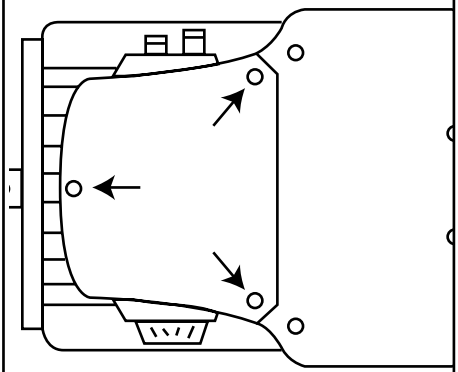
LEROY SOMER

Réf. 2534 - 4.33 / c - 2.99

This manual must be given to the end user



VARMECA

Variable speed motor or geared motor

Installation and maintenance

NOTE

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

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CAUTION

For the user's own safety, this VARMECA motor must be connected to an approved earth (B terminal).

It is imperative that the equipment is supplied via an isolating device and a circuit-breaking device (power contactor) which can be controlled by an external safety system (emergency stop, fault detector).

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

VARMECA is a component designed to be integrated in an installation or an electrical machine and can under no circumstances be considered to be a safety device. It is the responsibility of the manufacturer of the machine, the designer of the installation or the user to take all necessary precautions to ensure that the system complies with current standards and to provide devices to ensure the safety of equipment and personnel.

For safety reasons, **LEROY-SOMER prohibits the use of VARMECA for lifting applications**.

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

SAFETY AND OPERATING INSTRUCTIONS FOR ELECTRICAL ACTUATORS (In accordance with the low voltage directive 73/23/EEC modified by 93/68/EEC)

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

1 - General

Depending on their degree of protection, VARMECA motors may contain moving parts, as well as hot surfaces, during operation.

Unjustified removal of protections, incorrect use, faulty installation or inappropriate operation could represent a serious risk to personnel, animals and equipment.

For further information, consult the manual.

All work relating to transportation, installation, commissioning and maintenance must be performed by experienced qualified personnel (see IEC 364 or CENELEC HD 384, or DIN VDE 0100 and national specifications for installation and accident prevention).

In these basic safety instructions, qualified personnel means persons competent to install, mount, commission and operate the product and possessing the relevant qualifications.

2 - Use

VARMECA motors are components designed for integration in installations or electrical machines.

When integrated in a machine, commissioning must not take place until it has been verified that the machine conforms with directive 89/392/EEC (Machinery Directive).

It is also necessary to comply with standard EN 60204, which stipulates in particular that electrical actuators (which include VARMECA) cannot be regarded as circuit-breaking devices and certainly not as isolating switches.

Commissioning can take place only if the requirements of the Electromagnetic Compatibility Directive (EEC/89/336, modified by EEC 92/31) are met.

VARMECA motors meet the requirements of the Low Voltage Directive 73/23/EEC, modified by 93/68/EEC. The harmonised standards of the DIN VDE 0160 series in connection with standard VDE 0660, part 500 and EN 60146/VDE 0558 are also applicable.

The technical characteristics and instructions concerning the connection conditions specified on the nameplate and in the documentation provided must be observed without fail.

3 - Transportation, storage

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

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

4 - Installation

The installation and cooling of equipment must comply with the specifications in the manual supplied with the product.

VARMECA motors must be protected against excessive stress. In particular, there must be no damage to parts and/or modification of the clearance between components during transportation and handling. Avoid touching the electronic components and contact parts.

VARMECA motors contain parts which are sensitive to electrostatic stress and may be easily damaged if handled incorrectly. Electrical components must not be exposed to mechanical damage or destruction (risks to health!)

5 - Electrical connection

When work is performed on VARMECA motors which are powered up, national accident prevention specifications must be respected.

The electrical installation must comply with the relevant specifications (for example conductor cross-sections, protection via fused circuit-breaker, connection of protective conductor). More detailed information is given in the manual.

