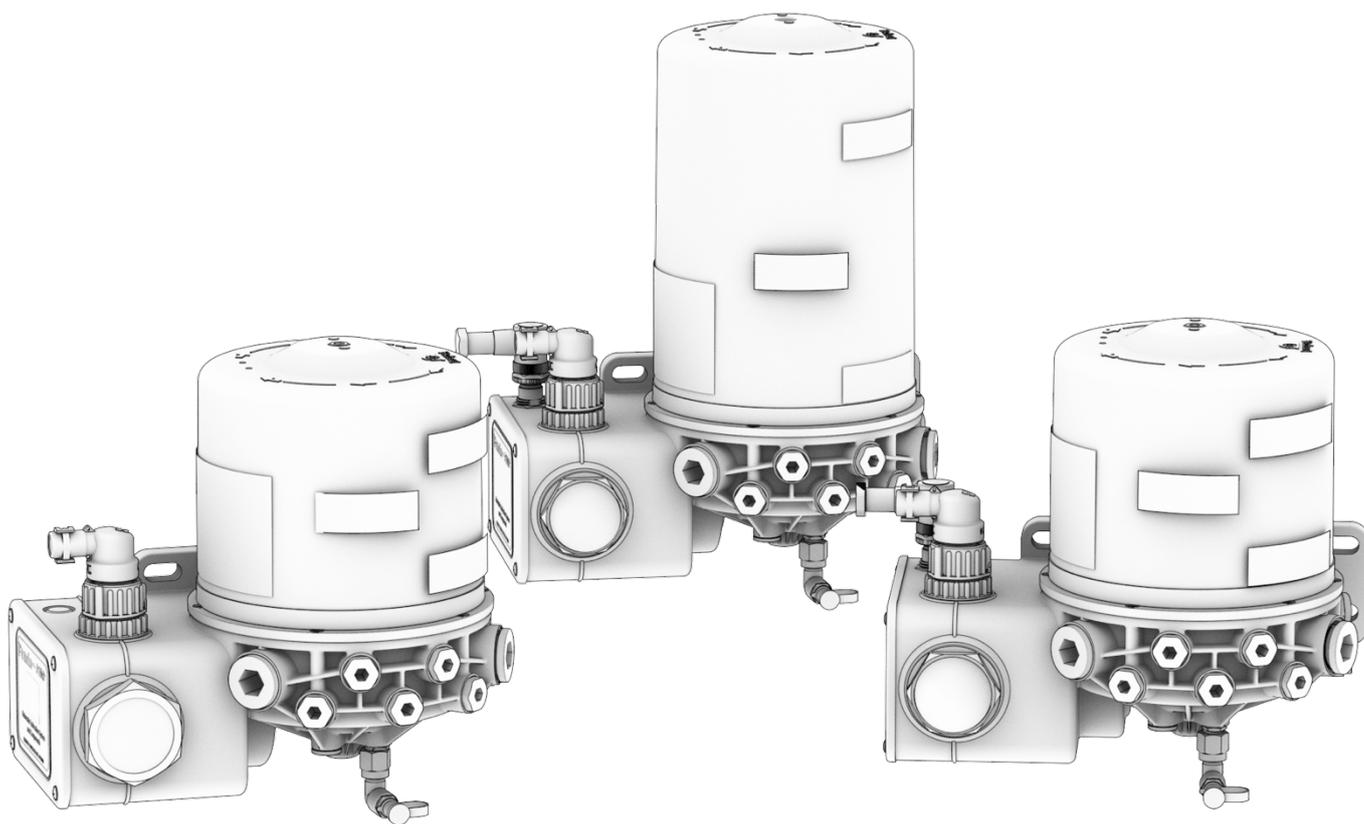


Multi-output grease electric pump

User and Maintenance Manual

Translation of original instructions



Manual drafted in compliance
with directive 2006/42

C23871E WK 24/24

www.dropsa.com

DropsA products can be purchased from DropsA branches and authorised distributors.
Visit the website www.dropsa.com/contact or send an e-mail to sales@dropsa.com

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1. INTRODUCTION

This user and maintenance manual is for the **FemtoPUMP** electric pump and contains important information to protect the health and safety of personnel who use this equipment.

The latest version of this manual is available from the Technical-Commercial Office or by consulting our website <http://www.dropsa.com>.

Please read this manual carefully and keep it in a safe place so that it is always available to operators who wish to consult it.

2. GENERAL DESCRIPTION

Central lubrication systems are designed for automatic lubrication of specially arranged friction points. These systems considerably reduce the maintenance costs of the machines on which they are installed, eliminating downtimes due to lubrication operations and extending the life of the lubricated components. Lubrication systems also make it possible to reach all the points that need lubrication, especially those that are difficult for operators to reach.

The pump can be used to supply systems with different lubrication systems: centralised (Basic), direct to point (Multi-line) and single line (System 33V).

2.1. CENTRALISED LUBRICATION (BASIC)

The simplest configuration, consisting of the following components:

- Electric feed pump with tank (FemtoPUMP)
- Primary piping
- Multi-line distributor
- Secondary piping

Through the primary piping (derived from the pumping unit), the electric pump feeds a distributor, whose task is to distribute and dose the flow of lubricant between the various friction points.

The modular system of the progressive feeder offers the advantage of flexibility for system design engineers as well as low-cost maintenance advantages.

The progressive system is mainly used for grease lubrication in total loss or circulation systems. High pressures and operation with very long piping are common requirements as are demanding environmental conditions.

The progressive system can also be used zoned, when irregular cycle conditions are required for different parts of the machine. The design parameters of a progressive system include many variables such as the volume and frequency of grease required for each point, the number of points, the operating conditions, the pump pressure, etc.

2.2. DIRECT TO POINT (*MULTI-LINE*) LUBRICATION

FemtoPUMP electric pumps lubricate the friction point directly without the need for any other flow metering devices. This makes for an economical, versatile and easy-to-use lubrication product.

FemtoPUMP is designed to supply single point lubrication systems in vehicles, plants and machinery of various kinds for grease use.

Designed to operate with a maximum of 8 pumping units, allowing several independent lines to be fed.

It is delivered as standard without pumping units, which must be ordered separately and selected from 5 models for the desired flow rate.

2.3. FEATURES AND BENEFITS

- The FemtoPUMP electric pump is a piston pump driven by an eccentric system with spring return, designed to operate with a maximum of 2 Basic and 8 Multi-line pumps, allowing several independent lines to be fed. It is supplied as standard without pumping units, which must be ordered separately.
- For all versions (with follower plate or stirring paddle) the pump is complete with a minimum level sensor.
- Specifically, the minimum level system on the stirring paddle, given its flag configuration, significantly reduces the accumulation of grease at the bottom of the tank.
- The tank for the version with follower plate is made of transparent plastic material. The maximum level is signalled visually. A sensor for maximum level signalling can be fitted with the appropriate conversion kit.
- The electrical connection includes an AMP DIN 72585 connector for the power supply and an M12 connector for the output signals.
- The electronic version has an LTC (Lubricate Time Control) timer card for cycle time control.
- The manual version has no circuit board but simply a minimum level control on the output connection.
- The overall dimensions are considerably reduced and the fixing distances with slots allow a wide range of fastening.

3. SAFETY AND PRECAUTIONS FOR USE

This manual must be read before carrying out any operation. We recommend that you comply with the safety regulations of the country in which the equipment is installed and employee specialised personnel in the various maintenance, use, installation, etc. necessary during the life of the equipment.

This manual uses safety indications and symbols in accordance with the ANSI Z535, ISO 3864 and ISO 7010 standards listed below:

Warnings Table			
Warning	Damage to	Definition	Consequences
	People	Indicates a hazardous situation that, if not avoided, will certainly cause death or serious injuries.	Death or severe injury, paralysing.
		Indicates a hazardous situation that, if not avoided, could cause death or serious injuries.	Possible death or serious injuries.
		Indicates a hazardous situation that, if not avoided, could cause mild or moderate injuries.	Possible mild or moderate injuries
	What	Indicates practices not related to personal injury. Tips or other information.	Damage to things and not to people

Table of symbols					
HAZARD		PROHIBITION		OBLIGATION	
	General hazard		General prohibition		General obligation
	Laser beam hazard		No smoking or use of open flames		It is mandatory to read the instructions
	Electricity hazard		Do not enter with watches and metal objects		It is mandatory to use hearing protection
	Hot surface hazard		Do not touch		It is mandatory to use eye protection
	Vessel under pressure hazard		Do not extinguish with water		It is mandatory to ensure earthing
	Danger of crushing hands				It is mandatory to disconnect the power
	Explosive area hazard				It is mandatory to wear protective gloves

4. PRODUCT IDENTIFICATION

A plate on the pump tank shows the product code, power supply voltages and basic characteristics.



	<p style="text-align: center;">WARNING</p> <p>Removing the pump identification plate is prohibited</p>	
<p style="text-align: center;">NOTICE</p> <p>The pump includes some items made with alloyed metals that have a percentage of Lead (CAS 7439-92-1) < 0.35% weight. See the chapter on disposal for details.</p>		

5. TECHNICAL CHARACTERISTICS

GENERAL TECHNICAL CHARACTERISTICS		
Pumping system	Type	<i>spring-return cam</i>
Flow rate:	<i>Multi-line</i>	cm ³ /cycle [in ³ /rev] 0.005 - 0.01 - 0.015 - 0.025 - 0.05 [0.0003 - 0.0006 - 0.0009 - 0.0015 - 0.003]
	<i>Basic</i>	cm ³ /rev [in ³ /min] 0.19 [0.011] 0.14[0.0085]
	<i>Basic Reg.</i>	0.03- 0.2 [0.0018 ÷ 0.012] 0.02- 0.14 [0.0012 ÷ 0.0085]
Maximum operating pressure	<i>Multi-line</i>	bar 200 [2900]
	<i>Basic</i>	[psi] 280 [4061]
Number of outputs (pumping units)	<i>Multi-line</i>	No. 8
	<i>Basic</i>	2
Discharge connection (pumping unit outlet)	<i>Multi-line</i>	Type G1/8"
	<i>Basic</i>	G1/4"
Operating temperature	°C [°F]	-40 ÷ +60 [-40 ÷ +140]
Storage temperature	°C [°F]	-30 ÷ +80 [-22 ÷ +176]
Net weight	Kg [lb]	2.5[5.5]
Relative humidity	%	90
Tank capacity	<i>Follower plate</i>	Kg [gal US]
	<i>Stirring paddle</i>	
	<i>Stirring paddle</i>	2 [0.52]
Lubricant	NLGI	<i>Grease 000 - 2</i>
Degree of protection	IP	6K9k
Noise level	dB	<70
Power supply voltage	VDC	12 – 24
Maximum absorption	A	4 @12V – 2 @24V
Speed	RPM	17±4
Minimum/Maximum level	Type	<i>NO/NC contact (in the absence of fluid) Reed (Maximum current 0.25A @ 120V)</i>
Note: The use of Arctic grease is recommended when using the pump at temperatures below or equal to 0 °C.		

