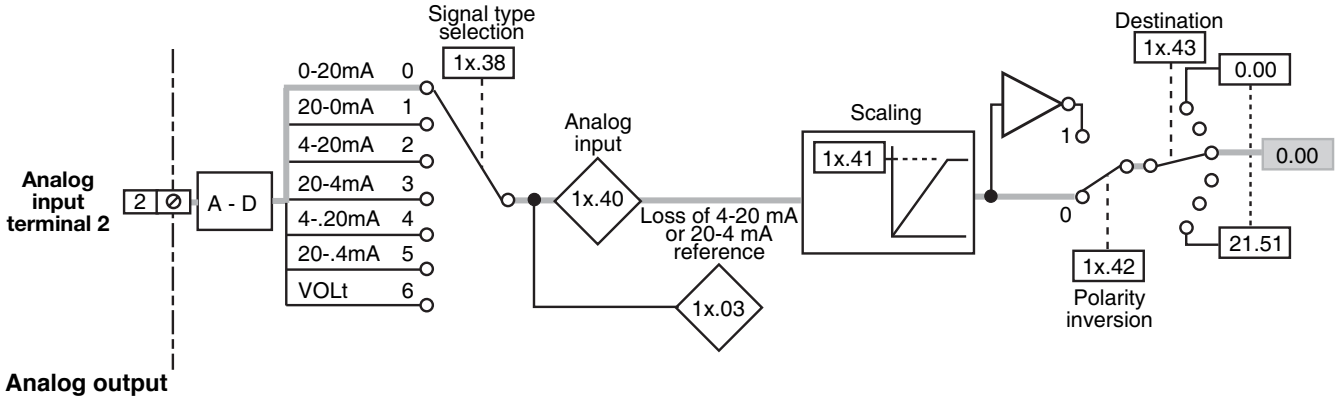
• **Relay outputs**



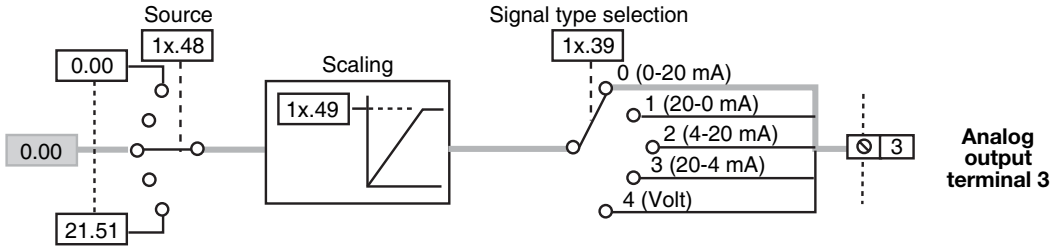
Parameters	Variation range			Factory setting		
1x.01	0 to 599			-		
1x.02	0.00 to 99.99			-		
1x.04 to **1x.07**	OFF (0) or On (1)			-		
1x.20	0 to 120			-		
1x.50	0 to 255			-		
1x.51	0 to 99			-		

SM-I/O Lite and SM-I/O Timer module (continued)

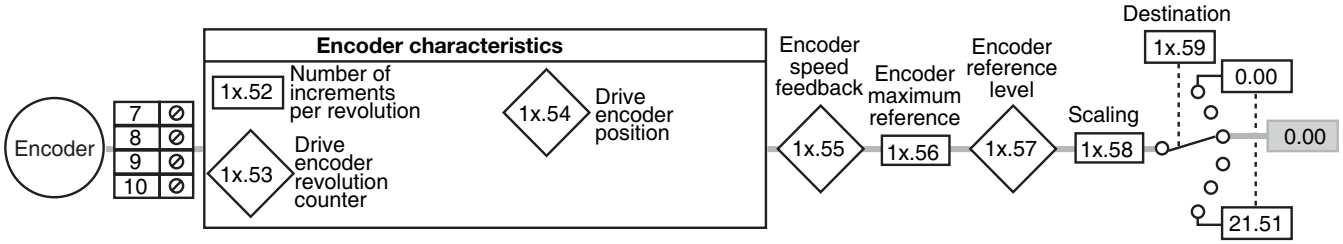
- **Analog input**



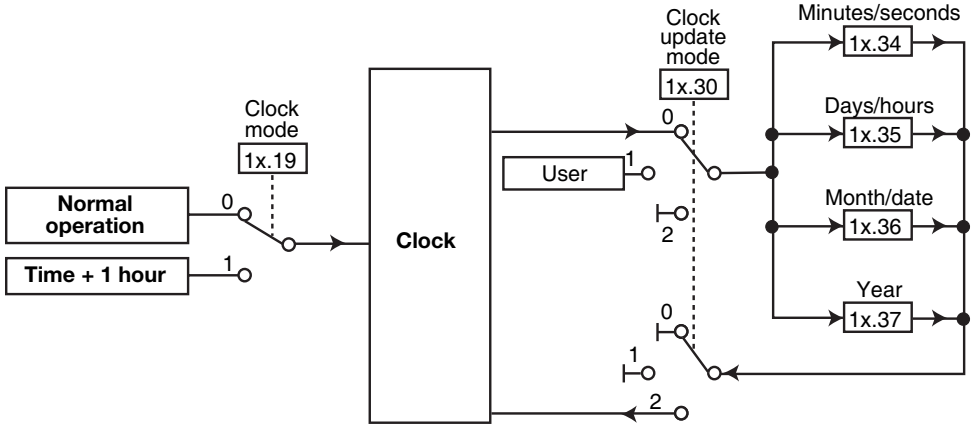
- **Analog output**



- **Encoder reference**

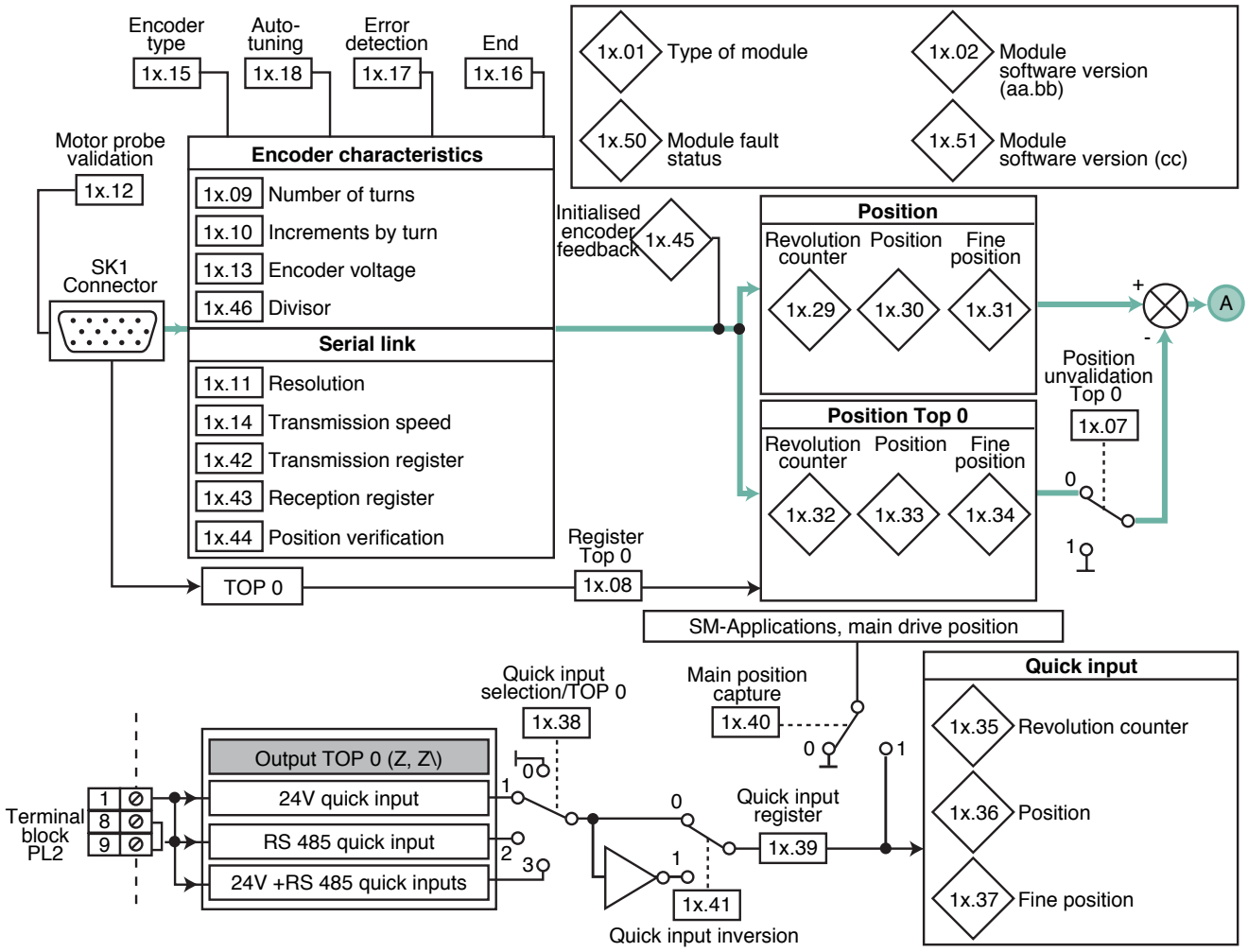


- **Clock (SM-I/O Timer module only)**



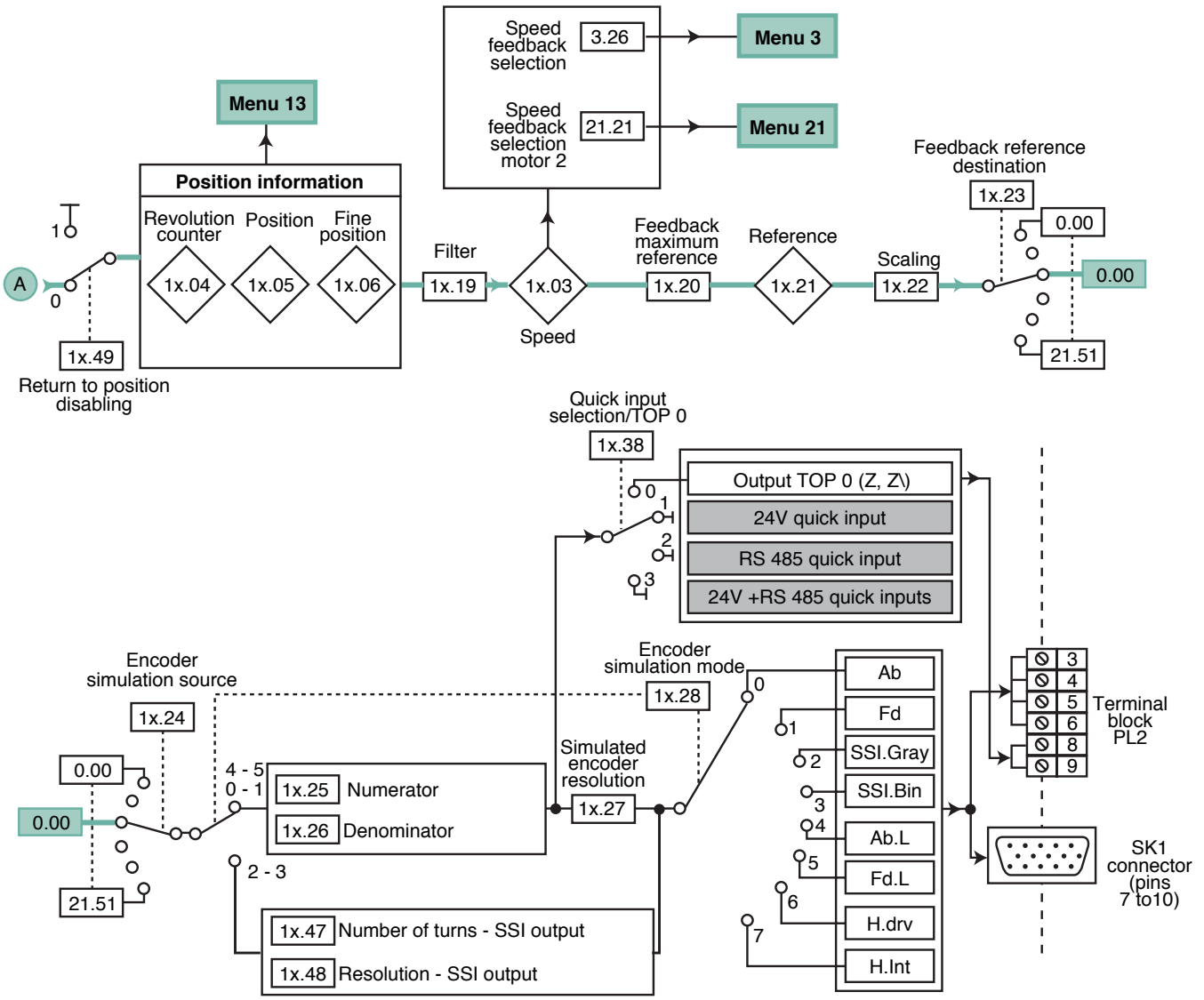
Parameters	Variation range			Factory setting		
1x.34	0 to 59.59			00.00		
1x.35	1.00 to 7.23			00.00		
1x.36	0 to 12.31			00.00		
1x.37	2000 to 2099			2000		
1x.40	±100%			-		
1x.41	0.000 to 4.000			1.000		
1x.49	0.000 to 4.000			1.000		
1x.52	512 (0), 1024 (1), 2048 (2), 4096 (3)			1024 (1)		
1x.53	0 to 65535 revolutions			-		
1x.54	0 to 65535 (1/2^{16th} revolution)			-		
1x.55	± 32000 min^{-1}			-		
1x.56	0 to 32000 min^{-1}			1500 min^{-1}		
1x.57	±100%			-		
1x.58	0.000 to 4.000			1.000		

