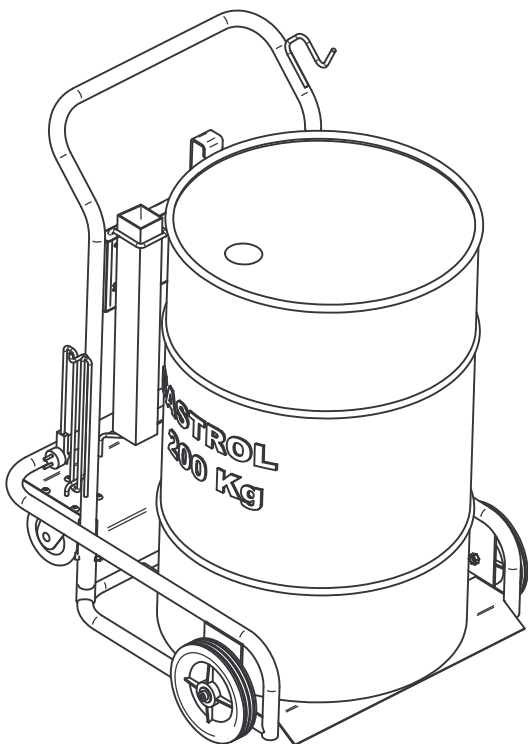
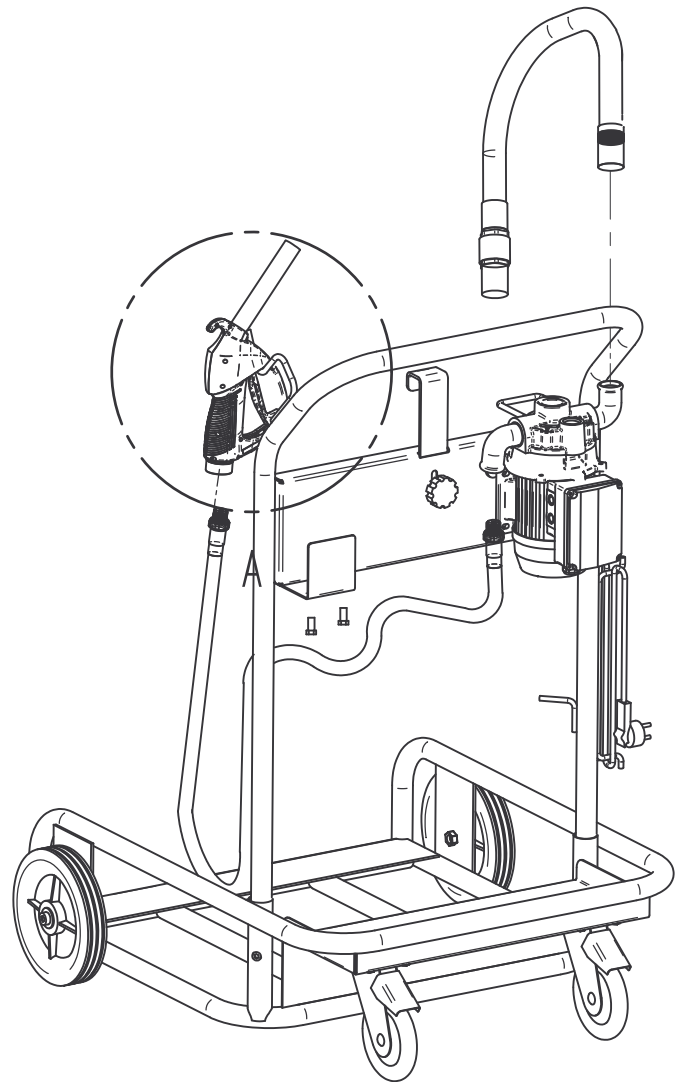
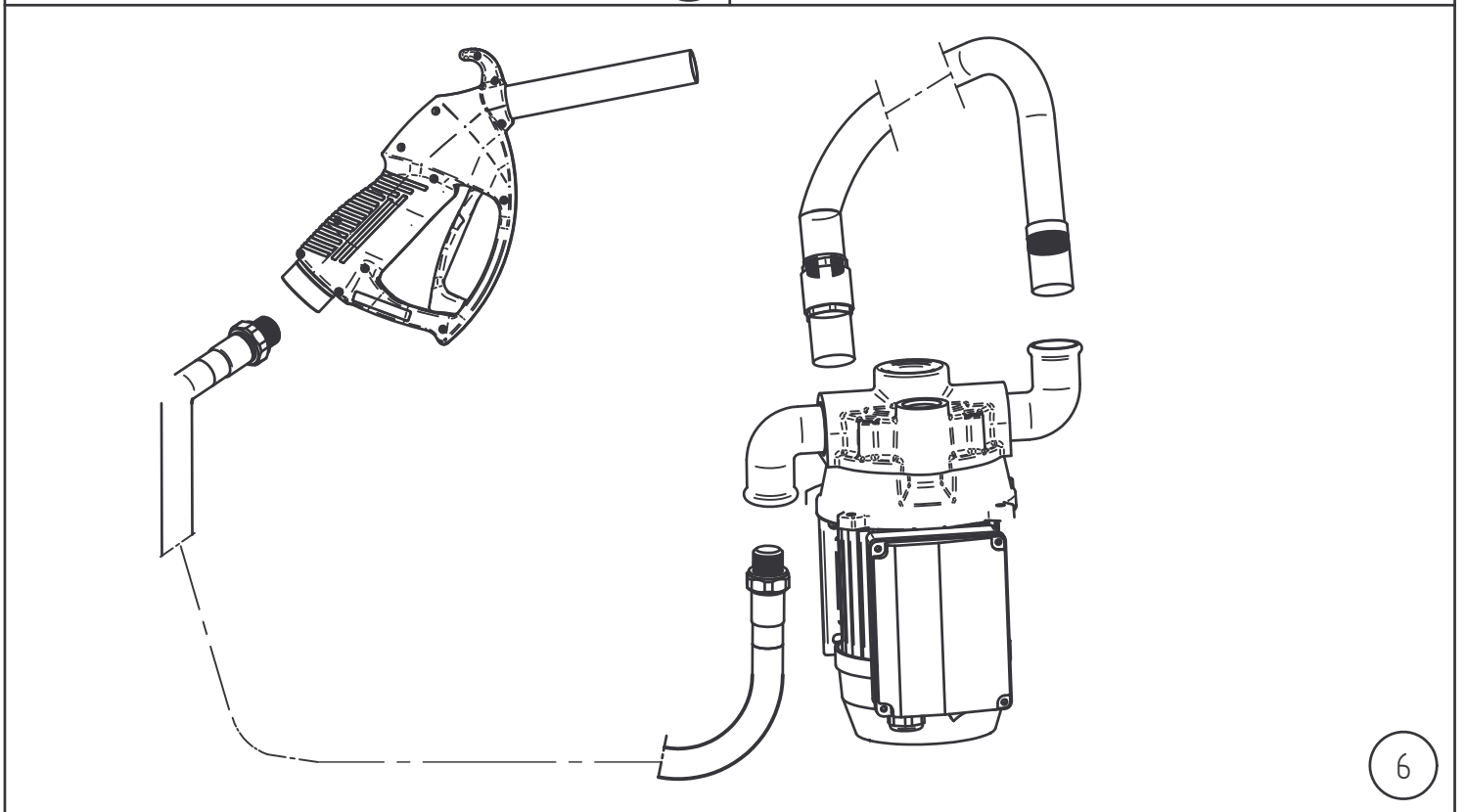
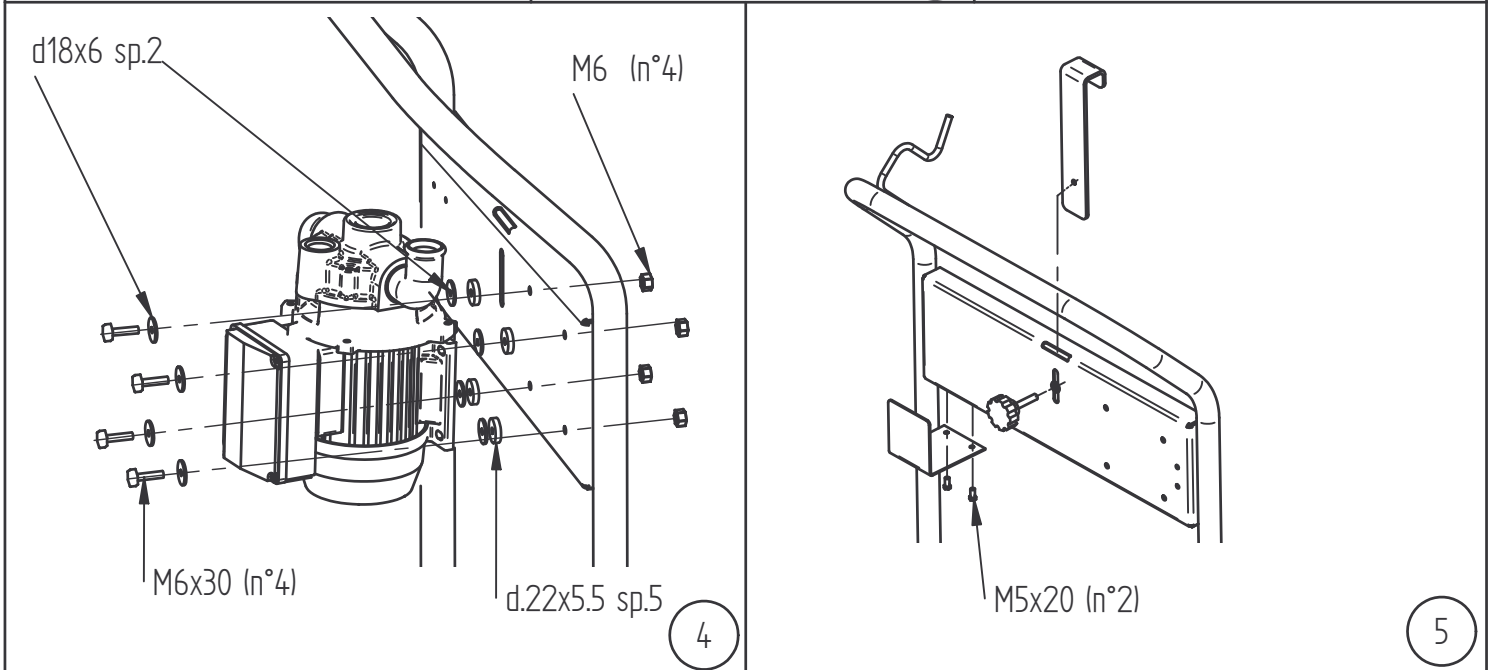
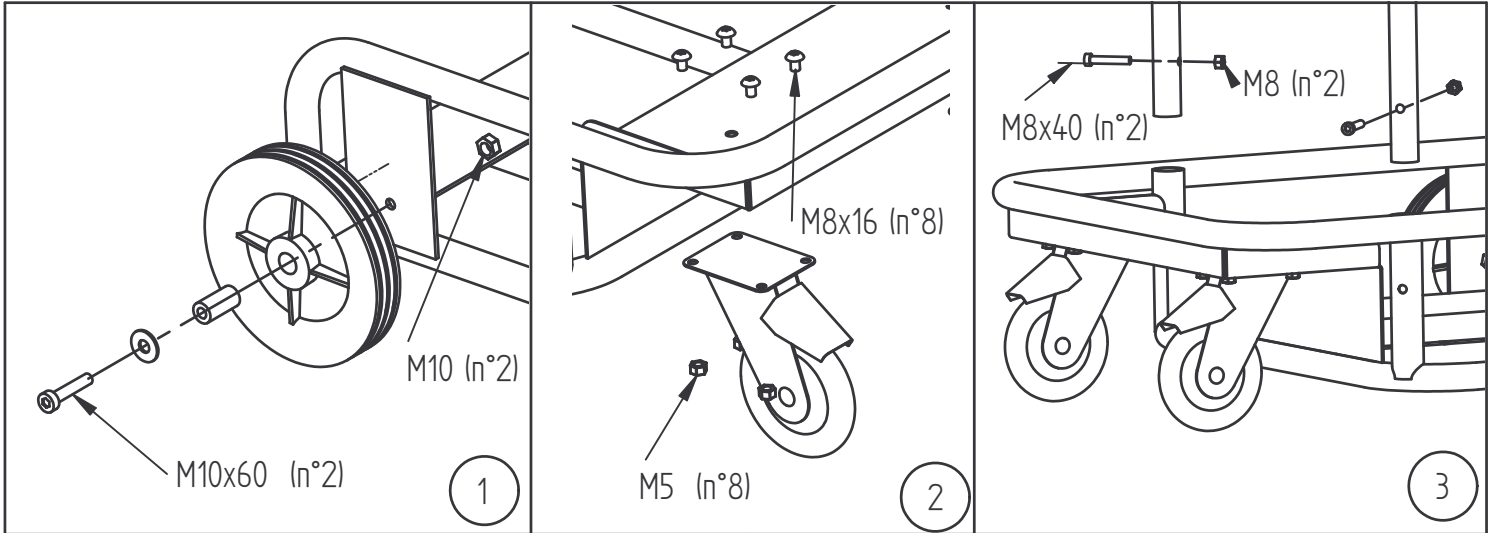
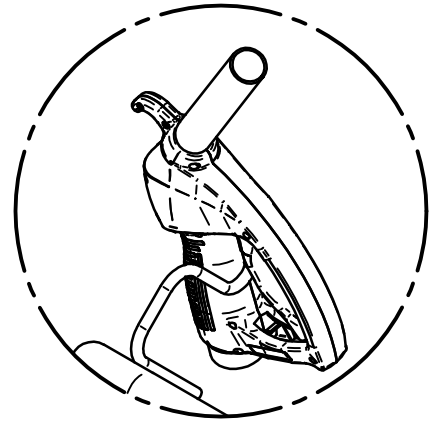
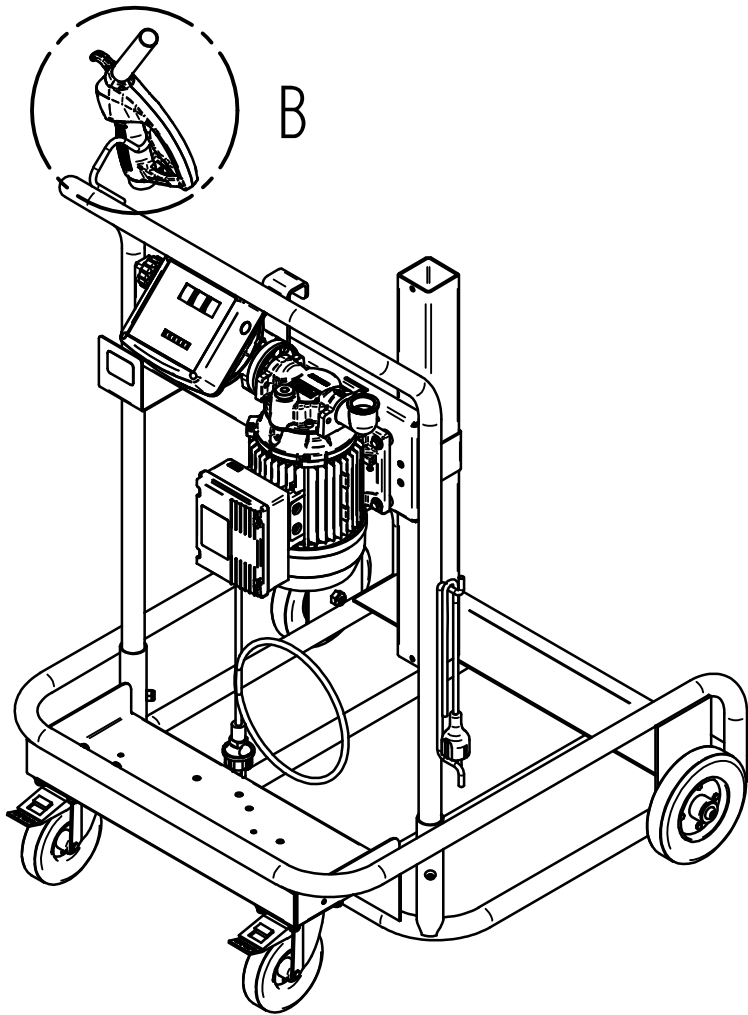