CIRCUIT BOARD TECHNICAL SPECIFICATIONS		
Operating voltages	VDC	12 - 24 \pm 10%
Hardware specifications		Reverse polarity protection on power supply Power supply noise protection (Spike) Remote signalling of cycle status and alarm Cycle control via external sensor Start via external pulse Reset/Extra-cycle via external button
3 input signals	PNP	Same supply voltage
2 output signals	NPN	Digital output, maximum 2 Amps per output

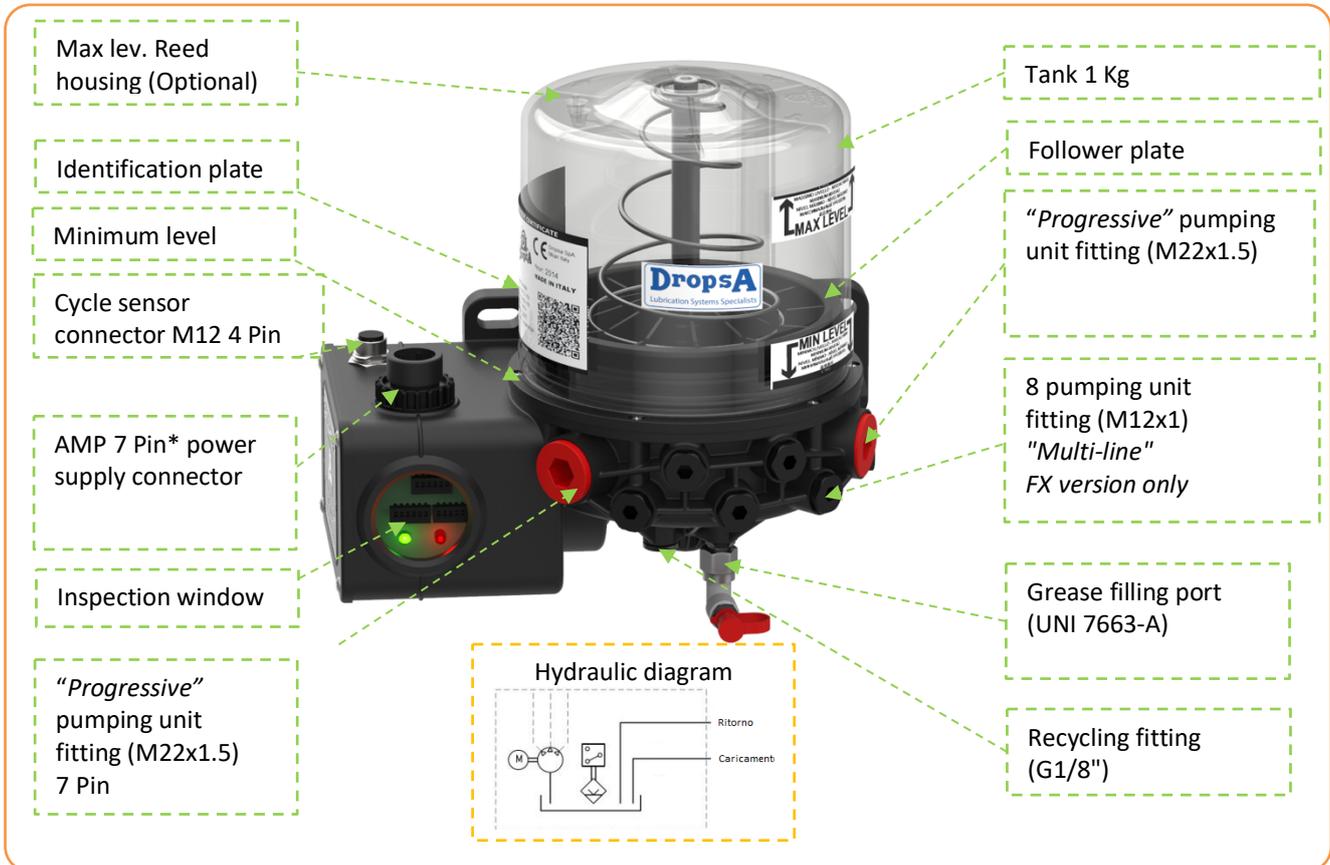
	 WARNING
	<p>Do not supply the machine with voltages other than those indicated on the rating plate.</p>

NOTICE
<p>The indicated flow rate value refers to the following test conditions: grease with NLGI consistency class 2, standard ambient conditions (Temperature 20°C [68°F], pressure 1bar [14.5psi]), back pressure of 50bar [735psi] and 12VDC and 24VDC nominal voltage.</p>

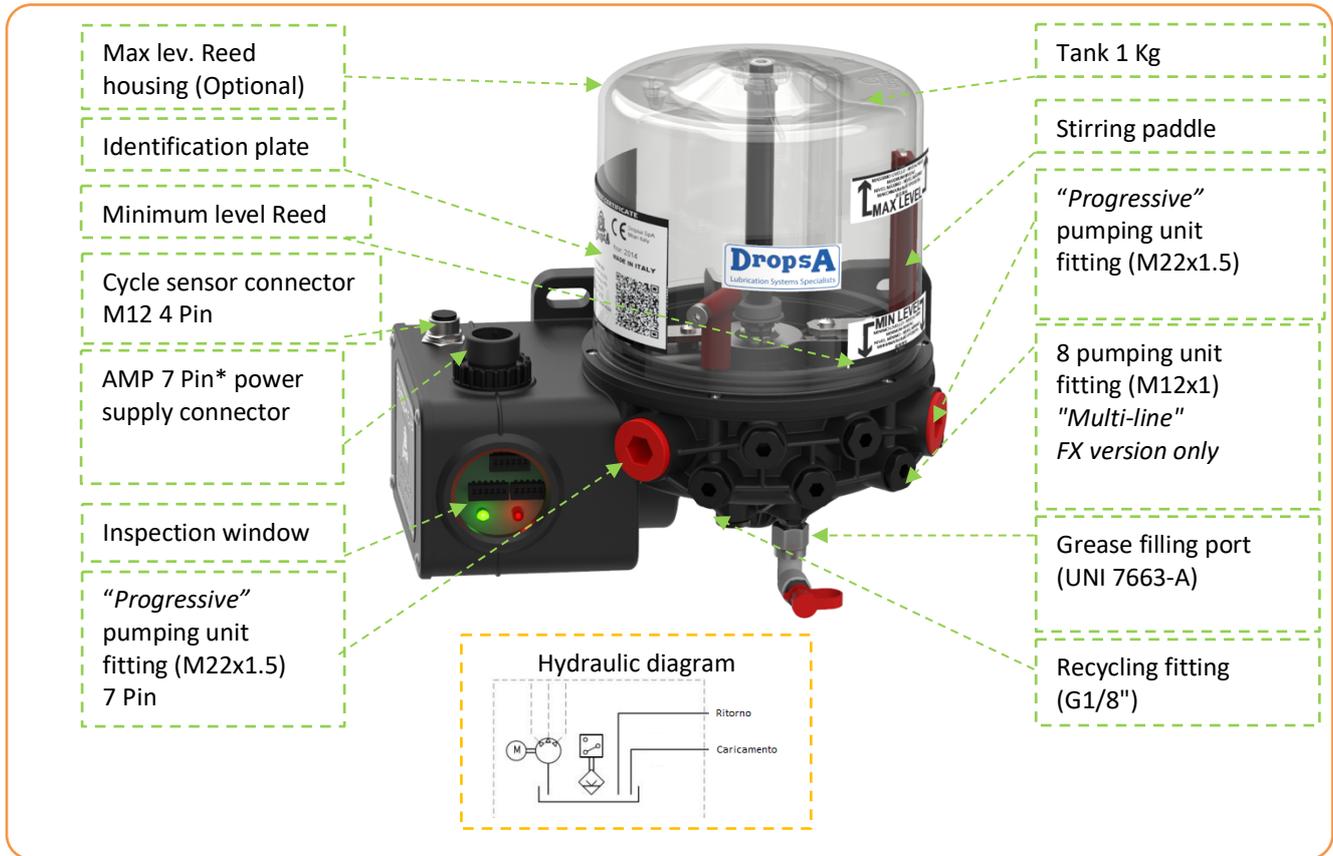
6. PARTS

The main parts that make up the pump in the various versions, the accessories and optionals are shown below.