H6.20.4 - SM-UNIVERSAL ENCODER PLUS module



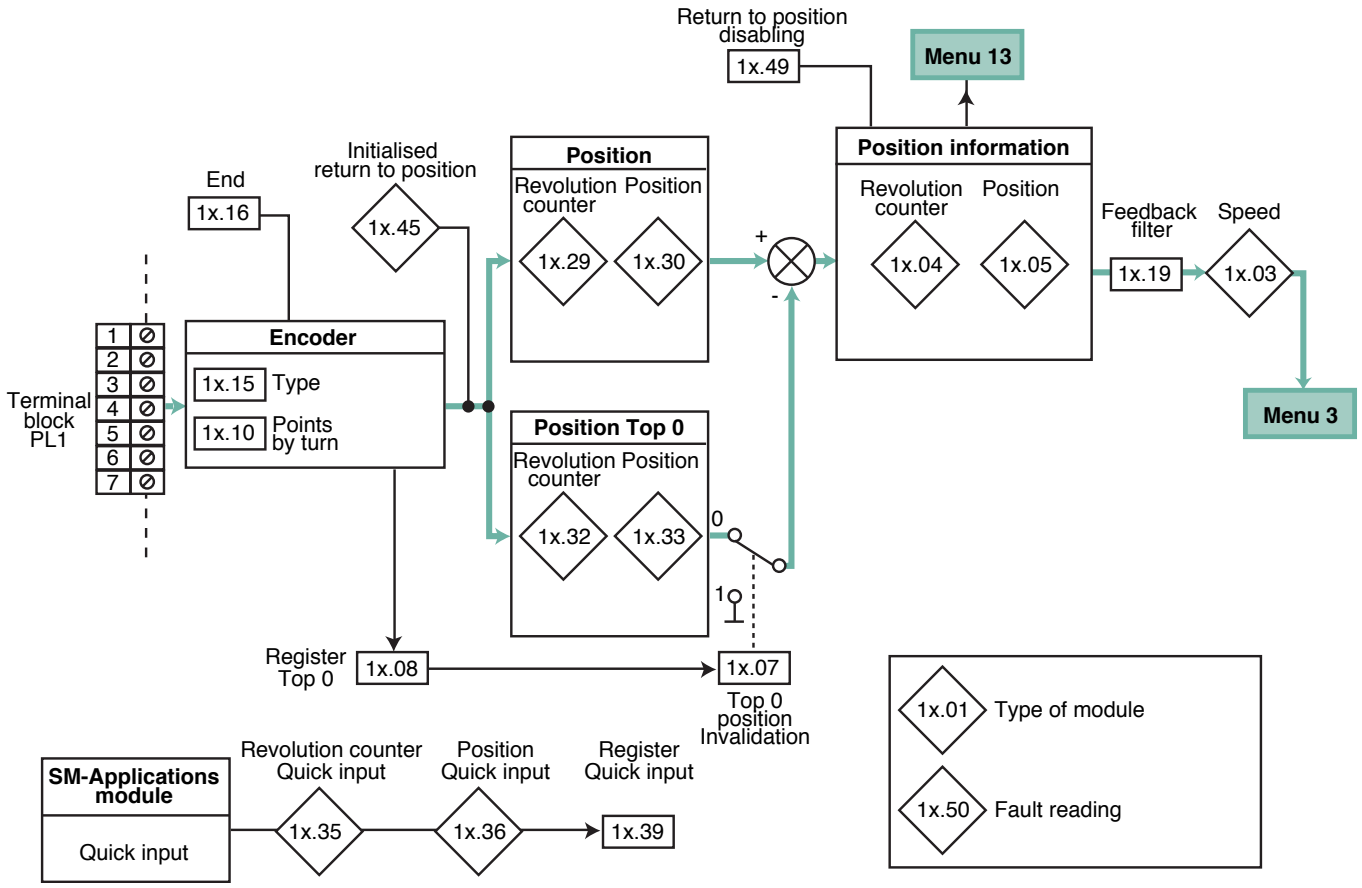
Parameters	Variation range			Factory setting		
1X.01	0 to 499			-		
1x.02	0 to 99.99			-		
1x.08 - 1x12 - 1x.18 - 1x.39 -	OFF (0) or On (1)			OFF (0)		
1x.09	0 to 255 bits			16 bits		
1x.10	0 to 50000			4096		
1x.11	0 to 32 bits			0		
1x.13	5 V (0), 8 V (1), 15 V (2)			5 V (0)		
1X.14	100 (0), 200 (1), 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 revolutions			-		
1x.30 - 1x.33 - 1x.36	0 to 65535 ($1/2^{16th}$ revolution)			-		
1x.31 - 1x.34 - 1x.37	0 to 65535 ($1/2^{32nd}$ revolution)			-		
1x.42 - 1x.43	0 to 65535 revolutions			0		
1x.45	OFF (0) or On (1)			-		
1x.46	0 to 1024			1		
1x.50	0 to 255			-		
1x.51	0 to 99			-		

SM-UNIVERSAL ENCODER PLUS module (continued)



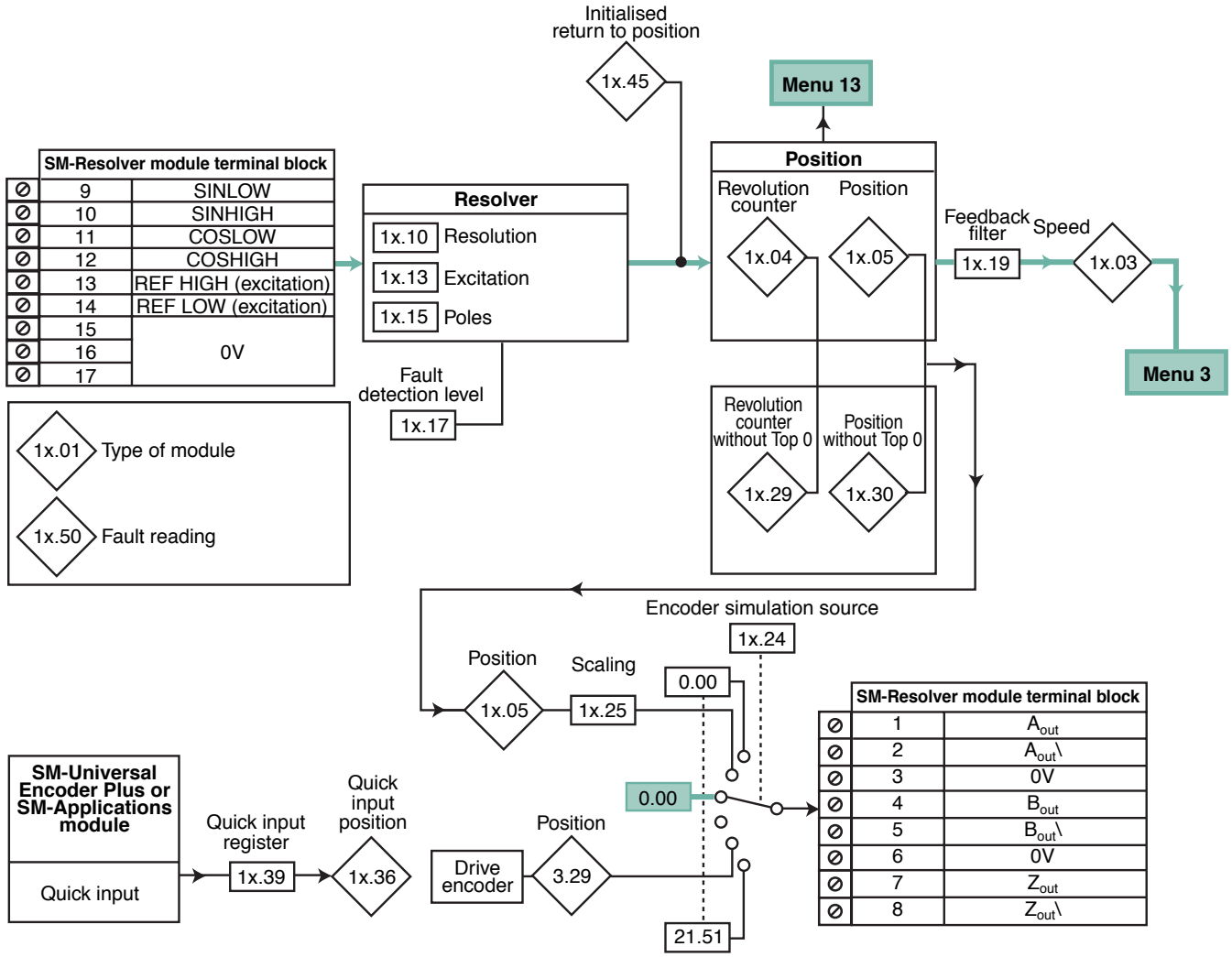
Parameters	Variation range			Factory setting		
1x.03	± 40000.0 min^{-1}			-		
1x.04	0 to 65535 revolutions			-		
1x.05	0 to 65535 (1/2^{16} th revolution)			-		
1x.06	0 to 65535 (1/2^{32} nd revolution)			-		
1x.19	0 (0), 1 (1), 2 (2), 4 (3), 8 (4), 16 (5) ms			0		
1x.20	0 to 40000.0 min^{-1}			1500.0 min^{-1}		
1x.21	± 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		

H6.20.5 - SM-ENCODER PLUS module



Parameters	Variation range			Factory setting		
1x.01	0 to 499			-		
1x.03	± 40000.0 min^{-1}			-		
1x.04 - 1x.29 - 1x.32 - 1x.35	0 to 65535 revolutions			-		
1x.05 - 1x.30 - 1x.33 - 1x.36	0 to 65535 ($1/2^{16}$ th revolution)			-		
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 16 ms)		-	0	
1x.45	OFF (0) or On (1)			-		
1x.50	0 to 255			-		

H6.20.6 - SM-RESOLVER module



Parameters	Variation range			Factory setting		
1x.01	0 to 499			-		
1x.03	± 40000.0 min^{-1}			-		
1x.04 - 1x.29	0 to 65535 revolutions			-		
1x.05 - 1x.30 - 1x.36	0 to 65535 ($1/2^{16}$ th revolution)			-		
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 16 ms)		-	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			-		

H6.20.7 - SM-Fieldbus module

Parameters	Description	Variation range			Factory setting		
1x.01	Module type	0 to 599			-		
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	Diagnostics	±9999			-		
1x.07	Tripping 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 the SM module	OFF (0) or On (1)			OFF (0)		
1x.31	Storing of module parameters	OFF (0) or On (1)			OFF (0)		
1x.32	SM module reset	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 to 1x.48	Specific to the bus	0 to 255			0		
1x.49	Data assignment error	0 to 255			0		

H6.20.8 - SM-Applications module

Parameters	Description	Variation range			Factory setting		
1x.01	Module type	0 to 599			-		
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) baud			300 (0) baud		
1x.08	RS485 scan time	0 to 255 ms			2 ms		
1x.09	RS485 Tx validation time	0 to 1 ms			0		
1x.10	DPL Print transmission path	SYPT: OFF (0) or RS485: On (1)			SYPT: OFF (0)		
1x.11	Clock task polling time	0 to 200 ms			0		
1x.12	Pos task polling time	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 enabling	OFF (0) or On (1)			On (1)		
1x.14	Module trip enabling	OFF (0) or On (1)			OFF (0)		
1x.15	No module Reset on drive reset	OFF (0) or On (1)			OFF (0)		
1x.16	Encoder data update	0 to 3			0		
1x.17	Over-limit trip enable	OFF (0) or On (1)			OFF (0)		
1x.18	Watchdog enable	OFF (0) or On (1)			OFF (0)		
1x.19	Immediate saving of parameters	OFF (0) or On (1)			OFF (0)		
1x.20	Saving at power-down	OFF (0) or On (1)			OFF (0)		
1x.21	Enabling of saving and restoration 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 network 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 1st CTNet easy mode cyclic word	0 to 25503			0		
1x.27	Source of 1st CTNet easy mode cyclic word	0 to 9999			0		
1x.28	Destination of 2nd CTNet easy mode cyclic word	0 to 25503			0		
1x.29	Source of 2nd CTNet easy mode cyclic word	0 to 9999			0		
1x.30	Destination of 3rd CTNet easy mode cyclic word	0 to 25503			0		

SM-Applications module (continued)

Parameters	Description	Variation range			Factory setting		
1x.31	Source of 3rd CTNet easy mode cyclic word	0 to 9999			0		
1x.32	Slot 1 destination transfer	0 to 9999			0		
1x.33	Slot 2 destination transfer	0 to 9999			0		
1x.34	Slot 3 destination transfer	0 to 9999			0		
1x.35	Synchronisation of Event tasks	Disable (0), Event (1), Event1 (2), Event2 (3), Event3 (4)			Disable (0)		
1x.36	CTNet bus status	-3 to 0			-		
1x.37	Loading authorisation rejection	OFF (0) or On (1)			OFF (0)		
1x.38	No tripping on APC error	OFF (0) or On (1)			OFF (0)		
1x.39	Sync master status	0 to 3			0		
1x.40	Data transfer mode	0 to 10			1		
1x.41	Reserved						
1x.42	Main Pos. saved	OFF (0) or On (1)			OFF (0)		
1x.43	Position saving inversion	OFF (0) or On (1)			OFF (0)		
1x.44	Task priority level	0 to 255			0		
1x.45	Reserved						
1x.46	Reserved						
1x.47	Reserved						
1x.48	Faulty program line	0 to 2,147,483,647			-		
1x.49	User parameter	± 32767			-		
1x.50	Reading of fault						
1x.51	Software version (zz)						

H6.21 - Menu 18: Application parameters

Parameters	Description	Variation range			Factory setting		
18.01	Application parameter (stored at power-down)	-32768 to +32767			0		
18.02 to 18.10	Application parameters	-32768 to +32767			0		
18.11 to 18.30	Application parameters	-32768 to +32767			0		
18.31 to 18.50	Application parameters	OFF (0) or On (1)			OFF (0)		

H6.22 - Menu 19: Application parameters

Parameters	Description	Variation range			Factory setting		
19.01	Application parameter (stored at power-down)	-32768 to +32767			0		
19.02 to 19.10	Application parameters	-32768 to +32767			0		
19.11 to 19.30	Application parameters	-32768 to +32767			0		
19.31 to 19.50	Application parameters	OFF (0) or On (1)			OFF (0)		

H6.23 - Menu 20: Application parameters

Parameters	Description	Variation range			Factory setting		
20.01 to 20.20	Application parameters	-32768 to +32767			0		
20.21 to 20.40	Application parameters	-2^{31} to $(2^{31}-1)$			0		

Note: These application parameters are used mainly with SM-Applications or SM-Applications Lite modules, or to produce a "Syptlite" program (execution of a program internal to the drive using Syptlite software, available on the CD-ROM supplied with the drive).

