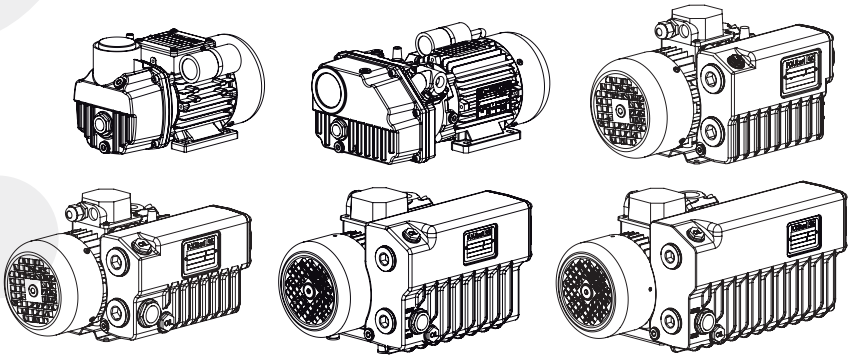
PVR
VACUUMDESIGN

EM4 - EM4/B - EM8 - EM8/B - EM12 - EM12/B
EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B

Lubricated vane monobloc vacuum pumps



Operating and maintenance instructions

Publication Number:
LI 2583.04 January 2020

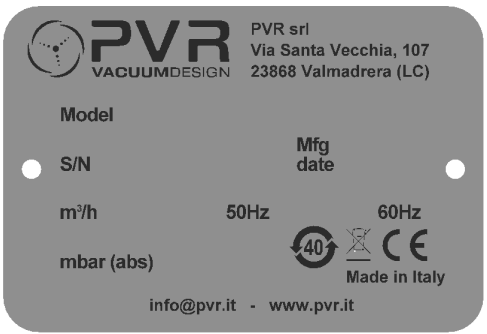
EN
TRANSLATION

ENGLISH INDEX

DRAWINGS AND TABLE REFERENCES

1. GENERAL INFORMATION

This manual contains information necessary for the proper operation of the pump in order to prevent unsuitable use and for the safety of the operators. Do not attempt any other type of operation without having first contacted our **Service Department**. The information provided herewith does not intend to replace, integrate or change any rules, regulations, law by decree, directive or law of specific character in force in the Country where the installation takes place.
The suggestions given to the staff engaged in the installation and servicing assumes that the personnel is expert and prepared in facing any problem of servicing, both mechanical and electrical. For any questions or information not included in this manual, please contact our **Service Department,** always providing: model (type), serial number, year of manufacture, stated on the pump name plate.



In this manual, the following symbols are used:

ATTENTON
Instructions that, if not followed, could result in serious personal injuries.

WARNING
Instructions that, if not followed, could result in pump damages.

2. PRODUCT SPECIFICATIONS

2.1 Pump description

The pump series:
EM4 - EM4/B - EM8 - EM8/B
EM12 - EM12/B - EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B

are lubricated, with oil recirculation system, rotary vane vacuum pumps.

The pump is splined to the electric motor directly.
The air cooling is ensured by the electric motor fan. At the inlet there is a mesh filter in order to protect the pump form sold parts having diameter bigger than 1 mm.
Furthermore, an integrated non-return valve prevents the oil from coming back and the return of air in the chamber to be pumped down during the stop phase (EM4 - EM 4/B excluded).
Inside the tank there is a system for separating oil smokes from discharged air (maximum oil residual 2 PPM/weight corresponding to 2.4 mg/m^3). The separated oil is recovered automatically by the pump.
A gas ballast valve, always on, prevents condensation inside the pump when pumping down small quantity of vapour (EM 4 - EM 4/B excluded).

This symbol identifies the inlet threaded port.

This symbol identifies the exhaust threaded port.

2.2 Expected use

These vacuum pumps have been designed to handle air and small quantity of water vapour only. They are suitable to evacuate closed systems or to operate at a constant vacuum within the following vacuum range:

EM4 are suitable to evacuate closed systems where the **max. pressure of 2 mbar (abs.)** is achieved (for ex. vacuum packaging).

EM4/B are suitable to evacuate closed systems and to operate at a constant vacuum **within 10 and 700 mbar (abs.).**

EM8	2 to 300 mbar (abs.)	**EM8/B**	20 to 800 mbar (abs.)
EM12	2 to 400 mbar (abs.)	**EM12/B**	20 to 850 mbar (abs.)

EM20	2 to 400 mbar (abs.)	**EM20/B**	20 to 850 mbar (abs.)
EM28	2 to 400 mbar (abs.)	**EM28/B**	20 to 850 mbar (abs.)
EM40	2 to 400 mbar (abs.)	**EM40/B**	20 to 850 mbar (abs.)

The ambient temperature and the inlet temperatures must be included between 5°C and 40°C. In case you get temperatures outside this range, please get in touch with us. Handling of other types of gas or vapours must be declared in advance to PVR that will give the conformity to the specific use.

2.3 Forbidden use

ATTENTION
The pump MUST NOT handle:
- liquids or solid substances;
- dangerous, explosive or aggressive gases and vapours;
- pure oxygen or air mixtures enriched with oxygen.
It is forbidden to use the discharge of the pump to create even limited pressures.

ATTENTION
It is forbidden to install the pump in a potentially explosive environment.

2.4 Protections

EM4 - EM4/B
The pump is supplied without inlet non-return valve.
To prevent the oil from coming back and the air from entering the chamber to be pumped down during the stop operation, it is necessary to install an external non-return valve near the pump inlet port. Alternatively a solenoid valve might be used.
FOR ALL THE PUMP MODELS
The pump must be protected against suction of dust, solids or liquids.
For those applications where such a protection is not ensured, a vacuum gauge must be installed on the oil tank for a visual check of the exhaust filter clogging. In order to get an automatic pump stop, a pressure switch set at 0.5 bar can be installed. The pump is supplied without electric control panel. The electric motor must be protected according to the regulations in force.

ATTENTION
In case of applications where the pump stop or failure can cause damages to people or things, safety measures for the system must be adopted.

2.5 Accessories

The following accessories useful for the installation and the operation are available:
- external inlet filters;
- vacuum gauges / vacuum switches;
- pressure gauges / pressure switches;
- pipe fittings;
- vibration dampers.

3. SAFETY PRESCRIPTIONS

ATTENTION
Despite of all the precautions adopted when designing the equipment, there are some risk elements that arise during operation and servicing.