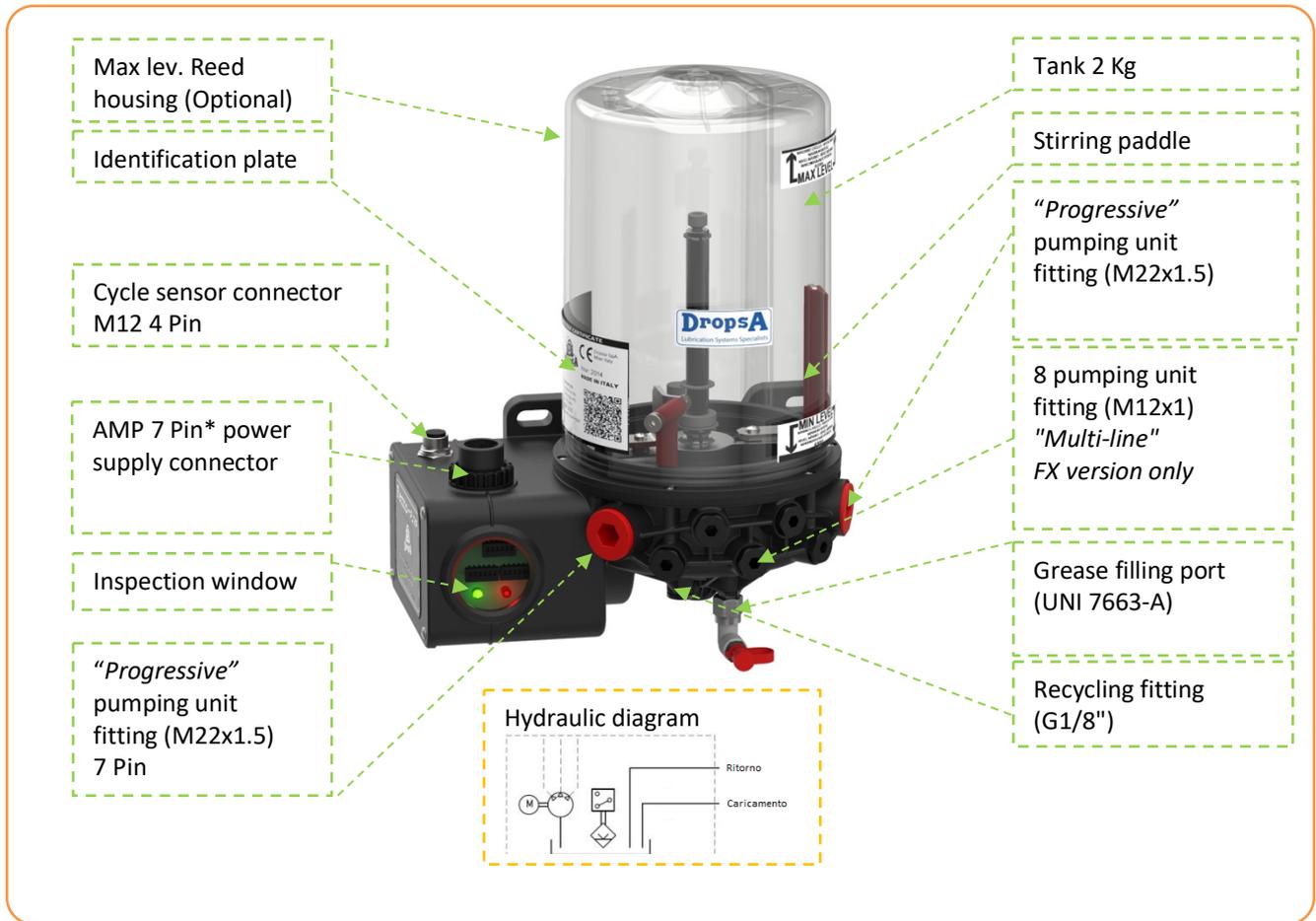
6.1. FEMTO PUMP WITH FOLLOWER PLATE



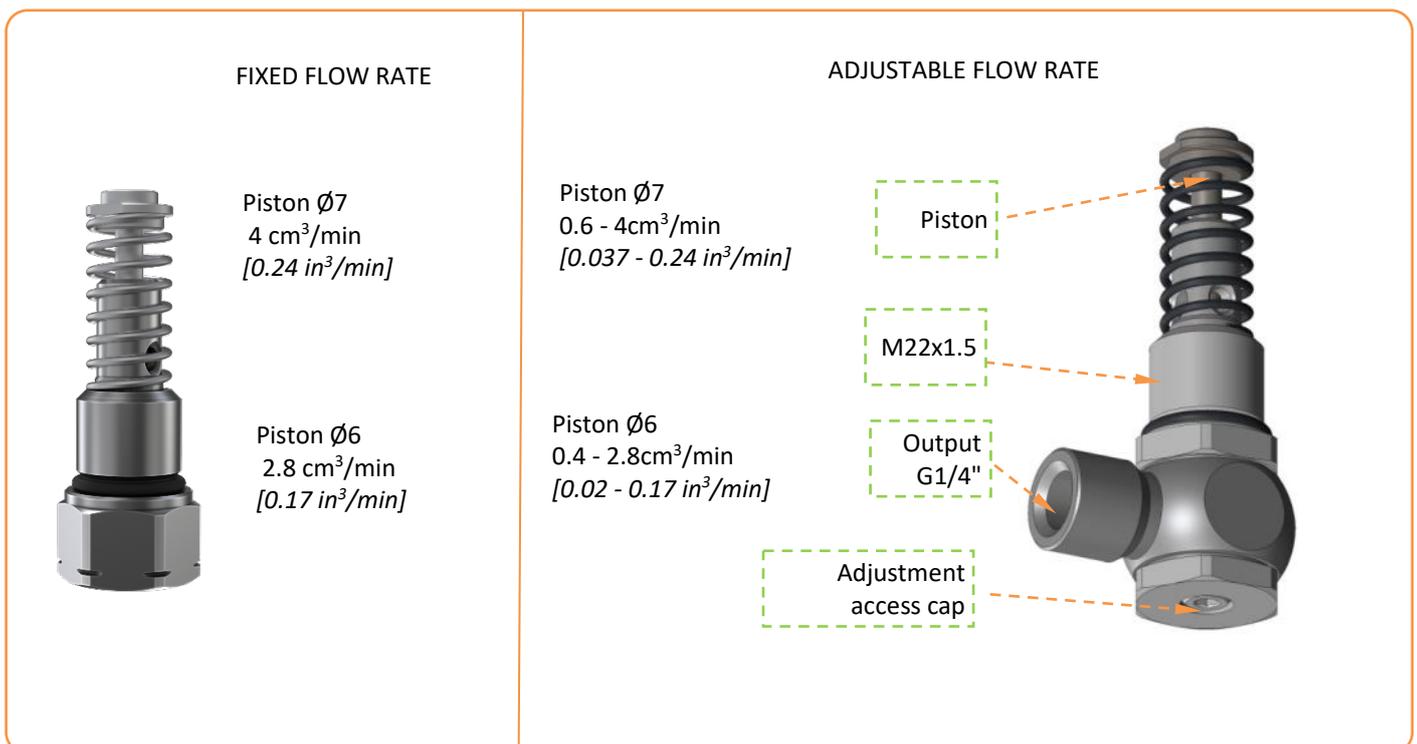
6.2. FEMTO PUMP WITH STIRRING PADDLE 1 L



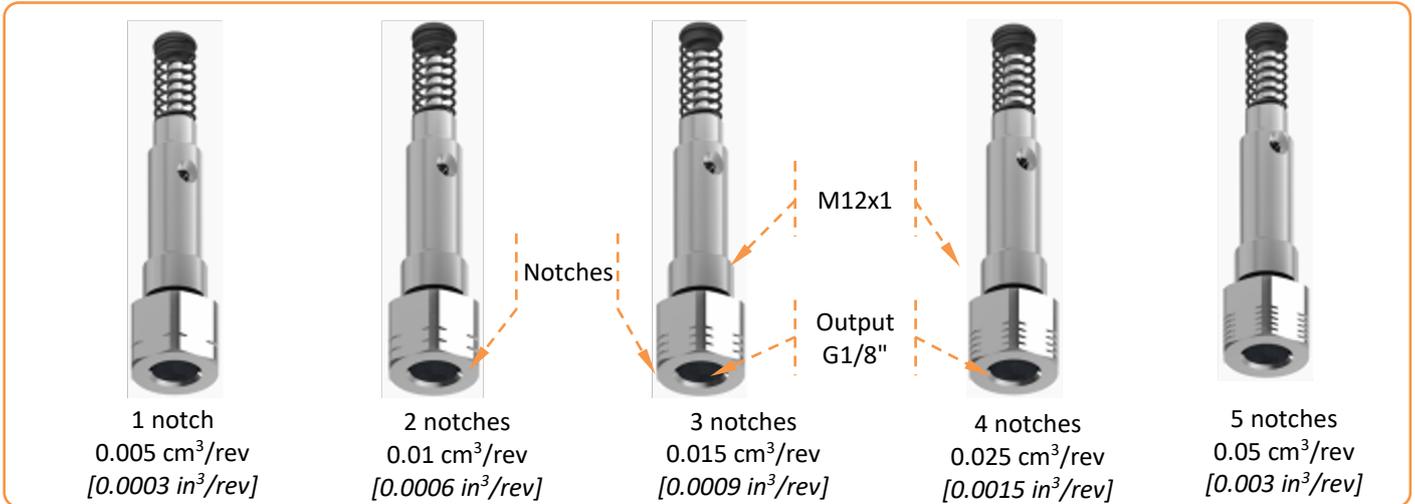
6.3. FEMTO PUMP WITH STIRRING PADDLE 2 L