Instructions for an installation which meets the requirements for electromagnetic compatibility, such as screening, earthing, presence of filters and correct insertion of cables and conductors, are given in the documentation supplied with the VARMECA.

These instructions must be followed in all cases, even if the VARMECA carries the CE mark. Adherence to the limits given in the EMC legislation is the responsibility of the manufacturer of the installation or the machine.

6 - Operation

Installations incorporating VARMECA motors must be fitted with additional protection and monitoring devices as laid down in the current relevant safety regulations : law on technical equipment, accident prevention regulations, etc. Modification of VARMECA motors using control software is permitted.

Active parts of the device and live power connections must not be touched immediately after the VARMECA is powered down, as the capacitors may still be charged. In view of this, the warnings fixed to VARMECA motors must be observed.

During operation, all doors and protective devices must remain closed.

7 - Service and maintenance

Refer to the manufacturer's documentation.

CONTENTS

1 - GENERAL INFORMATION

1.1 - General operating principle

The **VARMECA** is the physical association of a 3-phase asynchronous motor and an integrated speed controller**.**
The motor allows all kind of mounting arrangements (foot or flange) and can be combined with the standard gearboxes of the LEROY-SOMER range.

In the standard version, the integrated speed controller does not require any connection other than the power supply.
The options may be used to broaden the application range of the VARMECA speed controller.
Thanks to the advanced technology of the IGBT power module, very high efficiency and reduced noise level are possible.

1.2 - Product name

VARMECA rating

Rating	Power (kW)
37	0,37
55	0,55
75	0,75
90	0,9
110	1,1
150	1,5
180	1,8
220	2,2
300	3
400	4

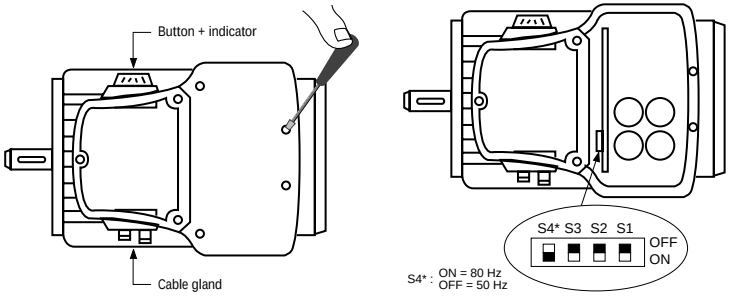
Cable gland position

Code	Position
BD	Button on left side Cable gland : right side
BG	Button on right side Cable gland on left side

Option

Code	Option
SD	Without button Cable gland : right side
SG	Without button Cable gland : left side
CMA	With integrated Run/Stop control
FLT VMA	Integrated EMC filter
RDCVS	With group option
CMA VAR	With integrated Forward/Reverse/Stop control
Brake	With electromechanical failsafe brake

VMA 150	BD	FLT VMA



1.3 - Specifications

1.3.1 - Electrical data

Power supply	3-phase supply 400V ± 10 %, 50-60Hz ± 5 %
Output voltage	From 0V to input voltage
Power range	0.37 - 0.55 - 0.75 - 0.9 - 1.1 - 1.5 - 1.8 - 2.2 - 3 - 4 kW
Maximum number of power-ups per hour	10

1.3.2 - Specifications and functions

Description	VARMECA
Overload	150 % of In for 40s 10 times per hour
Motor speed variation range ✶	From 12 to 80 Hz at constant torque ✶ mini DIP S4 = ON 6-pole motor : 240 to 1600 min^{-1} 4-pole motor : 360 to 2400 min^{-1} 2-pole motor : 720 to 4800 min^{-1}
	From 12 to 50 Hz for general applications ✶ mini DIP S4 = OFF 6-pole motor : 240 to 1000 min^{-1} 4-pole motor : 360 to 1500 min^{-1} 2-pole motor : 720 to 3000 min^{-1}
Efficiency	96 % x motor efficiency