H6.24 - Menu 21: Operating parameters for a second motor

Parameters	Description	Variation range			Factory setting		
21.01	Maximum limit	0 to 3000.0 Hz	0 to LIM N MAX		EUR: 50.0 Hz USA: 60.0 Hz	EUR: 1500 min^{-1} USA: 1800.0 min^{-1}	3000.0 min^{-1}
21.02	FWD/REV minimum limit	± 3000.0 Hz	± LIM N MAX		0		
21.03	Reference selection	A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), Pad (4), Prc (5)			A1.A2 (0)		
21.04	Acceleration ramp	0 to 3200.0 s/ 100 Hz	0 to 3200.000 s/1000 min^{-1}		5.0 s/100 Hz	2.000 s/1000 min^{-1}	0.200 s/1000 min^{-1}
21.05	Deceleration ramp	0 to 3200.0 s/ 100 Hz	0 to 3200.000 s/1000 min^{-1}		10.0 s/100 Hz	2.000 s/1000 min^{-1}	0.200 s/1000 min^{-1}
21.06	Rated frequency	0 to 3000.0 Hz	0 to 1250.0 Hz	-	EUR: 50.0 Hz / USA: 60.0 Hz		-
21.07	Rated current	0 to I_N MAX (A)			I_{NOM} DRIVE (**11.32**)		
21.08	Rated speed	0 to 180000 min^{-1}	0 to 40000.00 min^{-1}		EUR: 1500 min^{-1} USA: 1800 min^{-1}	EUR: 1450.00 min^{-1} USA: 1770.00 min^{-1}	3000.00 min^{-1}
21.09	Rated voltage	0 to U_{AC} MOT MAX (V)			TL: 230 V / T: EUR = 400 V, USA = 460 V / TM: 575 V / TH: 690 V		
21.10	Cos φ	0 to 1.000		-	0 to 0.850		-
21.11	Number of motor poles	Auto to 120 poles (0 to 60)			Auto (0)		6 POLE (3)
21.12	Stator resistance	Sizes 1 to 5: 0.000 to 65.000 Ω Size 6: 0.000 to 65.000 x 10 mΩ			0		
21.13	Voltage offset	0 to 25.0 V		-	0	-	
21.14	Transient inductance	0 to 500.000 mH			0		
21.15	Motor 2 parameters active	OFF (0) or On (1)			-		
21.16	Thermal time constant	0 to 3000.0 s			89.0 s		20.0 s
21.17	Speed loop Kp gain	-	0 to 6.5535 (1/rads^{-1})		-	0.0100 (1/rads^{-1})	
21.18	Speed loop Ki gain	-	0 to 655.35 (1/rad)		-	1.00 (1/rad)	
21.19	Speed loop Kd gain	-	0 to 0.65535 (s)		-	0	
21.20	Encoder phase angle	-	0 to 359.9°		-		0
21.21	Speed feedback selection	-	drv (0), SLot 1 (1), SLot 2 (2), SLot 3 (3)		-	drv (0)	
21.22	Current loop Kp gain	0 to 30000			20	TL: 75, T: 150, TM: 180, TH: 215	
21.23	Current loop Ki gain	0 to 30000			40	TL: 1000, T: 2000, TM: 2400, TH: 3000	
21.24	Stator inductance	-	0 to 5000.00 mH	-	-	0	-
21.25	Inflection point 1	-	0 to 100% of rated flux	-	-	50%	-
21.26	Inflection point 2	-	0 to 100% of rated flux	-	-	75%	-
21.27	Active current limit in motor mode	0 to LIM. IM1 MAX (%)			165.0%	175.0%	
21.28	Active current limit in generator mode	0 to LIM. IM1 MAX (%)			165.0%	175.0%	
21.29	Active current limit in symmetrical mode	0 to LIM. IM1 MAX (%)			165.0%	175.0%	
21.30	Motor voltage for 1000 min^{-1} Ke	-	-	0 to 10000 V	-	-	98 V
21.31	Linear motor step	0 to 655.35 mm			0		

H6.25 - Menu 22: Menu 0 parameter setting (continued)

Menu 0 configuration

Parameters	Description	Variation range			Factory setting		
22.01	Configuration of **0.31** of menu 0	**1.00** to **21.51**			**11.33**		
22.02	Configuration of **0.32** of menu 0	**1.00** to **21.51**			**11.32**		
22.03	Configuration of **0.33** of menu 0	**1.00** to **21.51**			**6.09**	**5.16**	**0.00**
22.04	Configuration of **0.34** of menu 0	**1.00** to **21.51**			**11.30**		
22.05	Configuration of **0.35** of menu 0	**1.00** to **21.51**			**11.24**		
22.06	Configuration of **0.36** of menu 0	**1.00** to **21.51**			**11.25**		
22.07	Configuration of **0.37** of menu 0	**1.00** to **21.51**			**11.23**		
22.08 and 22.09	Not used	-			-		
22.10	Configuration of **0.40** of menu 0	**1.00** to **21.51**			**5.12**		
22.11	Configuration of **0.41** of menu 0	**1.00** to **21.51**			**5.18**		
22.12 to 22.17	Not used	-			-		
22.18	Configuration of **0.48** of menu 0	**1.00** to **21.51**			**11.31**		
22.19	Not used	-			-		
22.20	Configuration of **0.50** of menu 0	**1.00** to **21.51**			**11.29**		
22.21	Configuration of **0.51** of menu 0	**1.00** to **21.51**			**0.00**		
22.22	Configuration of **0.52** of menu 0	**1.00** to **21.51**			**0.00**		
22.23	Configuration of **0.53** of menu 0	**1.00** to **21.51**			**0.00**		
22.24	Configuration of **0.54** of menu 0	**1.00** to **21.51**			**0.00**		
22.25	Configuration of **0.55** of menu 0	**1.00** to **21.51**			**0.00**		
22.26	Configuration of **0.56** of menu 0	**1.00** to **21.51**			**0.00**		
22.27	Configuration of **0.57** of menu 0	**1.00** to **21.51**			**0.00**		
22.28	Configuration of **0.58** of menu 0	**1.00** to **21.51**			**0.00**		
22.29	Configuration of **0.59** of menu 0	**1.00** to **21.51**			**0.00**		

Note: For configuration of **0.11** to **0.30**, see menu 11.

Notes

UNIDRIVE SP
Communication

Contents

I

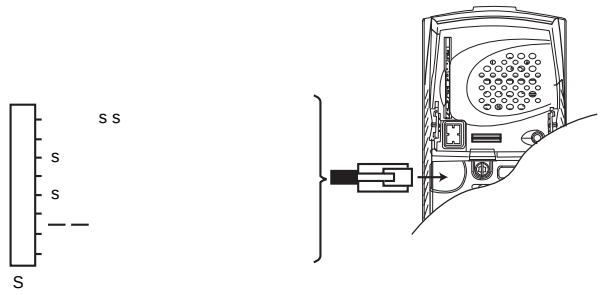
Notes

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 IEC60950 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 l'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.

I3 - 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

I4 - MODBUS RTU, **0.35** = rtU (1)

I4.1 - 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

I4.2 - Description of exchanges

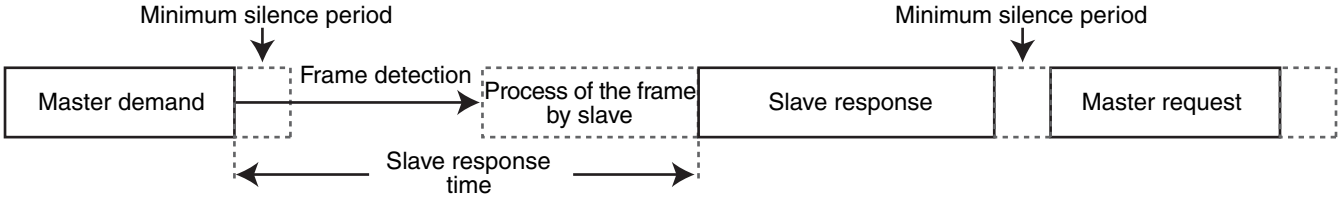
The exchanges are made on the initiative of the master, which imposes its demands: if the related slave comprised it, it sends its answer. Each frame (question or response) contains four types of information :
- the address of the related slave receiving the question frame (master demands) or the address 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.



I4.3 - 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.

I4.4 - 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 x 100) + (Y – 1)
Examples :	
1.02	101
1.00	99
0.01	0
70.00	6999

I4.5 - 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:

		1st	2nd	…	
16 – bits 0x1234	must be:	0x12	0x34		
32 – bits 0x12345678L	must be:	0x12	0x34	0x56	0x78

I4.6 - "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.

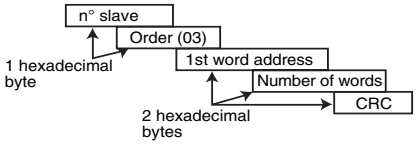
Code function	Description
3	Multiple reading of 16-bit registers
16	Multiple writing of 16-bit registers
23	Multiple reading and writing of 16-bit registers
64	CMP " capsulated " protocol Non standard function code

I4.6.1 - 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.

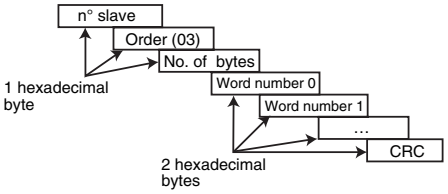
Frame sent by the master:

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

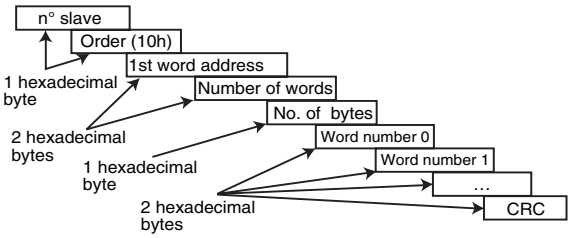


I4.6.2 - Function code 16 : writing

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").

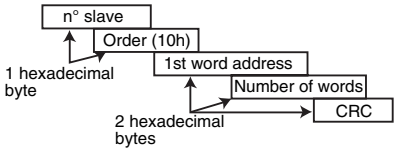
Frame sent by the master:

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



I4.6.3 - 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

I4.6.4 - 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 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

I4.7 - 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.

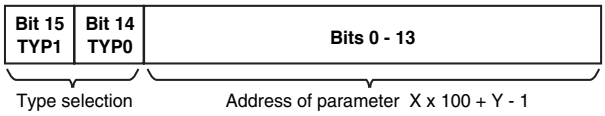
I4.8 - Types of large data

I4.8.1 - 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".

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** (0x4000 +201 – 1) = 16584 = 0x40C8
3	0xC8	
4	0x00	Number of 16-bit registers to read: **20.01** to **20.04** correspond to 4 32-bit registers = 8 16-bit registers
5	0x08	
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	-

I4.8.2 - 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

I4.8.3 - 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)

I4.9 - Exceptions

If an error is detected in the master demand, the slave will respond will 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.

I4.10 - 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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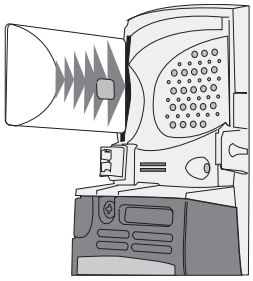
UNIDRIVE SP
SMARTCARD

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**



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

CAUTION:
• If the SMARTCARD already contains parameters, they will be "deleted and overwritten" by this procedure.
• The drive must not be in the "inh" state before carrying out configuring.

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 18 to 20, 70, 71, 74 and 75)	Press M.

J2.2 - Automatic saving

CAUTION:
If the SMARTCARD contains already parameters, they will be " deleted and reset " by this procedure.

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 ".			

J

J2.3 - Saving for automatic transfer to another drive

CAUTION:
If SMARTCARD contains already parameters, they will be " deleted and reset " by this procedure.

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.			

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 SMARCARD 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.

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

CAUTION:
• The operating mode, open loop ( ), closed loop flux vector control mode ( ) or servo ( ) of the drive and that contained in the SMARTCARD at the time of transfer must be identical. Otherwise, the mode of the drive will be changed by the SMARTCARD.
• The drive must not be in the "inh" state before carrying out configuring.

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 18 to 20, 70, 71, 74 and 75)	Press M.

J3.2 - Automatic loading

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.

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

UNIDRIVE SP
Diagnostics

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UNIDRIVE SP
Diagnostics

K1 - Introduction

UNIDRIVE SP supplies diagnostic information.
This information is split into 3 categories :
- indications concerning the operation,
- operating alarms,
- fault trips.

In addition, the faults type may be recovered by serial link as codes.

• The user must neither try to repair the drive by himself, nor give a diagnosis other than the ones listed in this chapter. In case of drive failure, it must be returned to LEROY-SOMER through the agency of your normal contact.

K2 - Operational indicators

The lower display of the Unidrive SP displays the status of the stopped or operating variable speed drive.

	Comment	Output status
ACt	The drive is in regenerative mode, and it is synchronised with the mains supply	
ACUU	Loss of the mains supply: the drive trys to keep the voltage on the DC bus, by decelerating the motor	Active
Auto/tunE	Auto-tuning phase in process	
boot	Automatic transfer of parameters from SMARTCARD to the drive (After power up)	-
cArd	Automatic transfer of the drive parameters to SMARTCARD (After power up)	-
dc	Braking phase by injection of continuous current	Active
dEC	Deceleration after a stop command	Active
inh	- The drive is disabled, and it will not start the motor - Freewheel stop	Inactive
loAding	The drive transfers information to an option module	-
POS	The drive positions the motor shaft	Active
rdY	- The drive is enabled, and waits for a command -The motor is ready to turn	Inactive
run	The motor is controlled by the drive	Active
SCAn	In the Open loop mode ( ), motor quick resumption on microcut	Active
StoP	The drive keeps the motor torque at zero speed	Active
triP	The drive is stopped, and it does not control the motor. The fault code is displayed on the lower display	Inactive

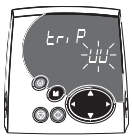
K3 - Operating alarms

Alarms may appear during the drive operation.
These alarms are for preventative action only, to alert the user: the drive continues to operate but there is a risk for stopping.

	Comment
br.rs	Overheat from the braking resistor (the braking thermal battery reached 75% of the value at which the drive stops)
OVLd	Motor overheat I^2t (the motor thermal reserve has reached 75% of the value at which the drive stops)
hot	Heater or control card overheating

K4 - Fault tripping

If the drive stops, the drive output bridge 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 stopped. The fault type may then be known by consulting the value of the parameter **10.20** by serial link. The value of **10.20** indicates then a fault code (1 to 230), and the correspondence of each code is to be found in the table of section K4.3.

After consulting the fault table, follow the procedure below:
- make the necessary checks in order to remove the cause of the fault,
- make sure that the drive is disabled (open terminal 31),
- press the key : if the drive is not stopped anymore, the display indicates " inh ".

• The opening then the closing of the enabling terminal may cancel the fault. If, when the fault is cancelled, the terminal Run forward or Run reverse is closed, the motor will immediately start.

Note : In the table, the faults related to the UNIDRIVE SP options contain the letter X, representing the module location having detected the fault.

