

Additional Installation, Operation and
Maintenance Instructions



Smart Pump Range

e-LNEEE, e-LNESE, e-LNTEE, e-LNTSE



See also:

- Quick Startup Guide
- e-LNEE, e-LNES, e-LNTE, e-LNTS
Installation and Operation Manual

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1 Introduction and Safety

1.1 Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



CAUTION:

Also refer to the “Quick Startup Guide” and the “Installation, Operation and Maintenance Manual” of e-LNEE, e-LNES, e-LNTE and e-LNTS pumps supplied with the product.

Before installing and using the product, make sure that you read and fully understand this manual in all its parts. Improper use of the product can cause personal injuries and damage to property, as well as making the warranty null and void.

NOTICE:

This manual is an integral part of the product. It must always be made available to the user, stored in the proximity of the product, and well kept.

1.2 Safety

1.2.1 Danger levels and safety symbols

Before using the product, and in order to avoid the following risks, make sure that you carefully read, understand and comply with the following danger warnings:

- Injuries and health hazards
- Damage to the product
- Product malfunction.

Danger levels

Danger level	Indication
DANGER:	It identifies a dangerous situation which, if not avoided, causes serious injury, or even death.
WARNING:	It identifies a dangerous situation which, if not avoided, may cause serious injury, or even death.
CAUTION:	It identifies a dangerous situation which, if not avoided, may cause small or medium level injuries.
NOTICE:	It identifies a situation which, if not avoided, may cause damage to property but not to people.

Special symbols

Some hazard categories have specific symbols, as shown in the following table:

Symbol	Description
	Electrical hazard
	Magnetic hazard
	Hot surface hazard
	Ionizing radiation hazard
	Potentially explosive atmosphere hazard (ATEX EU Directive)
	Cut and abrasion hazard
	Crushing hazard (limbs)

Other symbols

Symbol	Description
	User Specific information for the users of the product.
	Installer / Maintenance technician Specific information for personnel responsible for the installation of the product within the system (hydraulic and/or electric system), and for maintenance operations.

1.2.2 User safety

Strictly comply with current health and safety regulations.



WARNING:

This product must be used only by qualified users.

For the purposes of this manual, in addition to the provisions of any local regulations, qualified personnel means any individuals who, due to their experience or training, are capable of recognising any existing hazards and to avoiding dangers during the installation, the use and the maintenance of the product.

Inexperienced users**WARNING:****FOR THE EUROPEAN UNION**

- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance.
- Cleaning and user maintenance shall not be made by children without supervision.

FOR OTHER COUNTRIES

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.

1.2.3 General safety rules**WARNING:**

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

**DANGER: Electrical hazard**

- Avoid all electric dangers; pay attention to the risk of electric shock or electric arcs
- Unintended rotation of motors creates voltage and can charge the unit, resulting in death, serious injury, or equipment damage. Ensure that motors are blocked to prevent unintended rotation.

Magnetic fields

The removal or installation of the rotor in the motor casing generates a strong magnetic field.

**DANGER: Magnetic hazard**

The magnetic field may be dangerous for anyone wearing pacemakers, or any other medical devices sensitive to magnetic fields.

NOTE

The magnetic field may attract metal debris on the rotor surface, causing damage to the same.

Electrical connections**DANGER: Electrical hazard**

The connection to the electric power supply must be completed by an electrician possessing the technical-professional requirements outlined in the current regulations

Precautions before work**WARNING:**

- Install a suitable barrier around the working area, for example a guard rail
- Make sure that all safety guards are in place and secure.
- Make sure that you have a clear path of retreat.
- Make sure that the product cannot roll or fall over and injure people or damage property.
- Make sure that the lifting equipment is in good condition.
- Use a lifting harness, a safety line, and a breathing device as required.
- Allow all pump system components to cool before handling them

- Make sure that the product has been thoroughly cleaned
- Disconnect and lock out power before you service the pump.
- Check the explosion risk before you weld or use electric hand tools.

Precautions during work



WARNING:

- Never work alone.
- Always wear personal protective equipment
- Always use suitable working tools
- Always lift the product by its lifting device.
- Stay clear of suspended loads.
- Pay attention to the risk of sudden start in case of product connected to the lack of water control external contact (minimum pressure pressure switch, level sensor, etc.)
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized.
- Make sure that the unit is disconnected from the system and that all the pressure has been released before disassembling the pump. Empty the unit using the drain plug and then disconnect it from the piping system.
- Never operate the pump without a properly installed coupling guard.

In case of contact with chemical substances or dangerous liquids

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> 1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 min. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> 1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 min. 3. Seek medical attention, if necessary.

1.2.4 Protection of the environment

Disposal of packaging and product

Comply with the current regulations on sorted waste disposal.

1.2.5 Sites exposed to ionizing radiations



WARNING: Ionizing radiation hazard

If the product has been exposed to ionizing radiations, implement the necessary safety measures for the protection of people. If the product needs to be despatched, inform the carrier and the recipient accordingly, so that appropriate safety measures can be put in place.

1.3 Spare parts

Identify the spare parts with the product codes directly on the site www.lowara.com/spark. Contact Xylem or the Authorised Distributor for technical information.

1.4 Product warranty

For information on the warranty refer to the documentation of the sale contract.

2 Handling and Storage

Packaging inspection

1. Check that quantity, descriptions and product codes match the order.
 2. Check the packaging for any damage or missing components.
 3. In case of immediately detectable damage or missing parts:
 - Accept the goods with reserve, indicating any findings on the transport document, or
 - Reject the goods, indicating the reason on the transport document.
- In both cases, promptly contact Xylem or the Authorised Distributor from whom the product was purchased.

Unpacking and inspection of the unit

1. Remove the packaging material from the product.
2. Release the product by removing the screws and/or cutting the straps, if fitted.

CAUTION: Cut and abrasion hazard

Always wear personal protective equipment.



3. Check the product for integrity and to make sure that there are no missing components.
4. In case of damage or missing components, promptly contact Xylem or the Authorised Distributor.

2.1 Unit handling

The unit must be harnessed and lifted as shown in Figure 1.

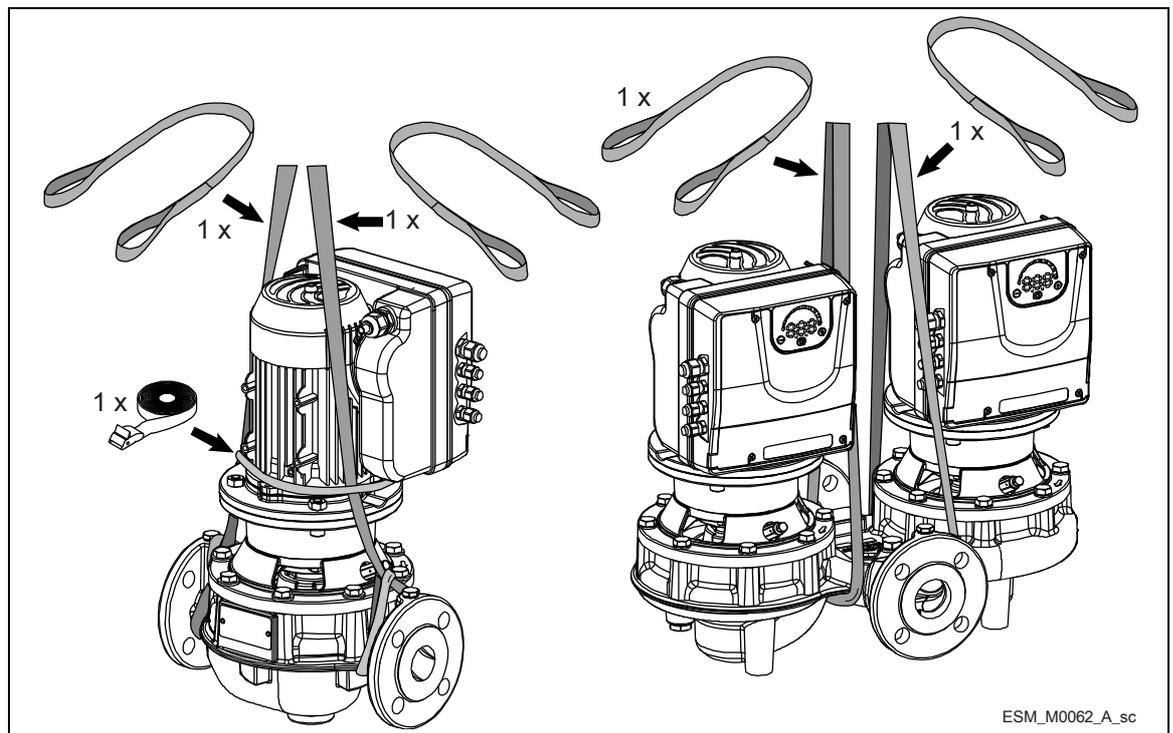


Figure 1: Lifting



WARNING: Crushing hazard (limbs)

- The product and its components may be heavy: risk of crushing
 - Always wear personal protective equipment
 - Manual handling of the product and its components must be in compliance with the current regulations on "manual load handling", to avoid unfavourable ergonomic conditions causing risks of back-spine injury.
 - Use cranes, ropes, lifting straps, hooks and clasps that comply with current regulations and that are suitable for the specific use
 - Make sure that the harnessing does not damage the unit
 - During the lifting operations, always avoid sudden movements that could compromise the stability of the load
 - During handling, make sure to avoid injury to people and animals, and/or damage to property.
-

2.2 Storage

The product must be stored:

- In a covered and dry place
 - Away from heat sources
 - Protected from dirt
 - Protected from vibrations
 - At an ambient temperature between -25°C and +65°C (-13°F and 149°F), and relative humidity between 5% and 95%.
-



NOTICE:

- Do not place heavy loads on top of the product
 - Protect the product from collisions.
-

3 Technical Description

3.1 Designation

Single stage in-line pump unit with permanent magnet and inverter motor. The pump unit can either be a twin-pump version (2 motors) or a single pump version, with single-phase or three-phase power supply.

The standard configuration requires the operation of the unit without sensor (sensorless). The version with sensors is available on request.