Control	VARMECA
Speed reference 0V or 4mA = minimum speed 10V or 20mA =maximum speed	• 0 - 10V with integrated potentiometer • 0 - 10V with remote potentiometer option • 0 - 10V with external reference • 4 - 20mA with external reference (with RDCVS option) • 0 - 10V with internal potentiometer including speed limiting with a second internal potentiometer (RDCVS option)
Run/Stop	• With 3-phase power supply (10 times per hour max) • With remote volt-free contact • With integrated Run/Stop control (CMA option)
Forward/Reverse	• With internal connection in the terminal block • With remote volt-free contact • With integrated Forward/Reverse/Stop control (CMVAR option)

✶ Selection by mini DIP switch, reference S4 situated on the electronic board (access via rear terminal box cover - see opposite).

Control (continued)	VARMECA
Stop modes	• On ramp (with volt-free contact or integrated Run/Stop control • Free wheel stop (by cutting off the 3-phase power supply) • On electromechanical brake (integrated control)
Ramps	• Selection of acceleration and deceleration ramps with volt-free contact : 2s or 5s (factory setting 5s)

Indications	VARMECA
Display	Two-colour indicator lamp • Permanent green light : mains connected • Flashing green light : overload • Flashing red light : Fault, under- or overvoltage • Permanent red light : other fault
Analogue output	• Speed image 0 - 10V, 3mA • 0V = zero speed • 10V = maximum speed

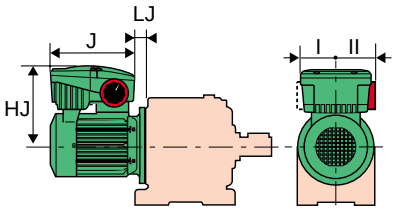
Protections	VARMECA
Power	• Undervoltage • Overvoltage • Overloads : - overheating, motor and speed controller - protection against blocked rotor • Short-circuit - motor windings - phase-earth
Control	Short-circuit on inputs or outputs 0-10V
Trip clearance	• By powering down the VARMECA

Options	VARMECA
Run/Stop control	• Integrated in the cover
Forward/Reverse/Stop control	• Integrated in the cover
Without control button	• For remote control. Indicator lamp on the VARMECA.
With EMC filter	Integrated in the cover
With grouped options	Integrated, mounted instead of the mains supply connection plate
Electromechanical brake	• Integrated, the control and power supply do not require any connection

1.4 - Environmental specifications

Specifications	Level
Protection index	IP 55
Storage temperature	-40°C to +70°C (IEC 68.2.3)
Transport temperature	-40°C to +70°C
Operating temperature	-20°C to +40°C (+50°C with derating)
Altitude	≤ 1000m without derating
Ambient humidity	Without condensation
Vibrations	IEC 68-2-34 (acceleration 0.01 g^2/Hz)
Shocks	IEC 68-2-27 (peak acceleration 50g)
Immunity	According to EN 50082-2
Conducted and radiated emissions (with integrated filter option)	According to EN 50081-2 and : EN 55011 class A

1.5 - Weight and dimensions



Weight : 4.2 kg in addition to motor weight.

Type	HJ	J	I	II	LJ		
					B3 / B14	B5	B5 with gearbox
LS 71	195	225	82,5	92,5	8	8	34
LS 80	205	225	82,5	92,5	12	12	39
LS 90	215	225	82,5	92,5	12	32	32
LS 100	220	225	82,5	92,5	12	12	33
LS112 M	220	225	82,5	92,5	-	-	-
LS 112 MG	229	225	82,5	92,5	22	12	16,5

2 - INSTALLATION

• It is the responsibility of the owner or user to ensure that the installation, operation and maintenance of the inverter and its options comply with legislation relating to the safety of personnel, animals and equipment, and with the current regulations of the country of use.

• Do not carry out any work before having disconnected and locked the speed controller power supply ; furthermore, it is necessary to wait 2 minutes to make sure that the capacitors have discharged.

• After connection, ensure that the seals are firmly in place, and that the screws and cable glands are watertight to ensure IP55 protection. Clear any condensation from the drain holes.