❑ ***HOT SURFACES***
The temperature of the pump surfaces may exceed 70°C.
Install the pump in a protected area accessible only by authorized personnel, to prevent possible personal injures by coming into contact with hot surfaces.
The pump can be placed inside other machines by adopting the necessary safeguards.
Before carrying out any maintenance on the pump, be sure the pump is cold.

❑ ***HARMFUL SUBSTANCES EMISSIONS***
The discharged air contains part of traces of oil mist.
Check the compatibility with the work environment. A failure or the seals wear can cause an oil leakage. Avoid the dispersion to the ground and the pollution of other materials. In case air containing dangerous substances must be pumped down (for example, biological or microbiological agents), adopt filtering systems before introducing air in the work environment. Used oil coming from the pump must be disposed of in accordance with the regulations in force in the Country of use.

Do not dispose into the environment.

❑ ***HAZARD CAUSED BY VACUUM***
Avoid the contact with the pump inlet port during the pump operation.
Introduce air in the inlet circuit before every operation.
The contact with parts under vacuum can cause injuries.

❑ ***HAZARD CAUSED BY PRESSURE***
The pump tank is pressurized. Do not open the oil filling and discharge plugs during operation.

❑ ***FOR A SAFE MAINTENANCE***
All maintenance operations must be carried out with the pump idle, disconnected from the electrical supply, with the pump cold, vented to atmospheric pressure. Prevent unexpected start-up (e.g. block the power switch with a personal lock).

❑ ***ELECTRIC SAFETY*** 
Some components of the electric equipment are electrically charged during operation whose contact may cause serious injuries to persons or objects.
Connection and control of the electric system must be carried out by skilled personnel only.
The electric equipment must comply with the EN 60204-1 standard and with the other laws in force in the Country of use.

❑ ***FIRE HAZARD*** 
WARNING! The use of the pump for situations unforeseen or not recommended by this manual, as well as lack of correct maintenance, may create high risks for overheating or fire.
In case of a fire do not use water to extinguish but use a powder CO2 extinguisher or other means compatible with the electric equipment and lubricating oil.

4. TRANSPORT-HANDLING

4.1 Lifting

The orientation of the packed components must correspond to the instructions given by the pictograms on the external covering of the packaging. Given the light weight, it is possible to lift the pump manually.

4.2 Unpacking and components control

When receiving the machine, check that the packing is intact or if is shows signs of damages occurred during transportation.
If there is no damage, proceed to the unpacking and check further the machine.
In case damages are found, inform immediately **PVR** and the carrier. A representative will contact you or it may be dispatched to the site to inspect and file full damage report.

4.3 Storage

The pumps must be stored or transported without oil and protected from the atmospheric agents at a temperature between -15°C and 50°C (normal humidity rate).

5. COMMISSIONING AND OPERATION

5.1 Assembly

EM4 - EM4/B

WARNING: Install an external non-return valve near the pump inlet port. Alternatively a solenoid valve might be used.

Remove the inlet cap and assemble the non-return valve. Fit the inlet filter with fittings as shown on page 34 on the exploded view (all the components are available as accessories).

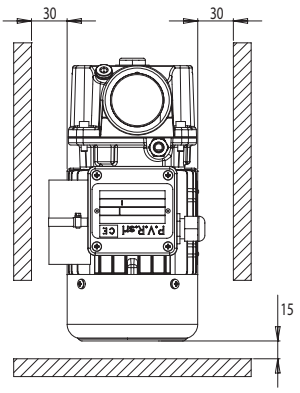
FOR ALL THE OTHER MODELS
Remove the inlet and exhaust caps.
Fit the external filter in horizontal position to prevent dirt coming inside the pump during the cleaning of the cartridge..
Fit the vibration dampers, if any, on the points of support.

EM8 - EM8/B see exploded view on page 36
EM12 - EM12/B see exploded view on page 38
EM20 - EM20/B see exploded view on page 40
EM28 - EM28/B see exploded view on page 42
EM40 - EM40/B see exploded view on page 44

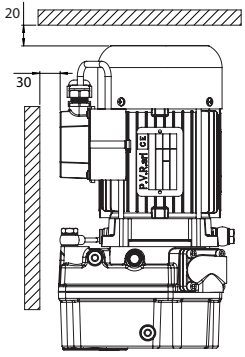
5.2 Location

- ❑ *The pump must be installed in a protected area (see paragraph 3, safety rules).*
- ❑ *It must be fastened with support feet on horizontal surface.*
- ❑ *Ensure there is ventilation in the room or inside the machine where the pump has been installed. To assure a sufficient cooling, avoid to overpass 40°C of ambient temperature.*
- ❑ *The pump must be protected against jets or sprays of water that may penetrate tank through the exhaust port.*
- ❑ *Whenever the pump is installed outside, it must be protected against atmospheric agents and used with an oil suitable for the ambient temperature.*
  Avoid warm air coming from the exhaust or the cooling fans causing discomfort to the personnel.
- ❑ *It must be accessible for correct and easy maintenance, by respecting the minimum distances from possible obstructions:*

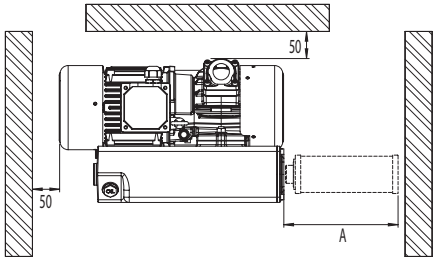
EM4 - EM4/B



EM8 - EM8/B



EM12 - EM12/B: A = 110
EM20 - EM20/B: A = 150
EM28 - EM28/B: A = 170
EM40 - EM40/B: A = 190



WARNING
Do not install the pump in a dusty area or where other materials may block or cover the cooling surfaces quickly.

5.3 Connection to the machine

The connection to the chamber to be pumped down must be carried out by means of pipes of the same diameter as the inlet port.
Pipe weights and expansions, if any, must not rest on the pump.
It is advisable to make the final connection to the pump with flexible pipes or fittings.
It is important that all the pipes and the different fittings are tight.
Very long or small diameter pipes decrease the pump performances.

5.4 Discharge air pipe line installation

- ❑ *When required, it is possible to pipe the pump discharge air to other rooms, or outside.*
- ❑ *Use pipes with the same diameter as the tank discharge port with a maximum length of 15 m. For longer pipes increase pipe diameter. Pipe weights must not rest on the pump. In the final length use flexible pipes or pipe fittings.*

WARNING:
This pipe must be descending, to avoid the condensate going back to the tank.

ATTENTION
Do not connect ball valves to this pipeline.