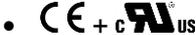
3.2 Data plates

The data plate is a label showing:

- The main product details
- The identification code

Approval and certifications

For the approvals see the motor data plate:

-  only
- 

3.2.1 Motor

Motor data plate

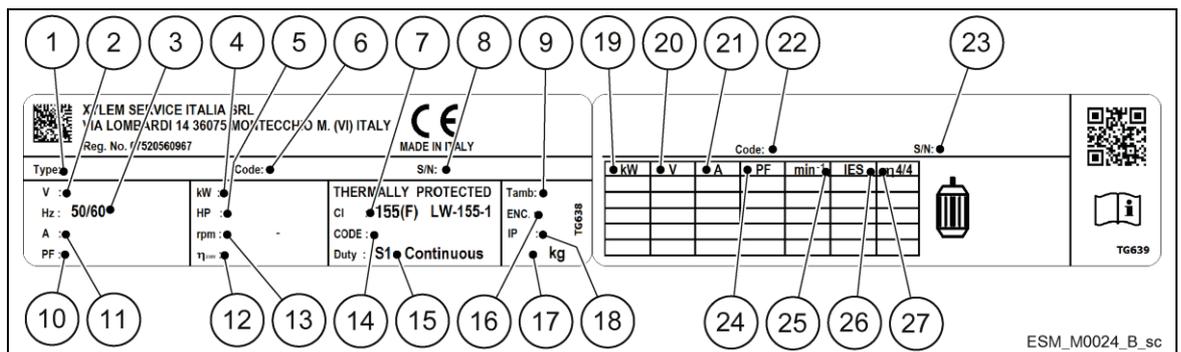


Figure 2: Motor data plate

- | | |
|----------------------------------|---|
| 1. Type definition code | 15. Duty type |
| 2. Rated voltage | 16. Enclosure type (NEMA) |
| 3. Rated frequency | 17. Weight |
| 4. Rated power [kW] | 18. Protection degree |
| 5. Rated power [HP] | 19. Shaft power |
| 6. Part number | 20. Voltage |
| 7. Insulation class | 21. Current |
| 8. Serial number | 22. Part number |
| 9. Maximum ambient temperature | 23. Serial number |
| 10. Power factor | 24. Power factor |
| 11. Rated current | 25. Speed |
| 12. Motor drive efficiency | 26. Power drive system efficiency class (according to EN 50598-2) |
| 13. Full power speed range | 27. Full load efficiency |
| 14. Code letter for locked rotor | |

Motor type definition code

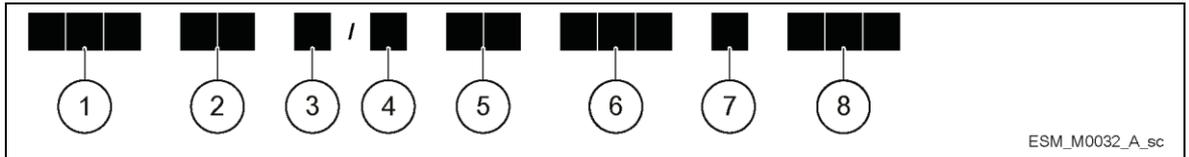


Figure 3: Motor type definition code

- | | |
|----------------------------|---|
| 1. Series | ESM |
| 2. Motor frame dimension | 90R: Oversized Flange
80: Standard Flange |
| 3. Shaft extension | □□: Standard shaft extension
S8: Custom Shaft extension |
| 4. Power supply | 1: single phase power supply
3: three phase power supply |
| 5. Shaft power•10 [kW] | 03: 0.37kW (0.50HP)
05: 0.55 kW (0.75 HP)
07: 0.75 kW (1.00 HP)
11: 1.10 kW (1.50 HP)
15: 1.50 kW (2.00 HP)
22: 2.20 kW (3.00 HP) |
| 6. Motor frame arrangement | SVE: Flange with tapped holes and shaft w/o keyseat
B14: Flange with tapped holes
B5: Flange with free holes
HMHA: Suitable for 1÷5 e-HME monolithic pumps
HMHB: Suitable for 1÷5 e-HME w/sleeve pumps
HMVB: Suitable for 1÷5 VM pumps
HMHC: Suitable for 10÷22 e-HME pumps
HMVC: Suitable for 10÷22 VM pumps
LNEE: Suitable for In-Line pumps
56J: Compliant to NEMA 56 Jet standard
56C: Compliant to NEMA 56C standard |
| 7. Reference market | □□: Standard
EU: EMEA
US: North America |
| 8. Voltage | 208-240: 208-240VAC 50/60Hz
380-460: 380-460VAC 50/60Hz
230/400: 208-240/380-460VAC 50/60Hz |

3.2.2 Pump

e-LNEEE/e-LNESE/e-LNTEE/e-LNTSE data plate

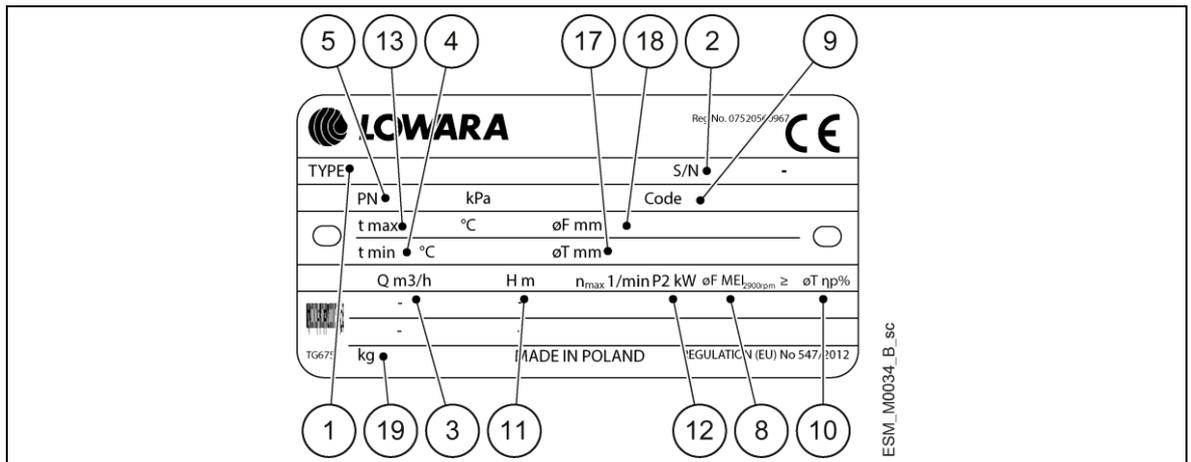


Figure 4: e-LNEEE/e-LNESE/e-LNTEE/e-LNTSE data plate

- | | |
|--|---|
| 1. Pump unit set type | 10. Hydraulic efficiency in best efficiency point |
| 2. Serial number (date+progressive number) | 11. Head range |
| 3. Flow rate range | 12. Pump rated power |
| 4. Minimum temperature of the handled liquid | 13. Maximum temperature of the handled liquid |
| 5. Maximum operating pressure | 17. Trimmed impeller diameter (only included for trimmed impellers) |
| 8. Minimum efficiency index at 2900 rpm | 18. Rated impeller diameter |
| 9. Pump unit set code | 19. Pump mass |

e-LNEEE/e-LNESE/e-LNTEE/e-LNTSE identification code

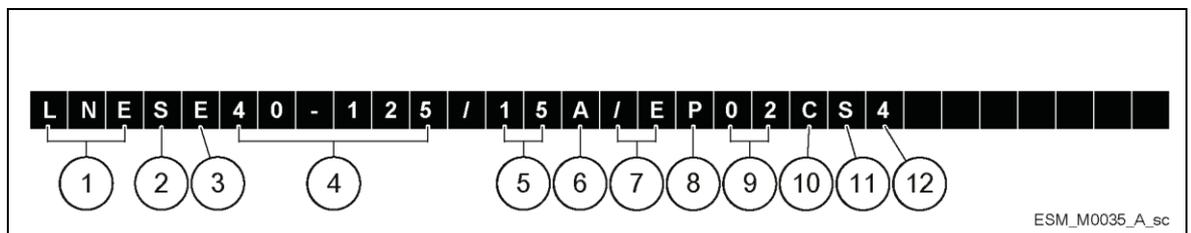


Figure 5: e-HME type definition code

- | | |
|---------------------------------|--|
| 1. Pump type | [LNE] = in line, single
[LNT] = in line, twin |
| 2. Coupling | [E]= Extended shaft
[S] = Rigid shaft |
| 3. Motor operation | [E] = e-SM |
| 4. Pump size | Discharge piping diameter - impeller rated diameter |
| 5. Motor rated power | kW x 10 |
| 6. Special trimmed impeller | [A or B] = Shortened average diameter that does not optimise the power of the motor
[X] = Shortened average diameter to meet the needs of customers |
| 7. Type of motor | [/E] = e-SM |
| 8. Number of poles | [P] = e-SM |
| 9. Electric voltage + frequency | [02] = 1x208-240 V
[04] = 3x380-460 V
[05] = 3x208-240/380-460 V |
| 10. Pump body material | [C] = Cast iron |
| 11. Impeller material | [C] = Cast iron
[S] = Stainless steel
[B] = Bronze
[N] = Cast stainless steel (1.4408)
[R] = Duplex (1.4517) |

12. Mechanical seal + O-ring configuration
- [4] = SiC/Carbon/EPDM
 - [2] = SiC/Carbon/FKM
 - [Z] = SiC/SiC/EPDM
 - [W] = SiC/SiC/FKM
 - [L..] = Tungsten carbide/Metal impregnated carbon/EPDM
 - [U..] = Tungsten carbide/Metal impregnated carbon/FKM

3.3 Names of the main components of the motor and the inverter

The unit can be fitted with the features the application requires.

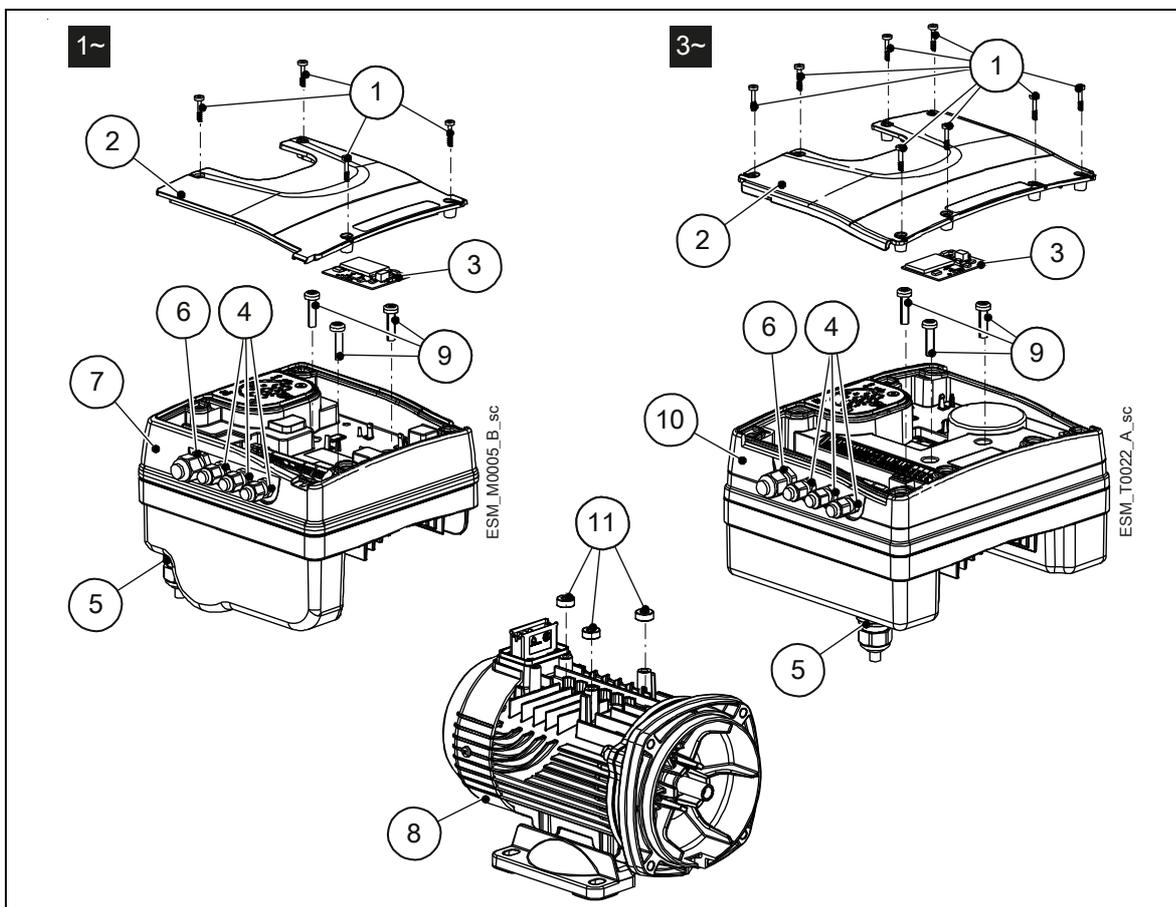


Figure 6: Main components - Single-phase and three-phase models

Table 1: Description of components

Position number	Description	Tightening torque $\pm 15\%$	
		[Nm]	[in•lbs]
1	Screw	1.4	12.4
2	Terminal Box Cover	-	-
3	Optional module with strip	-	-
4	M12 I/O cable gland	2.0	17.7
5	M20 cable gland for power supply cables	2.7	23.9
6	M16 I/O cable gland	2.8	24.8
7	Drive (single-phase model)	-	-
8	Motor	-	-

9	Screw	6.0	53.1
10	Drive (three-phase model)	-	-
11	Spacer	-	-

Pre-assembled ex factory components

Table 2: Included components

Component		Quantity	Notes
Plug for Cable Gland	M12	3	
	M16	1	
	M20	1	
Cable gland and lock nut	M12	3	Cable Outer Diameter:
	M16	1	
Cable Gland	M20	1	4.5 to 10.0 mm (0.177÷0.394 in)
			7.0 to 13.0 mm (0.275÷0.512 in)

NOTE:

in the twin-pump version, the unit is already equipped with a communication cable between the two inverters.