2.1 - General

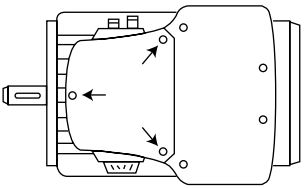
The **VARMECA** is fitted to the machine like a standard motor, with flange or foot mounting.

The motor ventilation cools the whole assembly. Make sure that the ventilation air inlet is free of obstruction.

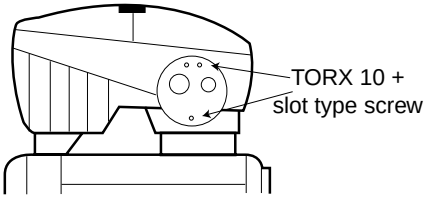
The position of the potentiometer and cable gland supports is specified at the time of ordering, however they may be reversed if necessary.

2.2 - Reversing the supports

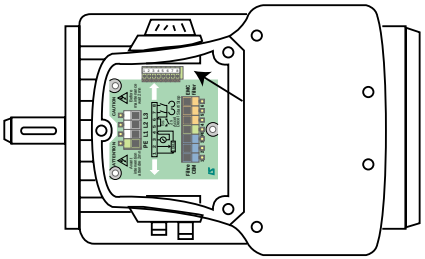
1) Undo the 3 TORX 20 + slot type screws and remove the cover.



2) Remove the control button and cable gland support fastening screws (TORX 10 + slot type screws).

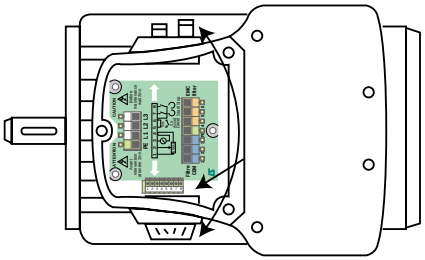


3) Disconnect the printed circuit layer holding the control button potentiometer.



4) Reverse the control button and cable gland supports.

5) Reconnect the printed circuit layer holding the control button potentiometer and replace the fastening screws.



6) Replace the cover.

CAUTION :

This operation should only be performed in exceptional circumstances and must be carried out by experienced and qualified personnel.

3 - CONNECTIONS

• The voltages existing on the power supply terminal blocks and the connected cables may cause fatal electric shocks. The stop function of the controller does not protect against these high voltages.

• The controller contains capacitors which remain charged at a fatal voltage level even after the power supply has been cut off.

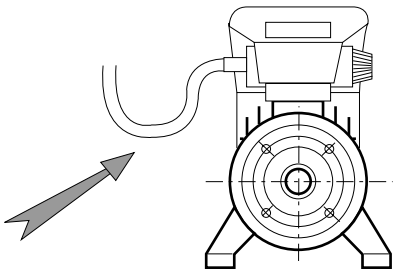
• After the controller power supply has been cut off, wait for 2 minutes (so the internal circuits can discharge the capacitors) before removing the protective covers.

• The speed controller power supply must be protected against overloads and short-circuits.

It is vital to respect the rating of protections.

3.1 - Wiring precautions

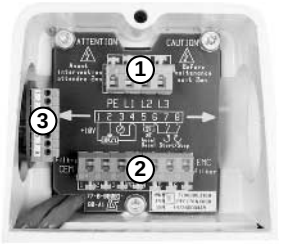
- When the VARMECA is controlled remotely, avoid parallel routing of power cables and control cables.
- All remote control cables should be shielded and have a cross-section between 0.22 mm^2 and 1 mm^2.
- Incorporate a bend where the cables enter the cable glands so that water cannot penetrate the terminal box.
- Tighten the cable glands firmly.