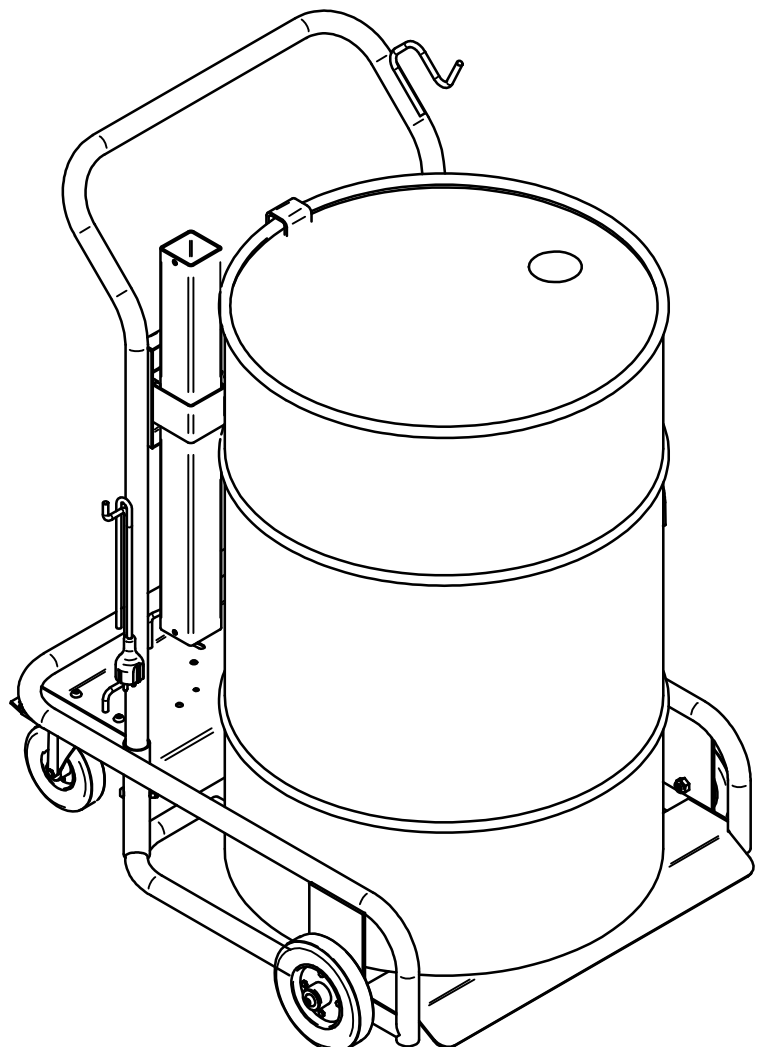
DETTAGLIO A

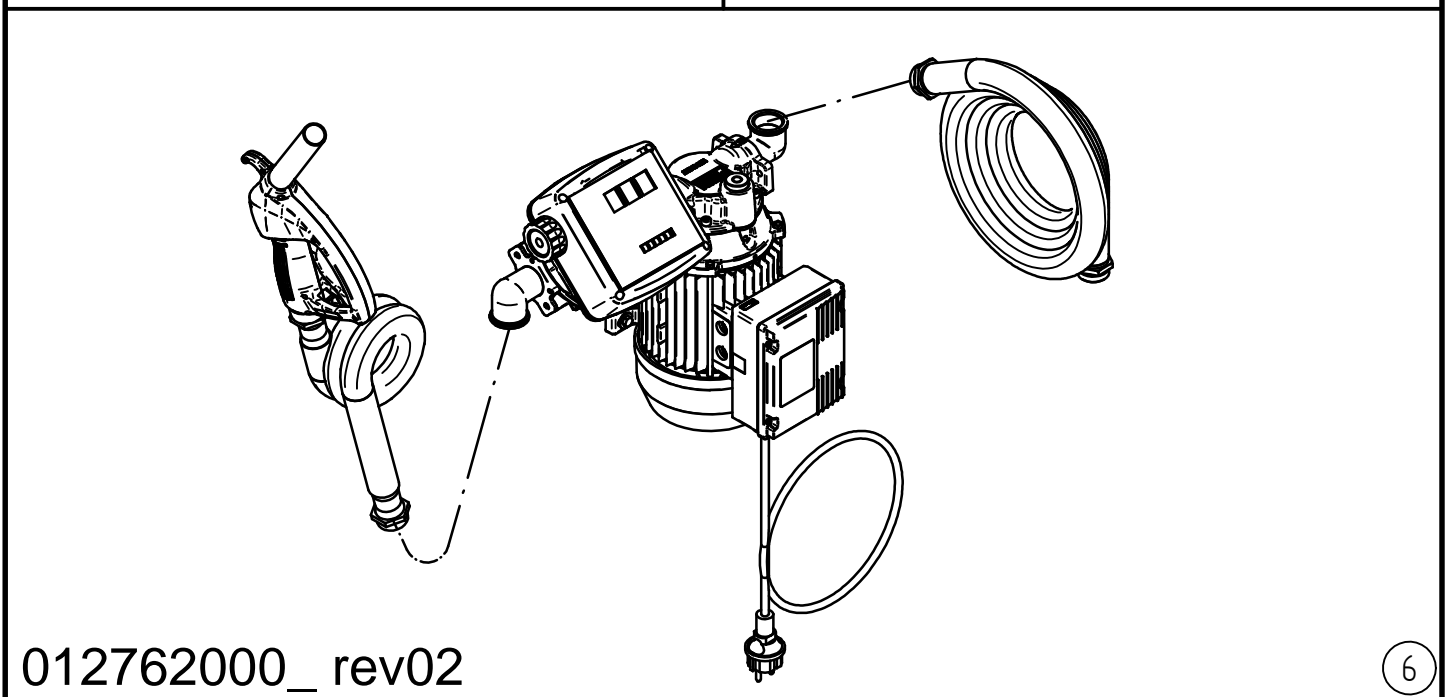
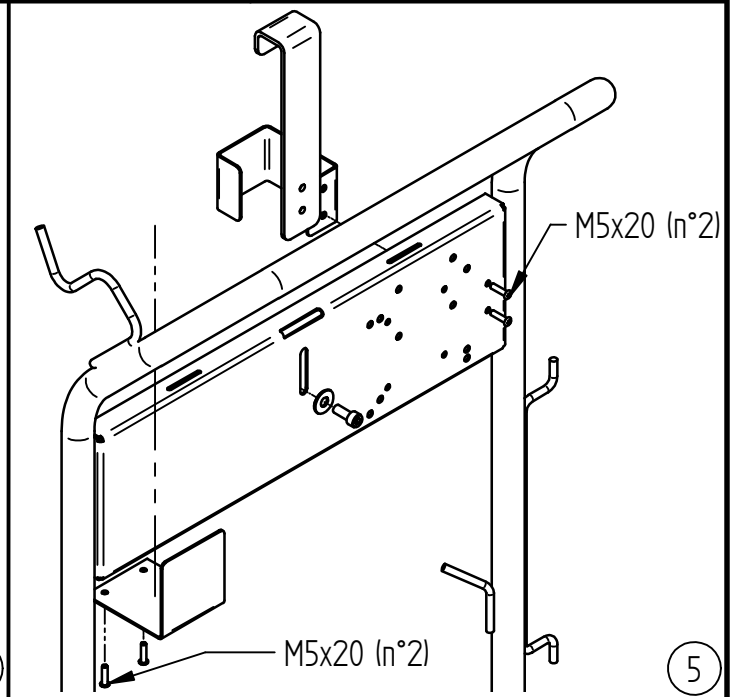
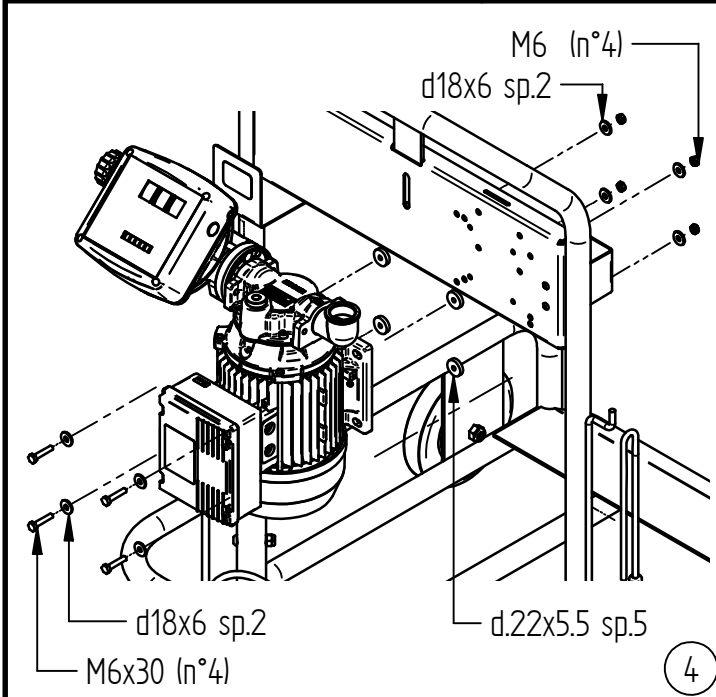