Optional components

Table 3: Optional components

Component	Description
Sensors	The following sensors can be used with the unit: <ul style="list-style-type: none"> • Pressure sensor
Adaptor	M20 Metric to 1/2" NPT Adapter (item is always supplied for US market)
RS485 Module	For the connection of a multi-pump system to a supervision system, via cable (Modbus or BACnet MS/TP protocol)

3.4 Intended use

- Water supply system in residential buildings
- Air conditioning systems
- Water treatment systems
- Industrial systems
- Domestic hot water circulation systems

3.5 Improper use



WARNING:

Improper product use can create dangerous conditions and cause personal injuries and damage to property

Also refer to the “Quick Startup Guide” and the “Installation, Operation and Maintenance Manual” of e-LNEE, e-LNES, e-LNTE and e-LNTS pumps supplied with the product.

4 Installation

4.1 Mechanical installation

Also refer to the “Quick Startup Guide” and the “Installation, Operation and Maintenance Manual” of e-LNEE, e-LNES, e-LNTE and e-LNTS pumps supplied with the product.

4.1.1 Installation area



DANGER: Potentially explosive atmosphere hazard

The operation of the unit in environments with potentially explosive atmospheres or with combustible dusts (e.g.: wood dust, flour, sugars and grains) is strictly forbidden.



WARNING:

- Always wear personal protective equipment
 - Always use suitable working tools
 - When selecting the place of installation and connecting the unit to the hydraulic and electric power supplies, strictly comply with current regulations.
 - Ensure that the input protection rating of the unit (IP 55, NEMA Type 1) is suitable for the installation environment.
-

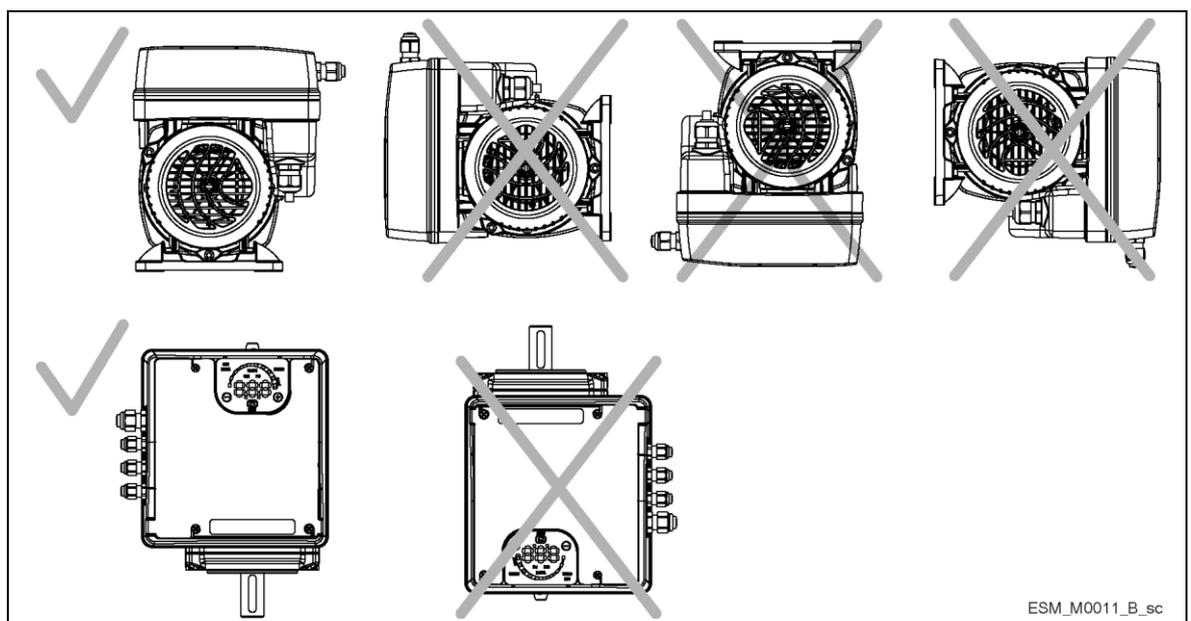


CAUTION:

- Input protection: to ensure the IP55 (NEMA type 1) protection index make sure that the unit is closed correctly.
 - Before opening the terminal box cover, check that there is no liquid in the unit
 - Make sure that all unused cable glands and cable holes are correctly sealed
 - Make sure that the plastic cover is correctly closed
 - Do not leave the terminal box without cover: risk of damage due to contamination.
-

4.1.2 Unit installation

- Position the unit as shown in Figure 7
- The arrows on the pump body indicate the flow and the rotation direction
- In case of operation with pressure sensors, these must be installed instead of the plugs found on the suction and discharge flange.



ESM_M0011_B_sc

Figure 7: Permitted positions

4.1.3 Outdoor unit installation

In case of outdoor unit installation, ensure appropriate cover (see example in Figure 8). The size of the cover must be such that the motor is not exposed to snow, rain or direct sunlight; comply with the guidelines of Par. 9, Table 13.

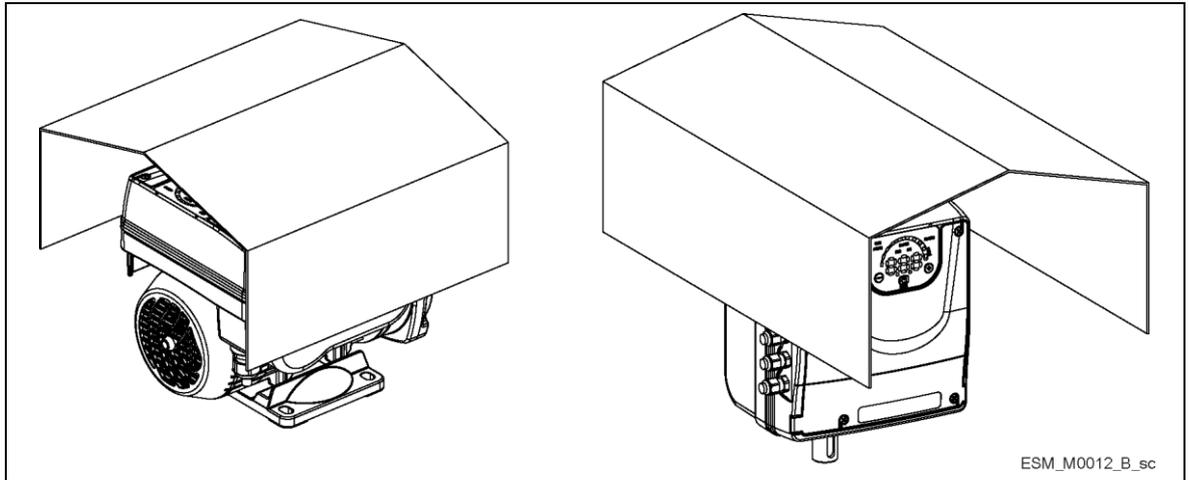


Figure 8: Outdoor installation

Minimum spacing

Area	e-SM Drive model	Free Distance
Above the unit	103..105..107..111..115	> 260mm (10.2 in)
Minimum distance between two units, taking the pump central axis as a reference	103..105..107..111..115	> 260mm (10.2 in)
	303..305..307..311..315..322	≥ 300mm (11.8 in)

4.2 Electrical Installation



DANGER: Electrical hazard

The connection to the electric power supply must be completed by an electrician possessing the technical-professional requirements outlined in the current regulations.

4.2.1 Electrical requirements

Local directives prevail on the specific requirements indicated below.

Electrical connection check list

Check that the following requirements are met:

- The electrical leads are protected from high temperature, vibrations, and collisions.
 - The main power supply current and voltage must meet the specifications on the data plate on the unit
 - The power supply line is provided with:
 - A mains isolator switch with a contact gap of at least 3 mm.
 - Ground fault circuit breaker (GFCI), or residual current devices (RCD), also known as automatic earth leakage circuit breakers (ELCD); comply with the following:
 - For single-phase power supply versions use GFCI (RCD), which are capable of detecting alternate currents (AC) and pulsing currents with DC components. These GFCI (RCD) are marked with the following symbol 
 - For three-phase power supply versions use GFCI (RCD), which are capable of detecting AC and DC currents. These GFCI (RCD) are marked with the following symbols 
 - Use GFCI (RCD) with a starting delay, to avoid problems due to transient earth currents.
 - The size of the GFCI (RCD) must comply with the system configuration and the environmental conditions.
-

NOTICE:

When selecting an automatic earth leakage circuit breaker or a ground fault circuit breaker, make sure to consider the total earth leakage current of all the electric devices of the system.

The electrical control panel checklist

NOTICE:

The control panel must match the ratings of the pump unit. Inappropriate combinations do not guarantee the protection of the unit.

Check that the following requirements are met:

- The control panel must protect the pump against short-circuit. A time lag fuse or a C type circuit breaker (MCB) can be used to protect the pump.
 - The pump is fitted with thermal and overload protection.
-

DANGER: Electrical hazard

- Before completing any electrical connections, make sure that the unit and the electric panel are isolated from the power supply and cannot be energized.
 - Contact with electric components may cause death, even after the unit has been switched off.
 - Before any interventions on the unit, the network voltage and any other input voltages must be disconnected for the minimum time indicated in Table 9.
-



Grounding (earthing)



DANGER: Electrical hazard

- Always connect the external protection conductor to the ground terminal before attempting to make any other electrical connections
- Connect all the electric accessories of the pump and the motor to the ground, making sure that the connections are completed correctly
- Check that the protection conductor (ground) is longer than the phase conductors; in case of accidental disconnection of the power supply conductor, the protection conductor (ground) must be the last one to detach itself from the terminal.

Use a cable with several strands to reduce electric noise.

4.2.2 Wire types and ratings

- All cables must comply with local and national standards in terms of section and ambient temperature
- Use cables with minimum heat resistance +70°C (158°F); to ensure compliance with UL (Underwriters Laboratories) regulations, all power supply connections must be completed using the following types of copper cables with minimum resistance +75°C: THW, THWN
- Cables must never enter into contact with the motor body, the pump and the piping.
- The wires connected to the power supply terminals and the fault signal relay (NO, C) must be separated from the others by means of reinforced insulation.

Table 4: Electric connection cables

Unit mode (power supply)	Electric power supply cord		Tightening torque	
	Wire numbers x Max. copper section	Wire numbers x Max. AWG	Mains and motor cable terminals	Earth Conductor
Single-phase	3 x 1.5 mm ² 3 x 0.0023 sq.in	3 x 15 AWG	Spring connectors	Spring connectors
Three-phase	4 x 1.5 mm ² 4 x 0.0023 sq.in	4 x 15 AWG	0.8 Nm 7.1 lb-in	3 Nm 26.6 lb-in

Control cables

External volt free contacts must be suitable for switching < 10 VDC.