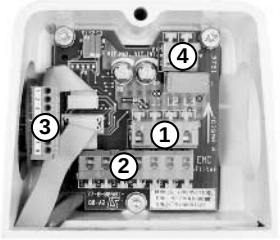
3.2 - Terminal blocks

3.2.1 - Layout

• Standard



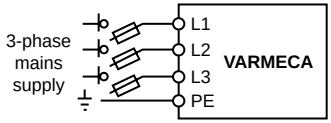
• With RDCVS option



3.2.2 - Mains terminal block ①

Ref.	Function
L1 L2 L3	Connection of the 3 mains protected phases, defined in section 1.3.1
PE	Compulsory connection to earth

Note : To open blade terminals, use a flat screwdriver with a maximum width of 4 mm.



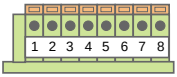
3.2.3 - EMC filter option terminal block ②

Ref.	Function
1 2 3	Filter output Connection of blue wires
PE	Compulsory connection of filter earth
4 5 6	Filter input Connection of orange wires

CAUTION :
Standard VARMECA motors are supplied with blade terminals 1 and 4, 2 and 5, 3 and 6 connected together : **to fit the filter it is necessary to undo these connections**.

3.2.4 - Control terminal block ③

This is located on the side printed circuit and is used for remote control.
To open blade terminals use a flat screw-driver with a maximum width of 2.5 mm.



Terminals	Specifications
1	Source +10V, 3mA of the 10kΩ potentiometer
2	Reference input 0 to +10V (4-20mA with RDCVS option)
3	Analogue speed output 0 to +10V, 3mA 0V = zero speed 10V = max speed 80 Hz
4	0V common with terminal 6
5	Ramp selection logic input 5s : terminals 5 & 6 connected 2s : terminals 5 & 6 not connected
6	0V common with terminal 4
7	Reverse/Stop control logic input
8	Forward/Stop control logic input

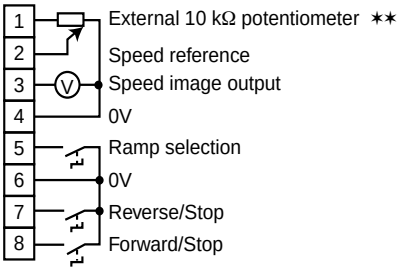
On leaving the factory, terminals 5 and 6 are connected together (ramp 5s) as well as terminals 6 and 8 (forward).

3.2.5 - Fault relay terminal block ④

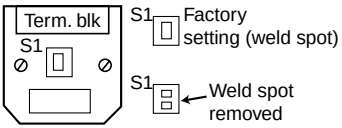
Ref.	Function
P1, P2	Volt-free contact 250V 1A

3.2.6 - Connection

⚠ All connections and work must be carried out with the power switched off.



✶✶ Connection of a 10kΩ potentiometer for remote control should be carried out with the "without control button" option. Nevertheless, if you have the standard "with control button" version, it is necessary to remove connection S1 (located on the side printed circuit which holds the terminal block) with a soldering iron, to avoid parallel connection of both potentiometers.



3.3 - Electrical and electromagnetic phenomena

The **VARMECA** conforms to electromagnetic compatibility directive 89/336/EEC, modified by 92/31/EEC, provided it is fitted with the EMC filter option.

3.4 - Description of cables and protections

- **When using a circuit-breaker, it must be a motor circuit-breaker.**
- **Comply with size of protection fuses.**
- **Cable size may vary according to current national standards, which take precedence over the values given in the table below without exception.**
- **These tables should never be used instead of current standards.**

VARMECA rating	Power (kW)	3-phase mains 400V ± 10 %		
		Current (A)	gl fuses (A)	Cables (mm^2)
37	0,37	1,7	3	1,5
55	0,55	2,2	3	1,5
75	0,75	3	4	1,5
90	0,9	3,5	6	1,5
110	1,1	4,1	6	1,5
150	1,5	5,3	6	1,5
180	1,8	6,2	8	2,5
220	2,2	7,7	10	2,5
300	3	8,9	16	2,5
400	4	10	16	2,5

Note : The value of the mains current is a typical value which depends on the source impedance. The higher the impedance, the lower the current.

4 - COMMISSIONING

• Before the VARMECA motor is powered up, check that all electrical connections are correct and that any moving parts are mechanically protected.