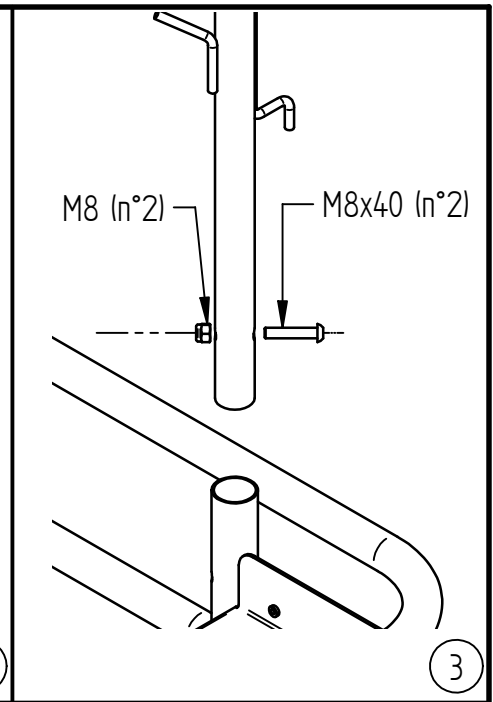
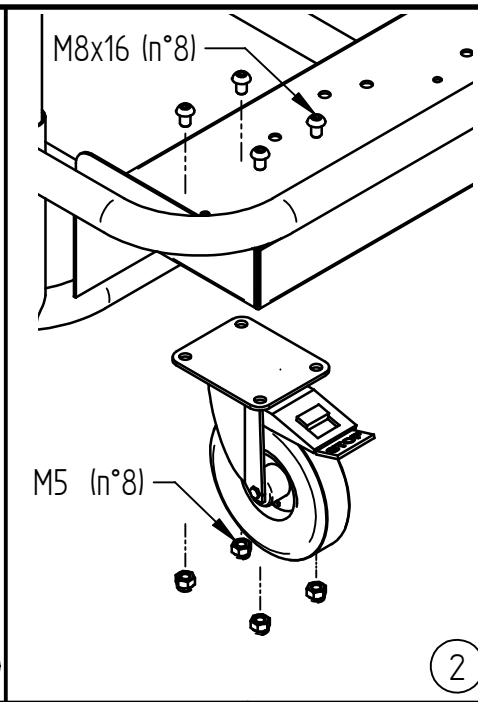
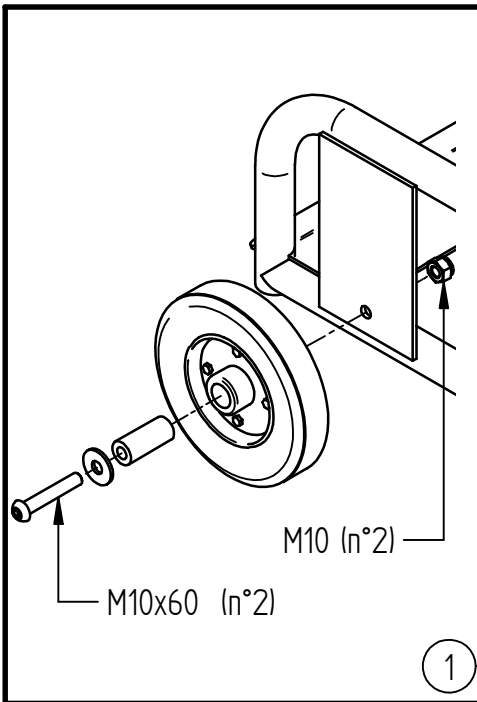


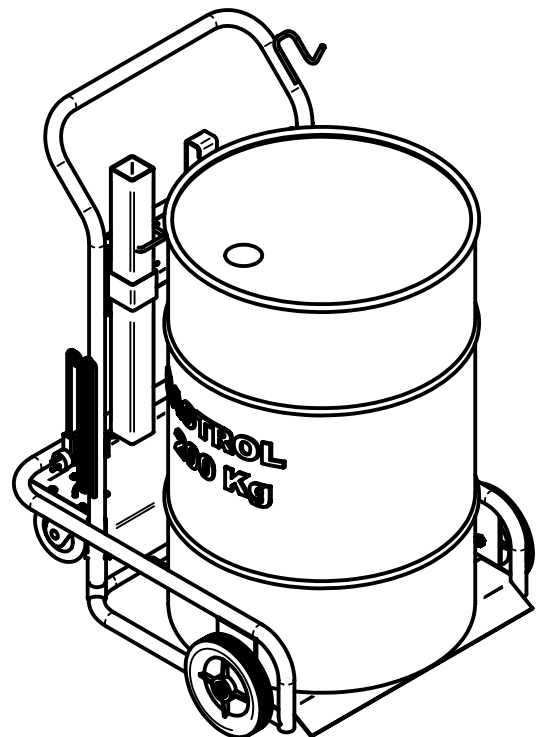
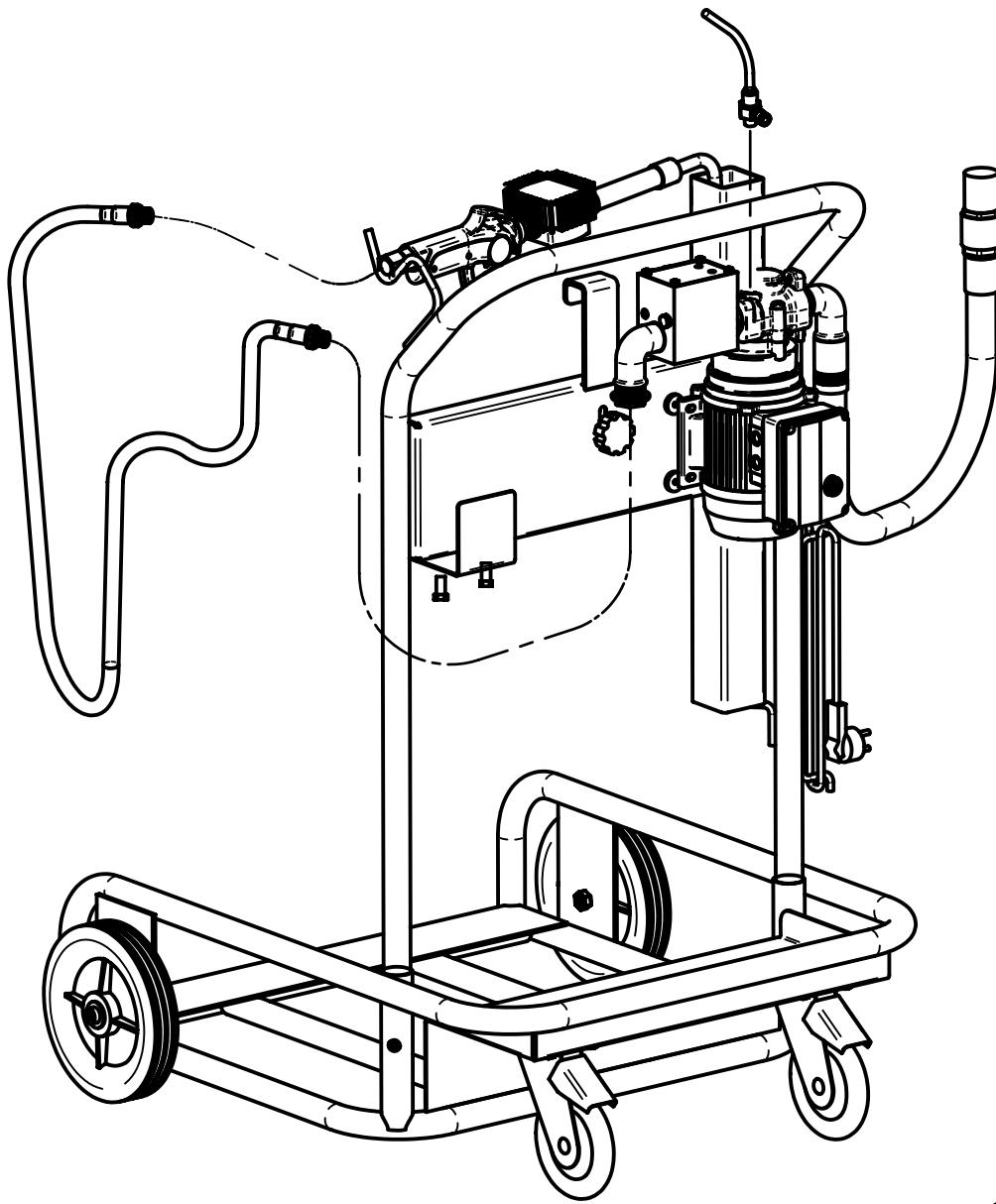