NOTICE:

- Install the control cables separate from the power supply cables and the fault signal relay cable
- If the control cables are installed in parallel with the power supply cable or the fault signal relay, the distance between the cables must exceed 200 mm
- Do not intersect the power supply cables; should this be necessary, a 90° intersection angle is permitted.

Table 5: Recommended control cables

e-SM Drive control cables	Signal/control cables	AWG	Tightening torque
All I/O conductors	0.75÷1.5 mm ² 0.00012÷0.0023 sq.in	18÷16 AWG	0.6 Nm 5.4 lb-in

4.2.3 Power supply connection



WARNING: Electrical hazard

Contact with electric components may cause death, even after the unit has been switched off. Before any interventions on the unit, the network voltage and any other input voltages must be disconnected for the minimum time indicated in Table 9.



WARNING:

Only connect the electronic drive to Safety Extra Low Voltage circuits (SELV = very low safety voltage). Circuits intended for use with external communication and control equipment are designed to ensure insulation from the dangerous adjoining circuits inside the unit. Communication and control circuits inside the unit are floating in relation to the mass and are classed as SELV. They must only be connected to other SELV circuits, in order to maintain all the circuits within the SELV limits and avoid mass loops. The physical and electric separation of the communication and control circuits from non-SELV electric circuits must be maintained both inside and outside the inverters.

Table 6: Power supply wiring procedure

	Reference
1. Open the terminal box cover (2) by removing the screws (1).	Fig. 6
2. Insert the power cable in the M20 cable gland (5)	
3. Connect the cable according to the wiring diagram.	
4. Connect the earth conductor (mass), making sure that it is longer than the phase conductors.	Fig. 9
5. Connect the phase leads.	
6. Close the cover (2) and tighten the screws (1).	Fig. 6

Table 7: I/O wiring procedure

	Reference
1. Open the terminal box cover (2) by removing the screws (1).	Fig. 6
2. Connect the cable according to the wiring diagram.	Fig. 10
3. Close the cover (2) and tighten the screws (1).	Fig. 6

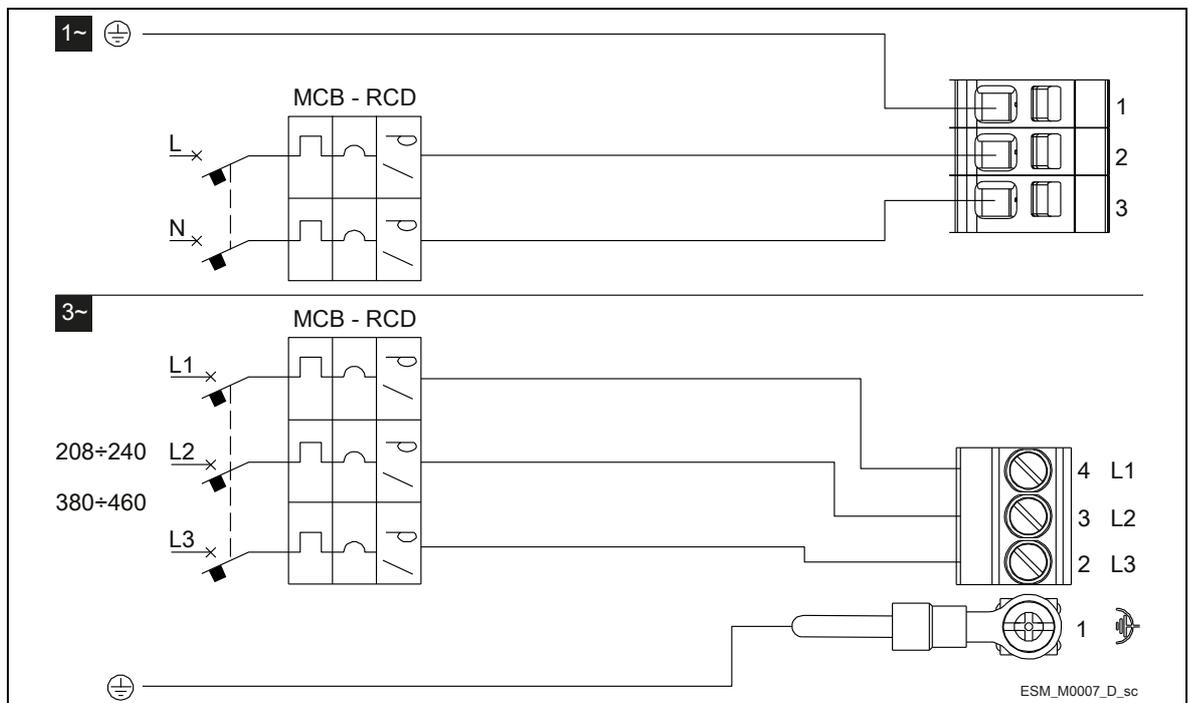


Figure 9: Wiring diagram

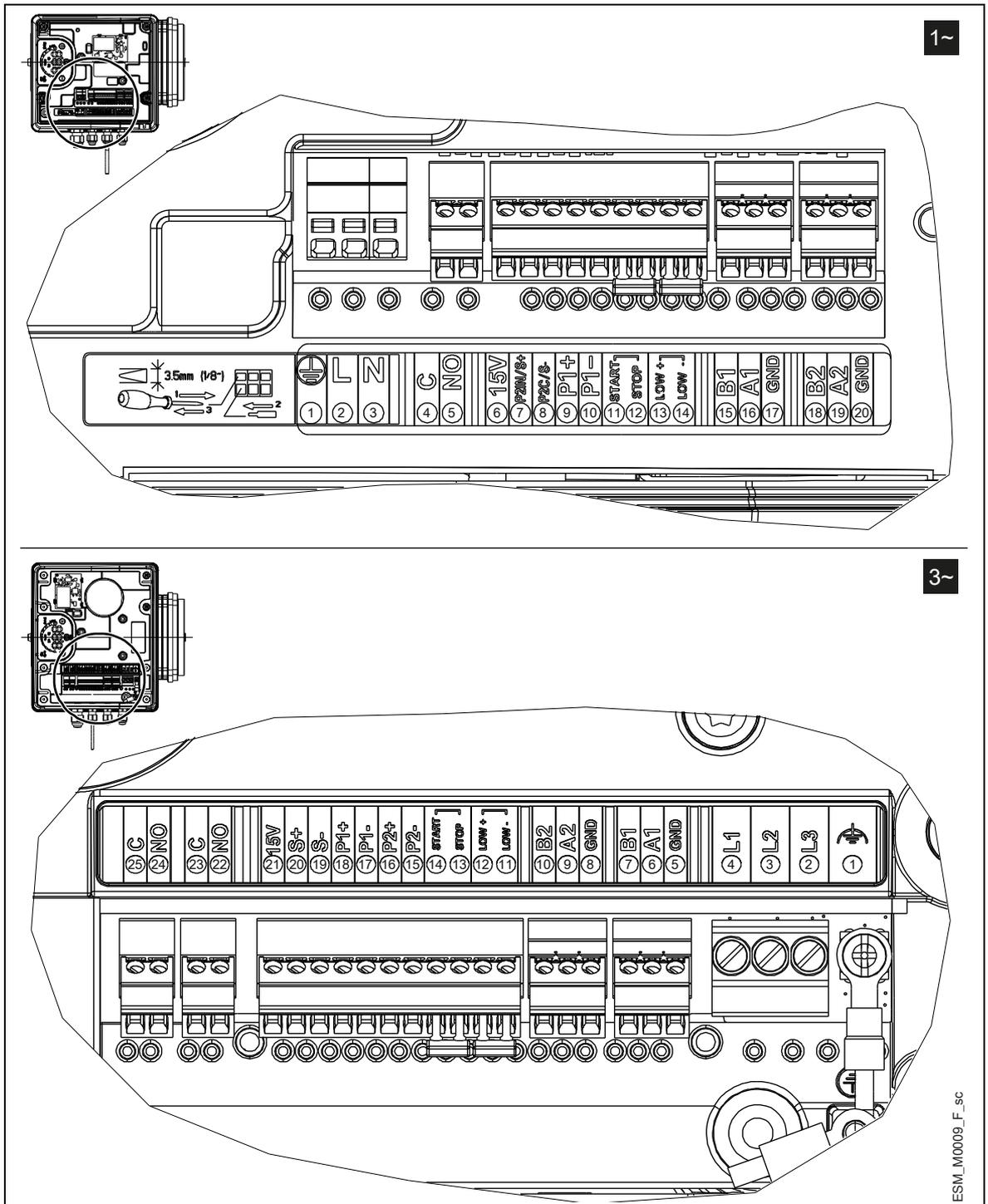


Figure 10: Connection label

Table 8: I/O terminals

	Item	Terminals	Ref.	Description	Notes
1~	Fault signal	C	4	COM - error status relay	Closed: error
		NO	5	NO - error status relay	Open: no error or unit off
	Auxiliary Voltage Supply	15V	6	Auxiliary voltage supply +15 VDC	15VDC, Σ max. 100 mA
	Analog input 0-10V	P2IN/S+	7	Actuator mode 0-10 V input	0 \pm 10 VDC
P2C/S-		8	GND for 0-10 V input	GND, electronic ground (for S+)	

	External Pressure sensor [also Differential]	P1+	9	Power supply external sensor +15 VDC	15VDC, Σ max. 100 mA
		P1-	10	External sensor 4-20 mA input	4÷20 mA
	External Start/Stop	START	11	External ON/OFF input reference	Default short circuited Pump is enabled to RUN
		STOP	12	External ON/OFF input	
	External Lack of Water	LOW+	13	Lack water input	Default short circuited Lack of water detection: enabled
		LOW-	14	Low water reference	
	Communication Bus	B1	15	RS485 port 1: RS485-1N B (-)	ACT, HCS control mode: RS 485 port1 for external communication MSE, MSY control mode: RS 485 port 1 for multi-pump systems
		A1	16	RS485 port 1: RS485-1P A (+)	
		GND	17	Electronic GND	
	Communication Bus	B2	18	RS485 port 2: RS485-2N B (-) active only with optional module	RS 485 port2 for external communication
		A2	19	RS485 port 2: RS485-2P A (+) active only with optional module	
		GND	20	Electronic GND	
Fault signal	C	25	COM - error status relay	In case of power cables: use the M20 cable gland Closed: error Open: no error or unit off	
	NO	24	NO - error status relay		
Motor running signal	C	23	Common contact	In case of power cables: use the M20 cable gland Open: motor in operation Closed: motor not in operation	
	NO	22	Normally open contact		
Auxiliary Voltage Supply	15V	21	Auxiliary voltage supply +15 VDC	15VDC, Σ max. 100 mA	
Analog input 0-10V	S+	20	Actuator mode 0-10 V input	0÷10 VDC	
	S-	19	GND for 0-10 V input	GND, electronic ground (for S+)	
External Pressure sensor [also Differential]	P1+	18	Power supply external sensor +15 VDC	15VDC, Σ max. 100 mA	
	P1-	17	External sensor 4-20 mA input	4÷20 mA	
External pressure sensor	P2+	16	Power supply external sensor +15 VDC	15VDC, Σ max. 100 mA	
	P2-	15	Sensor 4-20 mA input	4÷20 mA	
External Start/Stop	Start	14	External ON/OFF input	Default short circuited Pump is enabled to RUN	
	Stop	13	External ON/OFF input reference		
External Lack of Water	LoW+	12	Lack water input	Default short circuited Lack of water detection: enabled	
	LoW-	11	Low water reference		
Communication Bus	B2	10	RS485 port 2: RS485-2N B (-) active only with optional module	RS 485 port2 for external communication	
	A2	9	RS485 port 2: RS485-2P A (+) active only with optional module		
	GND	8	Electronic GND		
Communication Bus	B1	7	RS485 port 1: RS485-1N B (-)	ACT, HCS control mode: RS 485 port 1 for external communication Control mode MSE, MSY: RS 485 port 1 for multi-pump systems	
	A1	6	RS485 port 1: RS485-1P A (+)		
	GND	5	Electronic GND		

3~

5 Operation

In case of co-existence of two or more of the following conditions:

- high ambient temperature
- High liquid temperature
- duty points insisting on unit maximum power
- persisting undervoltage of mains,

may jeopardise the life of the unit, and/or derating may occur: for further information contact Xylem or the Authorised Distributor.