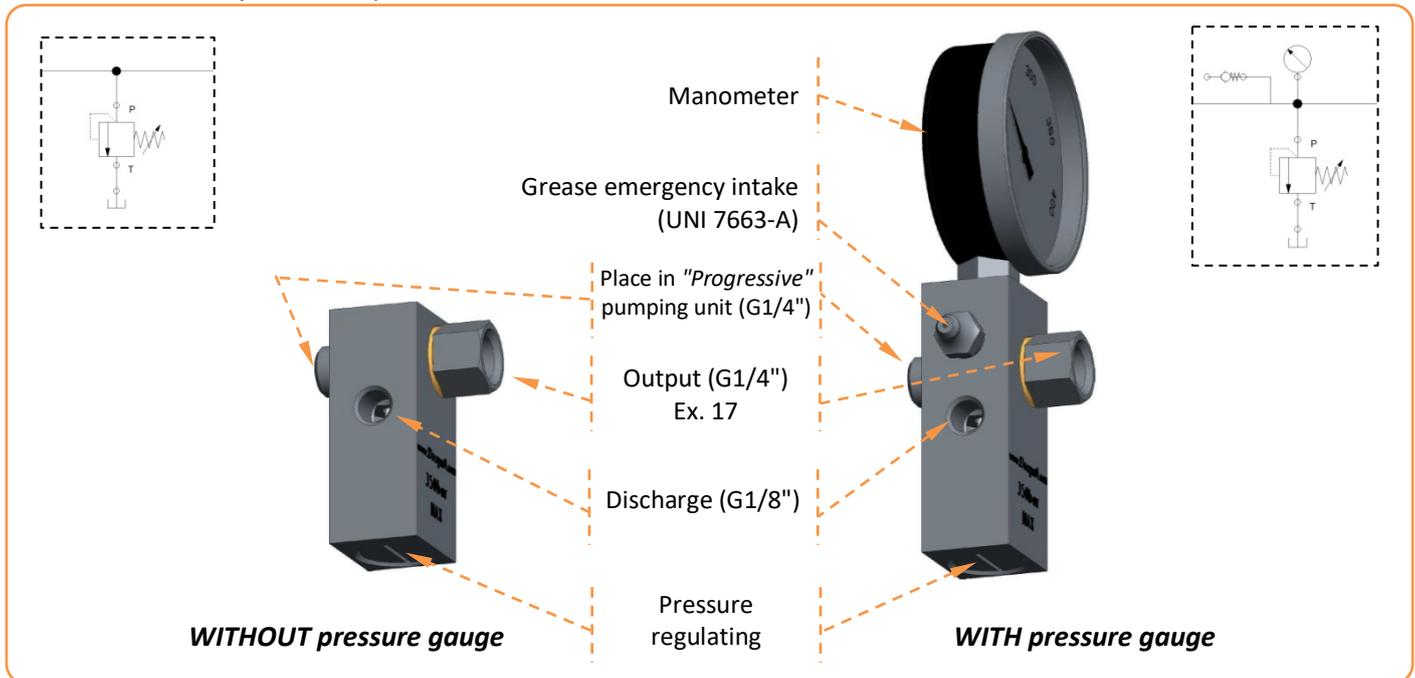
6.4. LUBRICANT FILLING



6.5. "MULTI-LINE" PUMPING UNITS



6.6. KIT BY-PASS (OPTIONAL)



7. UNPACKING AND INSTALLATION

7.1. UNPACKING

Once you have identified a suitable location for installation, open the packaging, take out the pump and make sure that it has not been damaged during transport or storage. The packaging material does not require special disposal precautions, as it is not dangerous or polluting in any way. Refer to local regulations for proper disposal.

7.2. INSTALLATION OF THE PUMP

- The version with follower plate can be mounted in any position.
- Position the electric pump and secure it to its support using the $\varnothing 9$ mm (0.354in) slots with 3 suitable screws.
- Mount the pump so that the greaser for filling the tank and the circuit board panel (auto versions only) are easily accessible.
- Leave at least 100 mm (3.94in) as a perimeter distance to other equipment or obstacles that prevent access to the pump.
- Mount the pump at "man height" to avoid abnormal posture or possibility of impact.
- Do not install the submersible pump in liquids and/or in particularly aggressive environments.
- Do not install the pump in environments where explosive or flammable mixtures are present.
- Do not install the pump near heat sources or close to electrical equipment that may disturb the proper functioning of the electronics.
- Ensure that pipes and cables are properly secured and protected from impact.
- Check that the lubricant used is suitable for the temperatures in use, especially for temperatures below 0°C doubt, contact our Technical Sales Department for the correct choice of lubricant.

7.3. HYDRAULIC CONNECTIONS

The hydraulic connection point for installing the pump to the system is located on the pumping unit body with G1/4" thread for "Basic" pumping units and G1/8" thread for "Multi-line" pumping units. It is possible to have the return in the pump with G1/8" thread.

The pump can be installed in any position on the version with follower plate.

NOTICE

The pipe must reach the point to be lubricated in the shortest possible distance.

During hydraulic connection, make sure that the pumping unit cannot rotate (screwing/unscrewing itself) by holding it in position with a 16 mm spanner (Multi-line) and 27 mm spanner (Basic).

7.4. ELECTRICAL CONNECTION

The user is responsible for the electrical connection and for the clear identification of the power supply, input signal and output signal connection.

Connect the machine to the power line as indicated in this manual.

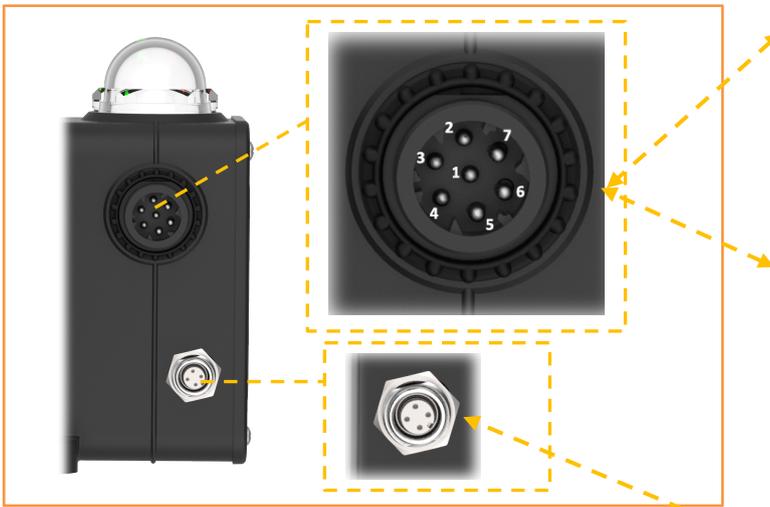
The plug connectors, power and signal cables must be of a cross-section and type suitable for the machine's power consumption and of a type that complies with current regulations. They can be ordered separately (see [12. ORDERING INFORMATION](#))

NOTICE

Check that the power supply of the pump corresponds to that of the machine (label on the side of the tank)

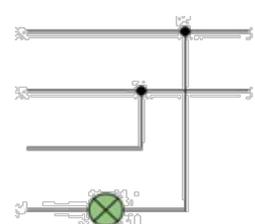
Manual Version Supply Connector	
1	VDC +
2	VDC -
3	COM. Level contact
4	N.O. Level contact in the absence of fluid

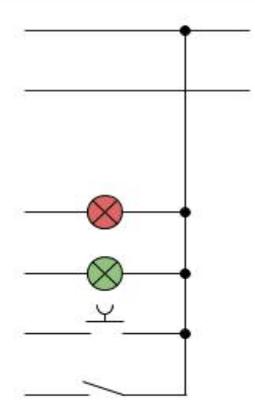
7.4.1. CONNECTION DIAGRAM

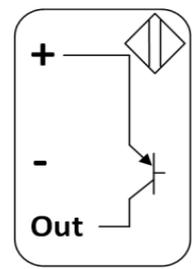
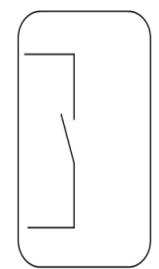


Automatic Connect	Version	Power	Supply
1	VDC +		
2	VDC -		
3	Not conn.		
4	Alarm status output		
5	Cycle status output		
6	Reset Input		
7	Stand-by Pulse Input		

Cycle Sensor Connector (Auto Vers.)	
1 - Brown	VDC +
2 - White	Not conn.
3 - Blue	VDC -
4 - Black	Cycle Sensor Input

Manual Power Supply Connector			
Pin	Description	Connection	Clean Contact
1	+	←	
2	-	←	
3	COM. Level contact	←	
4	N.O. Level contact in the absence of fluid	→	

Auto Power Supply Connector			
Pin	Description	Connection	Connections diagram
1	+	←	
2	-	←	
3			
4	Alarm Status Output	→	
5	Cycle Status Output	→	
6	Reset Input	←	
7	Stand-by Pulse Input	←	

Cycle Sensor Connector				
Pin	Description	Connection	PNP	CONTACT
1	+	→		
2				
3	-	→		
4	Cycle Sensor Input	←		

NOTICE

Pins 1 and 3 of the cycle sensor connectors supply the same voltage as the ends of the power connector. This voltage is used to power the sensor directly.

7.5. INSTALLING THE MAXIMUM LEVEL ALARM, ONLY FOR VERSIONS WITH FOLLOWER PLATE (OPTIONAL)

Screw the alarm sensor into the appropriate seats on the tank, keeping the connection wires towards the pump fastenings.



7.6. INSTALLING PUMPING UNITS/PLUGS

The pumping units are not included in the pump, they must be purchased separately, choosing the appropriate codes. The plugs are included with the pump, already mounted in the pumping unit holes.

To install the pumping units:

- Locate the most correct position, distributing them evenly over the holes present. (FX versions only)
- Remove the plugs from the holes using a 16mm fixed or 6mm spanner (Multi-line) and 12mm spanner (Basic).
- Screw in the pumping units and tighten with a torque of 5Nm (Multi-line) and 9Nm (Basic) using a 16mm spanner (Multi-line) and 27mm spanner (Basic).
- **CAUTION:** Insert the pump into the predefined outlet, making sure it correctly engages in the thread.

8. OPERATING INSTRUCTIONS

8.1. ACTIONS TO CARRY OUT BEFORE START UP

- The unit can only be operated by specialised personnel.
- The submersible pump must not be used in fluids, in particularly aggressive or explosive/flammable environments unless it has been prepared for this purpose by the supplier in advance.
- Use safety gloves and goggles as prescribed on the lubricant safety data sheet.
- DO NOT use aggressive lubricants against NBR seals, when in doubt consult Dropsa S.p.A. technical department who will provide a detailed data sheet on recommended lubricants.
- Do not ignore health hazards and observe hygiene rules.
- Always use piping that is suitable for operating pressures.
- Check the integrity of the pump.
- Check the lubricant level in the tank (min/max indication on the tank); if the level is low, proceed as described in chapter [7.2.1. TANK FILLING](#).
- Check that the pump works at operating temperature and that the pipes are free of air bubbles.
- Check the correct connection of the electrical devices.

To determine the maximum operating pressure, it is necessary to know the pressure drop of the pipe connected to the pumping units, depending on the length, operating temperature and type of lubricant.

Depending on these variables, to ensure correct dispensing to the point, it is always necessary to check that the pressure drop of the piping added to the pressure required at the point to be lubricated is not greater than the maximum pressure that can be dispensed to the pump discharge.

NOTICE

To avoid any malfunctions and loss of warranty, it is advisable to refill the impurity-free lubricant only through the dedicated filling system.

8.2. LUBRICANT FILLING

Check that all pumping unit housing holes/plugs have been filled.