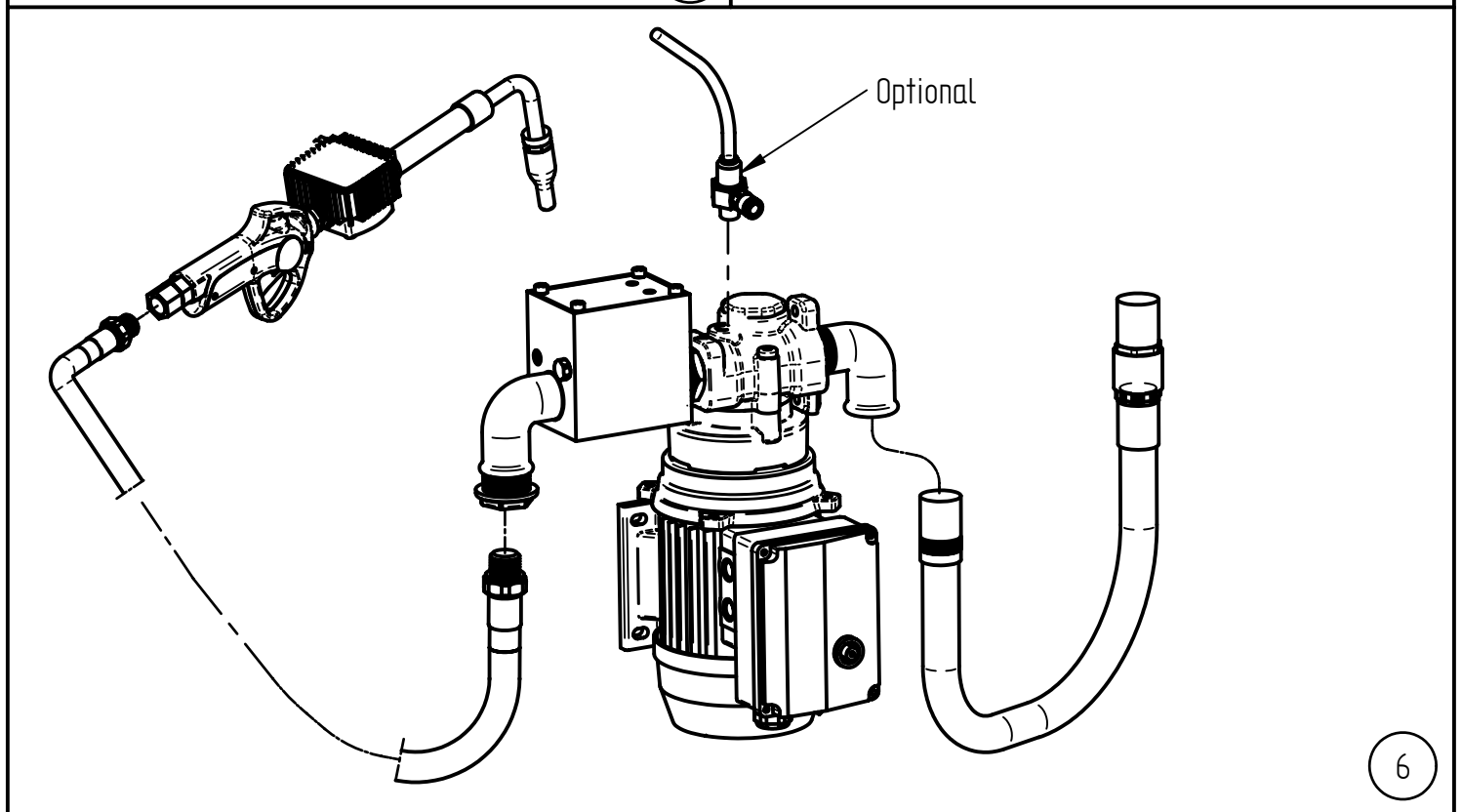
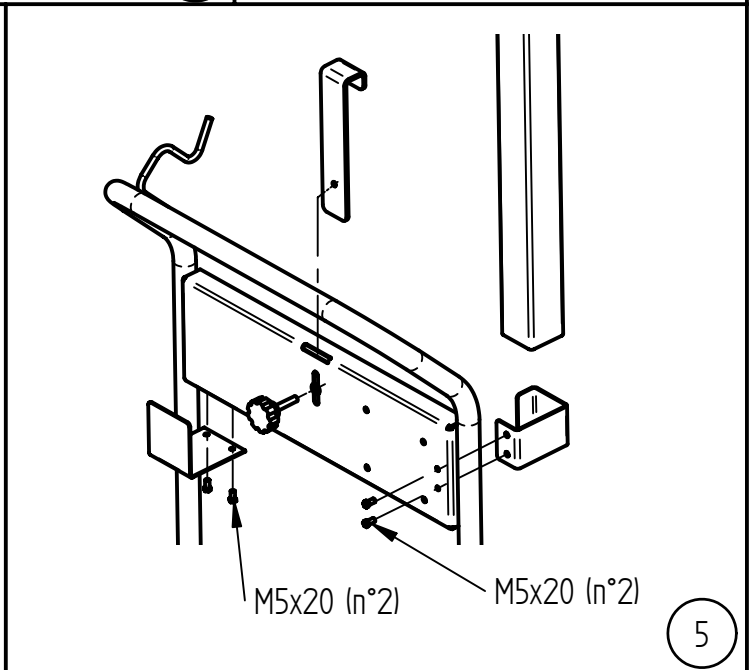
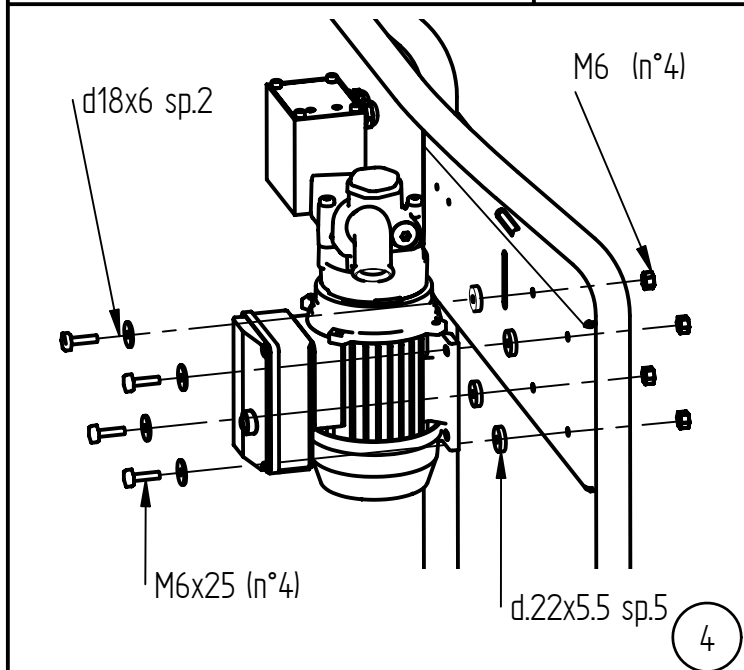
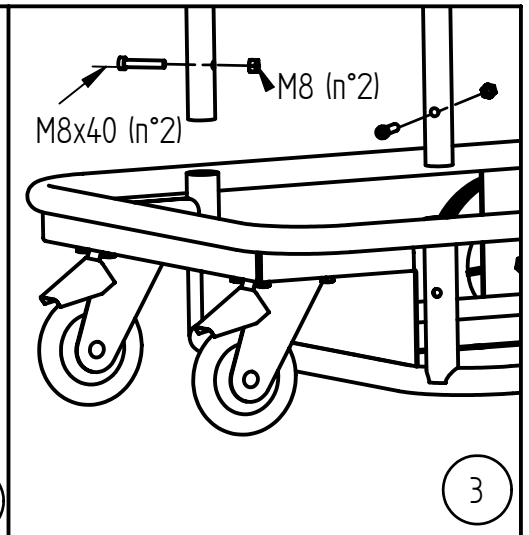
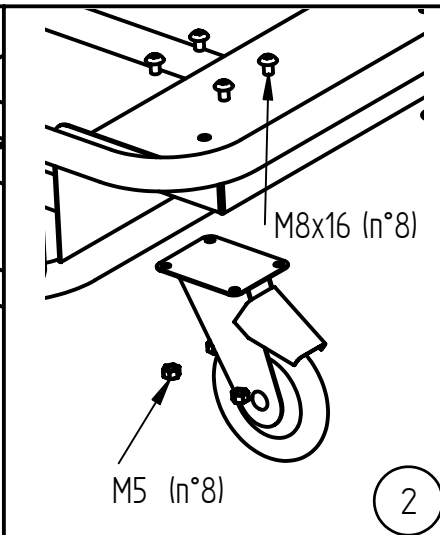
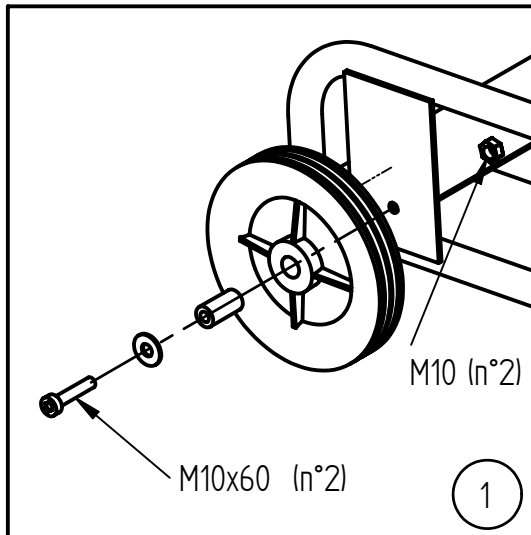


DETTAGLIO B









A INDEX

A	Index	H2	Preliminary Inspection
B	Identification of Machine and Manufacturer	H3	Mechanical Installation
C	Declaration of Conformity	H4	Hydraulic Connection
D	Machine Description	H5	Suction & Delivery Lines
E	Technical Information	H6	Electrical Connections
F	Performance	I	Initial Start-Up
G	Operating Conditions	L	Every Day Use
H	Environmental Conditions	M	Problems and Solutions
I	Maintenance	N	Noise Level
J	Electrical Power	O	Disposal of Contaminated Materials
K	Working Cycle	P	Explosion Diagrams and Spare Parts
L	Fluids Allowed / Fluids Not Allowed	Q	Dimensions and Weights
M	Moving and Transporting	R	Configuration of Delivery and Suction
N	Installation	S	H1 Disposing of the Packing Materials
O	H1 Disposing of the Packing Materials		

B IDENTIFICATION OF MACHINE AND MANUFACTURER

- Available Models:
- VISCOMAT 200/2 SINGLE-PHASE 230V/50HZ
 - VISCOMAT 200/2 SINGLE-PHASE 230V/60HZ
 - VISCOMAT 200/2 SINGLE-PHASE 400V/50HZ
 - VISCOMAT 350/2 SINGLE-PHASE 230V/50HZ
 - VISCOMAT 350/2 THREE-PHASE 400V/50HZ
 - VISCOMAT 200/2 THREE-PHASE 400V/50HZ

MANUFACTURER: **PIUSI SPA**
VIA PACINOTTI - Z.I. RANGAVINO
46029 SUZZARA (MN)

LABEL (EXAMPLE WITH IDENTIFICATION OF THE FIELDS):



ATTENTION
Always check that the revision level of the present manual agrees with the revision level indicated on the label.