K4.1 - Faults table

Mnemonic Display	Fault reason	Solution
C.Acc (185)	Communication problem with SMARTCARD	• Insert SMARTCARD • Check SMARTCARD to be correctly inserted • The fault can be cleared only after 1 second
C.boot (177)	SMARTCARD: It has not been possible to store the modification of a menu 0 parameter in the SMARTCARD since the card is not configured correctly	• Make sure that **11.42** is correctly set to auto (3) or boot (4), then press Reset. Attempt to modify the menu 0 parameter again
C.bUSY (178)	SMARTCARD: The SMARTCARD cannot carry out the requested command since it is being used by a Solutions module	• Wait until the Solutions module finishes with the SMARTCARD and relaunch the desired command
C.Chg (179)	The unit selected in the SMARTCARD already contains parameters	• Erase the unit parameters before attempting a new transfer to SMARTCARD • Select another unit not used in SMARTCARD • The fault can be cleared only after 1 second
C.Cpr (188)	The drive parameters are not identical to the parameters of the unit selected in SMARTCARD	• In order to cancel the fault, press the Reset key • The fault can be cleared only after 1 second
C.dat (183)	The unit selected in SMARTCARD has no parameter	• Check the unit number • The fault can be cleared only after 1 second
C.Err (182)	SMARTCARD : incorrect data	• Insert SMARTCARD • Check SMARTCARD to be correctly inserted • Erase the parameters and proceed again to the transfer • The fault can be cleared only after 1 second
C.Full (184)	SMARTCARD is full	• Erase an unit before realising again a transfer • Insert a new SMARTCARD • The fault can be cleared only after 1 second
cL2 (28)	Current reference loss on the analogue input 2, terminal 7 (**0.19** = 4-20 or 20-4)	• Check the current reference to be > to 3mA • If **10.37** = 1 or 3, the motor stops before the drive stops
cL3 (29)	Current reference loss on the analogue input 3, terminal 8 (**0.21** = 4-20 or 20-4)	
CL.bit (35)	Stop starting from a control word **6.42**	• Devalidate the control word (**6.43** = 0) • Check the setting of **6.42**
ConF.P (111)	The number of power modules does not correspond to the value stored in **11.35**	• Make sure that the power modules are correctly connected and supplied with power • Make sure that the value in **11.35** does correspond to the number of power modules connected
C.Optn (180)	The drive module(s) is (are) different from that (those) of the SMARTCARD	• Check the location and the type of module(s) mounted on the drive, there must be no difference from the configuration stored in the SMARTCARD • Check the options to be correctly inserted in the drive • Press the Reset key • The fault can be cleared only after 1 second
C.Prod (175)	SMARTCARD: The SMARTCARD data blocks are not compatible with this product	• Erase all the SMARTCARD data by setting **xx.00** to 9999, followed by the Reset key • Replace the SMARTCARD

UNIDRIVE SP
Diagnostics

<table>
<tr><th>Mnemonic Display</th><th>Fault reason</th><th>Solution</th></tr>
<tr><td>C.rdo
(181)</td><td>The storage in SMARTCARD is disabled</td><td>• Set XX.00 = 9777 + Reset to store a parameters set in SMARTCARD
• Check the selected unit is not protected (units n°500 to 999)
• The fault can be cleared only after 1 second</td></tr>
<tr><td>C.rtg
(186)</td><td>The drive rating does not correspond to the one stored in the SMARTCARD</td><td>• Press Reset
• SMARTCARD has transfered all parameters excepting those related to the drive rating that resume their factory settings:
<table>
<tr><th>Parameters</th><th>Function</th></tr>
<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>4.24</td><td>User max. current scaling</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>5.10 and 21.10</td><td>Rated power factor cos φ</td></tr>
<tr><td>5.17 and 21.12</td><td>Stator resistance</td></tr>
<tr><td>5.18</td><td>Carrier frequency</td></tr>
<tr><td>5.23 and 21.13</td><td>Voltage offset</td></tr>
<tr><td>5.24 and 21.14</td><td>Transient inductance</td></tr>
<tr><td>5.25 and 21.24</td><td>Stator inductance</td></tr>
<tr><td>6.06</td><td>Level of the brake by DC injection</td></tr>
<tr><td>6.48</td><td>Mains loss detection level</td></tr>
</table>
•The fault can be cleared only after 1 second</td></tr>
<tr><td>C.Typ
(187)</td><td>The unit selected in SMARTCARD is not compatible with the drive</td><td>• Press the Reset key
• Check the type of drive to be identical to the one contained in the SMARTCARD unit
• The fault can be cleared only after 1 second</td></tr>
<tr><td>dESt
(199)</td><td>Conflict : 2 parameters or more have the same destination parameter</td><td>• Set XX.00 = 12001 : the drive displays all the destination parameters, enabling error detection
• The fault can be cleared only after 1 second</td></tr>
<tr><td>EEF
(31)</td><td>EEPROM fault</td><td>• The operating mode becomes the open loop mode, and if a display is connected to the serial link, this one will be automatically invalidated
• Proceed to a factory settings return, and store the parameters (XX.00 = 1000 + Reset), then cut the power supply and power it up
• Fault will not clear without returning to factory settings</td></tr>
<tr><td>Enc1
(189)</td><td>Encoder power supply overload</td><td>• Check the encoder power supply current to be lower to the maximum admissible current (200mA at 15V or 300mA at 8V and 5V)
• The fault can be cleared only after 1 second</td></tr>
<tr><td>Enc2
(190)</td><td>Encoder connection breaking</td><td>• Check the connections and the encoder voltage
• Replace the encoder
• The fault can be cleared only after 1 second
• If the detection of the encoder cable breaking is not necessary on the drive encoder, set 3.40 = 0 in order to invalidate the Enc2 fault (ex : return of the encoder connected to a SM-Resolver module)</td></tr>
<tr><td>Enc3
(191)</td><td>Encoder : Offset of the incorrect UVW stage during the operation</td><td>• Check the encoder signals are being received
• Perform again the offset measurement procedure
• Check the encoder mechanical mounting
• The fault can be cleared only after 1 second</td></tr>
<tr><td>Enc4
(192)</td><td>Difficulty to connect with the encoder</td><td>• Check the transmission speed and the power supply
• Check the encoder signals not to be disrupted
• Replace the encoder
• The fault can be cleared only after 1 second</td></tr>
<tr><td>Enc5
(193)</td><td>Encoder : CRC error or control sum</td><td>• Check the encoder signals are being received
• With the EnDat encoders, check the link resolution and/or proceed to the automatic configuration 3.41
• The fault can be cleared only after 1 second</td></tr>
</table>

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Diagnostics

Mnemonic Display	Fault reason	Solution
Enc6 (194)	Encoder error	• For a SSI encoder, check the power supply setting as well as the cabling • Replace the encoder • The fault can be cleared only after 1 second
Enc7 (195)	Encoder initialisation problem	• Press Reset • Check the type of encoder, its cabling and its power supply to be 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 1 second
Enc8 (196)	The automatic configuration at the power up could not be realised	• 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 1 second
Enc9 (197)	The information concerning the module position return is not accessible starting from the selected location	• Check the settings of **3.26** (or of **21.21** if a second motor is used) • The fault can be cleared only after 1 second
Enc10 (198)	The encoder stage angle (**3.25** or **21.20**) is incorrect	• Check the encoder connection • Proceed to an auto-tuning or enter the value of the encoder phasing out manually in **3.25** or **21.20** • In the case of untimely Enc10 faults related to certain applications, the fault may be reset by setting a value higher that 0 in **3.08** (caution, a too high value may invalidate the detection of an encoder fault).
Enc11 (161)	Fault generated in case of difference between the sinus/ cosinus signals and the position measured permanently by the serial link. This fault is generally due to a spike in the sinus-cosinus path	• Check the shielding of the encoder cable • Check the sinus and cosinus signals are not disconnected
Enc12 (162)	Hiperface encoder problem : the encoder may not be identified by the auto-configuration procedure	• Check the type of encoder to be recognised by the autoconfiguration procedure • Check the encoder cabling • Enter the encoder characteristics manually
Enc13 (163)	EndAt encoder problem: the number of encoder turns read during the auto-configuration stage do not correspond to a power of 2	• Select another type of encoder
Enc14 (164)	EndAt encoder problem : during the auto-configuration stage,the number of bits that define the encoder position in a turn is important	• Select another type of encoder • The encoder is damaged
Enc15 (165)	Encoder problem : the number of periods calculated by turn during the auto-configuration stage is lower than 2 or higher than 50 000	• The number of points by turn or the non polarity of a linear motor is incorrect, for ex. **5.36** = 0 or **21.31** = 0 •The encoder is damaged
Enc16 (166)	EndAt encoder problem: the number of serial link bits by period for a linear motor is higher than 255	• Select another type of encoder • The encoder is damaged
Enc17 (167)	Revolving sincos encoder problem : the periods obtained by turn during the auto-configuration stage is not a power of 2	• Select another type of encoder •The encoder is damaged

UNIDRIVE SP
Diagnostics

Mnemonic Display	Fault reason	Solution
EnP.Er (176)	Data error in the encoder electronic range	• Replace the encoder • The fault can be cleared only after 1 second
Et (6)	External fault on terminal input 31	• Check terminal 31 to be connected to 24V (in positive logic) • Check **10.32.** Enter 12001 in **0.00**, and check the parameter that controls the value of **10.32** • Make sure that **10.32** or **10.38**(=6) are not controlled by the serial link • The fault can be cleared only after 1 second
HF01 to HF13 and HF17 to HF32 (217 to 232)	Internal error	• Power down and power up again • Contact your ordinary interlocutor LEROY-SOMER if the fault persists • The Reset key may not cancel these faults
It.AC (20)	Motor overload I^2t	• Read the battery value in **4.19** • Check the motor is not overloaded • Adjust the rated speed ( ) • Check that the motor rated current is correctly set (**0.46)** • Speed return: check the connecting up, and check the signal not to be disrupted • Check the parameter number of motor poles **0.42** • The fault can be cleared only after 1 second
It.br (19)	Overload of the braking resistor	• Read the value of the battery in **10.39** • Increase the resistance value • Check **10.30** and **10.31** to be correctly set (too many braking cycles). For setting see the manual available on the CDRom (ref. 3655) • Check the cabling and the resistor • Check the integrated transistor • The fault can be cleared only after 1 second
L.SYnC (39)	Synchronisation failure of the drive in Regen mode	• Please consult LEROY-SOMER
O.CtL (23)	Overheating of the control card	•Check that the fans turn, the cooling vents are not blocked, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Diminish the carrier frequency **0.41** • The fault can be cleared only after 1 second
O.ht1 (21)	Thermal simulation of the power components in function of I^2t	• Diminish the motor load, the cycle, the carrier frequency, and the acceleration and deceleration ramps • Check the I_N motor • The fault can be cleared only after 1 second
O.ht2 (22)	Heater overheating	•Check that the fans turn, the cooling vents are not blocked, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Diminish 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 1 second
O.ht2.P (105)	Heater overheating of a power module	•Check that the fans turn, the cooling vents are not blocked, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Diminish 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 1 second
O.ht3 (27)	Drive thermal simulation	•Check that the fans turn, the cooling vents are not blocked • Increase the ventilation flow • Diminish the motor load, the cycle, and the acceleration and deceleration ramps • The fault can be cleared only after 1 second

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Diagnostics

Mnemonic Display	Fault reason	Solution
O.ht4.P (102)	Rectifier overheating of a power module	•Check that the fans turn, the cooling vents are not blocked, the ambient temperature does not exceed 50°C, and the space around the drive is sufficient • Diminish 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 1 second • Check that there is no stage inbalance
OI.AC (3)	• Overcurrent at the drive output (output current point > 225 %) • Boost too high during the auto-tuning stage	•Check the insulation and the motor coupling • Increase the acceleration and deceleration ramps • Check the cabling, the coupling out and the speed return signals (perturbation) • Check that the motor cable lengths are not too long • Diminish the gains of the speed loop (**0.07, 0.08** and **0.09**) and • If it has not already been made, proceed to an auto-tuning **0.40** = 2 • Diminish the gains of the current loop (**0.38** and **0.39**) and • The fault can be cleared only after 10 second
OI.AC.P (104)	Overcurrent detected by a power module	• Increase the acceleration and deceleration ramps • If it occurs during an auto-tuning, reduce the Boost value in **5.15** • Check that there is no short-circuit at the drive output •Check the motor insulation • Check the cabling, the connecting and the speed return signals (perturbation) • Check that the motor cable lengths are not too long • Diminish the gains of the speed loop **0.07**, **0.08** and **0.09** (and) • If it has not already been made, proceed to an auto-tuning **0.40** =2 . • Diminish the current loop gains **0.38** and **0.39** (and) • The fault can be cleared only after 10 second
OI.br (4)	Overcurrent of the braking resistor	• Check the resistor insulation • Remove the resistor output short-circuit • Set a higher resistance value • The fault can be cleared only after 10 second
OIbr.P (103)	Overcurrent of the braking resistor detected by a power module	• Check the cabling and the braking resistor insulation • Check that the braking resistor value is higher than the drive minimum resistance value
OIdc.P (109)	Overcurrent detected by a power module	• IGBT Vce protection detected • Check the motor and cables insulation
O.Ld1 (26)	Overload of the power supply +24V or of the digital outputs	• Check the total current used by +24V (terminal 22) and the digital outputs of terminals 24 to 26 or of SM modules terminals (it must be < 200mA) • If **10.37** = 1 or 3, the motor stops before the drive stops
O.SPd (7)	Overspeed	• The speed is 1,2 times higher than the value of **0.02** ( ) • Check the load is being driven • Make sure of the adequate set of the overspeed threshold in **3.08** (and) • Speed loop gains adjustment (and) • Set a higher deceleration time in **0.04** • The fault can be cleared only after 1 second
0V (2)	Overvoltage of continuous bus : • TL : > 410V DC perm., 415V peak • T : > 815V DC perm., 830V peak • TM : > 970V DC perm., 990V peak • TH : > 1175V DC perm., 1190V peak	• Provide a braking resistor (option). When a resistor is already connected, diminish its value (in the authorised limit). • Check that the mains supply is not disrupted (overvoltage) • 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 1 second • In "backup power supply" mode, the fault trip level corresponds to 1.45 x **6.46** (V)

UNIDRIVE SP
Diagnostics

Mnemonic Display	Fault reason	Solution
0V.P (106)	Overvoltage of a power module	• Provide a braking resistor (option). When a resistor is already connected, diminish its value (in the authorised limit). • Check that the mains supply is not disrupted (overvoltage) • 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 1 second
PAd (34)	The drive waits a reference from the keyboard and this one has been removed	•Replace the keyboard and press Reset • Select another speed reference •The fault can be cleared only after 1 second
Ph (32)	• Loss of a power supply stage • Important stage inbalance	• Check the mains supply (3 existing and well-balanced stages) • Check the level of the power supply voltage (with full load) **Note :** • A stage loss may be detected only if the active current is located between 50 % and 100 % of the rated value. • The drive trys to stop the motor before the fault tripping " Ph ". •The fault can be cleared only after 1 second
Ph.P (107)	• Loss of a power module stage	• Check the mains supply (3 existing and well-balanced stages) • Check the power supply voltage level (with full load)
PS (5)	Internal power supply fault	• If there are application modules, remove them and press Reset • Check the band status connecting the power card to the control card (sizes 4, 5, 6) • "Hard" fault: consult LEROY-SOMER • The fault can be cleared only after 1 second
PS.10V (8)	Overcurrent on the internal analogue source +10V (>10mA)	• Check the cabling and the terminal 4 load • The fault can be cleared only after 1 second
PS.24V (9)	Power supply overload +24V	• If there are 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 digital outputs and encoders consumption) • Supply an external power supply 24V (> 50W) • The fault can be cleared only after 1 second
PS.P (108)	Power supply fault of a power module	• If there are application modules, remove them and press Reset • Check the band status connecting the power card to the control card (sizes 4, 5, 6) • "Hard" fault: consult LEROY-SOMER • The fault can be cleared only after 1 second
PSAVE.Er (37)	The parameters saved at power-down contained in the EEPROM are corrupted	• Indicates a problem during storing of the parameters saved at power-down • The drive will use the parameters recorded successfully at the previous power-down • Carry out a store operation (**xx.00** at 1000 or 1001 then Reset of the drive) in order to make sure that this problem will not happen again at the next power-down
rS (33)	Fault during the stator resistance measurement during an auto-tuning or when **5.14** = 0 or 3	• Adapt the drive power to that of the motor • Check the connection of motor cables • The fault can be cleared only after 1 second
SAVE.Er (36)	The user parameters contained in the EEPROM are corrupted	• The drive was powered down during storing of the user parameters • The drive will use the parameters recorded successfully at the previous power-down • Carry out a store operation (**xx.00** at 1000 or 1001 then Reset of the drive) in order to make sure that this problem will not happen again at the next power-down
SCL (30)	Communication loss by serial link	• Replace the keyboard or the cable • Check the connectors between the keyboard and the drive • Check the cable not to be damaged • If **10.37** = 1 or 3, the motor stops before the drive stops