• For safety of personnel, the VARMECA motor must not be powered up with the protective covers removed.

4.1 - Standard VARMECA

4.1.1 - Starting on power-up

- Power-up : the green indicator lamp is lit continuously. As control terminals 6 and 8 are connected, the motor starts running forward.
- Set the speed reference with the side control button.

The number of power-ups is limited to 10 per hour.

4.1.2 - Starting with remote control

- Power-up : the green indicator lamp is lit continuously.
- Activate the run command corresponding to the desired direction, the motor starts.
- Set the speed reference with the side control button.

4.2 - VARMECA with remote control option

- Power-up : the green indicator lamp is lit continuously.
- Select the desired ramp.
- Set the reference with the 10 kΩ remote potentiometer.
- Select the desired direction of rotation, the motor starts running.

5 - FAULTS - DIAGNOSTICS

Information relating to the VARMECA status is provided by a two-colour indicator lamp located on the control button support.

Colour and state of indicator lamp	Trip cause	Checks to be performed
Permanent green	No fault Mains present	-
Flashing green	• Overload	• Check that the motor is not overloaded or jammed
Permanent red	• Short-circuit of a motor winding • Locked rotor • Faulty insulation of winding • Overheating I^2t • Internal fault	• Check no incident has occurred • Power down the controller, then power up again • Check that the deceleration ramp is long enough (5s) for applications with high inertia • If the fault remains, consult LEROY-SOMER
Flashing red	• Undervoltage • Overvoltage	• Check mains voltage • Check that the deceleration ramp is long enough (5s) for applications with high inertia • Switch off and then on again

Trips can be cleared by powering down.

6 - MAINTENANCE

• All work related to installation, commissioning and maintenance must be carried out by experienced and qualified personnel.

• Do not carry out any work before the VARMECA power supply has been cut off and locked, and wait 2 minutes until the capacitors have discharged.

6.1 - Servicing

No specific maintenance is required for **VARMECA** motors, apart from the regular removal of dust from the ventilation louvres and the cooling fins situated at the bottom of the box.

Do not dismantle the VARMECA while it is still under guarantee, as this would then immediately become null and void.

CAUTION :

The rear cover protects the electronic boards and should only be removed for adjustment using the mini DIP switch marked S4 ✶.

Certain components which are sensitive to electrostatic discharges can be destroyed simply by touching them.

Do not leave any metal object in the connection area, as this might cause a short-circuit.

✶ For ratings 300 and 400, S4 can be accessed without removing the rear cover, via the connection space, through a special opening in the rear cover, which is protected by a plastic plug.

6.2 - Measurements

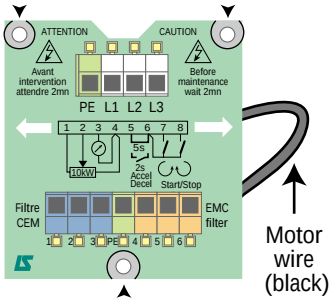
6.2.1 - General

The input voltages can be measured with ordinary instruments.

Motor current is not measured on the VARMECA power supply (L1, L2, L3). It is measured with an ordinary clamp ammeter on the longest wire, which forms a loop on the side of the connection circuit.

6.2.2 - Procedure for measuring the motor current (if the motor wire loop is accessible)