5.5 Electric connection

- ❑ *The control panel and electric connections must be carried out by skilled personnel and conform to the EN 60204-1 rules or to other local regulations in the Country of use. The electric equipment must comply with EN 61000-6-4 and EN 61000-6-2 standard concerning electromagnetic compatibility, emission standard and immunity for industrial environments*

- ❑ *Check the main voltage and frequency in use to correspond to the data stamped on the motor name plate.*
  The electric motor must be protected against overload. The full load amperage value on the motor name plate must be considered when sizing the electrical components and motor protection against overloading.
  Make sure the grounding is correctly done.
  Carry out the electric connection following the diagram shown on the motor terminal box.

- ❑ *Check the direction of rotation by starting the pump for a short time (2-3 seconds). The correct direction is shown by the arrow on the pump:*
  EM4 - EM4/B - EM8 - EM8/B
  EM 12 - EM 12/B - EM 20 - EM20/B
  EM 28 - EM 28/B - EM 40 - EM 40/B
  In case of wrong rotation, it is necessary to change the motor rotation by exchanging position of two of the three connections in the motor terminal box.

5.6 Commissioning

The pump is supplied without lubricating oil.

WARNING
The operation without oil causes big damages to the pump.

Carry out the first filling up through the plug (**E**) up to the half of the sight glass (**F**) and close the plug (**G**):
EM4 - EM4/B - EM8 - EM8/B
EM12 - EM12/B - EM20 - EM20/B
EM28 - EM28/B - EM40 - EM40/B

WARNING
A quantity of oil greater than necessary may clog the oil separator and damage the pump or the electric motor.

Start the pump and take it to the maximum vacuum level for at least 2 minutes. Stop the pump, check again the oil level and add it if needed, in order to get to the correct oil level.

5.7 Suggestions for the use

When the room temperature is lower than 10°C, it is good to let the pump operate at maximum vacuum level for about 5 minutes. During this period the pump may not reach the stated pressure limits.

WARNING for EM4
Allow the pump to achieve the maximum vacuum (within 5 minutes) cyclically, so that a regular recovery of the oil knocked down by the exhaust filter is assured. Alternatively, stop the pump every five minutes.

WARNING
Avoid operating pump for long periods with inlet port at atmospheric pressure. Avoid frequent stop-starting. (It is advisable not to exceed 30 startings per hour).

5.8 Water vapour suction (excluded EM4 - EM4/B)

In order to pump down water vapour it is essential to take the pump temperature to its operating value. In case there are other condensate in the oil, let the pump run at maximum vacuum for at least thirty minutes, at the end of the working cycle.
It is advisable to carry out this operation before stopping the pump for a long time. The gas ballast valve will allow the elimination of water condensate from the lubricating oil.

6. SERVICING

6.1 General information

Before every maintenance operation:
- Ensure the pump insulation from the electric energy so that the pump can't start automatically.
- Make sure the pump has reached a non-dangerous temperature.
- Introduce air in the inlet circuit.

In order to keep the pump operating at a high efficiency level, follow all periodical service points listed in the table below. However, more frequent service operations may be necessary depending on what the pump is used for (suction of condensable vapours, suction of powders or polluting substances). For such cases, only direct experience can indicate the correct service frequency needed. The exhausted oil and the replaced spare parts must be considered as special waste products and handled according to the local regulations in the Country of use.

SERVICING FREQUENCY		DESCRIPTION OF THE OPERATION	AUTHORIZED PERSONNEL
24	Hours/ Every day	Check oil level before starting	Operator
100	Hours / Every week	Clean the external element with compressed air. If necessary, replace it**	Operator
		Clean with a blast of air the cooling surfaces of the pump and of the electric motor	Operator
500/1000*	Hours/every 6 months	Change the lubricating oil	Skilled worker
		If the pressure gauge is fitted on the pump, check the exhaust filter (max 0.5 bar). If necessary, replace it (EM4 - EM4/B excluded)	Skilled worker
		Clean with a blast of air the silencer and the filtering mesh** (EM4 - EM4/B excluded)	Skilled worker
		Clean the lubrication and oil recovery circuits carefully	Skilled worker
2000	Hours/every year	Replace the exhaust filter**	Skilled worker
		Check the electrical connection	Skilled worker
30000	Hours/every 5 years	Pump overhaul	Customer Service Skilled worker

**The first oil change has to be done after 500 hours of operation. If any polluting substances are found in the oil, next oil change could take place within 1.000 hours.*

****EM4 - EM4/B** see exploded view on page 34 - **EM8 - EM8/B** see exploded view on page 36 - **EM12 - EM12/B** see exploded view on page 38 - **EM20 - EM20/B** see exploded view on page 40 **EM28 - EM28/B** see exploded view on page 42 - **EM40 - EM40/B** see exploded view on page 44

6.2 Oil change

Oil change should be done when the pump is still warm.

ATTENTION:
Use protective gloves to avoid injury caused by heat.

References:
EM4 - EM4/B
EM8 - EM8/B
EM12 - EM12/B
EM20 - EM20/B
EM28 - EM28/B
EM40 - EM40/B

Unscrew the oil filling plug (**E**) and the discharge plug (**G**) only after having placed below the pump tank a suitable container (proper size and shape) for collecting the total quantity of oil. Once the oil has been completely discharged from the tank, re-assemble both plugs ("**E**" and "**G**") and let the pump run under vacuum for about one minute, so that the lubricating/cooling line get emptied and any oil residual keeps inside the pump. Then, remove the plugs and discharge the rest of the oil.
If the oil is polluted or if some water is in the oil, clean the pump by letting it run at maximum vacuum level with about 0.5 litre of fresh oil for at least 5 minutes. Change again the lubricating oil. Fill the pump with fresh oil (please see "commissioning" and "recommended oil table").

Lubricating line cleaning (for EM 4- EM 4/B)

Dirty or blocked lubricating line (the fitting pos. 13 in particular) might be the reason for the pump bad operation or performance decrease.
In order to clean the pipeline, please carry out the following operations:

- With reference to the exploded view on page 34, disassemble the tank (pos. 14) by unscrewing its screws (pos. 20). Remove the end plate (pos. 8) by unscrewing its screws (pos. 9).
- Using compressed air, clean the lubricating fitting (and its internal adapter) by blowing in the opposite direction with respect to the normal oil flow, through the passage hole which is in the internal flat side of the end plate pos. 8.

- Clean the inside of the tank carefully. Please make sure not to leave any residual.
- For assembly, proceed the reverse of above steps.