UNIDRIVE SP
Diagnostics

Mnemonic Display	Fault reason	Solution
SL.rtd (215)	The operating mode of the drive has changed and the module data no longer correspond	• Press the Reset key • If the fault persists, consult LEROY-SOMER • The trip can be cancelled only after one second
t010 (10)	Reserved	
t038 (38)	Reserved	
t040 to t069 (40 to 69)	Reserved	
t070 (70)	Position reference greater than the maximum reference set in **75.07** or outside the software limit stops	• Give a position reference smaller than **75.07** or between **19.27** and **19.28**
t071 (71)	Absolute encoder overflow	• Check the operating range of the absolute encoder in relation to the movement of the mobile
t072 to t079 (72 to 79)	Reserved	
t080 (80)	Load back driving	• Motor setting problem, or mechanical problem, the load is driving the motor • To disable the trip, refer to **20.15**
t081 (81)	Speed difference	• Speed error greater than the value in **20.35** (speed error reference) • Gain setting problem, or parameter **20.35** with too low a threshold • To disable the trip, refer to **20.15** **Note:** For a dynamic movement with short acceleration and deceleration ramps, it is preferable to disable the trip
t082 (82)	Pursuit error	• Position or speed loop gain incorrectly set or pursuit error threshold **20.36** with too low a threshold • To disable the trip, refer to **20.15**
t083 (83)	Software limit stop reached or exceeded	Position of the mobile outside the limit stops configured in **19.27** or **19.28** • To disable the trip, refer to **20.15**
t084 (84)	End stop sensor reached	End stop sensor activated (see parameter **18.37** or **18.38**)
t085 (85)	Current threshold reached	• Motor current greater than threshold **20.32** • Motor stopped mechanically, mechanical "stiffness" or threshold too low (**20.32**) • To disable the trip, refer to **20.15**
t086 (86)	Difference in position between the motor encoder and the machine encoder	Slip between motor encoder and machine encoder: - Mechanical problem due to play or torsional rigidity - Threshold **20.39** too low • To disable the trip, refer to **20.15**
t087 (87)	CTSYNC trip (no communication)	• Check the wiring • Remove requirement for synchronisation with CTSYNC mode (**20.17** = 4)
t088 (88)	Magnetising current trip	• Check the motor rated current setting (**0.46**) • Check the magnetising threshold setting (**75.01**)
t089 (89)	Motor phase missing	• Check motor U, V, W wiring
t099 (99)	Reserved	
t101 (101)	Reserved	
t112 to t119 (112 to 119)	Reserved	
t120 (120)	Additional module location fault	• Check the locations of the additional modules
t121 (121)	External sensor fault	• Check the connection of the external sensors and the shape of their signals, and that no sensor edges are missing between the master and slave according to **19.23**
t122 to t124 (122 to 124)	Reserved	
t125 (125)	Radius calculation fault or product breakage	• The product is broken or not held correctly by the tractor (slip) • Check the condition of the product or the setting relating to the catch band device **20.27**

Mnemonic Display	Fault reason	Solution
t126 (126)	Reserved	
t127 (127)	• Fault on RS485 link for Modbus RTU • A problem occurred on signal reception	• Check the wiring • Check the drive configuration, transmission speed, addressing, etc.
t128 & t129 (128 & 129)	Reserved	
t130 (130)	Error: speed > threshold set In **19.26** percentage of Vmax in ▣ and ⬬ Torque > threshold set in **18.14** in ▣	• Check the motor load level and the setting of the brake control • Fault disabling: refer to parameter **0.58** (= **20.40**)
t131 (131)	Direction of rotation in ▣ and ⬬	• Check the motor load level and the setting of the brake control • Fault disabling: refer to parameter **0.58** (= **20.40**)
t132 (132)	Phase missing	• Check the motor connection • Fault disabling: refer to parameter **0.58** (= **20.40**)
t133 (133)	Brake feedback	• Check the correct operation of the brake or relay • Fault disabling: refer to parameter **0.58** (= **20.40**)
t134 (134)	Transmission break only if the following present: SM-ENCODER Plus or SM-UNIVERSAL ENCODER Plus	• Check the correct operation and wiring of the slow shaft encoder • Fault disabling: refer to parameter **0.58** (= **20.40**)
t168 to t174 (168 to 174)	Reserved	
t216 (216)	Reserved	
th (24)	Motor thermal sensor has tripped	• Check the motor load • Reduce the overload level • Check the motor ventilation and the ambient temperature • Check the sensor wiring (pin 15 of connector HD-15 or terminal 8 of the control terminal block) • The trip can be cancelled only after one second
thS (25)	Motor thermal probe in short-circuit	• Check the resistance value of the motor probe • The fault can be cleared only after 1 second
tunE (18)	Auto-tuning stop before the end of the procedure	• Drive stop during the auto-tuning stage • The Stop key has been activated • Terminal 31 has been opened during the auto-tuning stage • The fault can be cleared only after 1 second
tunE1 (11)	• The information concerning the position has not changed during the auto-tuning •Problem during the inertia measurement procedure (see **5.12**)	• Check the encoder cabling • Make sure that the motor rotation takes place normally • The fault can be cleared only after 1 second
tunE2 (12)	Incorrect direction of rotation during the auto-tuning	• For the closed loop, reverse 2 motor stages or 2 encoder paths • The fault can be cleared only after 1 second
tunE3 (13)	Incorrect connection of the encoder commutation paths detected during the auto-tuning (see **5.12**)	• Check the motor cabling and the encoder commutation paths • The fault can be cleared only after 1 second
tunE4 (14)	Encoder : Failure of the U commutation signal during the auto-tuning (see **5.12**)	• Check the encoder connection (encoder U path) • Replace the encoder • The fault can be cleared only after 1 second
tunE5 (15)	Encoder : Failure of the V commutation signal during the auto-tuning (see **5.12**)	• Check the encoder connection (encoder V path) • Replace the encoder • The fault can be cleared only after 1 second

Mnemonic Display	Fault reason	Solution
tunE6 (16)	Encoder : Failure of the W commutation signal during the auto-tuning (see **5.12**)	• Check the encoder connection (encoder W path) • Replace the encoder • The fault can be cleared only after 1 second
tunE7 (17)	Setting of the incorrect motor poles number	• Check the number of increments by encoder turn • Check the setting of **5.11** number of poles • The fault can be cleared only after 1 second
Unid.P (110)	Unknown fault of a power module	• Check all cablings between the power modules • Check the cables to be sent in areas without perturbations
UP.ACC (98)	Impossible to access "Syptlite" program	• The driver must be enabled • A task is already in the process of being realised, try again when the task is over • The fault can be cleared only after 1 second
UP.diVO (90)	The program tries to divide by 0 (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.Ofl (95)	The program variables and the function units used appeal to a RAM memory higher than the allowed one.	• Check the program • The fault can be cleared only after 1 second
UP.ovr (94)	The program tries to write a value outside the parameter range (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.PAr (91)	The program searches a parameter that does not exist (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.ro (92)	The program tries to write in a LS parameter (only reading) (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.so (93)	The program tries to read a writing parameter (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.udf (97)	Fault not defined in the program (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UP.uSEr (96)	The program waits a fault (Syptlite program)	• Check the program • The fault can be cleared only after 1 second
UU (1)	Continuous bus powered up : TL: <175Vdc T : <350Vdc TM: <435Vdc	• Check the mains supply (mains supply powering up) • Fault removal when the mains supply voltage increases again in relation to the threshold

K4.2 - Faults related to an option module

K4.2.1 - Faults table

In the table, the faults contain the letter X that represents the location of the module responsible of the fault.

Mnemonic Display	Fault reason	Solution
SLX.df (204, 209, 214)	The option inserted in the X location has changed	• Store and press Reset • The fault can be cleared only after 1 second
SLX.Er (202, 207, 212)	The option inserted in the X location has detected a fault	• Read the value of the parameters **15.50, 16.50** or **17.50.** Then see the table of the section K4.2.2 that lists the faults for the speed return modules, Application or Inputs/Outputs • When an application is used (positioning, synchronisation...), check the type of data exchanged in **1x.34** (send **1x.34** to 1) • The fault can be cleared only after 1 second
SLX.HF (200, 205, 210)	Hardware fault of the module inserted in the X location	•Check the module to be correctly inserted • Replace the module (contact your ordinary interlocutor LEROY-SOMER) • The Reset key may not cancel these faults
SLX.nF (203, 208, 213)	The module has been removed	•Check the module to be correctly inserted • Save the parameters and press the Reset key • The fault can be cleared only after 1 second
SLX.tO (201, 206, 211)	Out of date wizard module	• Press the Reset key • If the fault persists, consult LEROY-SOMER • The fault can be cleared only after 1 second

K4.2.2 - Error codes related to the " SLX.Er " fault

• Error codes for a speed return module:

Value	Problem	Solution
0	No fault	-
1	Overload of the encoder power supply	See Enc1 fault
2	Encoder connection break	See Enc2 fault For a SM-Universal Encoder Plus module, this fault may be devalidated by **1x.17** = 0 (ex. when the module is used only to give the image of the main encoder)
3	Encoder : incorrect stage U, V, W offset during the operation	See Enc3 fault
4	Problem of connection with the encoder	See Enc4 fault
5	Encoder : control sum or CRC error	See Enc5 fault
6	Encoder error	Replace the encoder
7	Encoder initialisation problem	•Check the type of encoder set in**15.15**, **16.15** or **17.15** •Check the cabling and the encoder power supply •Replace the encoder
8	Automatic configuration when power up could not be realised	Modify the parameter setting 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 probes fault
10	-	Motor probes short-circuit
11	Resolver : the number of poles does not correspond to the motor	Check the parameter setting of the poles number in **15.15**, **16.15** or **17.15**
12	Identification of encoder type impossible during automatic configuration	•Check that it is possible to configure the encoder type automatically •Check the encoder wiring •Enter the parameters manually
13	The number of encoder revolutions read during automatic configuration is not a power of 2	Select another encoder type
14	The number of communication bits defining the encoder position in a revolution during automatic configuration is too large	•Select another encoder type •Faulty encoder
15	The number of periods per revolution calculated from the automatic configuration is either < 2 or > 50,000	•The "linear motor step/encoder ppr (pulses per revolution)" parameter setting is incorrect or outside the adjustment range (**5.36** = 0 or **21.31** = 0) •Faulty encoder
16	The number of communication bits per period for a linear encoder exceeds 255	•Select another encoder type •Faulty encoder
74	The module has overheated	

• Error encoder for an application module :

Value	Problem
39	User level exceeded
40	Unknown error
41	Non-existent parameter
42	Reading parameter only
43	Writing parameter
44	Parameter value outside the range
45	Invalid synchronisation modes
46	Not used
47	Synchronisation lost together with the Master
48	RS485 is not in the user mode
49	Invalid RS485 configuration
50	Mathematical error
51	Pointer outside the limits
52	Fault of the user control word
53	DPL program incompatible with the target
54	Microprocessor overload / exceeded task
55	Invalid encoder configuration
56	Configuration of the invalid time unit
57	Function unit not processed by the system
58	Damaged non-volatile flash memory
59	Impossible to consider the Application module as synchronisation reference
60	CTNet Hardware error
61	Invalid CTNet configuration
62	The CTNet transmission speed does not correspond to the mains supply

Value	Problem
63	The CTNet ID node already used
64	Digital output overload
65	Parameters of the invalid function unit
66	The user demand is too important
67	Non-existent file
68	Non-associated file
69	Problem related to the access to the Flash version during the loading
70	Transfer of the user program when the drive is enabled
71	The modification of the drive mode has failed
72	Invalid CTNet register operation
73	Failure of the parameter quick initialisation
74	Modules overload
76	Identification of the module impossible
77	Internal communication error with the optional module connected to location 1
78	Internal communication error with the optional module connected to location 2
79	Internal communication error with the optional module connected to location 3
80	Internal communication error with the optional module connected to an unknown location
81	APC internal error
82	Communication error with the drive

UNIDRIVE SP
Diagnostics

• Error code for Inputs/Outputs module

Value	Bus Type	Problem
0	All	No error
1	All	Digital output short-circuit
2	SM-I/O Lite, SM-I/O Timer	Analog input 1 current too high (> 22 mA) or too low (< 3 mA)
	SM-I/O PELV, SM-I/O 24V Protected	Digital input overload
3	SM-I/O PELV, SM-I/O 24V Protected	Analog input 1 current too low (< 3 mA)
	SM-I/O 24V Protected	Communication error
4	SM-I/O PELV	User power supply missing
5	SM-I/O Timer	Communication error with the real time clock
74	All	Module overheating

• **Error code for a field Bus module :**

Value	Bus Type	Problem
0	All	No fault
52	All excepting DPLCAN	User control word fault
61	All	Invalid configuration parameters
64	SM-DeviceNet	Delay in the transmission of expected packets
65	All excepting DPLCAN	Field bus mains supply loss
66	Devicenet, CANopen and DPLCAN	The "Bus-Off" node detects too many transmission errors
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 transfer in the drive ; it is possible that the user did not stored the data, or the storage did not work correctly
74	All	Module overheating
75	SM-Ethernet	No response from the drive
76	SM-Ethernet	Modbus connection time delay
80	Profibus	The communication time is exceeded. The fault cause is unknown.
81	All (except SM-SERCOS)	Communication error with location 1
82	All (except SM-SERCOS)	Communication error with location 2
83	All (except SM-SERCOS)	Communication error with location 3
84	SM-Ethernet	Memory allocation error
85	SM-Ethernet	File system error
86	SM-Ethernet	Error relating to the configuration file
87	SM-Ethernet	Error relating to the language file
98	All	The module basic task is not finished
99	All	Software fault

K4.3 - Faults codes by serial link

A fault may be read by the serial link, with the help of the parameter **10.20** that indicates a code.
The table below gives the correspondence of these codes with the faults detected by the drive or by the options.