8.2.1. TANK FILLING (*FOLLOWER PLATE VERSION*)

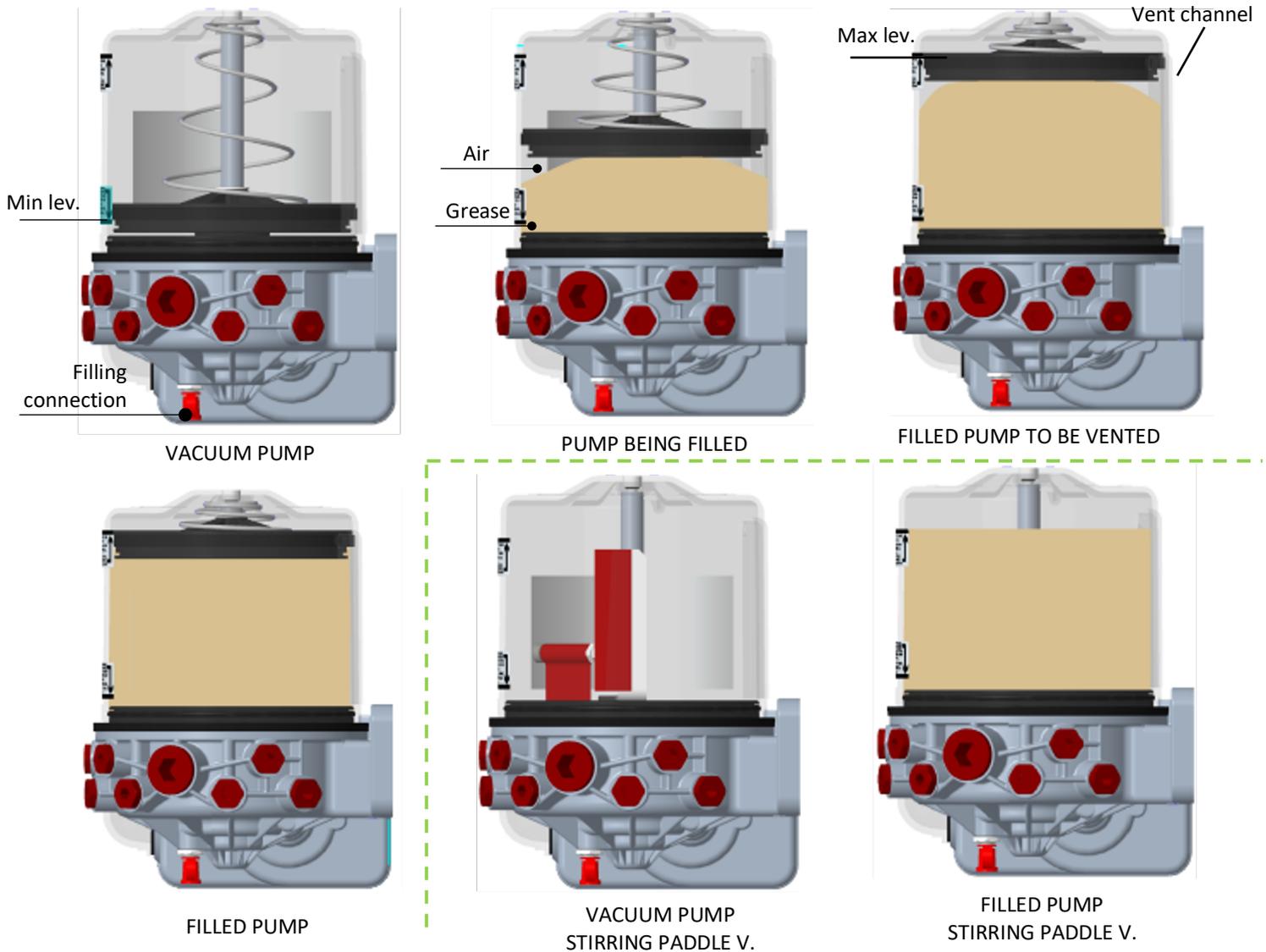
The tank is filled using the dedicated device complete with filter to be interfaced to the filling connection. A filling KIT with a manual pump can also be used, interfaced with an adapter on the M22 thread where the Basic pumping unit is not present.

In the case of a first filling (with the pump completely empty, without any grease remaining from the previous filling), it is necessary to keep the pump vertical in order to eliminate any air present in the tank. Reaching and slightly exceeding the point coinciding with the line slightly placed on the maximum level plate (the lubricant comes from below) will open the vent hole which will allow the air to escape.

If the maximum level line is exceeded by a large amount, lubricant may leak from the vent channel. As soon as the follower plate returns to its working position after the excess volume has been discharged, this will stop.

Subsequently, filling can also be carried out in different orientations, making sure that the maximum level line is not exceeded.

If this happens, lubricant will again leak from the vent channel.



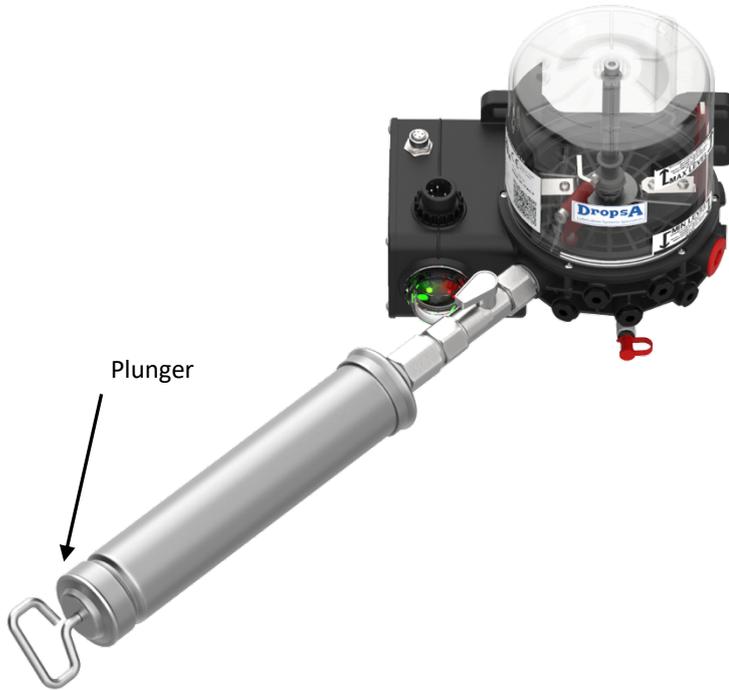
8.2.2. TANK FILLING (STIRRING PADDLE VERSION)

Tank filling must be carried out using the dedicated device complete with filter to be interfaced to the filling connection. A manual filling KIT can also be used, interfaced on the M22 thread where the Basic pumping unit is not present. During filling, the air will be discharged directly from the hole present on the vent channel. If the Max. level line is exceeded, lubricant will leak from the vent channel.

8.2.3. TANK FILLING WITH MANUAL PUMP KIT (ALL VERSIONS)

Where available, mount the fittings for connecting the manual filling pump.

Open the tap, engage the pump on the appropriate connection and move the pump plunger, close the tap and remove the cartridge.



8.3 ADJUSTABLE PUMPING UNIT SETTING

To set the Basic pumping unit with adjustable flow:

- Ensure that there is no residual pressure in the discharge pipe.
- Remove the adjustment access plug using a size 4 Allen key (see [5.4. "Basic" PUMPING UNITS](#)).
- Turn the pumping unit jacket using a size 4 Allen key inserted into the grub screw on the inside.
- Each full rotation of the wrench corresponds to approx. 0.03 cc/cycle with an adjustment range of 0.4 to 2.8 cc/min or corresponds to approx. 0.04 cc/cycle with an adjustment range of 0.6 to 4 cc/min for a total of 4 rotations.
- Check the presence and conformity of the copper seal (replace if necessary).
- Refit the plug using a size 4 Allen key.

8.4 EXTERNAL BY-PASS KIT INSTALLATION

The optional external By-Pass-Kit is only designed for use with pumping units in positions A and B (see 14.2.2 "Basic")

The By-Pass can be fitted in different solutions (see 6.6 "Optional By-Pass-Kit").

Piping and connection fittings are the responsibility of the installer.

Proceed as follows for installation and use:

- Ensure that there is no residual pressure in the discharge pipe.
- If connected, unscrew the discharge pipe from the pumping unit while holding it with the 27 mm spanner.
- Screw the By-Pass kit onto the pumping unit while holding it with the 27 mm spanner.
- Connect the outlet to the recycling or filling port at the bottom of the pump with the appropriate fittings.
- Reconnect/connect the discharge pipe while holding the By-Pass fitting with the 17 mm spanner.
- Once in operation, pressure can be adjusted by screwing/unscrewing the screw at the bottom of the kit.

8.5 SETUP

- Check the setting data set on the control panel, if any.
- Press the start button of the machine to which the pump is connected.
- Check pump start-up.
- Check that the machine is adequately lubricated (if there are any doubts as to its correct operation, contact the Dropsa S.p.A. technical office to request testing).

8.6 START UP

No adjustments are foreseen; the pump is electrically powered by a system that controls its operation and manages the minimum level contact if the LTC card is not present.

For operation of the lubrication system, please refer to the operating and control instructions of the machine in which the pump is installed.

9. LUBRICATION CONTROL PRINCIPLE (AUTOMATIC VERSION)

9.1. CYCLE OPERATION

In this version, the pump is fitted with a circuit board for controlling lubrication.

The control board, located inside the motor housing, guarantees total pump autonomy for the management of lubrication cycles, alarms and controls. In addition, the pump is equipped with three *digital inputs* for controlling the lubrication cycle and two *digital outputs* for monitoring the lubrication status and alarms.

The **Femto** automatic lubrication control unit can be programmed to operate according to the **Work-Stand-by lubrication** principle.

This principle is based on three fundamental concepts:

- A) **Pre-Lube**
- B) **Work**
- C) **Stand-by**

D) **Pre-Lube**

If enabled via switch 1 on the Config dip-switch, this phase consists of performing a full lubrication cycle immediately after the pump is powered up.

If pre-lubrication is not enabled, the pump will resume operation from the state prior to shut-down.

A) **Work**

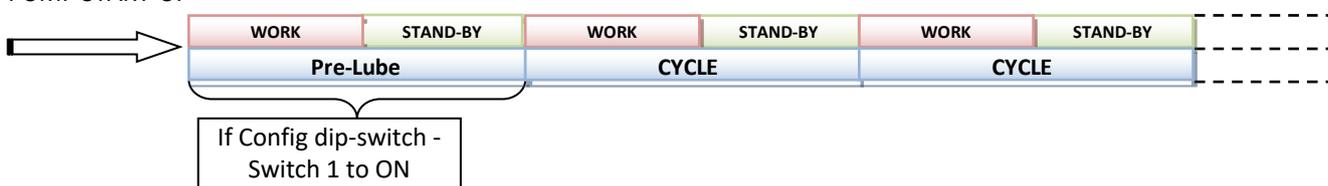
This phase consists of a time during which the equipment carries out lubrication. If enabled via switch 5 on the Config dip-switch, during this time the device can check for actual lubrication via an external cycle sensor. If there is no change in the status of the sensor during the lubrication phase, the only thing that will be signalled is that lubrication is not correct (the cycle continues to operate), by means of the alarm LED and the relative alarm output.