Oil recovery line cleaning (for EM4/B)

A dirty or blocked oil recovery line (orifice pos. 22 and filter pos. 21 particularly) is the reason for oil accumulation in the exhaust filter seat and can be the reason for its ejection during the pump operation. In order to get the line cleaned, please follow the instructions:

- Taking the exploded view on page 34 as a reference, disassemble the tank (pos. 14) by unscrewing its screws (pos. 20). Remove the exhaust filter (pos. 19) and the oil sight glass (pos. 16 and 16A) from the tank.
- Using compressed air, clean the parts (pos. 21 and 22) of the lubricating circuit, by blowing the opposite direction with respect to the normal oil flow, through the passage hole in the tank inside surface.
- Clean the tank inside and the exhaust filter seat carefully. Do not leave any residual.
- For assembly, proceed the reverse of above steps.

6.3 Replacement of exhaust filter

Exhaust elements which are overly dirty may cause a considerable pump temperature rise and the electric motor protection tripping. Maximum allowed pressure in the tank is 0.5 bar measured at the maximum capacity (when the pump is working with the inlet open to atmospheric pressure). If a pressure gauge has been fitted on the tank, check the exhaust filter blockage with the pump warm. To replace the filter, unscrew the exhaust filter by removing its screws. Unscrews the exhaust filter and replace it. If needed, change the tank cover gasket, too.

EM4 - EM4/B see exploded view on page 34
EM8 - EM8/B see exploded view on page 36
EM12 - EM12/B see exploded view on page 38
EM20 - EM20/B see exploded view on page 40
EM28 - EM28/B see exploded view on page 42
EM40 - EM40/B see exploded view on page 44

For assembly, proceed the reverse of above steps and observe the max. tightening torque of 10 Nm.

6.4 Pump overhaul

For this operation please request the proper instructions and direct any questions to our Customer Service department. The overhaul consists of a complete disassembly, cleaning of all components as well as replacement of parts that are subject to wear (bearings, vanes and gaskets).

6.5 Spares necessary for the normal servicing

The recommended spares are shown in the list of the exploded drawing marked with the letter "**R**". Gasket kit marked in the list with the letter "**G**" is also essential for spare parts.

6.6 How to order spare parts

When ordering spare parts, always state the pump model (type), serial number, year of production, electric motor characteristics (single-phase/three-phase, kW. V, Hz), position reference on the spare parts list, description and quantity needed

7. LUBRICANTS

❑ **Recommended oil for generic use**
Use the mineral oil for compressors according to DIN 51506 group VC-VCL or VDL classification ISO L-DAG

EM4 - EM4/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 32**	**Rotant VF 201**
EM8 - EM8/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 46**	**Rotant VF 202**
EM12 - EM12/B - EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 68**	**Rotant VF 203**

❑ **Synthetic oil recommended**
Use the synthetic oil

EM4 - EM4/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 32**	**Rotant VF 301**
EM8 - EM8/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 46**	**Rotant VF 302**
EM12 - EM12/B - EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B		
Ambient temperature	Grade	**PVR oil**
5 - 40°C	**ISO 68**	**Rotant VF 303**

For ambient temperature outside the stated range , please get in touch with our Customer Service Department.

8. DE-COMMISSIONING

Drain the oil from the pump prior to the removal.
If the oil is polluted, flush the pump with fresh oil (see "**oil change**").
Drain the oil from the tank, plug the inlet and the discharge ports and store the pump without oil.
In case of pump disposal, separate the pump parts by materials and trash the parts in accordance with the local regulations in the Country of use.

9. RETURN FOR REPAIR

In case of pump return for repair to **PVR,** provide a list of substances which have come in contact with the pump and advise the risks involved in handling, if any. Drain the lubricant from the pump prior to shipping the pump back

10. DISPOSAL

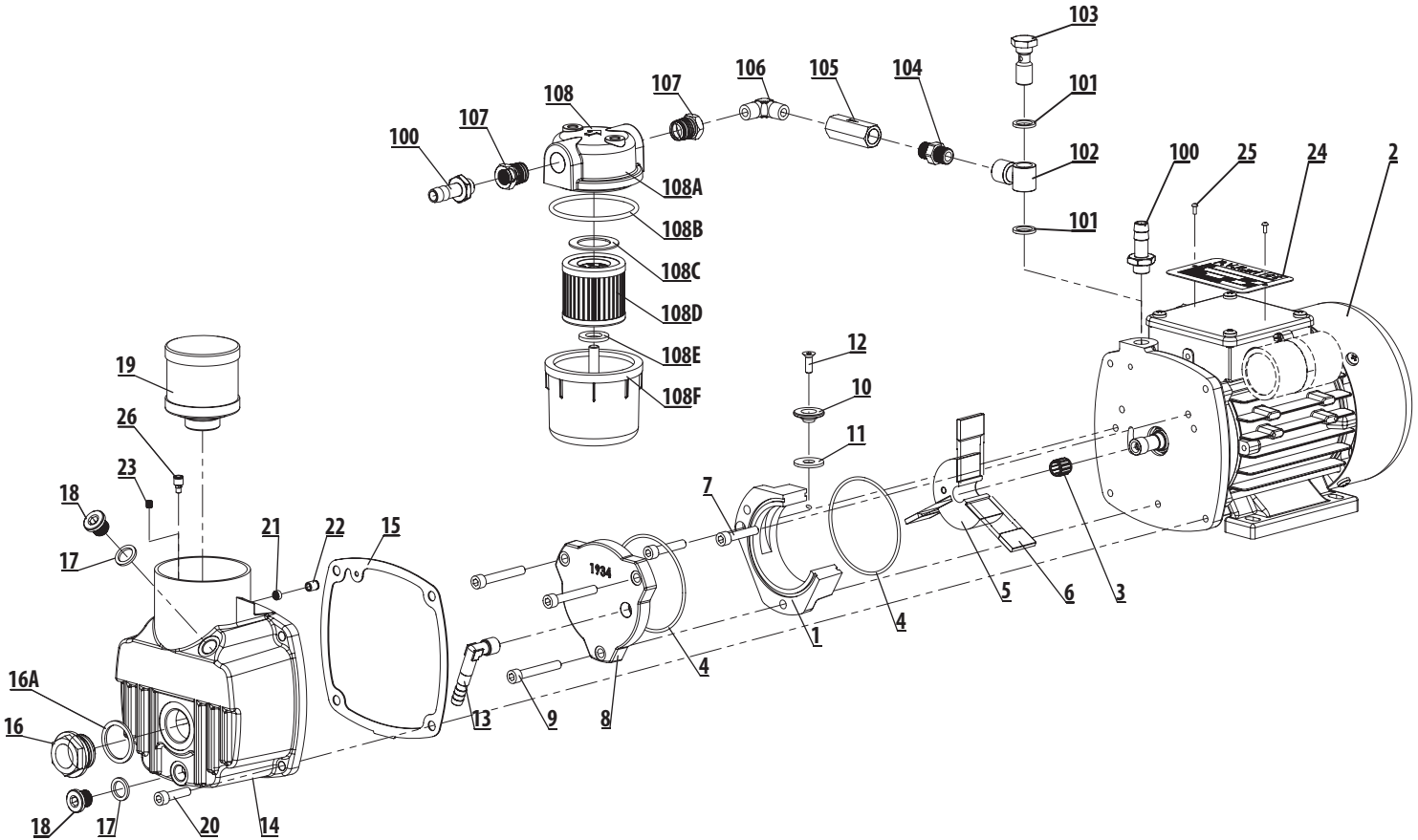
Meaning of the "WEEE" logo found in labels
The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment) Directive. This symbol (valid only in countries of the European Community) indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system.
The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.