No.	Fault
1	UV
2	OV
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
36	SAVE.Er
37	PSAVE.Er
38	t038
39	L.SYnC

No.	Fault
40 to 89	t040 to t089
90	UP div0
91	UP PAr
92	UP ro
93	UP So
94	UP ovr
95	UP OFL
96	UP uSEr
97	UP udF
98	UP ACC
99	t099
100	-
101	t101
102	Oht4.P
103	OIbr.P
104	OIAC.P
105	Oht2.P
106	OV.P
107	PH.P
108	PS.P
109	OIdC.P
110	Unid.P
111	ConF.P
112 to 160	t112 to t160
161	Enc11
162	Enc12
163	Enc13
164	Enc14
165	Enc15
166	Enc16
167	Enc17
168 to 174	t168 to t174
175	C.Prod
176	EnP.Er
177	C.boot
178	C.bUSY
179	C.Chg
180	C.OPtn
181	C.RdO

No.	Fault
182	C.Err
183	C.dAt
184	C.FULL
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	t216
217	HF17
218	HF18
219	HF19
220 to 232	HF20 to HF32

Notes

UNIDRIVE SP
Options

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UNIDRIVE SP
Options

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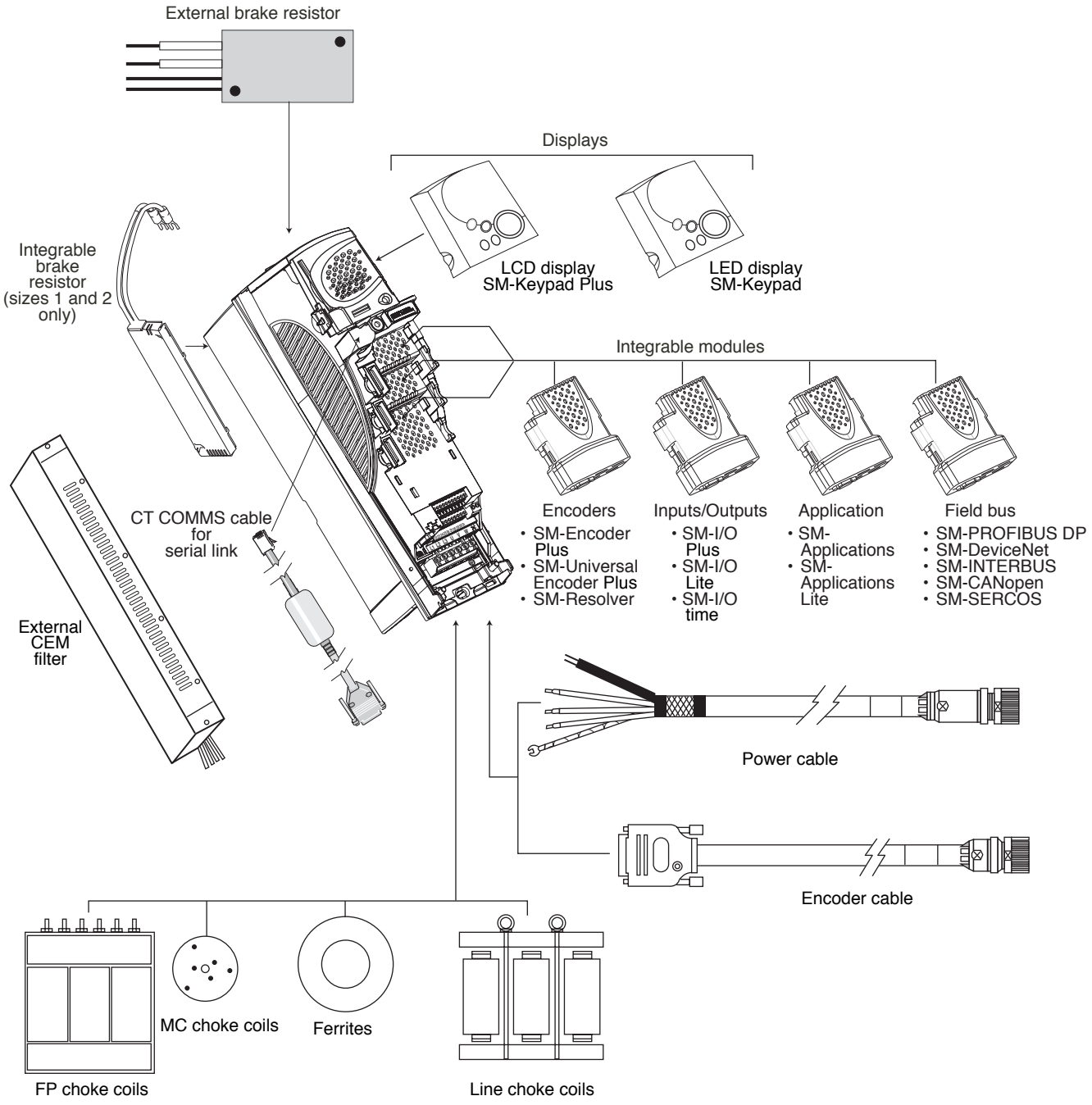
L1 - Introduction

• UNIDRIVE SP and its options



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
	Deep yellow	SM-I/O Lite	Additional I/O module: • 3 digital inputs • 1 analog input • 1 analog output • 1 relay
	Dark red	SM-I/O Timer	Additional I/O module with real-time clock: • 3 digital inputs • 1 analog input • 1 analog output • 1 relay • 1 clock
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
	Red	SM-SERCOS	SERCOS option
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.

L2.3 - SM-I/O Plus module

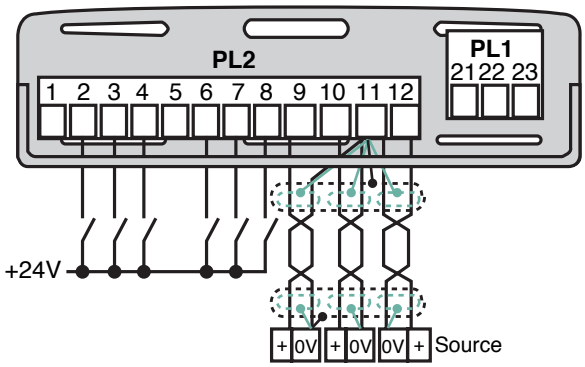
L2.3.1 - General information

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 IEC61131 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 ans 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.

L2.4 - SM-I/O Lite and SM-I/O Timer module

L2.4.1 - General

The SM-I/O Lite and SM-I/O Timer modules are used to increase the number of drive inputs and outputs. These options are fully configurable.

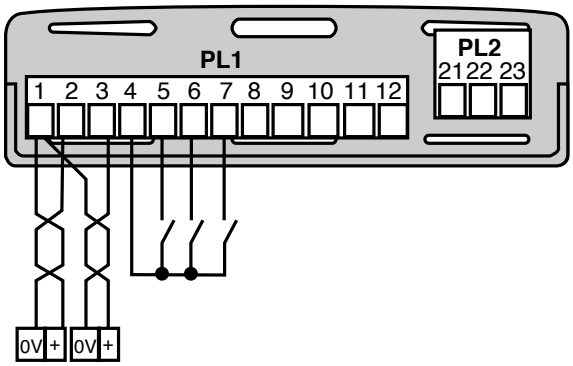
Additional functions of the SM-I/O Lite module:
- 1 analog input
- 1 analog output
- 3 digital inputs
- 1 assignable relay

Additional functions of the SM-I/O Timer module:
- 1 analog input
- 1 analog output
- 3 digital inputs
- 1 assignable relay
- 1 internal clock
- year, month, day, hours, minutes, seconds backup mode

Terminal blocks PL1 (terminals 1 to 12) and PL2 (terminals 21 to 23) are removable.

Note: The speed reference encoder input available from these modules is not compatible with the UNIDRIVE SP.

L2.4.2 - Connection



L2.4.3 - Characteristics

Terminal block PL1

1	Common 0 V

2	Voltage or current analog input
Factory setting	±10 V bipolar input
Voltage/current	±10 V/mA bipolar input according to the signal type (see **1x.38**)
Signal type	0-20, 20-0, 4-20, 20-4, 4-.20, 20-.4, VoLt
Scaling	Automatic scaling according to the minimum and maximum of the parameter
Input impedance	200 Ω (current) / 100 kΩ (positive voltage input), 18 kΩ (negative voltage input)
Resolution	11 bits + sign
Accuracy	2% for positive voltage or current input 4% for negative voltage input
Maximum voltage range	-18 V to +35 V with respect to the common 0 V

3	Voltage or current analog output
Factory setting	0 to 10 V
Voltage/current	0 to 10 V/mA according to the signal type (see **1x.39**)
Signal type	0-20, 20-0, 4-20, 20-4, 4-.20, 20-.4, VoLt
Scaling	0 V represents value 0 of the parameter 10 V represents the maximum of the parameter
Maximum output current	5 mA
Resolution	13 bits
Accuracy	±2%
Protection	Tolerates continuous short-circuit to 0 V

4	24 V output
Maximum output current	100 mA
Accuracy	±15%
Protection	Tolerates continuous short-circuit to 0 V

5	Digital input 1
6	Digital input 2
7	Digital input 3
Control logic	Positive logic only
Variation range	0 to 24 V
Input impedance	6 kΩ
Nominal voltage threshold	+10 V
Maximum voltage range	-18 V to +35 V with respect to the common 0 V

8	Channel B\ or channel D
9	Channel A or channel F
10	Channel A\
	Not used

11	Common 0 V

12	+5 V encoder power supply
	Not used

Terminal block PL2

21	Relay	Normally open contact
22	Not connected	
23	Relay	
Rated voltage		240 V AC / 30 V DC
Rated current		2 A / 6 A (resistive)
Contact isolation		1.5 kV AC (overvoltage, category 2)

• Provide a fuse or overcurrent protection in the relay circuit.

L2.4.4 - Module/drive refresh

Use	Refresh (ms)
Background task (mandatory)	1
Data input (terminal 5)	0.5
Data input (terminal 6)	0.5
Data input (terminal 7)	0.5
Relay output	0.5
Analog input	0.5/2*
Analog output	0.5

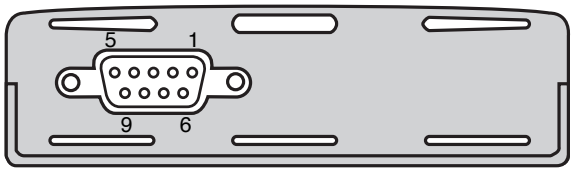
* When the analog input is assigned to the accuracy reference parameters **1.18** and **1.19**, the maximum refresh time is 4 x 0.5 = 2 ms.

L2.5 - SM-PROFIBUS DP module

L2.5.1 - 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.

L2.5.2 - 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)

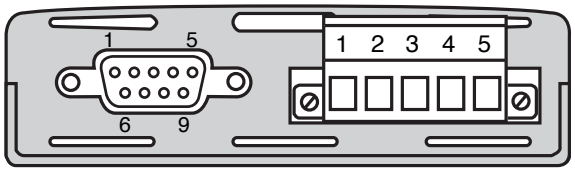
It is strongly recommended to use Profibus certified connectors.
These connectors accept 2 Profibus cables and they have a 4 screw-terminal block, one for each data connection. They have also a shielding connection support, this providing the shielding continuity for an adequate immunity to Profibus mains supply interference.

L2.6 - SM-DeviceNet module

L2.6.1 - 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 DeviceNetmains 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	Blindage	Cable shielding connection
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

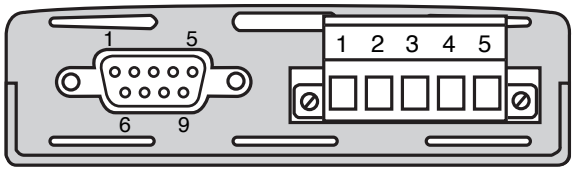
CAUTION :
It is recommended to use the terminal block with screw instead of the SUB-D connector for the connection to the Devicenet mains supply, because the SUB-D connectors are not recognised for the DeviceNet conformity.

L2.7 - SM-CANopen module

L2.7.1 - 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 communicate with the drive despite the mains supply loss.

L2.7.2 - Connection



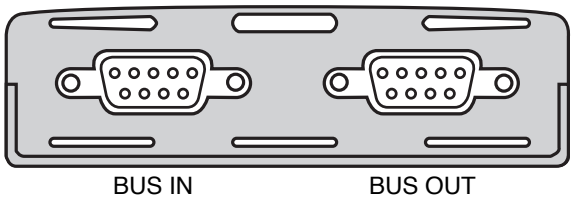
Terminal block 5 terminals	SUB-D 9 pins	Functions	Description
1	6	0V	0V of the external power supply
2	2	CAN-L	Negative data line
3	3.5	Shielding	Cable shielding connection
4	7	CAN-H	Positive data line
5	9	+24V	External power supply

L2.8 - SM-INTERBUS module

L2.8.1 - 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.

L2.8.2 - 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	

L2.9 - SM-Universal Encoder Plus module

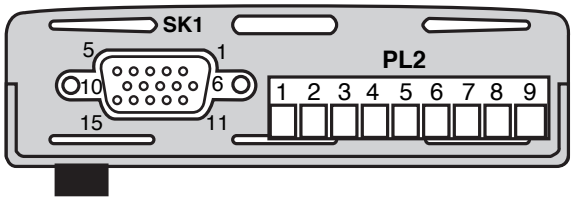
L2.9.1 - General information

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

L2.9.2 - 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 1SM-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 En Dat or SSI link		EnDat		SSI		SinCos with U, V, W paths	
					and		and		and		and		and		and
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														

L2.9.3 - Connector characteristics SK1

Incremental encoders (quadrature, frequency/direction, Fwd/Rev)

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

L2.9.4 - 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 9	Quick input RS 485

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.

• 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}\

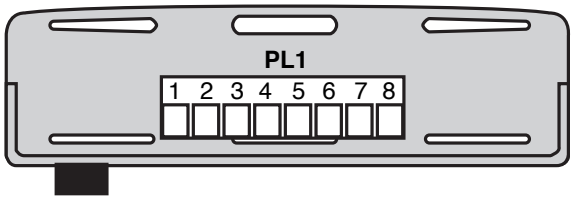
Characteristics	RS485 differential voltage
Maximum input frequency	500 kHz
Line load	< 2 drives for terminals 3 and 4 32 drives for terminals 5 and 6 1 drive for terminals 8 and 9
Input impedance	120 Ω
Operating range	-7 to +12V
Absolute maximum differential voltage	± 14V

L2.10 - SM-Encoder Plus module

L2.10.1 - 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.

L2.10.2 - Connection



Terminals PL1	Functions		
	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.