B) **Stand-by**

In this phase the lubrication system is inactive until the next lubrication phase.

This phase can be set either in time mode (switch 1 on the Config dip-switch to Off) or pulse mode (switch 1 on the Config dip-switch to On). In both modes (Time - Pulse), the stand-by count will start as soon as the lubrication phase has ended. In this phase, the pump will remain stationary until the time has elapsed or the pulses have been reached, depending on the type of stand-by chosen.

PUMP START-UP



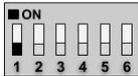
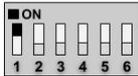
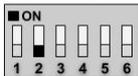
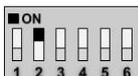
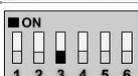
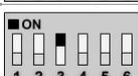
10. LUBRICATION CONTROL SETTINGS

10.1. DESCRIPTION OF PARTS

The pump is equipped with a configuration dip-switch, two dip-switches for adjusting the lubrication time and the stand-by phase and two LEDs for operation and alarm status.



10.1.1.CONFIG. DIP-SWITCH

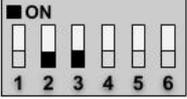
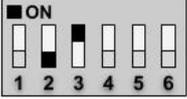
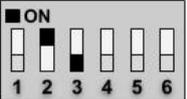
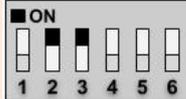
Config. dip-switch				
Switch	Function	Switch Status	Function status	Description
1	Start-up from		Last Status	After the pump has been started up, the lubrication cycle will resume from the state prior to shut-down.
			Pre-lubrication	After the pump has been started up, a new lubrication cycle will start.
2	Stand-by		Time	Stand-by is time-based
			Pulses	Stand-by is pulse-based
3	Stand-by		Scale 1	The stand-by value scale is 1 (Minutes)
			Scale 2	The stand-by value scale is 2 (Hours)
4	Work		Scale 1	The work value scale is 1 (Seconds)
			Scale 2	The work value scale is 2 (Minutes)
5	Cycle Control		Off	The pump does not perform any control on the cycle sensor
			On	The pump checks the actual movement of the cycle sensor during the lubrication phase
6	Minimum Level		Off	The pump does not stop in the event of minimum level
			On	The pump stops in the event of minimum level

10.1.2.STAND-BY DIP-SWITCH

This dip-switch is used to configure the stand-by time/pulses. To set the desired time/pulses, the combination of one or more switches and the chosen scale can be set via the Config dip-switch. The table below shows the values of each individual switch.

NOTICE

At least one active switch must be present for correct operation

Stand-by Dip-switch				
Stand-by Switch	Time mode		Pulse mode	
	Config	Config	Config	Config
	 Scale 1 (Minutes)	 Scale 2 (Hours)	 Scale 1	 Scale 2
1	1	0.5	1	50
2	2	1	2	100
3	4	2	4	200
4	8	4	8	400
5	16	8	16	800
6	32	16	32	1600
	From 1 to 63 minutes, step 1 minute	From 0.5 to 31.5 hours, step 30 minutes	From 1 to 63 pulses, step 1 pulse	From 50 to 3150 pulses, step 50 pulses

10.1.3.WORK SWITCH

This dip-switch is used to configure the lubrication time. To set the desired time, the combination of one or more switches and the chosen scale can be set via the Config dip-switch. The table below shows the values of each individual switch.

Work Dip-switch		
Work Switch	Config	Config
	 With scale 1 (Seconds)	 With scale 2 (minutes)
1	1	1
2	2	2
3	4	4
4	8	8
5	16	16
6	32	32
	From 1 to 63 seconds, step 1 second	From 1 to 63 minutes, step 1 minute

10.1.4 CYCLE LED

The green “Cycle” LED will light up in different ways depending on the current status of the pump. If the pump is in 'Stop' status, the light stays off; if it is lubricating the light will stay on and if the pump is in stand-by the light will be flashing.

10.1.5 ALARM LED

The red “Alarm” LED lights up if there is a problem with the pump and the number of flashes indicates the type of alarm. If the LED flashes once per second, this means that there is a level alarm. If it flashes twice, this means that the cycle sensor control is enabled, but a cycle has been completed without any change in sensor status.

To restore correct pump operation, press the external reset button or switch the pump off and on again.

10.2. FIRST START-UP

Before starting to power up the pump, remember to fill the lubricant tank following the instructions in paragraph [7.2.1](#). and proceed as follows:

1. Open the window in front of the dip-switches.
2. Set all the dip-switches to the chosen mode.
3. Close the window.
4. Connect all connectors to the pump.
5. Power up the pump.
6. On power-up, the system will read the dip-switch settings and start with that configuration. To change the dip-switches see paragraph [9.3](#).

10.3. CHANGING SETTINGS

To change the dip-switch setting:

1. Switch off the power supply to the pump.
2. Open the window in front of the dip-switches.
3. Adjust the dip-switches.
4. Close the window.
5. Restore power to the pump.

11. TROUBLESHOOTING

Below is a diagnostic table highlighting the main faults, probable causes and possible solutions to be activated immediately (contact Dropsa).

In case of doubts and/or problems that cannot be solved, do not try to disassemble parts of the pump; contact the Dropsa Technical Office.

DIAGNOSTICS TABLE		
FAULT	CAUSE	REMEDY TO ADOPT
The pump motor does not work.	There is no power supply.	Check the power supply system.
	The circuit board is not working.	Replace the circuit board  .
The pump works but no lubricant reaches the lubrication points.	Disconnected pipes.	Check the piping conditions and relative connections to the fittings. Replace worn pipes.
	The progressive distributor is blocked.	Clean or replace the distributor.
Irregular doses of lubricant is distributed to the lubricant points.	The distributor is not properly connected to the lubrication points.	Check the doses against the system diagram.
The pump starts the greasing phase but ends it immediately.	The motor is defective.	Let it cool down for a few minutes and then try again, if the problem persists replace the motor  .
The pump does not dispense lubricant.	The tank is empty.	Re-fill the tank with clean lubricant.
	Air bubbles in the lubricant.	Disconnect the primary piping from the pumping unit connection. Operate the pump according to the manual/automatic operating cycle until lubricant comes out of the fitting completely free of air bubbles.
	Use of unsuitable lubricant.	Empty the tank and refill it again with suitable lubricant.
	Pump suction clogged.	Remove the pump and clean the suction lines.
	The pump piston is worn.	Replace the pumping element.
	The pump discharge valve is blocked.	Replace the pumping element.

 CAUTION		
		
Operations to be carried out by Dropsa specialists only.		

12. MAINTENANCE PROCEDURES

The pump does not require special equipment for any inspection and/or maintenance operations. In any case, it is recommended to use equipment and personal protective equipment suitable for use (gloves, protective glasses, etc.) and in good condition in accordance with the regulations in force to avoid damage to persons or parts of the pump. The unit has been designed and constructed to require minimal maintenance operations. It is however advisable to always keep the equipment body clean and to periodically check the piping joints in order to promptly detect any leaks.

	 WARNING	
	Make sure that the electrical, hydraulic and pneumatic power supplies are disconnected before carrying out any maintenance operations.	

12.1.SCHEDULED MAINTENANCE

The following table lists the periodic checks, the frequency and the intervention to be carried out by the maintenance technician to ensure the efficiency of the system over time.

CHECK	FREQUENCY	OPERATION
Pipe attachments	After the first 500 hours Every 1500 hours	Check the connection to the fittings. Check the attachment to the machine parts.
Tank level	As needed	Restore the level of lubricant in the tank.

13. DISPOSAL

During pump maintenance, or in case of its demolition, do not dispose of polluting parts in the environment. Refer to local regulations for their correct disposal. When dismantling the pump, the identification plate and any other documents must be destroyed.

NOTICE
The pump contains the following items made of AlCu6 BiPb,11SMnPb37 and 11SMnPb30: Guide Rod 1Kg 0890039 Guide Rod 2Kg 0890035, BRAVO-PUMPING UNIT D7 0880104, D6 0888156, BRAVO-PUMPING UNIT D7 ADJUSTABLE 0880060, D6 ADJUSTABLE 0888555, PUMPING UNIT 0.005cc - 1 NOTCH 0890034, PUMPING UNIT 0.010cc - 2 NOTCHES 0890033, PUMPING UNIT 0.015cc - 3 NOTCHES 0890032, PUMPING UNIT 0.025cc - 4 NOTCHES 0890031, PUMPING UNIT 0.050cc - 5 NOTCHES 0890030