C DECLARATION OF CONFORMITY

DECLARATION OF CONFORMITY

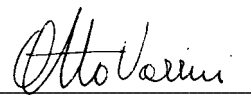
IN CONFORMANCE WITH THE DIRECTIVES:
98/37/EEC (MACHINERY) • 73/23/EEC (LOW TENSION)
89/336/EEC (ELECTRO-MAGNETIC COMPATIBILITY)

THE MANUFACTURER
PIUSI SPA - 46029 SUZZARA (MANTOVA) ITALY

DECLARES THAT THE FOLLOWING MODEL - VISCOMAT
CONFORMS TO THE FOLLOWING EUROPEAN REGULATIONS:

- | | |
|--|---|
| EN 292-1-01
Safety of Machinery - General Concepts, Basic Principles for Design - Terminology, Basic Methodology | EN 60334-5-86
Classification of Grades of Protection for the Housings of Rotating Electrical Machinery |
| EN 292-2-91
Safety of Machinery - General Concepts, Basic Principles for Design - Specifications and Technical Principles | EN 50081-1-92
Electro-Magnetic Compatibility - Generic Emission Standards |
| EN 294-92
Safety of Machinery - Safe Distances to Prevent the Operator's Upper Limbs from Reaching Dangerous Areas | EN 50082-1-92
Electro-Magnetic Compatibility - Generic Emission Standards |
| EN 60034-1-95
Rotating Electrical Machinery - Nominal and Functional Specifications | EN 55014-93
Limits and Methods for Measuring Radio Disturbance |

Suzzara 01/01/01



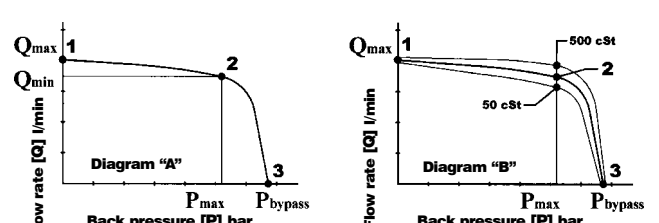
D MACHINE DESCRIPTION

PUMP: Electric self-priming rotary internal gear pump, equipped with a by-pass valve
MOTOR: Asynchronous motor, single-phase or three-phase, 2 or 4 pole, closed type (Protection class IP55 according to regulation EN 60034-5-86) self-ventilating, flange-mounted directly to the pump body.

E TECHNICAL INFORMATION

E1 PERFORMANCE

The performance data provided for the various pump models of the VISCOMAT family can be illustrated with curves that show the relationship between the **flow rate** supplied and the **back pressure**.



Point "1" is the point at which the pump is functioning with practically no back pressure in which case the pump supplies the maximum flow rate (Q_{max}).

Point "2" is the functioning point characterized by the maximum back pressure (P_{max}) at which the pump supplies the minimum flow rate (Q_{min}).

When the back pressure exceeds the value P_{max} , thanks to the special design of the by-pass, there is a sudden opening of the by-pass, with a consequent sudden reduction of the flow rate supplied.

PUMP MODEL	Q max (liters/min)	Q min (liters/min)	P max (bar)	P by-pass (bar)
VISCOMAT 200/2 SINGLE-PHASE 230V/50HZ	12	9	11	15
VISCOMAT 200/2 SINGLE-PHASE 230V/60HZ	12	9	11	15
VISCOMAT 200/2 THREE-PHASE 400V/50HZ	12	9	11	15
VISCOMAT 350/2 SINGLE-PHASE 230V/50HZ	12	9	25	30
VISCOMAT 350/2 THREE-PHASE 400V/50HZ	12	9	25	30
VISCOMAT 230/3 230V/50HZ	15	13.5	16	19
VISCOMAT 230/3 400V/50HZ	15	13.5	16	19

VISCOMAT pumps can pump oils of very different viscosities, within the limits indicated in the TECHNICAL INFORMATION, without requiring any adjustment of the by-pass.

The characteristic flow rate/back pressure curve illustrated in diagram "A" relates to functioning with oil of a viscosity equal to approximately 110cSt (comparable, for example, to oil SAE W80 at a temperature of 45°C). As the viscosity of the oil varies, the variation in

E2 ELECTRICAL INFORMATION

PUMP MODEL	Current (A)	Voltage (V)	Frequency (Hz)	Rated (Watt)	Maximum (Amp)	SPEED (rpm)
VISCOMAT 200/2 SINGLE-PHASE 230V/50HZ	AC	230	50	550	4	1450
VISCOMAT 200/2 SINGLE-PHASE 230V/60HZ	AC	230	60	550	4.7	1700
VISCOMAT 200/2 THREE-PHASE 400V/50HZ	AC	400	50	550	1.5	1450
VISCOMAT 350/2 SINGLE-PHASE 230V/50HZ	AC	230	50	900	6.3	1450
VISCOMAT 350/2 THREE-PHASE 400V/50HZ	AC	400	50	750	2.5	1450
VISCOMAT 230/3 230V/50HZ	AC	230	50	900	6	1400
VISCOMAT 230/3 400V/50HZ	AC	400	50	750	2.7	1400

ATTENTION
The power absorbed by the pump depends on the functioning point and the viscosity of the oil being pumped. The data for MAXIMUM CURRENT provided in the Table refer to pumps functioning at the point of maximum compression P_{max} , with oils of a viscosity equal to approximately 500 cSt.

F OPERATING CONDITIONS

F1 ENVIRONMENTAL CONDITIONS

TEMPERATURE: min. -10°C / max. +60°C
RELATIVE HUMIDITY: max. 90%

ATTENTION
The temperature limits indicated are applied to the pump components and must be respected to avoid possible damage or malfunction. It is understood, nevertheless, that for a given oil, the real functioning temperature range also depends on the variability of the viscosity of the oil itself with the temperature. Specifically:
• The minimum temperature allowed (-10°C) could cause the viscosity of some oils to greatly exceed the maximum allowed, with the consequence that the static torque required during the starting of the pump would be excessive, risking overload and damage to the pump.
• The maximum temperature allowed (+60°C) could, on the other hand, cause the viscosity of some oils to drop well below the minimum allowed, causing a degradation in performance with obvious reductions in flow rate as the back pressure increases.

F2 ELECTRICAL POWER

Depending on the model, the pump must be fed by three-phase or single-phase alternating current whose nominal values are those indicated in the Table of paragraph E2 - ELECTRICAL INFORMATION.

ATTENTION
Electrical power from lines with values outside the limits indicated can cause damage to the electrical components.

F3 WORKING CYCLE

The motors are intended for continuous use. Under normal operating conditions they can function continuously with no limitations.

ATTENTION
Functioning in by-pass conditions is only allowed for brief periods (2 to 3 minutes maximum). Whenever a particular installation carries the risk of functioning in by-pass mode for longer periods of time, it is necessary that the by-passed flow not be recirculated inside the pump, but be returned to the suction tank.

F4 FLUIDS ALLOWED / FLUIDS NOT ALLOWED

ALLOWED:
• OIL with a VISCOSITY from 50 to 2000 cSt (at working temperature)

- NOT ALLOWED:**
- GASOLINE (PETROL)
 - INFLAMMABLE LIQUIDS with $PM < 55\mu m$
 - WATER
 - LIQUID FOOD PRODUCTS
 - CORROSIVE CHEMICALS
 - SOLVENTS

G MOVING AND TRANSPORTING

Given the limited weight and size of the pumps (see DIMENSIONS AND WEIGHTS), the moving the pumps does not require the use of lifting equipment.

H INSTALLATION

H1 DISPOSING OF THE PACKING MATERIALS

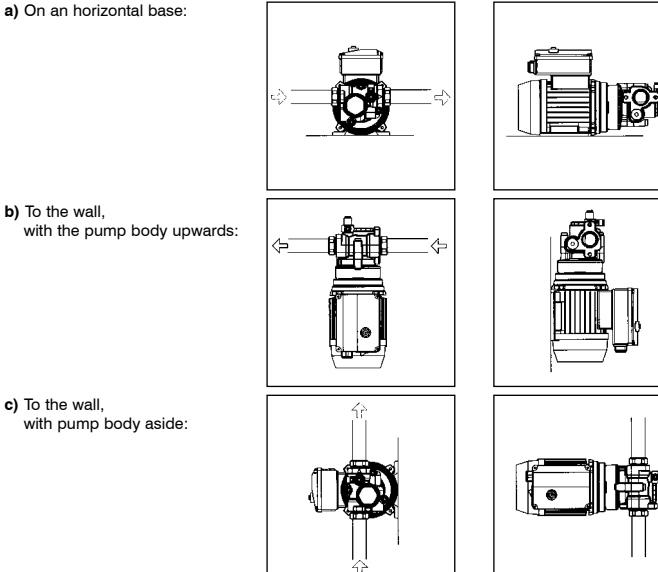
The packing material does not require any special precautions in its disposal, not being in any way dangerous or polluting. For disposal, refer to local regulations.

H2 PRELIMINARY INSPECTION

- Check that the machine has not suffered any damage during its transport or warehousing.
- Check the inlet and outlet openings with care, removing any dust or packing residue.
- Make sure that the motor shaft turns freely.
- Check that the electrical information corresponds with what is shown on the label.

H3 MECHANICAL INSTALLATION

The Viscomat in by-pass pumps can be installed in the following two ways:



It is recommended to install a non-return valve in order to resume the system operation quickly and easily even after the first priming.

WARNING
DO NOT install the pump vertically with the pump body downwards. If absolutely necessary, install a foot-valve and fill the suction tube with oil during the first priming phase.

Fix the pump using screws of a diameter suitable for the provided fixing holes as indicated in the drawing "Dimensions and weights".

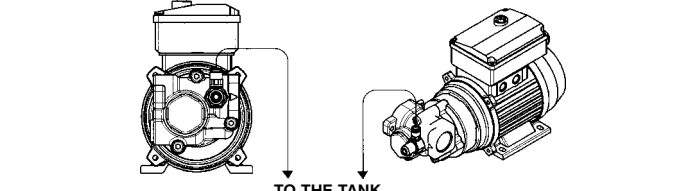
To make the installation easier, the VISCOMAT pump body has been provided with two inlet openings:

- Opening "IN1" is aligned with the delivery opening "OUT".

WARNING
The use of one inlet opening or the other has no effect on the performance of the pump, which remains practically unchanged in either case. It should, nevertheless, be remembered that the type of installation should be chosen so as to make the suction line between the tank and the pump as short and direct as possible for the purpose of optimising suction conditions.

PRIMING DEVICE

The Viscomat series pumps are equipped with a priming device installed on the delivery opening "OUT" which operates during

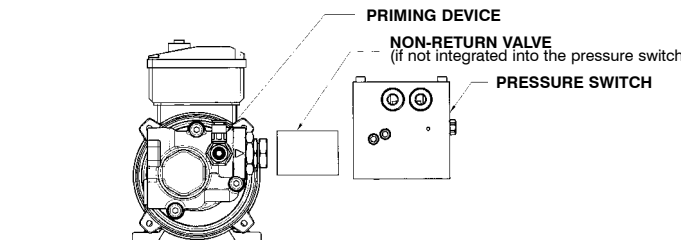


If the system is equipped with a foot valve, the priming device can be closed once the starting phase has been completed (see paragraph F7).