L2.10.3 - 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

L2.11 - SM-Resolver module

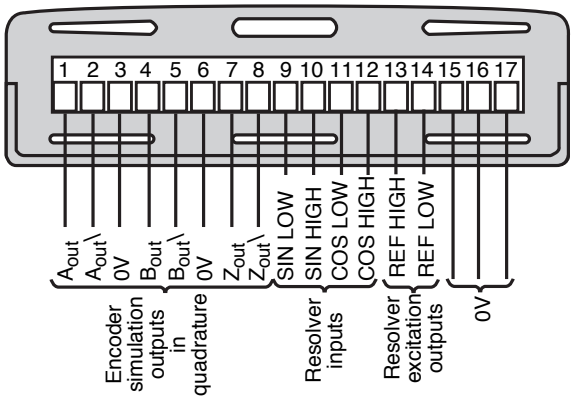
L2.11.1 - General information

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.

L2.11.2 - 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	• 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

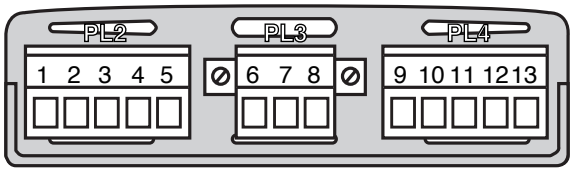
L2.12 - SM-Applications module

L2.12.1 - 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.

L2.12.2 - 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

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

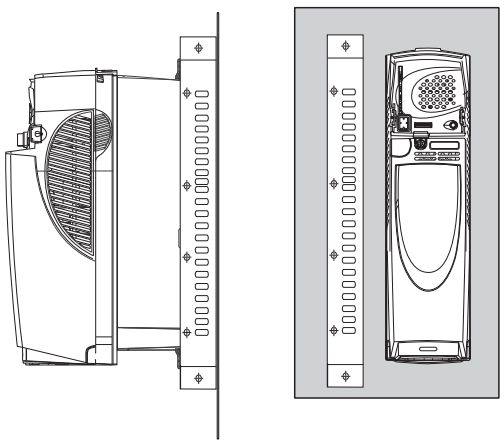
UNIDRIVE SP	Filter reference (Schaffner)	Voltage (V)	Rated current (A)		Maximum leakage current (mA)	Joule losses (W)
			40°C	50°C		
1.5TL, 2TL, 1.5T, 2T, 2.5T, 3.5T	FS6008-10-07	240/480	10	10	29.4	6.9
2.5TL, 3.5TL, 4.5T, 5.5T	FS6008-16-07	240/480	16	16	38.8	9.2
4.5TL, 5.5TL, 8TL, 8T, 11T, 16T	FS6008-32-07	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						
120TH and 150TH						

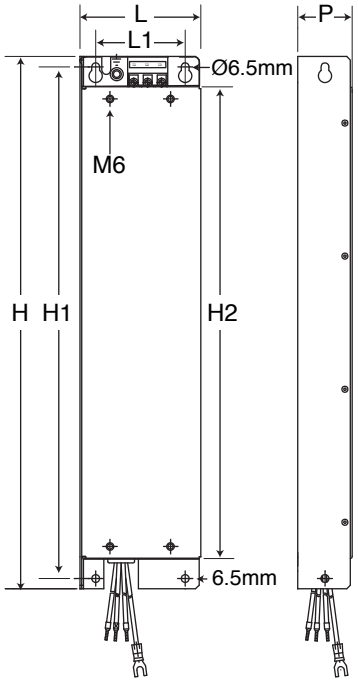
• Mechanical characteristics

- Protection : IP20.
- Installation for drives sizes 1 to 3 : the filter may be mounted backward or it may be installed on the drive side.

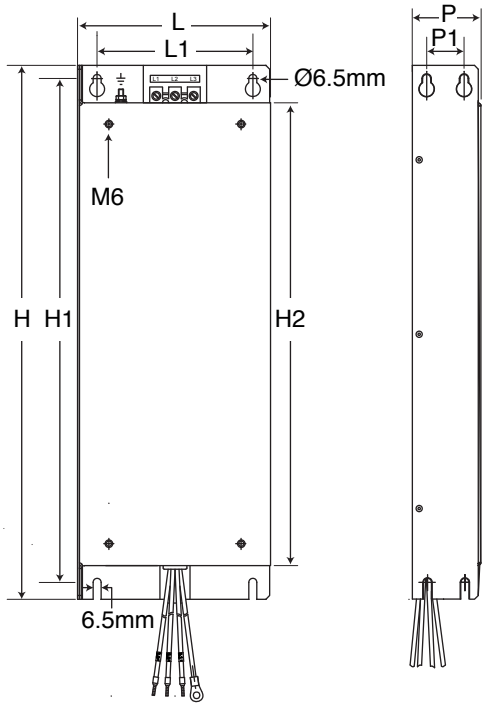


UNIDRIVE SP
Options

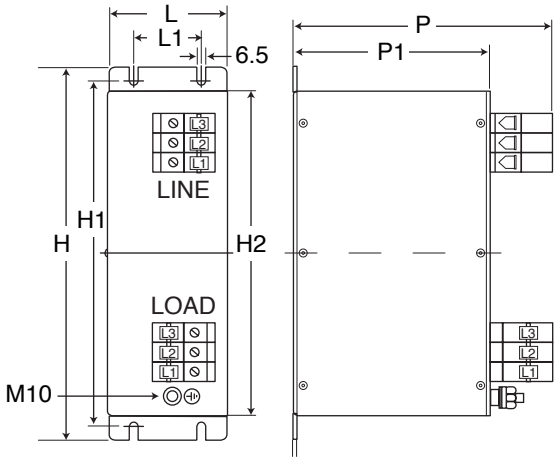
FS6008-10-07, FS6008-16-07,
B84143-A10-R207, B84143-A16-R207



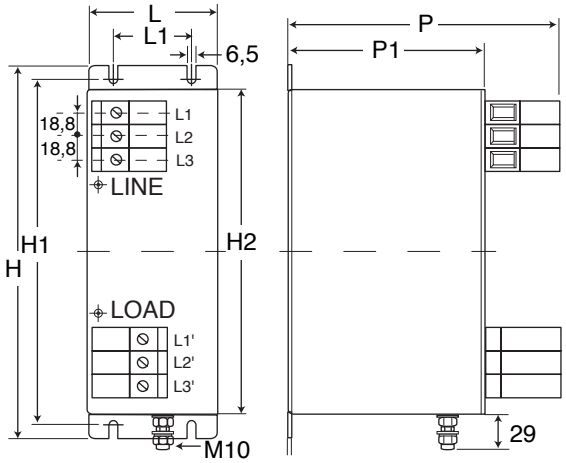
FS6008-32-07, FS6008-62-07, FS6008-75-07
B84143-A32-R207, B84143-A75-R207, B84143-A0030-R207



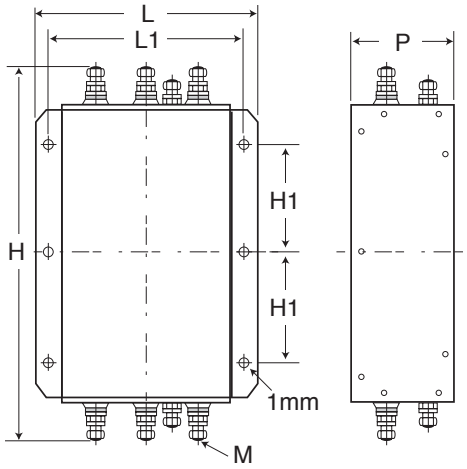
FS6008-58-53, FS6008-101-35, FS6008-164-40



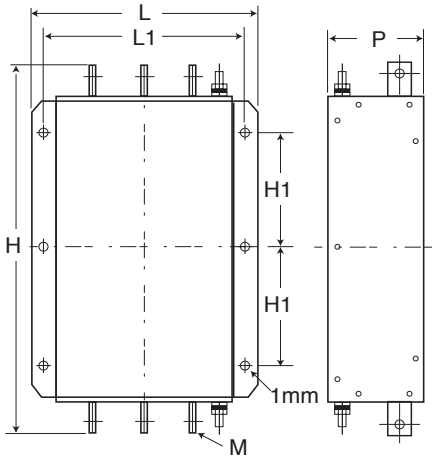
B84143-A0101-R207



FN3359HV-250-99



FN3359HV-400-99



Filter reference	Width (mm)		Height (mm)			Depth (mm)		Output cable section		Weight (kg)	Terminal ⏚		Terminals L1, L2, L3		
											Ø	Braking torque	Maximum cable section		Braking torque
	L	L1	H	H1	H2	P	P1	mm^2	AWG			(Nm)	(mm^2)	AWG	(Nm)
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	**100**	**65**	**300**	**275**	**260**	**208**	**171.5**			**3.8**					
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	**120**	**85**	**300**	**275**	**260**	**249**	**171.5**			**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).

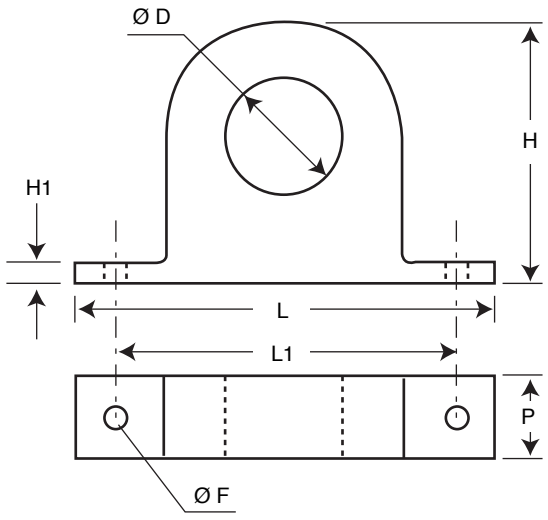
Note : Do not run the shielding through the ferrite.

L4.2 - Characteristics

• Characteristics of the ferrites delivered in standard version (drives size 2 and 3)

Sizes (mm)	Ø inside	Ø 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	ØF	ØD
RU1261 (Schaffner)	62	5	105	90	24	5	28

UNIDRIVE SP
Options

L5 - MC choke coils

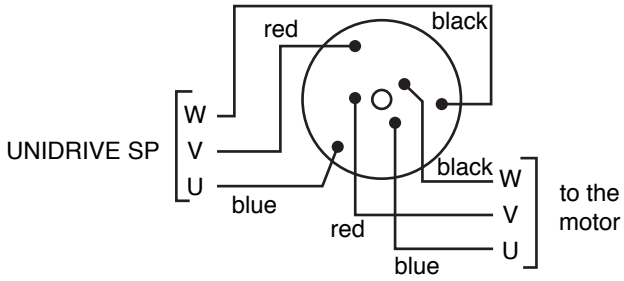
L5.1 - General information

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 contact.

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.

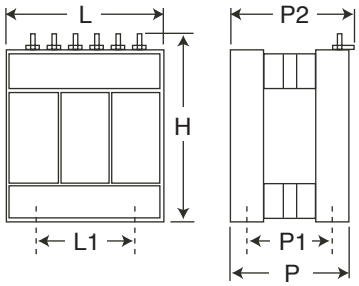
L6 - FP choke coils

L6.1 - General information

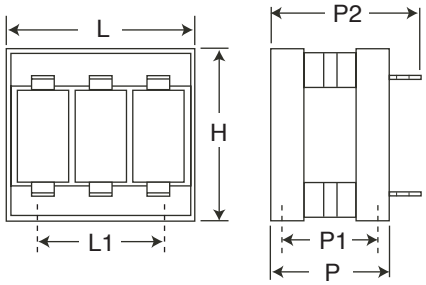
The FP loss slow choke coils filter the HF earth leakage currents, but also the differential currents (circulating currents between phases).
This choke coil is mainly used at the output of a drive that feeds several motors, reducing the differential HF leakage currents that disturb the operation of the 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 contact.
• The selections correspond to a "low overload" drive current.

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.

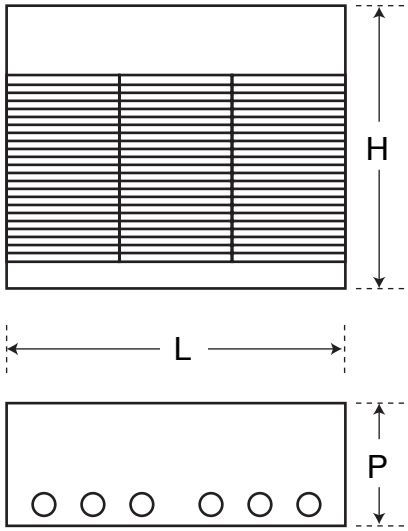
L7.2 - Electrical characteristics

Rating	Choke Coil reference	Current (A)	Inductance (mH)	Losses (W)
1.5T	5.5 ST 4.2	5.5	4.2	36
2T to 4.5T	11 ST 2.6	11	2,6	37
1.5TL and 2TL 5.5T and 8T	21 ST 1.4	21	1.4	66
2.5TL, 11T and 16T	29 ST 1	29	1	69
3.5TL to 5.5TL 22T and 27T	46 ST 0.64	46	0.64	99
8TL 33T and 40T	75 ST 0.39	75	0.39	135
11TL and 16TL 50T and 60T	105 ST 0.23	105	0.23	170
22TL and 27TL 75T	150 ST 0.155	150	0.155	190
33TL 100T	185 ST 0.13	185	0.130	200
120T	220 ST 0.11	220	0.110	230
150T	292 ST 0.08	292	0.08	280

Note : For the other ratings and mains supply of 575V (TM) and 690V (TH), consult your usual LEROY-SOMER contact.

L7.3 - Mechanical characteristics

They are give for information only and may vary depending on the supplier.



Protection : IP00IP00

Choke Coil reference	Sizes (mm)			Weight (kg)
	L	H	P	
5.5 ST 4.2	125	130	75	2.5
11 ST 2.6	125	130	75	2.5
21 ST 1.4	155	150	95	5.4
29 ST 1	155	150	95	5.4
46 ST 0.64	190	200	120	11
75 ST 0.39	210	225	160	15
105 ST 0.23	260	285	210	15
150 ST 0.155	260	285	210	15
185 ST 0.13	260	285	220	20
220 ST 0.11	260	285	225	22.5
292 ST 0.08	260	265	260	30

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 it if must retain a load, it is necessary to connect a brake resistor.

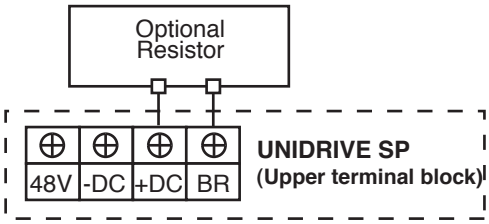
For ratings 1.5TL to 8TL and 1.5T to 16T, integrable brake resistors may be mounted into the heater slots.

• If a brake resistor is connected, it is necessary to set 0.15 to "FASt".