14. ORDERING INFORMATION

14.1. PUMP ORDERING CODE

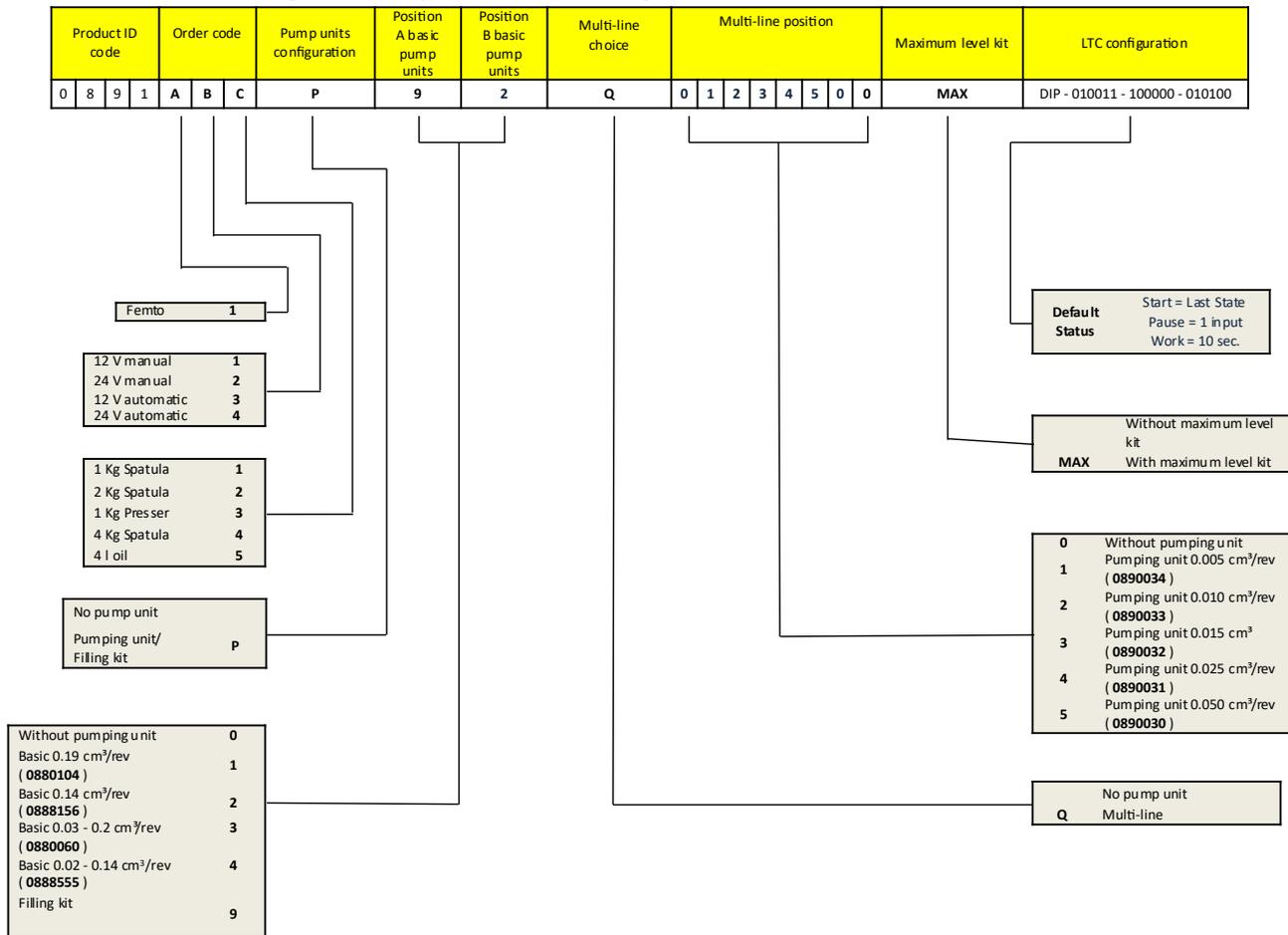
TYPE	VOLTAGE	TANK	MANUAL VERSION (Without Controller)	AUTOMATIC VERSION (With integrated Controller)
Femto	12 VDC	1KG	0891111	0891131
		2KG	0891112	0891132
		4KG	0891114	0891134
		4LT	0891115	0891135
		1KG Version with follower plate disc	0891113	0891133
	24 VDC	1KG	0891121	0891141
		2KG	0891122	0891142
		4KG	0891124	0891144
		4LT	0891125	0891145
		1KG Version with follower plate disc	0891123	0891143

14.2. BASIC/MULTI-LINE PUMPING UNIT CODES

PUMPING UNITS				
CODE	Tipo	FLOW RATE	NOTES	ID
0880104	BASIC	4 cm ³ /min	Fixed	1
0888156		2.8 cm ³ /min	Fixed	2
0888555		0.4 - 2.8cm ³ /min	Adjustable	3
0880060		0.6 - 4cm ³ /min	Adjustable	4
0890034	MULTI-LINE	0.005 cm ³ /rev	1 notch	1
0890033		0.010 cm ³ /rev	2 notches	2
0890032		0.015 cm ³ /rev	3 notches	3
0890031		0.025 cm ³ /rev	4 notches	4
0890030		0.050 cm ³ /rev	5 notches	5

14.2.1.FACTORY-PRE-SET PUMPS

The above identification string has been split into the following five sections:



➤ **SECTION 1: Product ID Code + Order Code.**

7 digit string which identifies the series (0891) of the FEMTO pump and the "basic" order code

➤ **SECTION 2: Basic Pumping Units.**

Up to 3 digit string that indicates whether or not the Basic pumping units, bypass and filling kit are included. Positions A and B indicate the type and position of the pumping units/ filling kits.

➤ **SECTION 3: Multiline Pumping Units.**

Up to 9 digit string that indicates whether or not the Multiline pumping units are included and their position.

➤ **SECTION 4: Maximum Level Kit.**

Up to 2 digit string that indicates whether or not the maximum level sensor kit is included.

➤ **SECTION 5: LTC Configuration.**

24 digit string that indicates the standard setting of the LTC configuration (not considered in the configurator)

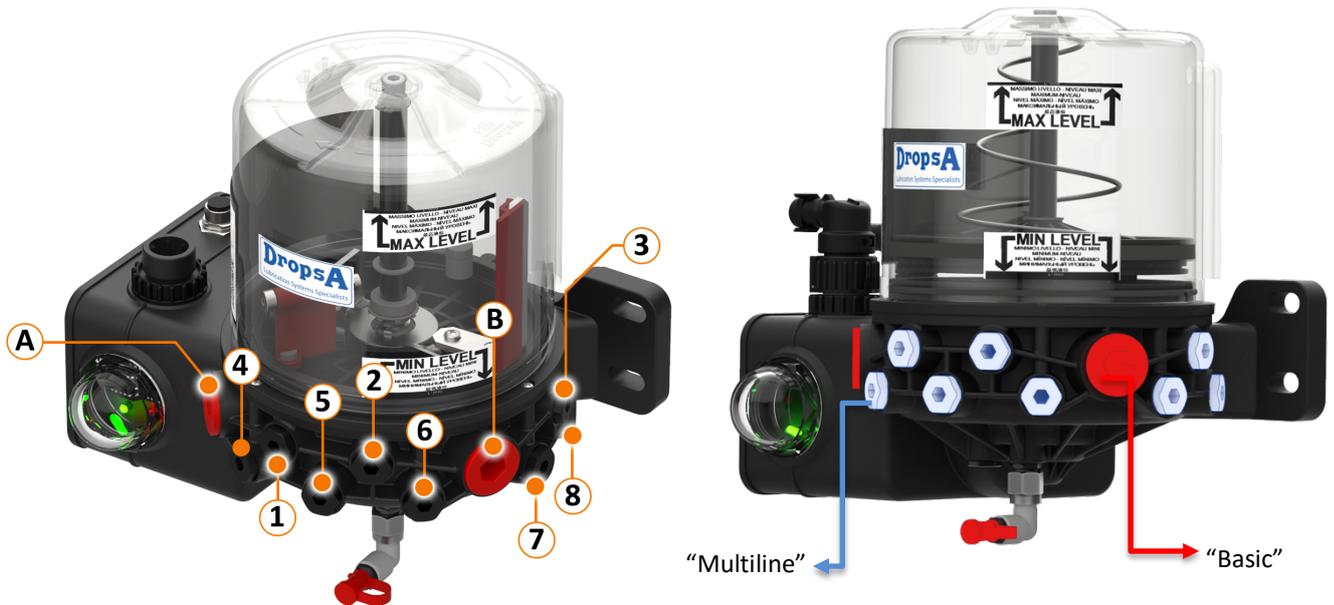
Examples Pag.28

14.2.2. POSITION OF BASIC/MULTI-LINE PUMPING UNITS & REFILLING KIT (ALL VERSIONS)

The position of the pumps elements is defined:

Alphanumeric character = Pump element "Basic" & Refilling kit

Numeric character = Pump element "Multiline"



Example of ordering with pumping units:

➤ FIRST EXAMPLE: **0891111P10**

- Femto Pump
- Power supply 12Vdc manual
- Tank capacity 1K with Stirring paddle
- N°1 pumping unit with a capacity of 0.19 cm³ per revolution in pos.(A)

➤ SECOND EXAMPLE: **0891123P11Q11000000MAX**

- Femto Pump
- Power supply 24Vdc Manual
- Tank capacity 1Kg with follower plate
- N°1 pumping unit with a capacity of 0.19 cm³ per revolution in pos.(A)
- N°1 pumping unit with a capacity of 0.19 cm³ per revolution in pos.(B)
- N°1 pumping unit multiline with a capacity of 0.05 cm³ per revolution in pos.(1)
- N°1 pumping unit multiline with a capacity of 0.05 cm³ per revolution in pos.(2)
- Max level Kit

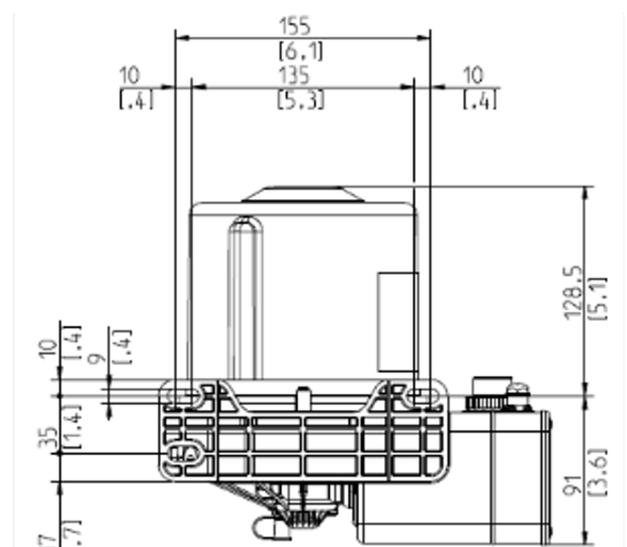
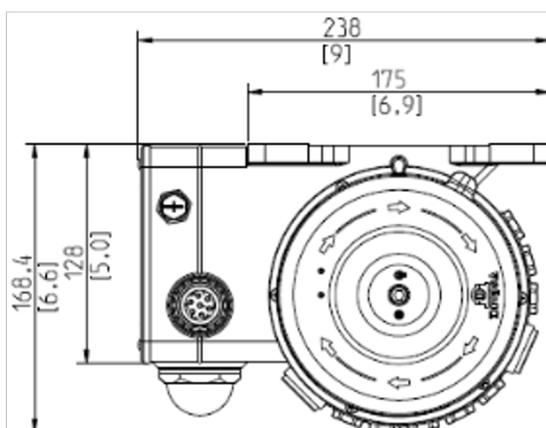
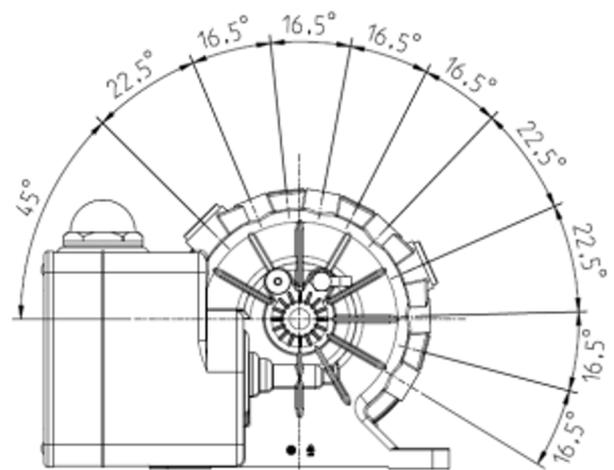
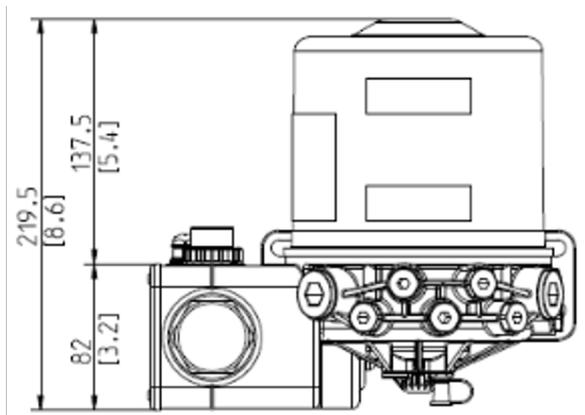
15. SPARE PART KITS AND ACCESSORIES