Also refer to the “Quick Startup Guide” and the “Installation, Operation and Maintenance Manual” of e-LNEE, e-LNES, e-LNTE and e-LNTS pumps supplied with the product.

5.1 Wait times



WARNING: Electrical hazard

Contact with electric components may cause death, even after the unit has been switched off. Before any interventions on the unit, the network voltage and any other input voltages must be disconnected for the minimum time indicated in Table 9.

Table 9: Wait times

Mode (power supply)	Minimum waiting times (min)
Single-phase	4
Three-phase	5



WARNING: Electrical hazard

Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered.

To avoid electrical hazards:

- Disconnect the AC power supply
- Disconnect all types of permanent magnet motors
- Disconnect all DC-link remote power supplies, including the battery backups, the Uninterrupted Power Supply units and the DC-link connections to other frequency converters
- Wait for the capacitors to discharge completely before carrying out any maintenance or repairs; see Table 9 for the waiting times

6 Programming

Precautions

NOTICE:

- Carefully read and follow the following instructions before starting the programming activities, to avoid wrong settings that may cause malfunctioning
- All modifications must be done by qualified technicians.

6.1 Control panel

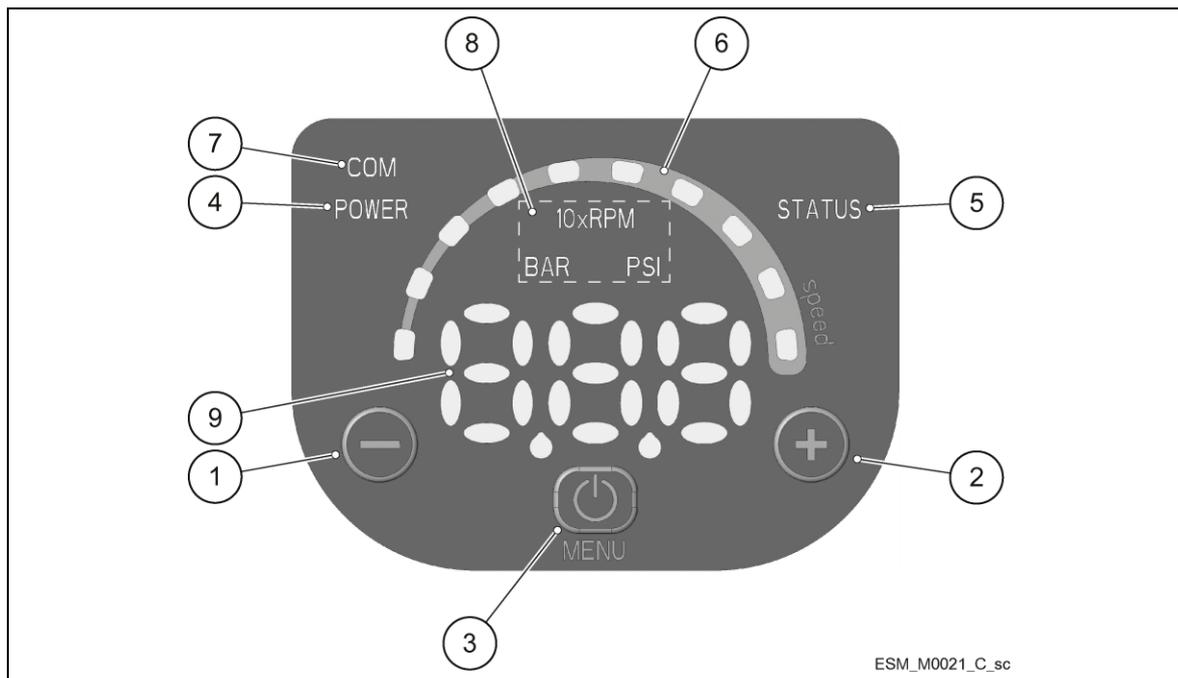


Figure 11: Control panel

Table 10: Description of the control panel

Position number	Description	Para.
1	Decrease button	6.2
2	Increase button	6.2
3	START/STOP and menu access button	6.2
4	POWER LED	6.3.1
5	Status LED	6.3.2
6	Speed LED bar	6.3.3
7	Communication LED	6.3.4
8	Unit of measure LEDs	6.3.5
9	Display	6.4

6.2 Description of the buttons

Table 11: Functions of push buttons

Push button	Function
	<ul style="list-style-type: none"> Main view (see Par. 6.4.1): decreases the required value for the selected control mode Parameter menu (see Par. 6.4.2): decreases the displayed parameter index Parameter view / editing (see Par. 6.4.2): decreases the value of the displayed parameter Zero pressure auto-calibration (see Par. 6.5, P44): automatic calibration of the pressure sensor.
	<ul style="list-style-type: none"> Main view (see Par. 6.4.1): increases the required value for the selected control mode Parameter menu (see Par. 6.4.2): increases the displayed parameter index Parameter view / editing (see Par. 6.4.2): increases the value of the displayed parameter Zero pressure auto-calibration (see Par. 6.5, P44): automatic calibration of the pressure sensor.
	<ul style="list-style-type: none"> Main view (see Par. 6.4.1): START/STOP the pump Parameter menu (see Par. 6.4.2): switches to parameter view / editing Parameter view / editing (see Par. 6.4.2): saves the value of the parameter.
 long press	<ul style="list-style-type: none"> Main view (see Par. 6.4.2): switches to parameter selection Parameters Menu: switches to Main Visualization
 and 	Main view: alternates between Speed and Head units of measure (see Par. 6.4.1).
 and 	Main View: alternates between the Speed and Head units of measure, disables the operation of the buttons (with the exclusion of START/STOP) (see Par. 6.4.1).

6.3 LEDs description

6.3.1 POWER (power supply)

When ON (**POWER**) the pump is powered and the electronic devices are operational.

6.3.2 STATUS

LED	Status
Off	Pump unit stopped
Green steady	Pump unit in operation
Flashing green and orange	Non-locking alarm with the pump unit in operation
Orange steady	Non-locking alarm with the pump unit stopped
Red steady	Locking error, the pump unit cannot be started

6.3.3 SPEED (speed bar)

It consists of 10 LEDs, each representing, in percentage steps between 10 and 100%, the speed range between parameter P27 (minimum speed) and parameter P26 (maximum speed).

LED bar	Status
On	Motor in operation; the speed corresponds to the percentage step represented by the LEDs ON in the bar (e.g.: 3 LEDs ON = speed 30%)
First LED flashing	Motor in operation; the speed is lower than the absolute minimum, P27
Off	Motor stopped

6.3.4 COM (communication)

Condition 1

- The communication bus protocol is the Modbus RTU protocol; the P50 parameter is set to the Modbus value
- No optional communication module is used.

LED	Status
Off	The unit cannot detect any valid Modbus messages on the terminals provided for the communication bus
Green steady	The unit has detected a communication bus on the provided terminals and has recognised the correct addressing
Flashing green light	The unit has detected a communication bus on the provided terminals and has not been addressed correctly
From green steady to off	The unit has not detected a valid Modbus RTU message for at least 5 seconds
From green steady to flashing	The unit has not been addressed correctly for at least 5 seconds

Condition 2

- The communication bus protocol is the BACnet MS/TP protocol; the P50 parameter is set to the BACnet value
- No optional communication module is used.

LED	Status
Off	The unit has received no valid requests from other BACnet MS/TP devices for at least 5 seconds
On steady	The unit is exchanging information with another BACnet MS/TP device

Condition 3

The optional communication module is being used.

LED	Status
Off	RS485 or wireless connection faulty or missing
Flashing	The unit is exchanging information with the communication module

6.3.5 Unit of measurement

LED on	Measurement active	Notes
10xRPM	Impeller rotation speed	The display shows the speed in 10xRPM
BAR	Hydraulic head	The display shows the value of the head in bar
PSI		The display shows the value of the head in psi

6.4 Display

6.4.1 Main visualization

Display	Mode	Description
	OFF	Contacts 11 and 12 (see Par. 5.4) are not short-circuited. Note: It has lower display priority than SBY mode.
	STOP	Pump stopped manually. If the pump is switched on after setting P04 = OFF (see Par. 6.5.1), it is stopped so that the motor is not in operation, and STP flashes (→). To manually stop the pump: <ul style="list-style-type: none"> • Example A. CPP/PPP control mode with initial requested value (Head) of 1.00 bar and minimum value 0.5 bar: → press → once. • Example B. ACT control mode with initial required value (speed) of 200 10xRPM: → press → once.
	ON	Pump on; the motor starts following the selected control mode. It appears for a few seconds when contacts 11 and 12 (see Par. 5.4) are short circuited and the pump is not in STOP mode. To manually set the pump to ON mode: <ul style="list-style-type: none"> • Example A. CPP/PPP control mode, reaching a requested value (pressure) of 1.00 bar, starting with a minimum value of 0.5 bar, after a manual stop: → press → → once, and after a few seconds... → . • Example B. ACT control mode that reaches a requested value (speed) of 200 10xRPM, starting with a minimum value of 80 10xRPM after manual stop: → press → → once, and after a few seconds... → . With the pump in operation, it is possible to display the Actual Head and the Actual Speed: <ul style="list-style-type: none"> • Example A CPP/PPP control mode with Actual Head 1.00 bar and corresponding Actual Speed 352 10xRPM: → + → → after 10 seconds or + → . • Example B ACT control mode with Actual Speed 200 10xRPM and corresponding Actual Head of 2.37 bar: → + → → after 10 seconds or + → .
	Stand-by	The analog input is configured as speed set (P40 = or), the read value is in the Stand-by zone and P34 = STP (see paragraph 6.6.1) Note: it has lower display priority than STOP mode
	Lock	To lock press + for 3 seconds; the lock will be confirmed by the temporary appearance of . It appears if a button is pressed (with the exception of) after a locking procedure had been completed. Note: the function connected with START/STOP is always disabled. At startup the buttons are locked, if they were locked at the previous switch off Default: unlocked

	Unblock	<p>To unlock press + for three seconds; the unlock will be confirmed by the temporary appearance of </p> <p>Note: at startup the buttons are unlocked, if they were unlocked at the previous switch off</p> <p>Default: unlocked</p>
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6.4.2 Parameters menu visualization

The parameter menu gives the possibility to:

- select all the parameters (see Par. 6.5)
- access Parameter View / Editing (see Par. 6.2).