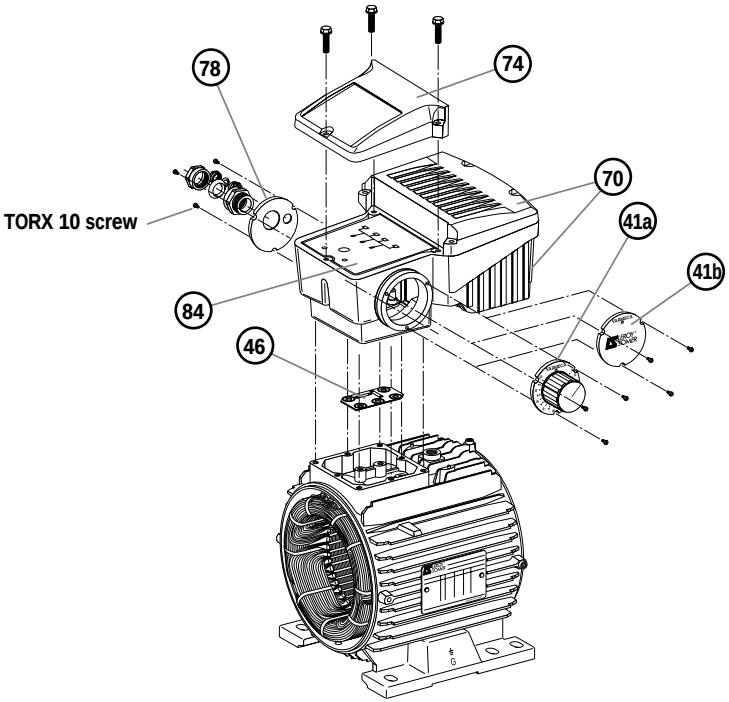
- Open the VARMECA power supply circuit and lock it.
- Wait 2 min for the capacitors to discharge.
- Open the cover of the VARMECA.
- Remove the mains cable (L1, L2, L3).
- Remove the 3 TORX 20 + slot type screws from the connection circuit.
- Pass the longest motor wire along the side of the connection circuit.
- Replace the connection circuit and fasten it.
- Reconnect the mains (L1, L2, L3).
- Pass the clamp ammeter through the motor wire loop.



6.3 - Spare parts

Description		Part code	Ref.
Control button + indicator lamp kit (BD or BG)		VMA999KB001	41a
Kit without control button (SD or SG)		VMA999KB002	41b
Cable gland kit (standard)		VMA999KE001	78
Cable gland kit (3 PE brake)		VMA999KE002	78
DE cover + EMC filter kit (FLT VMA) + Run/Stop control (CMA)		VMA999KC001	74
DE cover and EMC filter kit (FLT VMA)		VMA999KC002	74
DE cover + Run/Stop control kit (CMA)		VMA999KC003	74
DE cover only		VMA999KC004	74
DE cover + EMC filter kit (FLT VMA) + FWD/REV control (CMAVAR)		VMA999KC005	74
DE cover kit + FWD/REV control (CMAVAR)		VMA999KC006	74
Brake supply kit		VMA999KA001	46
Standard interconnection printed circuit		PEF770NC000	84
Interconnection printed circuit with RCDVS options		PEF770NH000	84
Standard speed controller kit with NDE cover	0.37 / 0.5 / 0.75 / 0.9 /1.1 kW	VMA080CB001	70
	1.5 / 1.8 / 2.2 kW	VMA090CB001	70
	3 / 4 kW	VMA100CB001	70
Speed controller kit with RDCVS option and NDE cover	0.37 / 0.55 / 0.75 / 0.9 / 1.1 kW	VMA080CB002	70
	1.5 / 1.8 / 2.2 kW	VMA090CB002	70
	3 / 4 kW	VMA100CB002	70

When ordering spare parts, specify the serial number and type of the motor and gearbox on which the VARMECA is installed.


78
74
TORX 10 screw
70
41a
41b
84
46

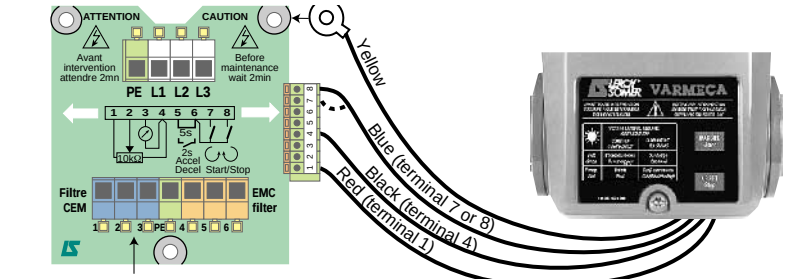
7 - OPERATING EXTENSIONS

7.1 - Option without control button (SD or SG)

The potentiometer is no longer located on the VARMECA (the indicator lamp remains), but near the operator.
Ramp selection and selection of running direction can also be positioned close to the operator.