WARNING
Make sure that the air discharge tube is not immersed in the oil inside the drawing tank. In this case, the operation of the priming device may be prejudiced.

INSTALLING A PRESSURE SWITCH

If you wish to install a pressure switch for the



WARNING
If the priming device is not equipped with a non-return valve, it is necessary to install one between the priming device and the pressure switch.

H4 HYDRAULIC CONNECTION

- Make sure that the hoses and the suction tank are free of dirt and filling residue that might damage the pump and accessories.
- Always install a metal mesh filter in the suction hose.
- Before connecting the delivery hose, partially fill the pump body with oil to avoid the pump running dry during the priming phase.
- When connecting pump models furnished with BSP threading (cylindrical gas) do not use joints with a conical thread. Excessive tightening of these could cause damage to the pump openings.

The MINIMUM recommended characteristics for hoses are as follows:

SUCTION HOSE - diameter:	1"
- nominal pressure:	2 times the pressure P by-pass (see the Table in paragraph E1 - PERFORMANCE)
- appropriate for use with suction:	

DELIVERY HOSE - diameter:	1/2"
- nominal pressure:	2 times the pressure P by-pass (see the Table in paragraph E1 - PERFORMANCE)

ATTENTION

The use of hoses and/or line components that are inappropriate for use with oil or have inadequate nominal pressures can cause damage to objects or people as well as pollution. The loosening of connections (threaded connections, flanges, gasket seals) can likewise cause damage to objects or people as well as pollution. Check all of the connections after installation and on a regular on-going basis with adequate frequency.

H5 SUCTION & DELIVERY LINES

DELIVERY
The choice of pump model to use should be made keeping in mind the viscosity of the oil to be pumped and the characteristics of the system attached to the delivery of the pump. The combination of the oil viscosity and the characteristics of the system could, in fact, create back pressure greater than the anticipated maximums (equal to P_{max}), so as to cause the (partial) opening of the pump by-pass with a consequent noticeable reduction of the flow rate supplied. In such a case, in order to permit the correct functioning of the pump equal to the viscosity of the oil being pumped. It will be necessary to reduce resistance in the system by employing shorter hoses and/or of larger diameter. On the other hand, if the system cannot be modified it will be necessary to select a pump model with a higher P_{max} .

SUCTION

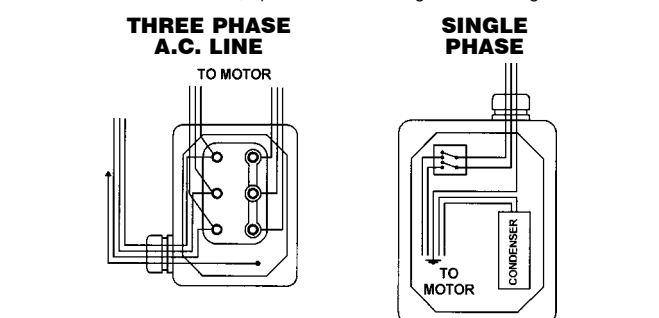
VISCOMAT series pumps are characterized by excellent suction capacity. In fact, the characteristic flow rate/back pressure curve remains unchanged even at high pump suction pressure values. As viscosity increases, the suction pressure at which cavitation phenomena begin decreases. In the case of oils with viscosities equal to approximately 500 cSt, the suction pressure must not exceed values of the order of 0.3 - 0.5 bar to avoid triggering cavitation phenomena. The values indicated above refer to the suction of oil that is substantially free of air. If the oil being pumped is mixed with air, the cavitation phenomena can begin at lower suction pressures.

Beyond these suction pressure values, cavitation phenomena begin as evidenced by accentuated running noise that over time can cause pump damage, not to mention a degradation of pump performance.

ATTENTION
It is a good system practice to immediately install vacuum and air pressure gauges at the inlets and outlets of the pump which allow verification that operating conditions are within anticipated limits. To avoid emptying the suction hose when the pump is turned off, the installation of a foot valve is recommended.

H6 ELECTRICAL CONNECTIONS

All motors come with a short cable used for production testing. To connect the motor to the line, open the terminal strip cover, remove the above mentioned cable and connect the line according to the following chart.



Single-phase motors are supplied with a bipolar switch and capacitors wired and installed inside the terminal strip box (see chart). Motors are likewise equipped with an automatic reset thermo-protector.

ATTENTION

Pumps are supplied without electrical safety devices such as fuses, motor protectors, and are intended for professional use only.

It is the installer's responsibility to carry out the electrical connection with respect to the applicable regulations.

- Comply with the following (not exhaustive) instructions to ensure a proper electrical connection:
- During installation and maintenance make sure that power to the electric lines has been turned off.
 - Employ cables characterized by minimum cross-sections, rated voltages and installation type adequate to the characteristics indicated in paragraph E2 - ELECTRICAL INFORMATION and the installation environment.
 - For three-phase motors, ascertain the correct rotation direction by referring to paragraph R - DIMENSIONS AND WEIGHTS.
 - All motors are equipped with a grounding terminal that is to be connected to the ground line of the electrical system.
 - Always close the cover of the terminal strip box before turning on the electric power, after checking the integrity of the gasket seals that ensure protection grade IP55.

I INITIAL START-UP

VISCOMAT series pumps are self-priming and, therefore, able to draw oil from the tank even when the suction hose is empty on start-up. The priming height (distance and, therefore, able to draw oil from the tank even when the suction hose is empty on

WARNING
Wetting the pump. Before starting the pump, wet the inside of the pump body with oil through the inlet and outlet openings.

If the pump is already installed, the wetting operation can be performed by unscrewing the threaded plug of the inlet opening (IN1 or IN2) not in use, by filling the internal chamber with oil and screwing in the plug, paying attention to the O-ring seal.

In the priming phase the pump must blow the air that was initially present in the suction hose into the line. Therefore, it is necessary to rotate the valve of the priming device anticlockwise to position "32" of the exploded drawing in order to purge the air present in the system. When the tube is filled with oil, the purging phase is concluded.

WARNING
If no foot valve is installed, it is advisable to leave the purge valve always open so that once the device is re-started again, it is ready to purge the air present in the suction tube. Please consider that during the operation, a small part of oil re-circulates in the tank. If a foot-valve is installed, close the air purge valve by turning it clockwise, so that no oil circulates in the tank. If the foot-valve seal is not perfectly tight, the suction tube may be emptied and the purging operation described above must be repeated.

The priming phase may last from several seconds to a few minutes, depending on the characteristics of the system.

If this phase is excessively prolonged, stop the pump and verify:

- that the pump is not running completely "dry"
 - that the suction hose guarantees against air infiltration and is correctly immersed in the fluid to be drawn
 - that any filters installed are not blocked
 - that the priming height is not greater than 2.5 meters
 - that the delivery hose allows for the easy evacuation of the air.
- For a complete and proper verification of points 2) and 3), the installation of vacuum and air pressure gauges at the inlet and outlet of the pump is recommended.

L EVERY DAY USE

No particular preliminary operation is required for every day use of VISCOMAT pumps.

MANUAL OPERATION

Before starting the pump, make sure that the ultimate shut-off device (delivery gun or line valve) is closed.

ATTENTION
Never start the pump by simply inserting the plug in the outlet.

Open the delivery valve or activate the delivery gun, gripping it securely.

ATTENTION

Fluid exits at high pressure from a delivery gun fed by a VISCOMAT pump. Never point the outlet of the gun towards any part of the body.

ATTENTION

Running in by-pass mode with the delivery closed is only allowed for brief periods (2 to 3 minutes maximum). When the thermo-protector trips, turn-off the electric power and wait for the motor to cool.

- Stop the pump.
- the pressure switch, at the moment that the pressure drops below the value "Pm", automatically starts the pump allowing delivery
- during delivery the pump delivers against a back pressure that, depending on the conditions of the delivery line, could turn out to be higher or lower than the pressure "Pm"
- at the moment the delivery gun is closed, the pressure will increase rapidly and the pressure switch, at the moment in which the consequent sudden lowering of pressure in the delivery line

The values of "Pa" and "Pm" are characteristics of the pressure switch used and are often adjustable within a certain range.

For the safe and proper functioning of the pump in these types of applications it is absolutely indispensable to make sure that:

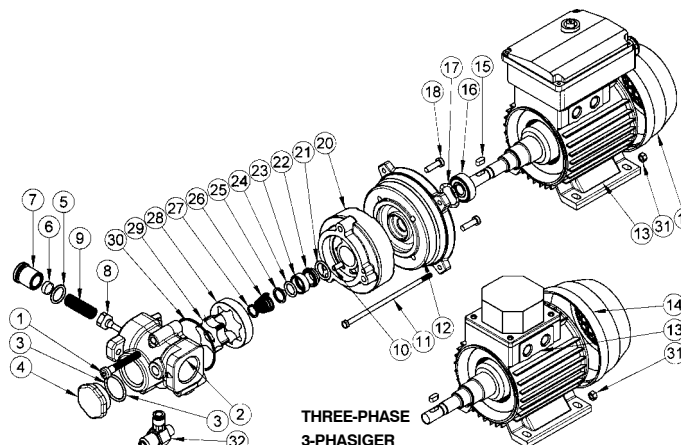
- "Pa" is sufficiently lower than the by-pass pressure, to assure that the pump will stop as soon as the gun is closed and that the pump will not run a long time in by-pass mode
- "Pm" is several bar lower than "Pa" to avoid the pump starting when not wanted due to small pressure drops not caused by opening the gun
- the foot valve guarantees an effective seal, to avoid frequent unwanted cycling on and off caused by its leakage
- the pump is entirely composed of metal tubing, or, at any rate, of highly rigid tubing, one should consider installing an accumulator capable of preventing small leaks from the foot valve, for example) from causing a pressure drop sufficient to automatically start the pump

ATTENTION

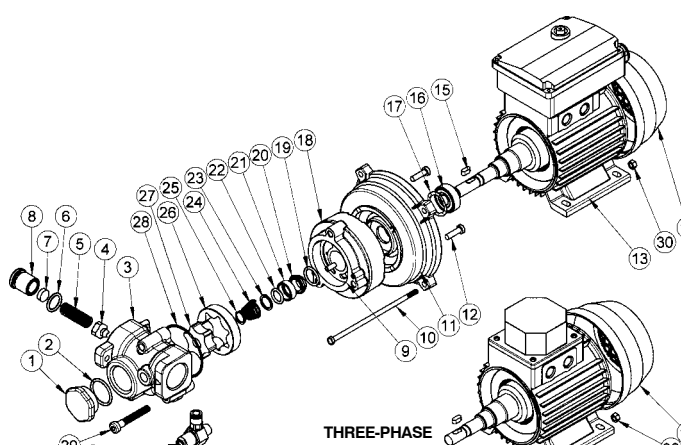
Failure to comply with the above can damage the pump.