Parameter	Description
Power on	<p>If after switching ON, parameter Menu View is accessed with P23 = ON, P20 flashes: → .</p> <p>Enter the password to display and change the parameters.</p>
Password timeout	<p>If with P23 = ON no button is pressed for over 10 minutes from the last parameter Menu View, both the view and the editing of the parameters are disabled.</p> <p>Enter the password again to display and change the parameters.</p>
Parameters Menu	<p>With P23 = OFF, or after entering the password (P20), it is possible to both display and edit the parameters. When accessing the Parameter Menu, the display shows:</p> <p> → → ... → </p> <p>The flashing parameter, indicating the selection possibility.</p>
Parameters Editing/Visualization	<p>The value of a parameter may be changed using the buttons, or the Modbus and BACnet communication protocols.</p> <p>When returning to the Parameter Menu, the displayed parameter index is increased automatically. For further information see Par. 6.5.</p> <ul style="list-style-type: none"> • Example A (P20) from 000 to 066: → → → → → ... until ... → → → sets the desired value → → • Example 2 (P26) from 360 to 300: → → → → → ... until... → → → sets the desired value → → →

6.4.3 Alarms and errors visualization

Parameter	Description
Alarm	<p>In case of alarm, the corresponding code appears on the display in alternation to the Main View.</p> <p>For example: → (ex. BAR) → (ex. 10xRPM) ... For further information see Par. 6.7.</p>
Error	<p>In case of error, the corresponding identification code appears on the display.</p> <p>For example: ... For further information see Par. 6.7.</p>

6.5 Software parameters

Parameters are marked differently in the manual depending on their type:

Mark	Parameter type
No mark	Applicable to all units
	Read only

6.5.1 Status Parameters

No.	Parameter	Unit of measurement	Description
P01	Required value 	bar/psi/ rpmx10	This parameter shows the SOURCE and the VALUE of the active required value. Visualization cycles between SOURCE and VALUE occur every 3 seconds. SOURCES: <ul style="list-style-type: none"> • SP (SP): required internal Setpoint value related to the control mode selected • VL (UL): external required speed Setpoint value, related to the 0-10V input. VALUE can represent a Speed or a Head, depending on the selected control mode: in case of Head, the unit of measure is defined by parameter P41.
P05	Operating time months 		Total months of connection to the electric mains, to add to P06.
P06	Operating time hours 	h	Total hours of connection to the electric mains, to add to P05.
P07	Motor Time Months 		This parameter shows the total operating time months, to be added to P08.
P08	Motor time hours 	h	This parameter shows the total operating time hours, to be added to P07.
P09	1st error 		This parameter stores the last error occurred in chronological order. The information displayed switches through the values: <ul style="list-style-type: none"> • (Exx): xx indicates the error code • (Hyy): yy is the value of hours referred to P05-P06 when the error Exx happened • (Dww): ww is the value of days referred to P05-P06 when the error Exx happened • (Uzz): zz is the value of weeks referred to P05-P06 when the error Exx happened Example of visualisation: 
P10	2nd error 		Saves the penultimate error in chronological occurred. Other characteristics: like P09.
P11	3rd error 		Saves the third from the last error in chronological occurred. Other characteristics: like P09.
P12	4th error 		Saves the fourth from the last error in chronological occurred. Other characteristics: like P09.
P13	Power Module	°C	Temperature of the power module.

	Temperature		
P14	Inverter Current	A	This parameter shows the actual current supplied by the frequency converter.
P15	Inverter Voltage	V	This parameter shows the actual estimated input voltage of the frequency converter.
P16	Motor Speed	rpmx10	This parameter shows the actual motor rotational speed.
P17	Software version		This parameter shows the Control Board software version.

6.5.2 Settings Parameters

No.	Parameter	Description
P20	Password entering [0÷999]	The user can enter here the system password, which gives access to all system parameters: this value is compared with the one stored in P22. When a correct password is entered, the system remains unlocked for 10 minutes.
P21	Jog Mode [MIN÷MAX*]	It deactivates the internal controller of the unit and forces the actual Control Mode (ACT): the motor starts and the value of P21 becomes the temporary ACT setpoint. It can be changed by just entering a new value on P21 without confirming it; otherwise, it causes immediate exit from temporary control.
P22	System password [1÷999]	This is the system password, and must be the same as the password entered in P20. Default: 66.
P23	Lock Function [OFF, ON]	By using this function, the user can lock or unlock parameter setting in the main menu. When ON, enter the P20 password to change the parameters. Default: ON.

6.5.3 Drive Configuration Parameters

No.	Parameter	Unit of measurement	Description
P25	Control mode [0-2]		<p>This parameter sets the Control Mode: ACT=0, CPP=1 e PPP=2</p> <p>ACT: Actuator mode. → A single pump maintains a fixed speed at any flow rate. ACT will always try to minimize the difference between the speed setpoint and the actual rotational speed of the motor.</p> <p>CPP: PI constant pressure. → The pump maintains a constant pressure delta (difference between discharge and suction pressure) irrespective of the flow rate. No absolute pressure sensor is required. The control algorithm will work in sensorless mode. In any case, as an alternative it will be possible to use an external pressure sensor (for the connections see par. 4.3.3, configured from P40): CPP will always try to reduce to the minimum the error between the pressure setpoint and the pressure feedback signal.</p> <p>PPP: PI proportional pressure. → This is a control mode during which the pump keeps a proportional pressure delta (difference between discharge and suction pressure) irrespective of the flow needed. The pressure increases with the increase of the flow. The control algorithm will work in sensorless mode. In any case, as an alternative it will be possible to use an external pressure sensor (for the connections see par. 4.3.3, configured from P40): PPP will always try to reduce to the minimum the error between the pressure setpoint and the</p>

* Depending on the type of pump used

			pressure feedback signal.
P26	Max RPM set [ACT set÷Max*]	rpmx10	Maximum pump speed setup.
P27	Min RPM set [Min*÷ACT set]	rpmx10	Minimum pump speed setup.

6.5.4 Multi-pump twin adjustment configuration parameters

The factory settings do not include the configuration of the twin-pump version for multi-pump twin operation, in spite of the version being supplied with a communication cable between the two inverters.

In addition to twin pumps, this mode can also be activated for two single pumps, provided that they are the same (same code), and that they are connected together through a communication cable

To activate the function proceed as follows

- Disconnect the power supply from the two motors
- Check/connect the 3-wire communication cable to the corresponding communication ports (terminals 15-16-17 for the single-phase version; terminals 5-6-7 for the three-phase version)
- Power both motors
- Configure one unit as Master (see parameter P38). In case of twin-pump versions, we recommend that the motor on the right when looking at the pump from the discharge side is set as Master.
- On the Master unit, select twin adjustment mode (see parameter P39) and the control mode (see parameter P25)
- After configuring the Master unit, the other unit is automatically configured as "Follower". The positive outcome of the configuration will be confirmed by the Follower display showing the COM LED always on green. Otherwise, and in case of alarms A12 or A13, refer to Par. 8.1, table 14

NOTICE:

- When twin mode is active, any used external ON/OFF contact (terminals 11-12 for the single-phase version, and terminals 13-14 for the three-phase version) must be connected in parallel on both units, making sure that the polarity is right.
- When the unit is configured as Follower and twin multi-pump communication:
 - works correctly (no A12 alarm, see Par. 8.1, table 14): the START/STOP operation of button 3 and the modification of the parameters (setpoint included) are disabled.
 - Does NOT work correctly (A12 alarm active, see Par. 8.1, table 14): the START/STOP operation of button 3 and the modification of the parameters (P21, P23, P38, P68) are enabled.
- Lack of water:

* Depending on the type of pump used

- When twin mode is enabled, if only one single lack of water external contact is used for both units (terminals 13-14 for the single-phase version, terminals 11-12 for the three-phase version), two diodes must be inserted, making sure to comply with the polarity between the contacts of the 2 units. Refer to figure 12.

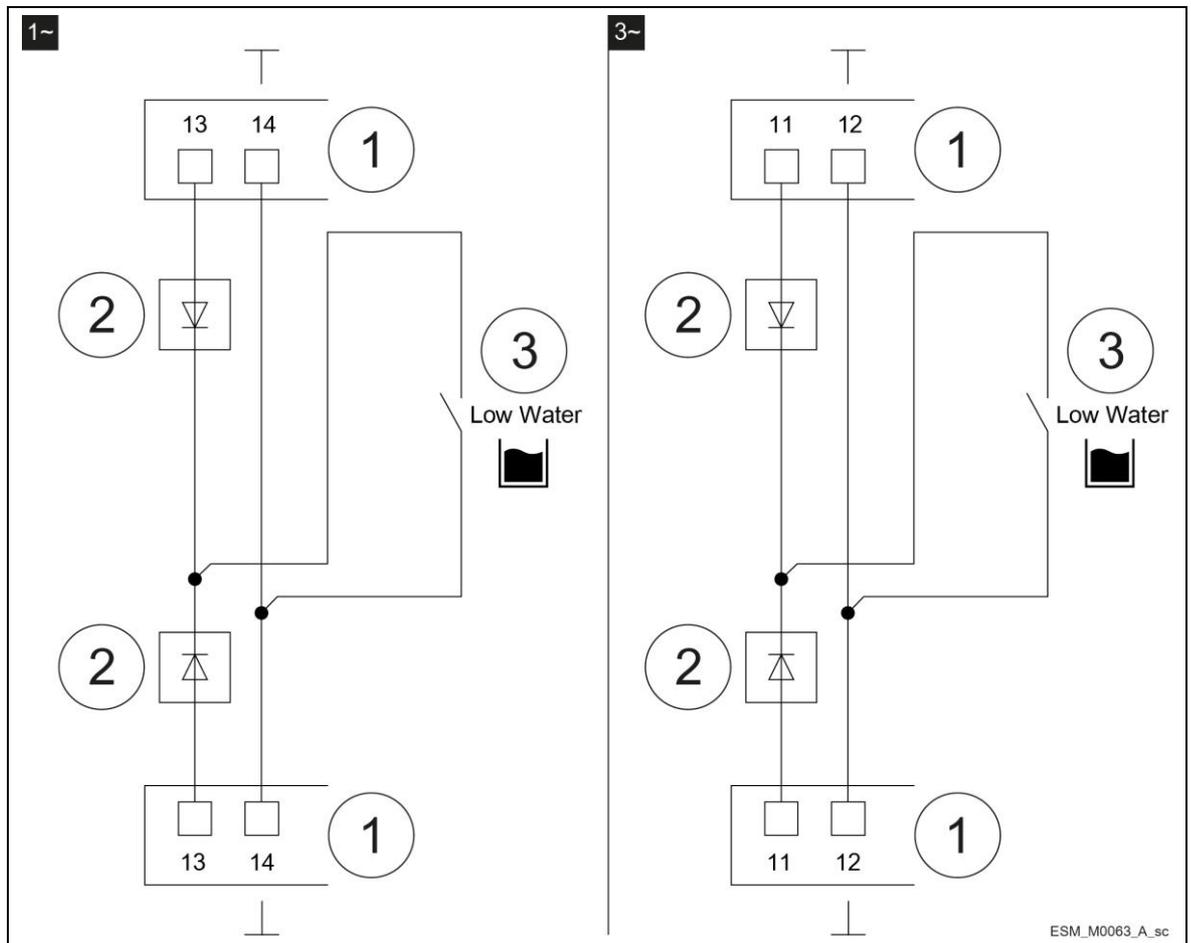


Figure 12: Diode

Table 12: Description

No.	Description
1	I/O terminals of the pump inverter (see Table 8)
2	External diode
3	Lack of water external contact

No.	Parameter	Unit of measurement	Description
P38	Adjustment type [SNG, MST, FOL]		Adjustment type selection: <ul style="list-style-type: none"> • SNG = single pump adjustment • MST = multi-pump twin adjustment, Master pump • FOL = multi-pump twin adjustment, Follower pump Default: SNG
P39	Multi-pump twin adjustment mode [bUP, ALT, PAR, FPA]		Multi-pump twin adjustment mode selection: <ul style="list-style-type: none"> • bUP = Backup: only the Master pump is in operation. The Follower pump only comes into operation in case of Master pump fault • ALT = Alternate operation: only one pump at the time is in operation. Pump operation switches regularly (parameter P57) in order to