OPTIONAL KITS AND ACCESSORIES	
CODE	DESCRIPTION
3133723	Cartridge-loading-kit
0890014	Maximum level sensor kit, only for versions with follower plate (optional)
0888572	External by-pass with pressure gauge
0888163	External by-pass without pressure gauge
0039137	M12 connector - 90° 5m cable
0039138	M12 connector - 90° 10m cable
0039139	M12 connector - 90° 15m cable
0039999	M12 connector - 90° without cable
0039169	M12 connector - dir. without cable
0888610	Connector wiring DIN 72585 5m
0888633	Connector wiring DIN 72585 10m
0888634	Connector wiring DIN 72585 15m
5717203	Nylon-Hose 6.6 6X4 L=130mm To be specified when ordering. (By-pass connection)
3084566	Push-in 90 g1/8 d6 (By-pass connection)
3084760	Push-in-dir 1/8 ø6 (By-pass connection)

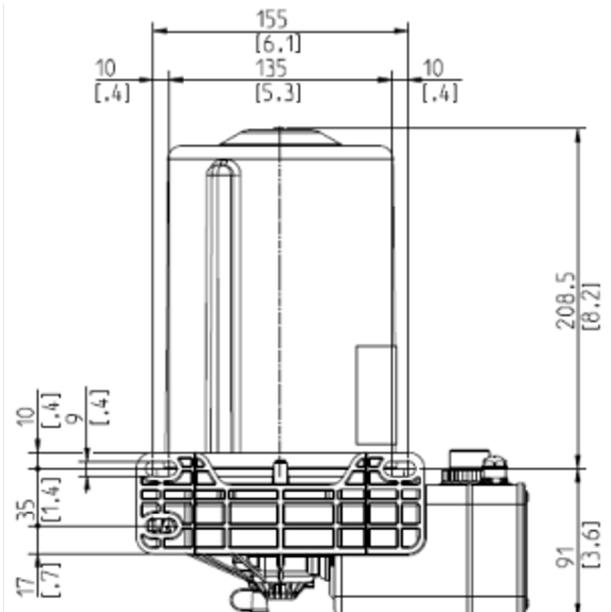
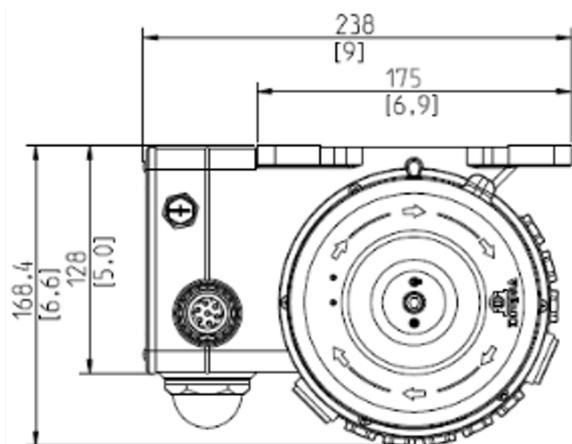
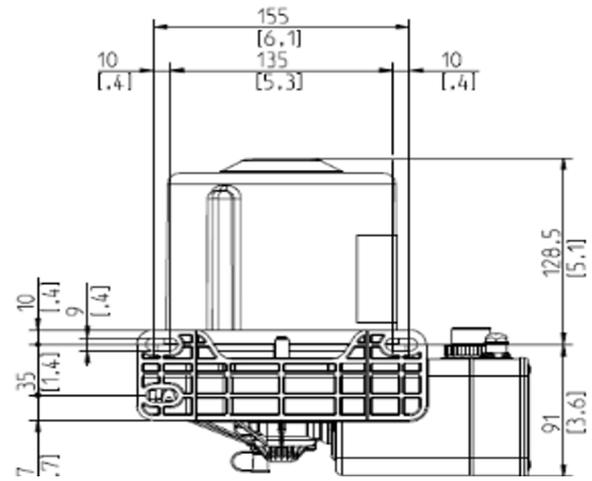
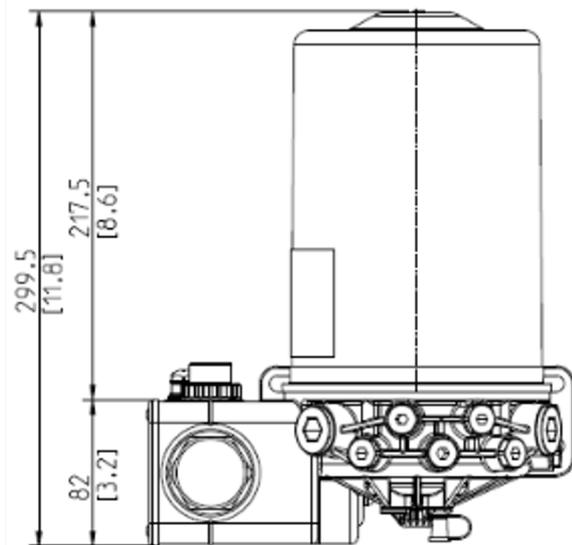
SPARE PARTS	
CODE	DESCRIPTION
0890011	Follower plate + seals kit
0890012	1kg tank kit
0890013	2kg tank kit
0888185	Pumping unit replacement plug (Multi-line)
3234300	Pumping unit replacement plug (Basic)
3235999	Inspection window
3236000	Blind Plug
1639281	LTC control card
0039086	Connector ring din 72585

16. OVERALL DIMENSIONS

1 Kg Femto Pump all versions



2 Kg Femto Pump all versions



17. HANDLING AND TRANSPORT

Before shipping, the pumps are carefully packed in a cardboard box. When transporting and storing the equipment, pay attention to the orientation indicated on the box. Upon receipt, check the packaging for damage and store the pump in a dry place.

18. PRECAUTIONS FOR USE

- Electrical power supply**
 No work should be carried out on the machine until it has been disconnected from the power supply and it has been ensured that nobody can reconnect it during the work. All installed equipment (electrical and electronic) must be connected to the earth line.
- Flammability**
 The lubricant generally used in lubrication circuits is not a flammable fluid. However, all necessary related precautions must be taken to prevent it coming into contact with hot parts or open flames.
- Pressure**
 Before any work is carried out, check that there is no residual pressure in any branch of the lubricating circuit, which could cause oil splashes when fittings or parts are removed.
- Noise level**
 The equipment does not emit noise exceeding 70 dB (A).

 CAUTION		
		
<p>CAUTION: Carefully read the warnings about the risks involved in using a lubricant pump. The user must familiarise him/herself with its operation through the User and Maintenance Manual.</p>		

18.1. LUBRICANTS

A comparison table is shown between the NLGI (National Lubricating Grease Institute) and ASTM (American Society for Testing and Materials) classification for greases, limited to the values affecting the FemtoPUMP pump.

NLGI	ASTM
000	445 - 475
00	400 – 430
0	355 – 385
1	310 – 340
2	265 – 295

For further information on the technical characteristics and safety measures to be adopted, consult the Product Safety Data Sheet (Directive 93/112/EEC) relating to the type of lubricant chosen and supplied by the manufacturer.

NOTICE

The pump is designed to work with lubricants with a maximum NLGI 2 grade. Use lubricants compatible with NBR seals. Any residual lubricant used for assembly and testing is NLGI grade 2.

19. CONTRAINDICATIONS OF USE

Verification of compliance with the essential safety requirements and the provisions of the Machinery Directive was carried out by means of pre-prepared check lists contained in the technical dossier.

Three types of lists were used:

- Compliance with essential safety requirements (2006/42 EC - Machinery Dir.).
- Risk assessment (EN ISO 12100).
- Electrical safety requirements (EN 60204-1).

The hazards that are not completely eliminated, but considered acceptable, are listed below:

- Low-pressure lubricant splashes may occur during maintenance. (Maintenance activities must therefore be carried out using appropriate PPE).
- Contact with lubricant during maintenance or tank filling. → Protection against direct or indirect contact with lubricant must be provided by the machine user. (See the requirements on the use of suitable PPE in accordance with the regulations in force).
- Use of unsuitable lubricant. → The lubricant characteristics are shown both on the pump and in this User and Maintenance Manual (if in doubt, contact the Dropsa Technical Office):

FLUIDS THAT ARE NOT PERMITTED	
FLUIDS	HAZARDS
Lubricants with abrasive additives	<i>High consumption of contaminated parts</i>
Lubricants with silicone additives	<i>Seizing of the pump</i>
Petrol – solvents – inflammable liquids	<i>Fire – explosion – damage to the gaskets</i>
Corrosive products	<i>Pump corrosion – damage to people</i>
Water	<i>Pump oxidation</i>
Food substances	<i>Contamination of the same</i>

DropsA

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