M PROBLEMS AND SOLUTIONS

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
MOTOR DOES NOT TURN	Lack of power	Check electrical connections and safety systems.
	Rotor blocked	Check for possible damage or obstruction to rotating parts
	Thermal motor protector has triggered	Wait until the motor cools, verify that it starts again, look for the cause of overheating
	Problems with the motor	Contact technical support
	Low voltage from the electrical power supply	Adjust the voltage within permitted limits
MOTOR TURNS SLOWLY WHEN STARTING	Excessive oil viscosity	Verify oil temperature and warm it to reduce excessive viscosity
	Low level in the suction tank	Fill the tank
	Foot valve blocked	Clean and/or replace valve
	Filter blocked	Clean the filter
	Excessive suction pressure	Lower the pump with respect to the level of the tank or increase the cross-section of the hose
LITTLE OR NO FLOW	High load loss in the delivery circuit (turning with by-pass open)	Use shorter hose or of wider diameter
	By-pass valve blocked	Detach the valve, clean or replace it
	Air in the pump or suction hose	Check the seal of the connections
	Narrowing of the suction hose	Use a hose appropriate for working under suction pressure
	Low rotation speed	Check the voltage at the pump. Adjust the voltage or use cables of greater cross-section
HIGHER PUMP NOISE	Suction hose resting on the bottom of the tank	Raise the hose
	Excessive oil viscosity	Verify the oil temperature and warm it to reduce the excessive viscosity
LEAKAGE FROM THE PUMP BODY	Cavitation	Reduce the suction pressure (see paragraph H5 - SUCTION & DELIVERY LINES)
	Irregular by-pass functioning	Deliver until the air in the by-pass system is purged
	Presence of air in the oil	Wait for the oil in the tank to settle
	Damage to the mechanical seal	Check and replace the mechanical seal



VISCOMAT 200/2



VISCOMAT 350/2

N MAINTENANCE

VISCOMAT series pumps are designed and constructed to require a minimal amount of maintenance.

- On a weekly basis check that the hose filters placed at the pump inlet.
- On a monthly basis check that the electric power cables are in good condition and clean it removing any impurities.

O NOISE LEVEL

Under normal operating conditions noise emission for all models does not exceed the value of 70 dB "A" at a distance of 1 Meter from the electric pump.

A INDEX

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B MACHINE AND MANUFACTURER IDENTIFICATION

MODEL:	VISCOMAT
MANUFACTURER:	PIUSI SPA 46029 SUZZARA (MN)
IDENTIFICATION PLATE (EXAMPLE WITH THE FIELDS IDENTIFIED):	
PRODUCT CODE	
MODEL	PRODUCTION YEAR
	TECHNICAL SPECIFICATIONS
	MANUAL

ATTENTION

Always check that the revision level of this manual coincides with what is shown on the identification plate.

C DECLARATION OF CONFORMITY

DECLARATION OF CONFORMITY	
IN CONFORMANCE WITH THE DIRECTIVES	
98/37/EEC (Machinery)	EN 60034-5-86
73/23/EEC (Electro-magnetic Compatibility)	Classification of Grades of Protection for the Housings of Rotating Electrical Machinery
89/336/EEC (Low Tension)	EN 50081-1-92
	Electro-Magnetic Compatibility - Generic Emission Standards
	EN 50082-1-97
	Electro-Magnetic Compatibility - Generic Immunity Standards
	EN 55014-93
	Limits and Methods for Measuring Radio Disturbance Characteristics

THE MANUFACTURER: **PIUSI SPA**
46029 SUZZARA (MANTOVA) ITALIA

DECLARES THAT THE FOLLOWING PUMP MODEL: **VISCOMAT**
CONFORMS TO THE FOLLOWING REGULATIONS:

EUROPEAN REGULATIONS:

EN 292-1-91
Safety of Machinery - General Concepts, Basic Principles for Design - Terminology, Basic Methodology

EN 292-2-91
Safety of Machinery - General Concepts, Basic Principles for Design - Specifications and Technical Principles

EN 294-92
Safety of Machinery - Safe Distances to Prevent the Operator's Upper Limbs from Reaching Dangerous Areas

EN 60034-1-95
Rotating Electrical Machinery - Nominal and Functional Specifications

Suzzara 01/01/01

OTTO VARINI, President

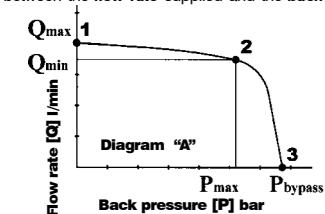
D MACHINE DESCRIPTION

PUMP: Self-Priming, volumetric, rotating electric vane pump equipped with by-pass valve.

MOTOR: Asynchronous motor, single-phase or three-phase, 2 or 4 pole, closed type (Protection class IP55 according to regulation EN 60034-5-86), self-ventilating, flange-mounted directly to the pump body.

E TECHNICAL SPECIFICATIONS**E1 PERFORMANCE SPECIFICATIONS**

The performance data provided for the various pump models of the VISCOMAT family can be illustrated with curves that show the relationship between the **flow rate** supplied and the **back pressure**.



Point "1" is the point at which the pump is functioning with practically no back pressure, in which case the pump supplies the maximum flow rate (Q_{max}).

Point "2" is the functioning point characterized by the maximum back pressure (P_{max}) at which the pump supplies the minimum flow rate (Q_{min}).

When the back pressure exceeds the value P_{max} , thanks to the special design of the by-pass, there is a sudden opening of the by-pass, with a consequent sudden reduction of the flow rate supplied.

PUMP MODEL	BY PASS Condition		Max. back pressure condition		Max. flow rate condition	
	D (l/min)	P (bar)	D (l/min)	P (bar)	D (l/min)	P (bar)
VISCOMAT 70	0	7,5	26	6	30	1
VISCOMAT 90	0	6	50	5	55	1

VISCOMAT pumps can pump oils of very different viscosities, within the limits indicated in the TECHNICAL SPECIFICATIONS, without requiring any adjustment of the by-pass.

The characteristic flow rate/back pressure curve illustrated in diagram "A" relates to functioning with oil of a viscosity equal to approximately 110cSt (comparable, for example, to oil SAE W80 at a temperature of 45°C). As the viscosity of the oil varies, the variation in the pump's performance will be more

noticeable the greater the back pressure against which the pump is working.

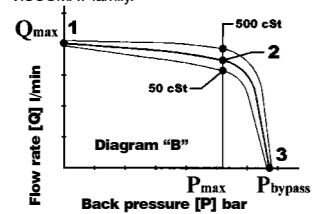


Diagram "B" illustrates how the characteristic curve changes in the case of the maximum and minimum viscosities (respectively equal to 50 cSt and 500 cSt), showing that, at the maximum working back pressure (P_{max}), the flow rate Q_{min} suffers a variation of between 10% and 15% with respect to the value relative to a viscosity of 110 cSt.

E2 ELECTRICAL SPECIFICATIONS

PUMP MODEL	ELECTRICAL POWER			POWER (Watt)	CURRENT (Amp)	SPEED (rpm)
	Current	Voltage (V)	Frequency (Hz)			
VISCOMAT (single-phase) 70	AC	230	50	750	4,6	1400
VISCOMAT (three-phase) 70	AC	400	50	750	2,2	1450
VISCOMAT (three-phase) 90	AC	400	50	2000	5	1450

ATTENTION

The power absorbed by the pump depends on the functioning point and the viscosity of the oil being pumped. The data for MAXIMUM CURRENT provided in the Table refer to pumps functioning at the point of maximum compression P_{max} , with oils of a viscosity equal to approximately 500 cSt.

F OPERATING CONDITIONS**F1 ENVIRONMENTAL CONDITIONS**

TEMPERATURE: min. -10°C / max +60°C

RELATIVE HUMIDITY: max. 90%

ATTENTION

The temperature limits shown apply to the pump components and must be respected to avoid possible damage or malfunction. It is understood, nevertheless, that for a given oil, the real functioning temperature range also depends on the variability of the viscosity of the oil itself with the temperature. Specifically:

- The minimum temperature allowed (-10°C) could cause the viscosity of some oils to greatly exceed the maximum allowed, with the consequence that the static torque required during the starting of the pump would be excessive, risking overload and damage to the pump.
- The maximum temperature allowed (+60°C) could, on the other hand, cause the viscosity of some oils to drop well below the minimum allowed, causing a degradation in performance with obvious reductions in flow rate as the back pressure increases.

F2 ELECTRICAL POWER SUPPLY

Depending on the model, the pump must be fed by three-phase or single-phase alternating current whose nominal values are those indicated in the Table of paragraph E2 - ELECTRICAL SPECIFICATIONS.

The maximum acceptable variations from the electrical parameters are:

- Voltage:** +/-5% of the nominal value
- Frequency:** +/- 2% of the nominal value

ATTENTION

Power from lines with values outside the indicated limits can damage the electrical components.

F3 WORKING CYCLE

The motors are intended for continuous use. Under normal operating conditions they can function continuously with no limitations.

ATTENTION

Functioning under by-pass conditions is only allowed for brief periods of time (2-3 minutes maximum). Whenever a particular installation carries the risk of functioning in by-pass mode for longer periods of time, it is necessary that the by-passed flow not be recirculated inside the pump, but be returned to the suction tank.

F4 FLUIDS PERMITTED / FLUIDS NOT PERMITTED

PERMITTED:

- OIL with a VISCOSITY from 50 to 500 cSt (at working temperature)

NOT PERMITTED:

- GASOLINE
- INFLAMMABLE LIQUIDS with PM < 55°C
- WATER
- FOOD LIQUIDS
- CORROSIVE CHEMICAL PRODUCTS
- SOLVENTS

RELATED DANGERS:

- FIRE - EXPLOSION
- FIRE - EXPLOSION
- PUMP OXIDATION
- CONTAMINATION OF THE SAME
- PUMP CORROSION
- INJURY TO PERSONS
- FIRE - EXPLOSION
- DAMAGE TO GASKET SEALS

G MOVING AND TRANSPORT

Given the limited weight and size of the pumps (see paragraph R - DIMENSIONS AND WEIGHTS), moving the pumps does not require the use of lifting devices.

The pumps were carefully packed before shipment. Check the packing material on delivery and store in a dry place.

SUCTION

VISCOMAT series pumps are characterized by excellent suction capacity.

In fact, the characteristic flow rate/back pressure curve remains unchanged even at high pump suction pressure values. In the case of oils with viscosity not greater than 100 cSt the suction pressure can reach values on the order of 0,7 - 0,8 bar without compromising the proper functioning of the pump. Beyond these suction pressure values, cavitation phenomena begin as evidenced by accentuated running noise that over time can cause pump damage, not to mention a degradation of pump performance. As viscosity increases, the suction pressure

at which cavitation phenomena begin decreases.

In the case of oils with viscosities equal to approximately 500 cSt, the suction pressure must not exceed values of the order of 0,3 -0,5 bar to avoid triggering cavitation phenomena. The values indicated above refer to the suction of oil that is substantially free of air.

If the oil being pumped is mixed with air, the cavitation phenomena can begin at lower suction pressures. In any case, for as much as was said above, it is important to guarantee low suction pressures (short hoses and possibly of larger diameter than the inlet opening of the pump, fewer curves, filters of wide cross-section and kept clean).

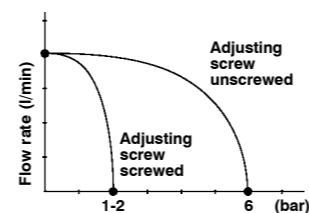
ATTENTION

It is a good system practice to immediately install vacuum and air pressure gauges at the inlets and outlets of the pump which allow verification that operating conditions are within anticipated limits. To avoid emptying the suction hose when the pump is turned off, the installation of a foot valve is recommended.