			<p>balance the work load between the two pumps.</p> <ul style="list-style-type: none"> • PPr = Parallel: both pumps operate at the same time with the same setpoint. The Master pump determines the behaviour of the system and is capable of optimising performance by ordering the start and the stop of the Follower pump based on the pressure and the flow, to ensure that the setpoint is kept, whilst at the same time minimizing power consumption • FPr = Forced parallel: the pumps always operate at the same time and with the same setpoint <p>In all configurations, when the communication between the two heads is lost, both start operating as if they were single pumps (P38 = SnU) Default: ALt</p>
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6.5.5 Sensor Configuration Parameters

No.	Parameter	Unit of measurement	Description
P40	Sensor selection [nOS , d2 , d1 , ISP , USP]		<p>Analog input configuration setup:</p> <ul style="list-style-type: none"> • nOS = no configuration • d2 = two pressure sensors (discharge/suction) • d1 = 4÷20 mA differential sensor • ISP = 4÷20 mA input as speed reference (see paragraph 6.6.1) • USP = 0÷10 V input as speed reference (see paragraph 6.6.1) <p>Default: nOS</p>
P41	Pressure Sensor Unit Of Measure [BAR, PSI]		<p>This parameter sets the unit of measure (bar, PSI) for the pressure sensor. It affects the head view LED parameter (see Par. 6.3.4). Default: bar.</p>
P42	Full scale value for pressure Sensor 1 4÷20mA [0.0÷25.0BAR] / [0.0÷363PSI]	bar/psi	<p>Setting of the full scale value of the 4÷20mA pressure sensor 1 connected to analog inputs 9 and 10 for the single-phase version, and inputs 17 and 18 for the three-phase version. Default: depending on the type of pump.</p>
P43	Pressure sensor 2 full scale value [0.0÷25.0BAR]/[0.0÷363PSI]	bar/psi	<p>Setting of the full scale value of pressure sensor 2 connected to analog inputs 7 and 8 for the single-phase version, and 15 and 16 for the three-phase version. Default: depending on the type of pump.</p>
P44	Zero Pressure Auto-Calibration	bar/psi	<p>This parameter lets the user perform the initial auto-calibration of the pressure sensor. It is used to compensate for the offset signal of the sensor at zero pressure caused by the tolerance of the sensor itself. Procedure:</p> <ol style="list-style-type: none"> 1. Access P44 when the hydraulic system is at a 0 pressure, without liquid inside, or with the pressure sensor disconnected from the piping: the actual pressure value of 0 is displayed. 2. Start the auto-calibration by pressing  or  (see Par. 6.2). 3. At the end of the auto-calibration, the 0 (zero) pressure is displayed, or the “---“ (---) message, if

			the sensor signal is out of the permitted tolerance.
P48	Lack of liquid input [DIS, ALR, ERR]		<p>Enabling/disabling of the management of the lack of liquid at the input (see par. 4.3.3, terminals 13 and 14). It defines the behaviour of the unit when the lack of water input is enabled and the switch is open:</p> <ul style="list-style-type: none"> • DIS (DIS): the unit does not manage the information from the "lack of liquid" input" • ALr (ALr): the unit reads the "lack of liquid" input (enabled) and upon opening of the circuit breaker reacts by displaying the A06 rotary alarm and keeping the motor in operation • Err (Err): The unit reads the "lack of liquid" input (enabled) and upon opening of the circuit breaker reacts by stopping the motor and generating the corresponding E11 error. The error condition is removed when the switch closes again and the motor is started. <p>Default: ERR.</p>

6.5.6 RS485 Interface Parameters

No.	Parameter	Unit of measurement	Description
P50	Communication protocol [MOD, BAC]		<p>This parameter selects the specific protocol on the communication port:</p> <ul style="list-style-type: none"> • MOD (MOD): Modbus RTU • BAC (BAC): BACnet MS/TP. <p>Default: MOD.</p>
P51	Communication protocol - Address [1÷247]/[0÷127]		<p>This parameter sets the desired address for the unit, when connected to an external device, depending on the protocol selected in P50:</p> <ul style="list-style-type: none"> • MOD: any value in the 1÷247 range • BAC: any value in the 0÷127 range.
P52	Comm Protocol – BAUDRATE [4.8, 9.6, 14.4, 19.2, 38.4, 56.0, 57.6 KBPS]	kbps	<p>This parameter sets the desired baud rate for the communication port.</p> <p>Default: 9.6 kbps.</p>
P53	BACnet Device ID Offset [0÷999]		<p>This parameter sets the hundreds, tens and units of the BACnet Device ID.</p> <p>Default: 002.</p> <p>Device ID default: 84002.</p>
P54	Comm Protocol – Configuration [8N1, 8N2, 8E1, 8o1]		<p>This parameter sets the length of the data bits, the parity and the length of the STOP bits.</p> <p>Default: 8N1</p>

6.5.7 Multi-pump twin adjustment mode configuration parameters

No.	Parameter	Unit of measurement	Description
P57	Switch interval	hours	<p>Setting of the forced switching interval of the pump in operation in alternated adjustment mode (P39 = ALt)</p> <p>Default: 24</p>

6.5.8 Test Run Configuration Parameters

Test Run is a function that starts the pump after the last stop, in order to prevent it from blocking.

No.	Parameter	Unit of measurement	Description
P65	Test Run – Time Start [0-100]	h	This parameter sets the time after which, once the pump has stopped for the last time, the Test Run will start. Default: 100 h.
P66	Test Run – Speed [P27-Max]	rpmx10	This parameter sets the pump rotational speed for the Test Run. The Min and Max speeds depend on the pump type. Default: 200 rpmx10.
P67	Test Run – Time Duration [0-180]	s	This parameter sets the duration of the Test Run. Default: 10 s.

6.5.9 Special Parameters

No.	Parameter	Unit of measurement	Description
P68	Default Values Reload [NO, RES]		If set to RES, after confirmation this parameter performs a factory reset that reloads the default parameter values.
P69	Avoid Frequent Parameters Saving [NO, YES]		This parameter limits the frequency with which the unit stores the required value P02 in the EEPROM memory, in order to extend its life. This could be particularly useful in applications with BMS control devices that require continuous variation of the value for fine tuning purposes. Default: NO.

6.5.10 Example: ACT control mode with analog input

Graph

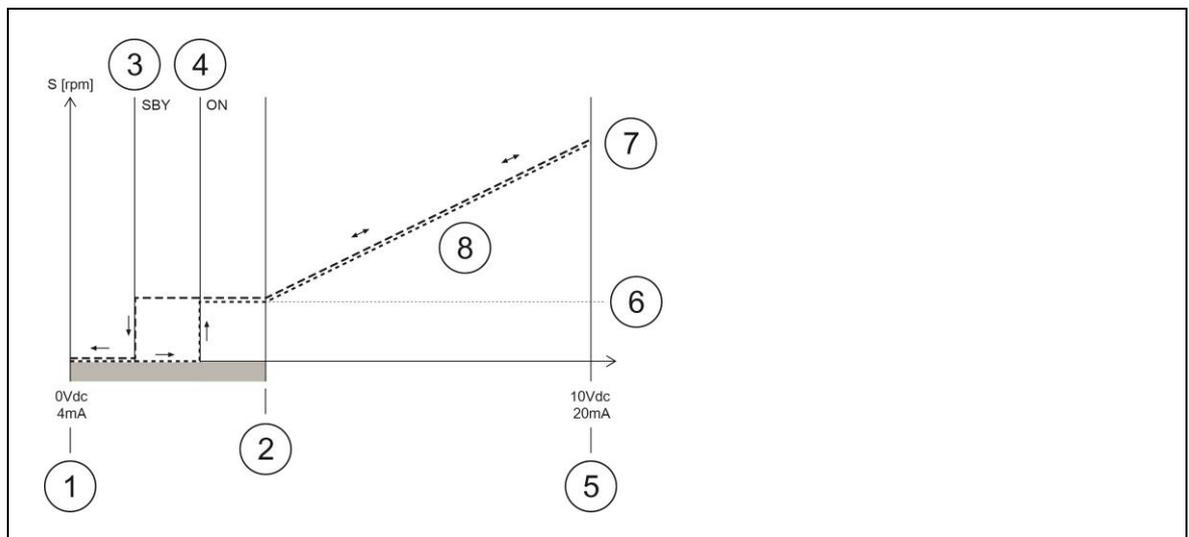


Figure 13: ACT control mode diagram

Table 13: Description

No.	Description
1	ZERO point (0Vdc - 4mA) = minimum analog signal value
2	Adjustment start point
3	Standby point (SBY) = 1/3 of the hysteresis zone
4	ON point (ON) = 2/3 of the hysteresis zone

5	MAX point (10Vdc - 2mA) = maximum analog signal value
6	Motor minimum speed (Parameter P27)
7	Motor maximum speed (Parameter P26)
8	Adjustment zone
3 - 4 - 2	Minimum speed operation zone (Parameter P27)
1 to 2	Hysteresis zone
1 - 3 - 4	Standby zone

For further information on the control mode and the ACT regulation parameters, see Par. 6.5.3. and 6.5.5

Table 14: Examples of calculation

<p>Example of calculation of the adjustment start point for P40 = ISP (4-20 mA analog signal)</p>	<ul style="list-style-type: none"> • P27 = 900 • P26 = 3600 • Calculation of the adjustment start point value = (maximum value - zero point) x (P27/P26) + zero point = (20-4) x (900/3600) + 4 = 8 mA
<p>Example of calculation of the adjustment start point for P40 = VSP (0-10 Vdc analog signal)</p>	<ul style="list-style-type: none"> • P27 = 900 • P26 = 3600 • Calculation of the adjustment start point value = (maximum value - zero point) x (P27/P26) + zero point = (10-0) x (900/3600) + 0 = 2.5 V

7 Maintenance

Precautions



DANGER: Electrical hazard

- Before attempting to use the unit, check that it is unplugged and that the pump and the control panel cannot restart, even unintentionally. This also applies to the auxiliary control circuit of the pump.
- Before any interventions on the unit, the network power supply and any other input voltages must be disconnected for the minimum time indicated in Table 9 (the capacitors of the intermediate circuit must be discharged by the built-in discharge resistors).

-
1. Make sure that the cooling fan and the vents are free from dust.
 2. Make sure that the ambient temperature is correct according to the limits of the unit.
 3. Make sure that qualified personnel perform all modifications of the unit.
 4. Make sure that the unit is disconnected from the power supply before any work is carried out. Always consider the pump and motor Instruction.



WARNING: Danger of exposure to magnetic field

If the rotor is removed or reinserted in the motor body, the existing magnetic field can:

- be dangerous for people wearing pacemakers and medical implants
- by attracting metal parts, cause personal injuries and damage to the bearings.

Function and parameter control

In case of changes to the hydraulic system:

1. Make sure that all functions and parameters are correct
2. Adjust the functions and parameters if necessary.
3. Also refer to the “Quick Startup Guide” and the “Installation, Operation and Maintenance Manual” of e-LNEE, e-LNES, e-LNTE and e-LNTS pumps supplied with the product.

8 Troubleshooting

In case of alarm or error, the display shows and ID code and the STATUS LED turns on (also see Par. 6.3.2).

In case of several alarms and/or errors, the display shows the main one.

Alarms and errors:

- are saved with date and time
- can be reset by switching the unit off for at least 1 minute.