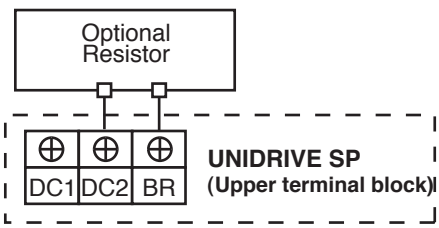
• The heater integrable resistors benefit from the drive overload protection. To validate the external resistor protection, the maximum braking length (10.30) and the minimum time between 2 braking cycles (10.31) must be set.

L8.2 - Connection

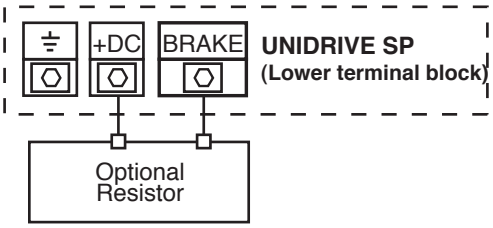
• Size 1



• 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	5
3.5TM to 22TM	18
22TH to 60TH	13
75TH and 100TH	10
120TH and 150TH	

Tolerance of the ohmic value : ± 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	
1220-2756	75	8	50	0.09	0.02	2		1.5TL to 3.5TL 1.5T to 5.5T
1220-2758	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	3.5T L	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
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/ P_{mot}	Resistor	10.30/ 10.31	Pc/ P_{mot}	Resistor	10.30/ 10.31	Pc/ P_{mot}	Resistor	10.30/ 10.31	Pc/ P_{mot}	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	Consult LEROY-SOMER			Consult LEROY-SOMER			Consult LEROY-SOMER		
120T	90000	Consult LEROY-SOMER											
150T	110000												

For any additional information, contact your usual LEROY-SOMER interlocutor.

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 switching must be provided. See section C5.4.

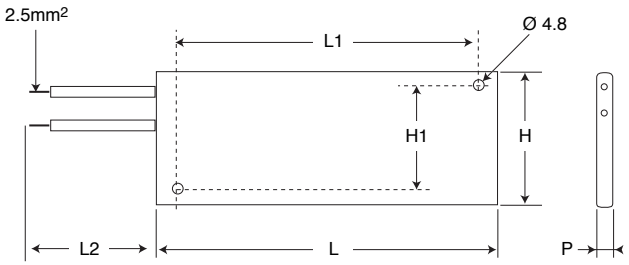
• However, if the application involves the installation of the heater inside the cabinet, the resistor losses must be added to the global losses in the cabinet listed in the table of section C4.2. In addition, provide a non-inflammable base plate.

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

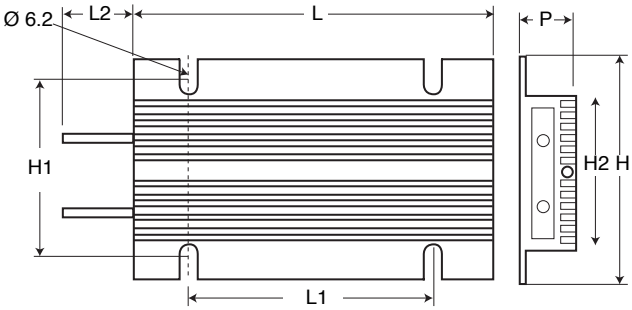
• RF - SIR 600 - 100



Weight : < 1 Kg / Protection : IP33

Type	Sizes (mm)					
	L	L1	L2	H	H1	P
RF-SIR 600-100	102	81	300	68	57	13

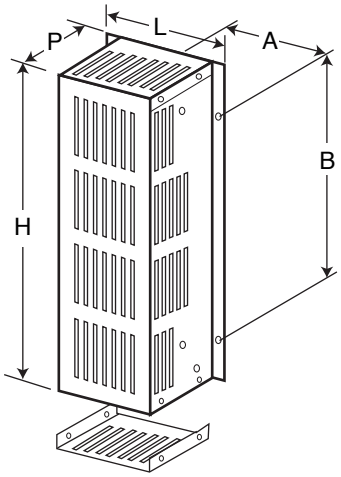
• RF-SIR-1100-100, RF-SIR-1100-50, RF-SIR-1100-25



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

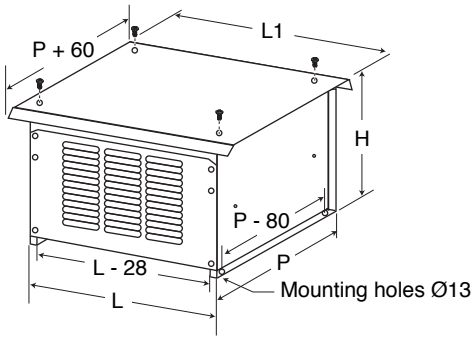
• RF-MD-2000-75, RF-MD-3000-25, RF-MD-3000-12



Protection : IP20

Type	Sizes (mm)			Mounting (mm) Ø 11		Weight
	L	P	H	A	B	(kg)
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
	L	L1	P	H	(kg)
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

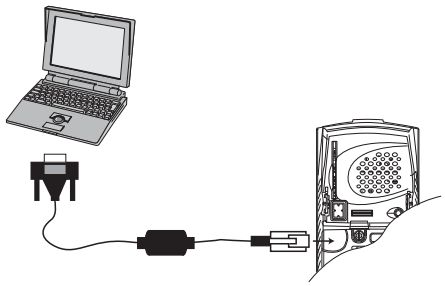
L9 - Cables

L9.1 - CT-COMMS cable (ref. 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

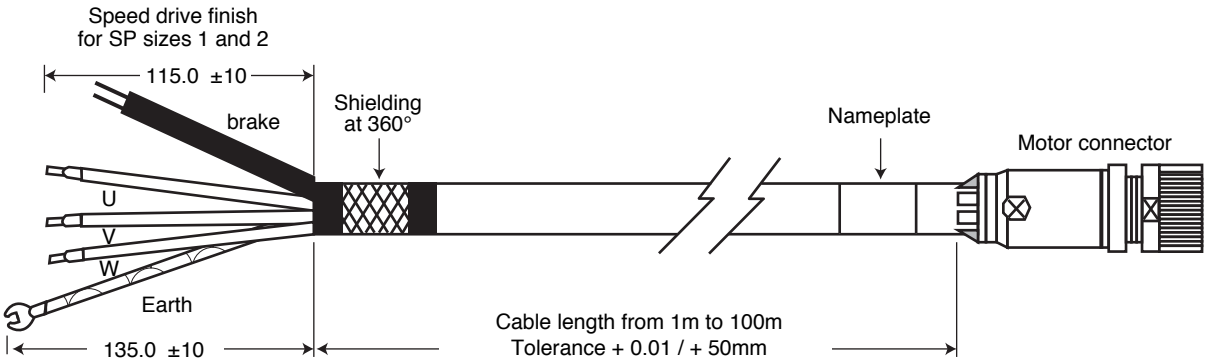
L.9.2.1 - Introduction

The cables are important components of the motor-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 **PB : with brake** **PS : without brake***	Insulator **B : PUR**	Cable section **A : 4 x 2.5 mm²** **B : 4 x 4.0 mm²** **G : 4 x 1.5 mm²**	Motor side finish **U : connector** + finish for Unidrive SP	Length **010 : 10m** 001 to100 : 1 to 100m

* Available with section of 1.5 mm² or 2.5 mm² only.

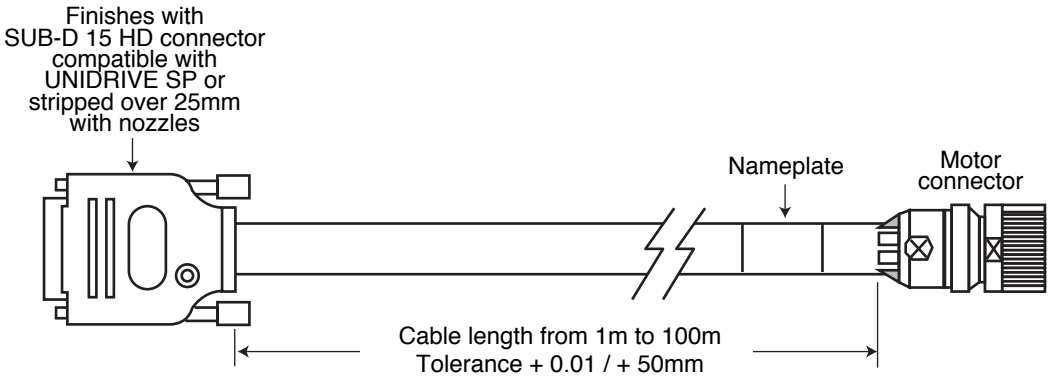
UNIDRIVE SP
Options

• **Characteristics**

Description				Isolated cable comprising 4 power conductors and 1 shielded twisted pair for the brake (option)		
Power conductors				4 x 1.5 mm²	4 x 2.5 mm²	4 x 4 mm²
Brake conductors (option)				2 x 1 mm²		
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 / s²	4 m / s²	7 m / s²
Maximum speed				120 m / mn	120 m / mn	180 m / mn
Resistance to stretch	Static			50 N / mm²		
	Dynamic			20 N / mm²		
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
			Phase-shielding	220 pf / m	220 pf / m	240 pf / m
		brake conductor	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	**SEBAAxxx**

* 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,
- Dive side finish: HD 15 connector
- Length : 10 m,

Designation : SSBBD010.

UNIDRIVE SP
Options

• Characteristics

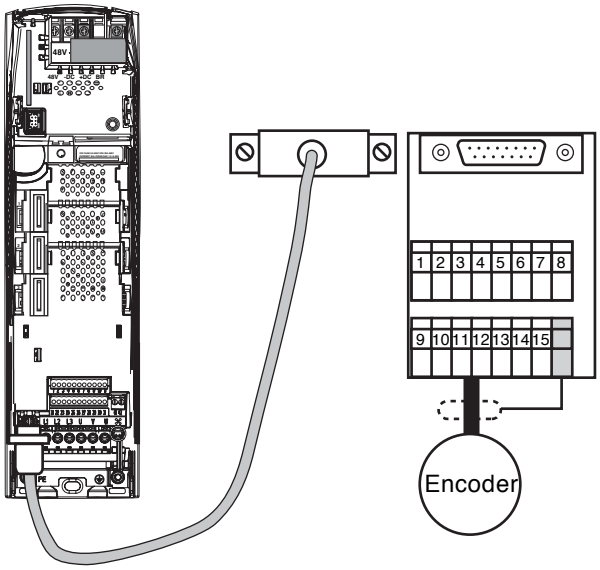
Description		Incremental encoder (asyn.) or resolver (servo) or SinCos - Hiperface link (asyn.)	Incremental encoder (servo)	SinCos - EndAt link (asyn.) or SinCos - Hiperface link (servo)
Insulator	external gain	PUR		
	conductors	TPE		
Class		6 according to VDE 0295		
Cable composition	Signal conductors	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		

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



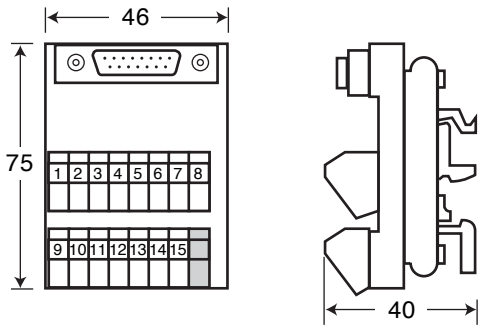
L10.3 - Characteristics

• 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 from1 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
Maintenance

Contents

M

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.

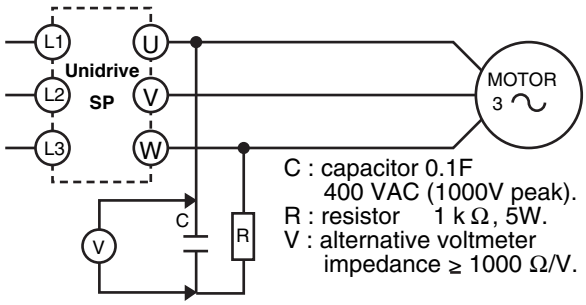
Periodical check-ups:

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

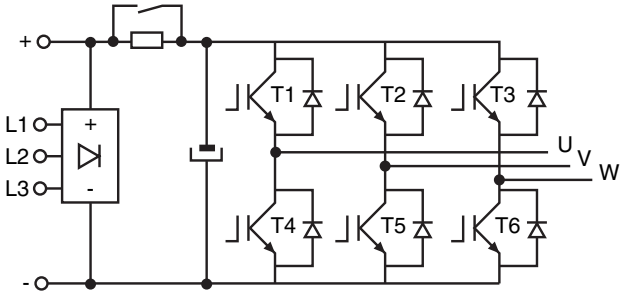
The drive input and output powers may be measured by using an electrodynamic device.

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

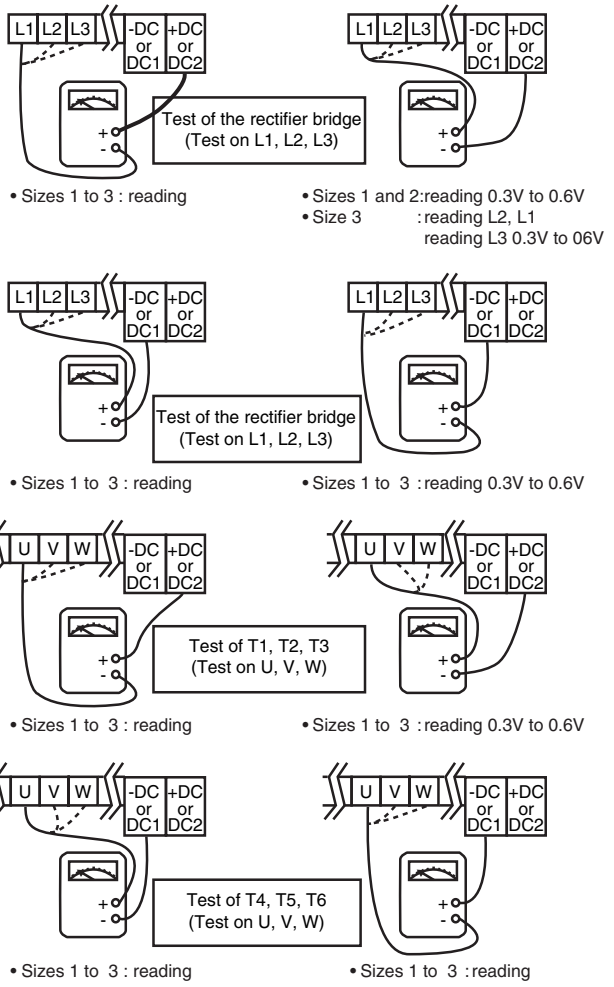
This test is quite brief. A positive response does not necessarily mean that the power stages are correct. However, a negative response generally shows that these are damaged.

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.



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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