H6 MAXIMUM PRESSURE DECREASE

VISCOMAT series pumps are equipped with an adjusting screw to adjust the by-pass valve pressure (pos. 10 in the exploded view). The screw is pre-set in the factory for operating at a maximum pressure that is equal to the maximum counter-pressure conditions indicated

in the table under paragraph E1 - Performance specifications. Should it be necessary to decrease the maximum pressure, unscrew the adjusting screw until you reach the desired value. The flow rate curve will be modified as follows:

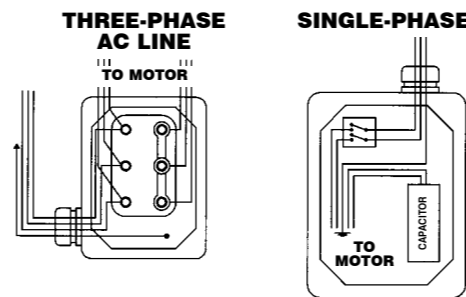


As a result, plant specifications being equal, the flow rate of the pump will be decreased due to the earlier opening of the by-pass valve.

H7 ELECTRICAL CONNECTIONS

All motors come with a short cable used for production testing. To connect the motor to the line, open the

terminal strip cover, remove the above mentioned cable and connect the line according to the following chart.



Single-phase motors are supplied with a bipolar switch and capacitors wired and installed inside the terminal strip box (see

chart). The capacitor characteristics are those indicated on the pump label.

The switch has the function of starting/stopping the pump and cannot in any way replace the main power switch required by the applicable regulations.

ATTENTION

Pumps are supplied without electrical safety devices such as fuses, motor protectors, and systems to prevent accidental restarting after periods of power failure or any other kind.

It is the installer's responsibility to carry out the electrical connection with respect to the applicable regulations.

Comply with the following (not exhaustive) instructions to ensure a proper electrical connection:

- During installation and maintenance make sure that power to the electrical lines has been turned off.
- Employ cables characterized by minimum cross-sections, rated voltages and installation type adequate to the characteristics indicated in paragraph E2 - ELECTRICAL SPECIFICATIONS and the installation environment.
- For three-phase motors, ascertain the correct rotation direction by referring to paragraph R - DIMENSIONS AND WEIGHTS.
- All motors are equipped with a ground terminal to connect to the ground line of the electrical network.
- Always close the cover of the terminal strip box before turning on the electric power, after checking the integrity of the gasket seals that ensure protection grade IP55.

I INITIAL START-UP

VISCOMAT series pumps are self-priming and, therefore, able to draw oil from the tank even when the suction hose is empty on start-up. The priming height (distance between the surface of the oil and the inlet opening) must not exceed 2,5 meters.

ATTENTION

Wetting the Pump. Before starting the pump, wet the inside of the pump body with oil through the inlet and outlet openings.

The priming phase may last from several seconds to a few minutes, depending on the characteristics of the system.

If this phase is excessively prolonged, stop the pump and verify:

- that the pump is not running completely "dry"
- that the suction hose guarantees against air infiltration and is correctly immersed in the fluid to be drawn
- that any filters installed are not blocked
- that the delivery hose allows for the easy evacuation of the air.
- that the priming height is not greater than 2,5 meters
- 1) that under conditions of maximum back pressure, the power absorption of the motor stays within the values shown on the identification plate
- 2) that the suction pressure does not exceed the limits indicated in paragraph H5 - CONSIDERATIONS REGARDING SUCTION & DELIVERY LINES
- 3) that the back pressure in the delivery line does not exceed the values indicated in paragraph H5 - CONSIDERATIONS REGARDING SUCTION & DELIVERY LINES.

When priming has occurred, after reattaching the delivery gun, verify that the pump is functioning within the anticipated ranges, possibly checking:

L DAILY USE

No particular preliminary operation is required for every day use of VISCOMAT pumps.

MANUAL OPERATION

Before starting the pump, make sure that the ultimate shut-off device (delivery nozzle or line valve) is closed. If the delivery has no shut-off device (free delivery) make sure that it is correctly positioned and appropriately attached to the delivery tank.

- turn the on-switch present on some pump models (single-phase) or the start/stop switch installed on the electrical power line
- make sure that the tank is filled with a quantity of oil greater than the quantity to be supplied (running dry could damage the pump).

ATTENTION

Never start the pump by simply inserting the plug in the outlet

- Open the delivery valve or activate the delivery gun, gripping it securely.

ATTENTION

Fluid exits at high pressure from a delivery gun fed by a VISCOMAT pump. Never point the outlet of the gun towards any part of the body.

- Close the delivery gun or the line valve to stop delivery. The pump will immediately enter by-pass mode.

ATTENTION

Running in by-pass mode with the delivery closed is only allowed for brief periods (2 to 3 minutes maximum). When the thermo-protector trips, turn-off the electric power and wait for the motor to cool.

STOP THE PUMP.

AUTOMATIC OPERATION
In certain applications it can be advantageous to provide for the automatic starting/stopping of the pump by means of a pressure switch that monitors the pressure of the delivery line. The functional logic of this type of installation is as follows:

- the pump is stopped, the delivery gun is closed and the delivery line is under pressure.
- the delivery gun is then opened, with the consequent sudden lowering of pressure in the delivery line.

The values of "Pa" and "Pm" are characteristics of the pressure switch used and are often adjustable within a certain range.

For the safe and proper functioning of the pump in these types of applications it is absolutely indispensable to make sure that:

- "Pa" is sufficiently lower than the by-pass pressure, to assure that the pump will stop as soon as the gun is closed and that the pump will not run a long time in by-pass mode.
- "Pm" is several bar lower than "Pa" to avoid the pump starting when not wanted due to small pressure drops not caused by opening the gun.
- the foot valve guarantees an effective seal, to avoid frequent unwanted cycling on and off caused by its leakage.
- whenever the system is entirely composed of metal tubing, or, at any rate, of highly rigid tubing, one should consider installing an accumulator capable of preventing small leaks (from the foot valve, for example) from causing a pressure drop sufficient to automatically start the pump.

ATTENTION

Failure to comply with the above can damage the pump.

M PROBLEMS AND SOLUTIONS

Problems	Possible cause	Corrective action
THE MOTOR IS NOT TURNING	Lack of electric power	Check the electrical connections and the safety systems.
	Rotor jammed	Check for possible damage or obstruction of the rotating components
	The motor protecting thermal switch has tripped	Wait until the motor cools, verify that it starts and/or, look for the cause of overheating
	Motor problems	Contact the Service Department
THE MOTOR TURNS SLOWLY WHEN STARTING	Low voltage in the electric power line	Bring the voltage back within the anticipated limits
	Excessive oil viscosity	Verify the oil temperature and warm it to reduce the excessive viscosity
LOW OR NO FLOW RATE	Low level in the suction tank	Refill the tank
	Foot valve blocked	Clean and/or replace the valve
	Filter clogged	Clean the filter
	Excessive suction pressure	Lower the pump with respect to the level of the tank or increase the cross-section of the tubing
	High loss of head in the delivery circuit (working with the by-pass open)	Use shorter tubing or of greater diameter
	By-pass valve blocked	Dismantle the valve, clean and/or replace it.
	Air entering the pump or the suction tubing	Check the seals of the connections
	A narrowing in the suction tubing	Use tubing suitable for working under suction pressure
	Low rotation speed	Check the voltage at the pump. Adjust the voltage and/or use cables of greater cross-section
	The suction tubing is resting on the bottom of the tank	Raise the tubing
Excessive oil viscosity	Verify the oil temperature and warm it to reduce the excessive viscosity	
INCREASED PUMP NOISE	Cavitation occurring	Reduce the suction pressure (see paragraph H5)
	Irregular functioning of the by-pass	Dispense fuel until the air is purged from the by-pass system
LEAKAGE FROM THE PUMP BODY	Presence of air in the oil	Wait for the oil in the tank to settle
LEAKAGE FROM THE PUMP BODY	Damage to the mechanical seal	Check and replace the mechanical seal

N MAINTENANCE

VISCOMAT series pumps are designed and constructed to require a minimal amount of maintenance.

- On a weekly basis, check that the tubing joints have not loosened, to avoid any leakage.
- On a monthly basis, check the pump body and keep it clean of any impurities.
- On a monthly basis check and clean the filters placed at the pump inlet.
- On a monthly basis, check that the electric power supply cables are in good condition.

O NOISE LEVEL

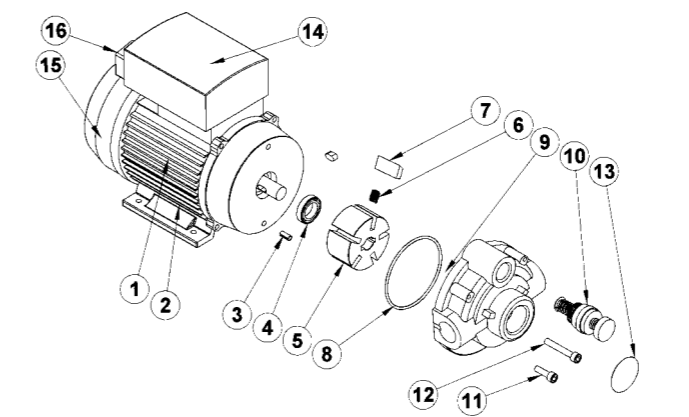
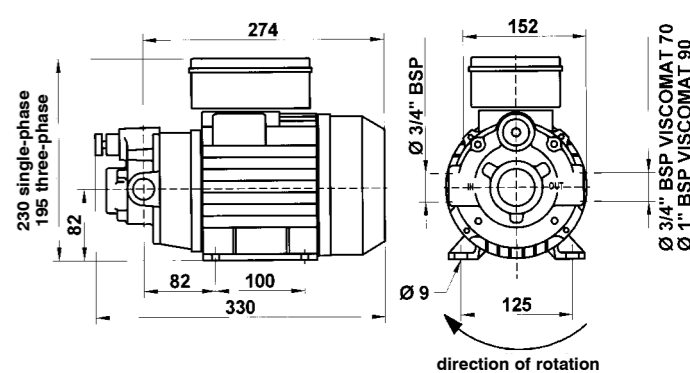
Under normal operating conditions noise emission for all models does not exceed the value of 70 dB "A" at a distance of 1 Meter from the electric pump.

P DISPOSING OF CONTAMINATED MATERIALS

In the case of maintenance or destruction of the machine, do not disperse contaminated parts into the environment. Refer to local regulations for their proper disposal.

Q EXPLODED DIAGRAMS AND SPARE PARTS

VISCOMAT 70-90		
Position	Component description	Quantity
1	MOTOR	1
2	SUPPORT	1
3	PARALLEL PIN DIAM. 5X14	1
4	SEAL BABS L 20/30/7, VITON	1
5	ROTOR	1
6	SPRING FOR BLADES	5
7	BLADE	5
8	O-RING 3275	1
9	PUMP BODY	1
10	ADJUSTING VALVE	1
11	SCREW UNI 5931 8.8 M6X20, SOCKET HEAD	2
12	SCREW UNI 5931 8.8 M6X40, SOCKET HEAD	2
13	PUMP BODY PLATE	1
14	BOX TERMINAL BOARD	1
15	FAN COVER	1
16	SWITCH (SINGLE-PHASE ONLY)	1

**R DIMENSIONS AND WEIGHTS**

direction of rotation