Errors cause the triggering of the status relay on the following terminal box pins:

- single-phase version: pins 4 and 5
- three-phase version: pins 24 and 25

8.1 Alarm codes

Table 15: Alarm codes

Code	Description	Cause	Solution
A03	Derating	Temperature too high	<ul style="list-style-type: none"> • Lower the room temperature • Lower the water temperature • Lower the load
A05	Data memory alarm	Data memory corrupted	<ol style="list-style-type: none"> 1. Reset the default parameters using parameter P68 2. Wait 10 s 3. Restart the pump <p>If the problem continues, contact Xylem or the Authorised Distributor</p>
A06	LOW alarm	Lack of water detection (if P48=ALR)	Check the water level in the system
A12	Multi-pump twin communication alarm	The pump does not detect the communication	<ul style="list-style-type: none"> • Check the condition of the connection cables between ports 1 of the two pumps • If the pump is configured as Master (P38 = MSL), on the pump configured as Follower (P38 = FOL) check that the RS485 interface parameters (Par. 6.5.5) are set as follows: P50 = MOD, P51 = 1, P52 = 9.6, P54 = 8n1 • If the pump is configured as Follower (P38 = FOL), check that the other connected pump is configured as Master (P38 = MSL)
A13	Communication alarm towards the Follower pump	The Follower pump is not accepting the writing of some adjustment parameters	<ul style="list-style-type: none"> • Check that the two pumps are the same (same part number)
A15	EEPROM write failure	Data memory damaged	Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
A20	Internal alarm		Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
A41	Sensor 1 alarm	Missing pressure sensor (not present in ACT mode)	<ul style="list-style-type: none"> • Check the condition of the sensor 1 connection cables
A42	Sensor 2 alarm	Missing pressure sensor (not present in ACT mode)	<ul style="list-style-type: none"> • Check the condition of the sensor 2 connection cables

A43	Sensor 1 and sensor 2 alarm	Missing pressure sensor (not present in ACT mode)	<ul style="list-style-type: none"> Check the condition of the connection cables of both sensors
------------	-----------------------------	---	--

8.2 Error codes

Table 16: Error codes

Code	Description	Cause	Solution
E01	Internal communication error	Internal communication lost	Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
E02	Motor overload error	<ul style="list-style-type: none"> High motor current Current absorbed by the motor too high 	Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
E03	DC-bus overvoltage error	<ul style="list-style-type: none"> DC-bus overvoltage External conditions cause the operation of the pump from generator 	Check: <ul style="list-style-type: none"> the system configuration the position and integrity of the check valve or the flap valve
E04	Rotor blocked	<ul style="list-style-type: none"> Motor stall Loss of rotor synchronism or rotor blocked by external materials 	<ul style="list-style-type: none"> Check that there are no foreign bodies preventing the pump from turning Stop the pump for 5 minutes and then start it again <p>If the problem continues, contact Xylem or the Authorised Distributor</p>
E05	EEPROM Data memory error	EEPROM Data memory corrupted	Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
E06	Grid voltage error	Voltage supply out of operating range	Check: <ul style="list-style-type: none"> the voltage the connection of the electric system
E07	Motor winding temperature error	Motor thermal protection trip	<ul style="list-style-type: none"> Check for impurities near the impeller and rotor. Remove them if necessary Check the conditions of installation, and the water and air temperature Wait for the motor to cool down If the error persists, stop the pump for 5 minutes and then start it again <p>If the problem continues, contact Xylem or the Authorised Distributor</p>
E08	Power module temperature error	Frequency converter thermal protection trip	Check the conditions of installation, and the air temperature
E09	Generic hardware error	Hardware error	Stop the pump for 5 minutes and then restart it again; if the problem continues, contact Xylem or the Authorised Distributor
E10	Dry-run error	Dry run detection	Check if there are any leaks in the system and refill the system
E11	LOW error	Lack of water detection (if P48=ERR)	Check the water level in the system
E14	Low pressure error	Pressure below minimum threshold (not present in ACT mode)	Check the settings of parameters P45 and P46
E15	Loss of phase error	One of the three power supply phases is missing (three-phase	Check the connection to the power supply network

		versions only)	
E41	Pressure sensor error 1	No pressure sensor 1 detected	Check the condition of the sensor connection cables
E42	Pressure sensor error 2	No pressure sensor 2 detected	Check the condition of the sensor connection cables
E43	Pressure sensor error	Missing pressure sensor (not present in ACT mode)	Check the condition of the sensor connection cables
E44	Input signal error	No current reference signal	<ul style="list-style-type: none"> • Check the condition of the current signal connection cables (terminals 9-10 for the single-phase version, terminals 17-18 for the three-phase version)

See also Par. 6.3.2 and Par. 6.4.3.

9 Technical Information

Table 17: Electrical, Environmental and Installation specifications

	e-SM Drive model										
	103	105	107	111	115	303	305	307	311	315	322
Input											
Input frequency [Hz]	50/60 ± 2										
Main supply	LN					L1 L2 L3					
Nominal input voltage [V]	208÷240 ±10%					208÷240 / 380÷460 ±10%					380÷ 460 ±10%
Maximum current absorbed (AC) in continuous service (S1) [A]	See data plate										
PDS Efficiency Class	IES2										
Output											
Min.÷Max. Speed [rpm]	800 to 3600										
Leakage Current [mA]	< 3.5										
I/O auxiliar + 15VDC power supply [mA]	I _{max} < 40										
Fault signal relay	1 x NO V _{max} < 250 [VAC] , I _{max} < 2 [A]					1 x NO V _{max} < 250 [VAC] , I _{max} < 2 [A]					
Motor status relay	-					1 x NO V _{max} < 250 [VAC] , I _{max} < 2 [A]					
EMC (Electro Magnetic Compatibility)	See Par. Declarations. Installations must be performed in accordance with the EMC good practice guidelines (e.g. avoid "eyebolts" on the transmission side)										
Sound pressure L _{pA} [dB(A)] @ [rpm]	< 62 @3000 < 66 @3600										
Insulation class	155 F										
Protection class	IP 55, Enclosure Type 1 Protect the product from direct sunlight and rainfall										
Relative humidity (storage & operating)	5% ÷ 95% RH										
Storage temperature [°C] / [°F]	-25÷65 (-13÷149)										
Operating temperature [°C] / [°F]	-20÷50 (-4÷122)										
Air Pollution	Pollution Degree 2										
Installation altitude a.s.l. [m] / [ft]	< 1000 / 3280 Derating may occur at higher altitudes										

Table 18: Dimensions and weights

Model			Net weight (motor + drive) [kg]					B1	B4	B5	D3	E1	E2
			1~		3~			[mm]					
			103 105 107	111 115	303 305 307	311 315	322						
ESM90R...LNEE			7.4	8.9	13	14.4	16	376	-	79	M20	-	-
ESM90RS8...LNEE			7.3	8.8	12.8	14.2	15.8	343	-	79		-	-
ESM90R...B14-SVE			7.5	9	13.1	14.5	16	292	-	79		-	-
ESM90R...B5			7.5	9	13.1	14.5	16	292	-	100		-	-
ESM80...HMHA	80...HMHA US	80...HMHA EU	7.5	9	13	14.5	16	263	90	79		100	125
ESM80...HMHB	80...HMHB US	80...HMHB EU	7.6	9.2	13.2	14.6	16.1	268	90	80		100	125
ESM80...HMVB	80...HMVB US	80...HMVB EU	7.4	8.9	13	14.4	16	268	-	80		-	-
ESM80...HMHC	80...HMHC US	80...HMHC EU	7.9	9.4	13.4	14.8	16.4	272	90	91		100	125
ESM80...HMVC	80...HMVC US	80...HMVC EU	7.6	9.1	13.2	14.6	16.2	272	-	91		-	-
ESM80...BG			7.3	8.8	12.9	14.3	15.9	282	-	108		-	-
ESM90R...56J			7.5	9.1	13	14.5	16.1	307	89	83	NPT 1/2"	76	124
ESM90R...56C			7.2	8.8	12.6	14.3	15.8	294	-	83		-	-

... = 103, 105, 107, 111, 115, 303, 305, 307, 311, 315, 322
 - = motor foot not found

10 Disposal

10.1 Precautions



WARNING:

The unit must be disposed of through approved companies specialised in the identification of different types of materials (steel, copper, plastic, etc.).



WARNING:

It is prohibited to dispose of lubricating fluids and other hazardous substances in the environment.

10.2 WEEE 2012/19/EU (50 Hz)

(IE) (MT) (GB) - INFORMATION TO USERS pursuant to art. 14 of the Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).



The crossed bin symbol on the appliance or on its packaging indicates that the product at the end of its useful life must be collected separately and not disposed of together with other mixed urban waste. Appropriate separate collection for the subsequent start-up of the disused equipment for recycling, treatment and environmentally compatible disposal helps to avoid possible negative effects on the environment and on health and favors the re-use and / or recycling of the materials it is composed of the equipment.

WEEE other than WEEE from private households¹: The separate collection of this equipment at the end of its life is organized and managed by the producer. The user who wants to get rid of this equipment can then contact the producer and follow the system that it has adopted to allow the separate collection of equipment at the end of life, or select a supply chain independently authorized to manage.

Producer of EEE as per Directive 2012/19/EU:

(IE)

Xylem Water Solutions Ireland Ltd - 50 Broomhill Close - Airton Road - D24 Tallaght - Dublin 24

(MT)

-

(GB)

Xylem Water Solutions UK Ltd - Millwey Rise Industrial Estate - Axminster - Devon EX13 5HU

¹ Classification according to product type, use and current local laws

11 Declarations

11.1 EC Declaration of Conformity (Original)

Xylem Service Italia S.r.l., with headquarters in Via Vittorio Lombardi 14 - 36075 Montecchio Maggiore VI - Italy, hereby declares that the product

Integrated variable speed drive in-line pump unit, with or without pressure transmitters (see rating plate)

fulfils the relevant provisions of the following European Directives:

- Machinery 2006/42/EC and subsequent amendments
(ANNEX II - natural or legal person authorised to compile the technical file:
Xylem Service Italia S.r.l.)
- Eco-design 2009/125/EC and subsequent amendments,
Regulation (EU) no. 547/2012 (water pump) if MEI marked

and the following technical standards:

- EN 809:1998+A1:2009, EN 60204-1:2006+A1:2009
- EN 61800-9-1:2017, EN 61800-9-2:2017.

Montecchio Maggiore, 22/04/2020

Amedeo Valente
(Director of Engineering and R&D)



rev.00

11.2 EU Declaration of Conformity (n. 24)

1. (EMCD) Apparatus/Product model:
LNE..E, LNT..E. (see rating plate)
(RoHS) Unique identification of the EEE:
N.LNE..E, LNT..E.
2. Name and address of the manufacturer:
Xylem Service Italia S.r.l.
Via Vittorio Lombardi 14
36075 Montecchio Maggiore VI
Italy
3. This declaration of conformity is issued under the sole responsibility of the manufacturer.
4. Object of the declaration:
Integrated variable speed drive in-line pump unit, with or without pressure transmitters (see rating plate)
5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:
 - 2014/30/EU Directive of 26 February 2014 (electromagnetic compatibility) and subsequent amendments.
 - 2011/65/EU Directive of 8 June 2011 (restriction of the use of certain hazardous substances in electrical and electronic equipment) and subsequent amendments.
6. References to the relevant harmonised standards used or references to the other technical specifications, in relation to which conformity is declared:
 - EN 60730-1:2011, EN 61800-3:2004+A1:2012 (Category C2), EN 55014-1:2006+A1:2009+A2 :2011, EN 55014-2:1997+A1:2001 +A2 :2008, EN 55014-2:2015, EN 61000-6-2:2005, EN 61000-6-3:2007+A1:2011.
 - EN 50581:2012.
7. Notified body: -

8. Additional information:

RoHS - Annex III – Applications exempt from the restrictions: lead as a binding element in steel, aluminium, copper alloys [6a), 6b), 6c)], in welds and electric/electronic components [7a), 7c)-I, 7c)-II]

Signed for and on behalf of: Xylem Service Italia S.r.l.

Montecchio Maggiore, 22/04/2020

Amedeo Valente
(Director of Engineering and R&D)



rev.00

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Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com



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