7.2 - Integrated run-stop control option (CMA)

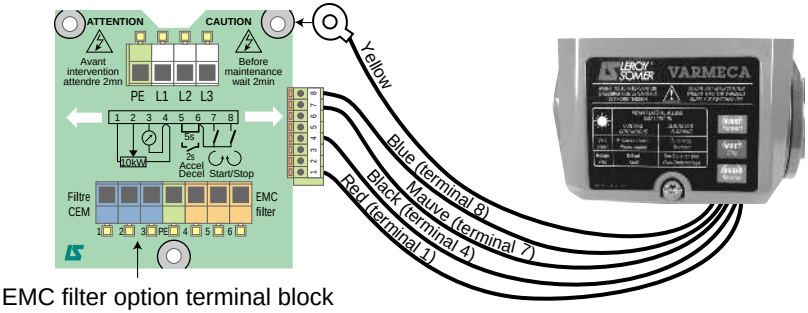
With a Run key and a Stop key located on the cover, it is possible to control the VARMECA locally, as desired, once powered up.



EMC filter option terminal block

7.3 - Forward/Reverse/Stop control option (CMAVAR)

As with the CMA option, the keys are located on the cover. They are used to control the motor locally in both directions of rotation.
For an instruction to be taken into account, the relevant key must be held down for 1 second.



EMC filter option terminal block

7.4 - Grouped options (RDCVS)

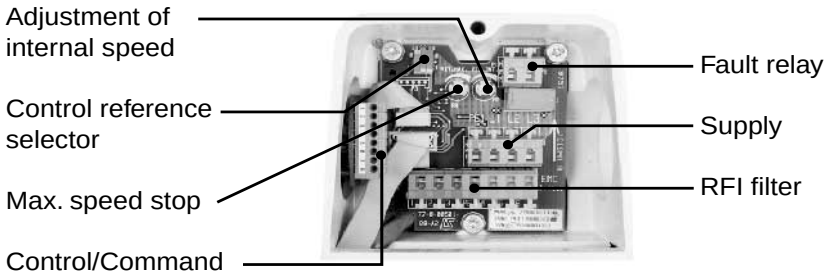
The RDCVS printed circuit is fitted instead of the standard connection circuit and offers the additional functions described below.

7.4.1 - Speed controller fault

Volt-free contact (1A/250V) on terminal block no. 4 (terminals P1 - P2). Contact open when there is a fault on the electrical part or when the speed controller is switched off.

7.4.2 - Adjustment of the internal speed (VIT INT) and the maximum speed (VIT MAX) via potentiometers.

The "VIT MAX" potentiometer is used to reduce the maximum speed for a maximum reference, independently of the setting of S4. The "VIT INT" potentiometer is used to adjust an operating speed : it replaces the adjustment of the external potentiometer. Access to these settings depends on the position of the selector switches (S1, S2, S3).



7.4.3 - Selector switches for the speed reference

The selection is made according to the table below :

Reference selected	Position of switches		
	S1	S2	S3
"Local" control button or external potentiometer	0	1	1
"VIT INT" potentio-meter	0	0	1
0 - 10 V external reference	1	0	1
4 - 20mA external reference	1	0	0

Factory setting.

7.5 - EMC filter option (FLT VMA)

The filter is located in the VARMECA cover and is connected instead of connections 1-4, 2-5, 3-6, paying attention to the colour of the wires.

It is essential to connect the filter PE terminal.

7.6 - Electromechanical brake option

The motor should be equipped with an **FCR brake adapted** for the VARMECA.

The brake has an integral power supply. The brake is energised as soon as the run instruction has been validated. It is released after a stop instruction, at the end of deceleration or on disconnection of the power supply.

The rectifier circuit is mounted on the motor terminal plate.