10. TROUBLESHOOTING

TROUBLE	CAUSE	SOLUTION
Drop in performance	Inlet filter is dirty	Clean or replace**
	Inlet pipes or machine are leaking	Stop leaks
	No lubrication	Check oil level and oil condition. Fill with oil to the right level or change the oil. Clean the lubricating line carefully (only EM4 - EM4/B)
Anomalous noise	No lubrication	See previous point
	Damaged motor or pump bearings	Replace
	Damaged vanes	Replace
	Damaged contact surfaces	Pump overhaul at our workshop
Oil leak	Worn motor shaft oil seal ring	Replace oil seal ring**
	Ineffective oil recovery system	Check and clean the oil recovery line
	Ineffective exhaust filter	Replace exhaust filter**
Motor protection is tripping	Blocked exhaust filter	Replace exhaust filter**
	No lubrication	Oil level filling up
	Pump seizure or jam	Pump overhaul
	Broken vane	Replace the vanes
Discharge oil mist	Ineffective exhaust filter	Replace exhaust filter**
	High temperature due to polluted oil	Oil change
	High operating temperature due to the ambient temperature (too high)	Decrease ambient temperature by allowing a better change of air
Oil is coming out from discharge (only EM4 - EM4/B)	Pump operation outside expected pressure limit range	Come back to the expected pressure limit range
	Ineffective oil recovery system	Check and clean the oil recovery line
	Ineffective exhaust filter	Replace exhaust filter**

See exploded view: **EM4 - EM4/B on page 34 - **EM8 - EM8/B** on page 36 - **EM12 - EM12/B** on page 38 - **EM20 - EM20/B** on page 40 - **EM28 - EM28/B** on page 42 - **EM40 - EM40/B** on page 44

EM4 - EM4/B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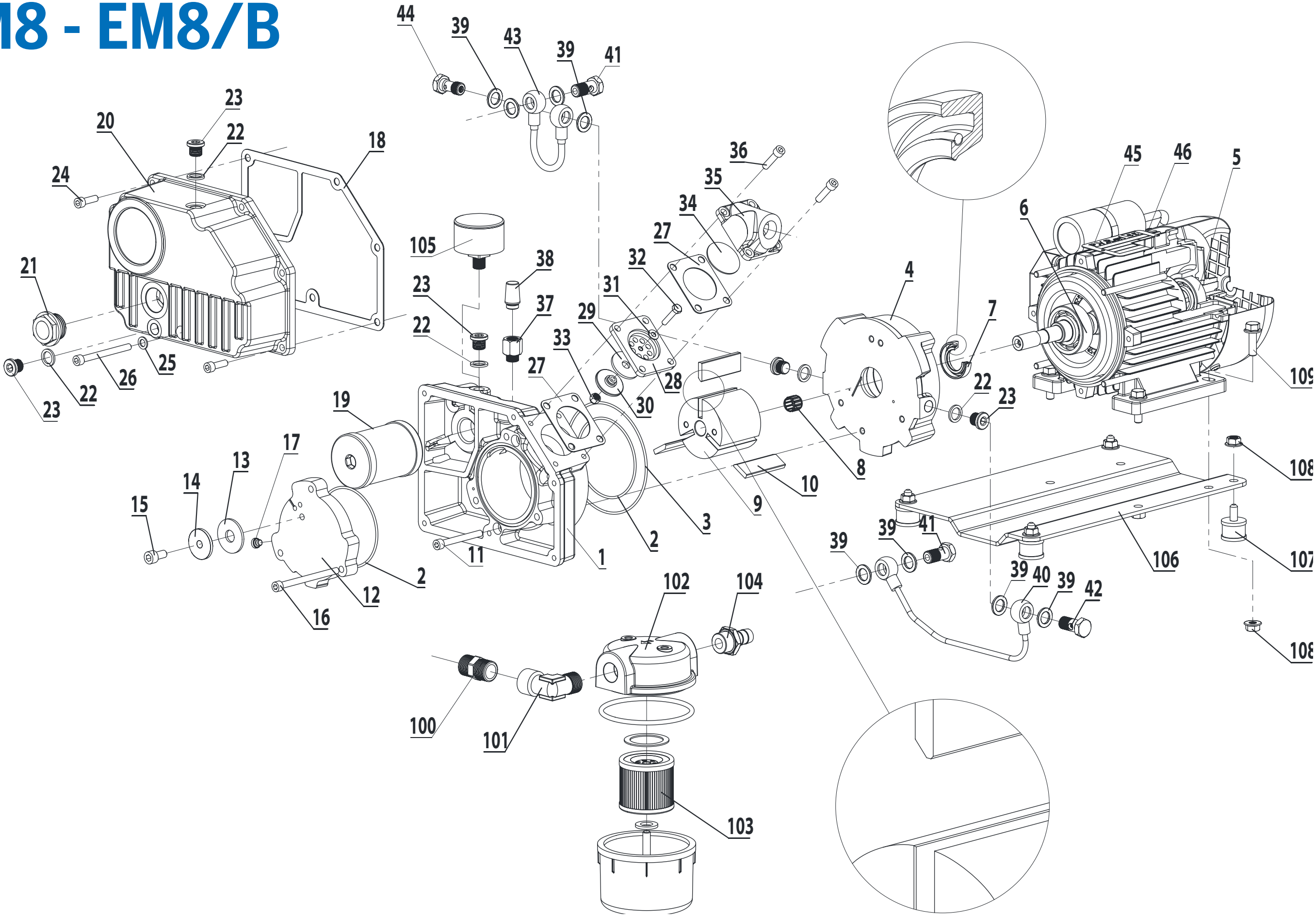
PART LIST
EM4 - EM4/B

POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump		1
2	Electric motor		1
3	Tolerance ring(*)		1
4G	2224 O-ring		2
5	Rotor		1
6R	Vane		3
7	M5x25 Hexagon socket head screw		2
8	External side cover		1
9	M5x35 Hexagon socket head screw		3
10	Support valve disk		1
11	D.18/7x1.5 Rubber disk		1
12	M4x12 Hexagon socket countersunk head cap screw		1
13	Body of pump lubrication fitting		1
14	Tank		1
15G	Tank gasket		1
16	1/2" Oil sight glass		1
17	1/8"G Al washer		2
18	1/8"G Hexagon socket head plug		2
19R	Exhaust filter		1
20	M5x20 Hexagon socket head screw		4
21	Oil recovery filter	-	1
22	Bushing with sized orifice	-	1
23	M4x4 Hexagon socket stud Bolt	-	1
24	Pump name plate		1
25	ø1.85x5 Rivet		2
26	Oil recovery valve	1	-

(*)Valid up to SN IT1543N085

POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
100	Fitting A19 1/8"G - D.9	1	
101	Al washer	2	
102	Fitting	1	
103	Banjo bolt	1	
104	Nipple 1/8"G	1	
105	Non-return valve	1	
106	1/8"G Elbow M-M	1	
107	1/4"G - 1/8"G Adapter	2	
108R	Inlet filter	1	

EM8 - EM8/B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PART LIST
EM8 - EM8/B

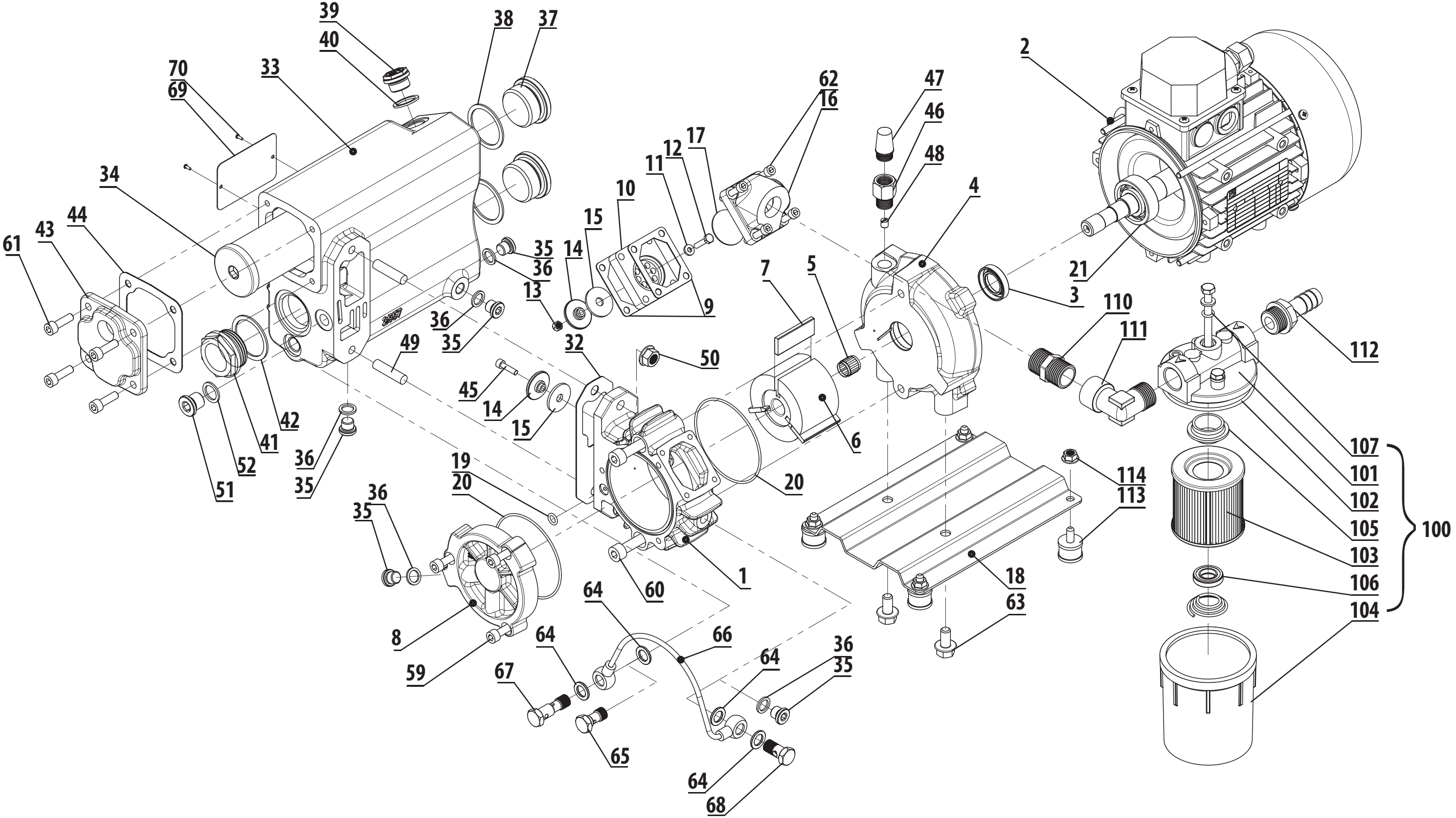
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump	1	
2G	O-Ring 2250	2	
3G	O-Ring 2350	1	
4	Electric motor flange	1	
5	LV Ball Bearing 6202	1	
6	LP Ball Bearing 6203	1	
7G	BAB(SL) 17x30x6 Seal ring	1	
8R	Toleranzhulsen ring(*)	1	
9	Rotor	1	
10R	Vane	3	
11	M5x45 Hexagon socket head screw	2	
12	External side cover	1	
13G	Valve disk	1	
14	Support valve disk	1	
15	M6x12 Hexagon socket head screw	1	
16	M5x65 Hexagon socket head screw	3	
17	M5 Plug + O-Ring	1	
18G	Tank gasket	1	
19R	Exhaust filter + O-Ring	1	
20	Tank	1	
21	1/2"G oil sight glass	1	
22	1/8"G Al washer	5	
23	1/8" Hexagon socket head plug	5	
24	M5x16 Hexagon socket head screw	5	
25	Al. ø10/6 th.1 washer	1	
26	M5x55 Hexagon socket head screw	1	
27G	Inlet port gasket	2	
28	Inlet valve body	1	
29G	Inlet valve disk	1	
30	Inlet valve support disk	1	
31	Al Washer	1	
32	M4x20 Hex. screw	1	
33	M4 Self-locking nut	1	
34	Inlet filtering mesh	1	
35	Inlet port	1	
36	M5x20 Hexagon socket head screw	4	
37	Gas ballast valve	1	

POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
38	Silencer	1	
39	1/8"Gas Cu washer	4	4
40	Oil recovery pipe (x /B; 20 mbar)	-	1
41	1/8"G Hollow bolt	1	1
42	Bolt with sized orifice (x /B; 20 mbar)	-	1
43	Oil recovery type (2 mbar)	1	-
44	1/8" Hollow bolt with non return valve	1	-
45	Pump name plate	1	
46	Electric Motor	1	

(*)Valid up to SN IT1603N021

POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
100	A2 M-M 3/8"G Nipple	1	
101	3/8" M-F Elbow	1	
102	Complete inlet filter	1	
103R	Filtering element x inlet filter	1	
104	3/8"G - D.12 fitting + O-Ring	1	
105	Pressure gauge x Exhaust filter	1	
106	Vibration-damping foot base plate	1	
107	Vibration-damping foot	4	
108	M6 Nut flanged and knurled	8	
109	M6x20 Hex. screw flanged and knurled	4	

EM12 - EM12/B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PART LIST
EM12 - EM12/B

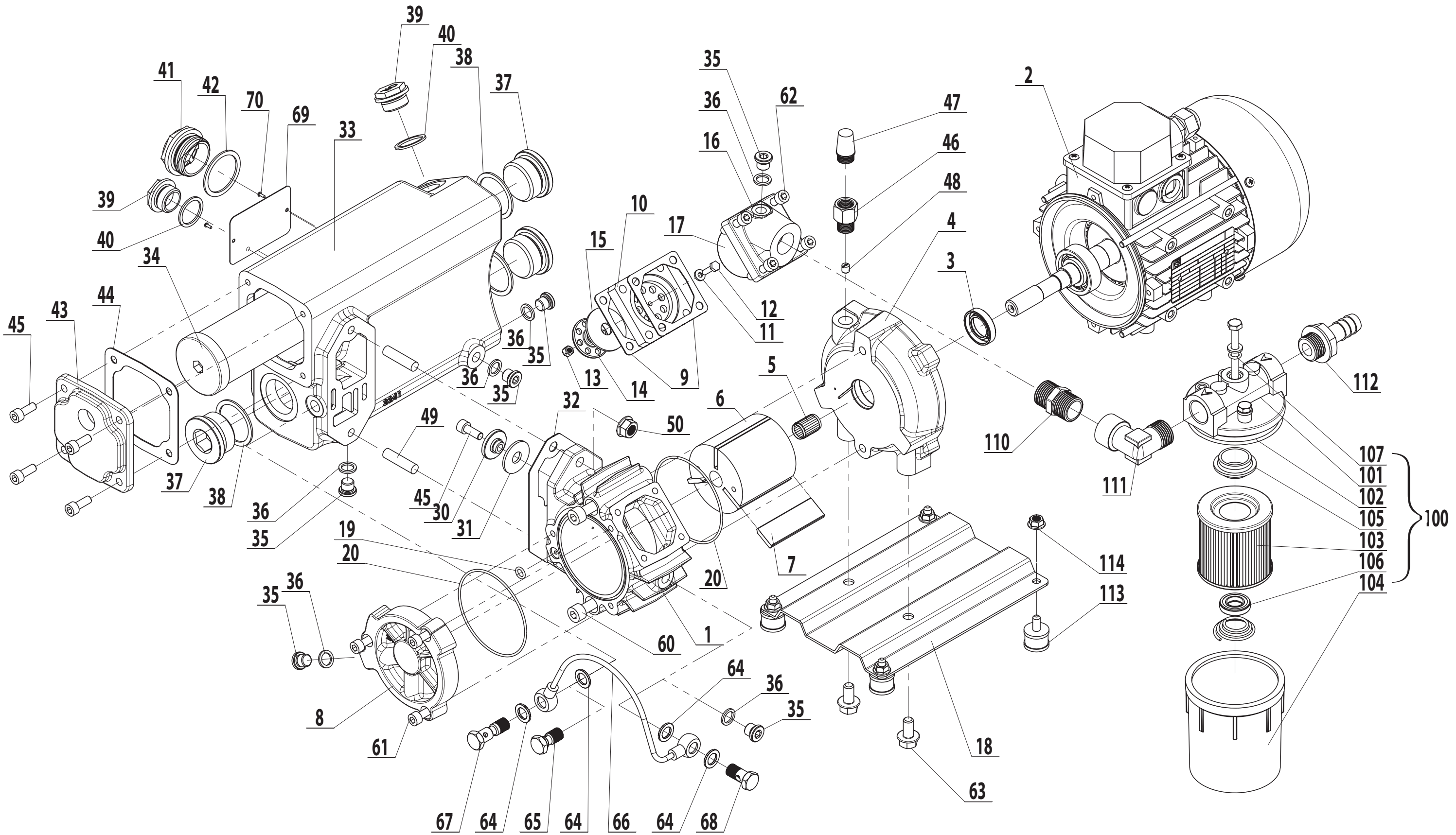
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump	1	
2	Electric motor	1	
3G	BABSL 17x30x6 Seal ring	1	
4	Motor side and plate / Motor flange	1	
5	BN 14-514 Toleranzhulsen(*)	1	
6	Rotor	1	
7	Vane	3	
8	External side cover	1	
9G	Inlet gasket	2	
10	Suction plate	1	
11	ø9/4x1,5 Al washer	1	
12	M4x16 Hex. screw	1	
13	M4 Locknut	1	
14	Support valve disk	2	
15G	ø25/7x2 Rubber disk	2	
16	Inlet port	1	
17	Filtering mesh	1	
18	Base plate	1	
19G	106 O-Ring	1	
20G	2287 O-Ring	2	
21	6203-2Z Bearing	1	
32G	Tank-pump gasket	1	
33	Tank	1	
34G	Exhaust filter	1	
35	1/8"G Hex. socket head plug	5	4
36	1/8" Al washer	5	4
37	1"G Hex. socket head plug	2	
38	1" Al washer	2	
39	3/8"G Filling plug	1	
40	3/8" washer	1	
41	1"G Oil sight glass	1	
42	1"G washer	1	
43	Tank cover	1	
44G	Tank cover gasket	1	
45	M6x16 Hex. socket head screw	1	
46	Fitting with non-return valve	1	
47	1/4"G Gas ballast valve	1	

POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
48	0.7mm Adapter	1	
49	M8 Screw	2	
50	M8 Nut flanged and knurled	2	
51	1/4"G Hex. socket head plug	1	
52	1/4"G Al washer	1	
59	M6x16 Hex. socket head screw	3	
60	M8x50 Hex. socket head screw	2	
61	M6x20 Hex. socket head screw	4	
62	M5x30 Hex. socket head screw	4	
63	M8x16 Hex. screw flanged and knurled	2	
64	1/8"G Cu washer	1	4
65	1/8" Hollow bolt with non-return valve	1	-
66	ø4/2 Pipe for EM/B	-	1
67	Double hollow bolt for EM/B	-	1
68	Bolt with sized orifice and filter for EM/B	-	1
69	Pump name plate	1	
70	ø1.85x5 Rivet	2	

(*)Valid up to SN IT1538N057

POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
100	Complete inlet filter	1	
101	Filter body	1	
102	O-Ring	1	
103	Filtering cartridge	1	
104	Air filter housing	1	
105	Upper gasket	1	
106	Lower seal gasket	1	
107	O-Ring	1	
110	A2 M-M 1/2"G Nipple	1	
111	A10 M-F 1/2"-1/2" Union elbow	1	
112	Fitting	1	
113	Vibration-damping foot	4	
114	M6 Nut flanged and knurled	4	

EM20 - EM20/B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PART LIST
EM20 - EM20/B

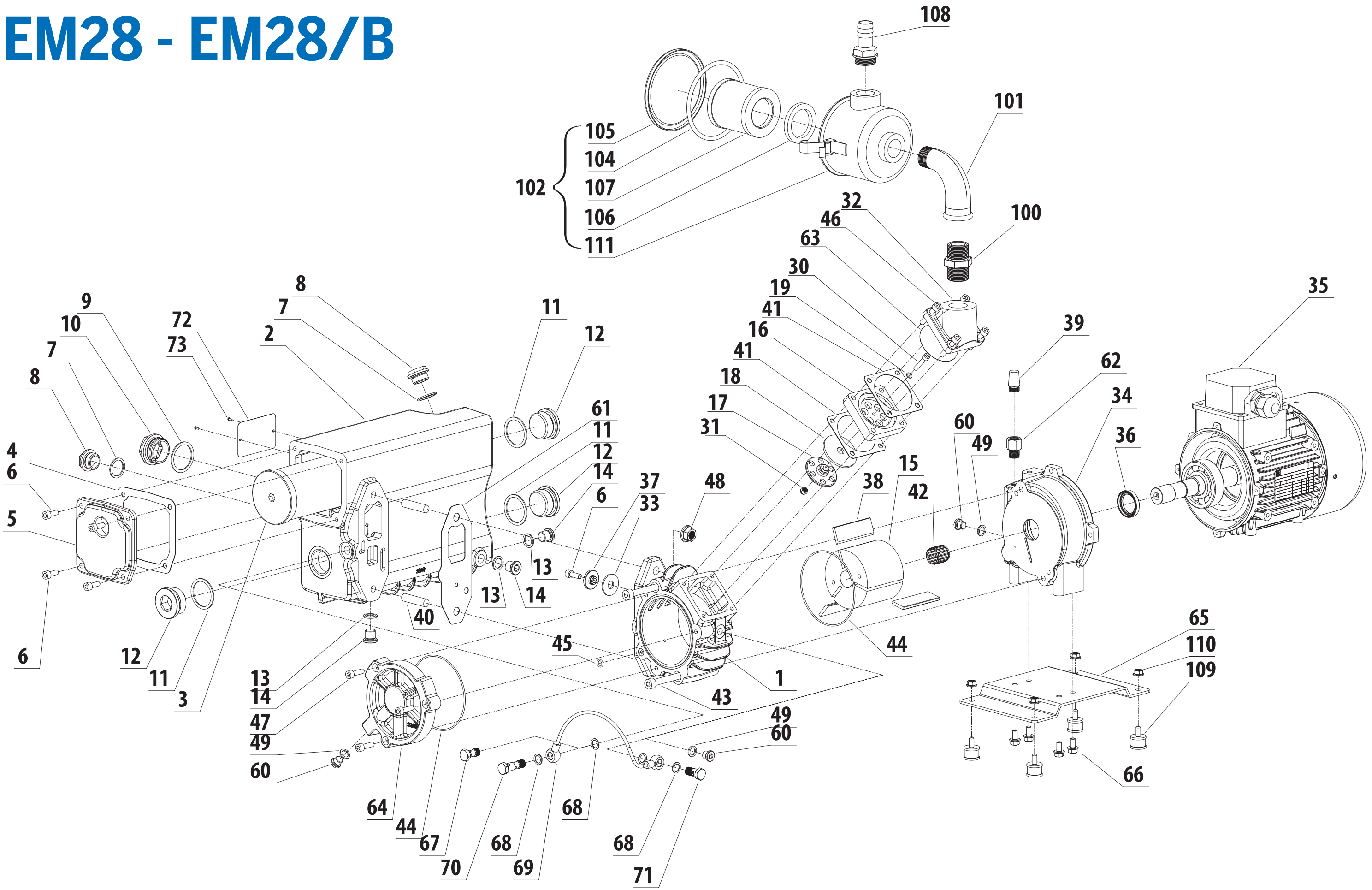
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump	1	
2	Electric motor	1	
3G	BABSL 17x30x6 Seal ring	1	
4	Motor side end plate/Motor flange	1	
5	BN 14-514 Toleranzhulsen ring(*)	1	
6	Rotor	1	
7	Vane	3	
8	External side cover	1	
9G	Inlet gasket	2	
10	Suction plate	1	
11	ø9/4x1,5 Al washer	1	
12	M4x16 Hex. screw	1	
13	M4 Locknut	1	
14	Support valve disk	1	
15	ø36/10X2 Rubber disk	1	
16	Inlet port	1	
17	Filtering mesh	1	
18	Base plate	1	
19G	106 O-Ring	1	
20G	2287 O-Ring	2	
30	Discharge valve disk	1	
31	Rubber disk	1	
32G	Tank-pump gasket	1	
33	Tank	1	
34	Exhaust filter	1	
35	1/8"G Hex. socket head plug	6	5
36	1/8"G Al washer	6	5
37	1"G Hex. socket head plug	3	
38	Al washer	3	
39	1/2"G Hex. socket head plug	2	
40	1/2"G Washer	2	
41	1" Oil sight glass	1	
42	1"G Washer	1	
43	Tank cover	1	
44G	Tank cover gasket	1	
45	M6x16 Hex. socket head screw	8	
46	Fitting with non-return valve	1	
47	1/4"G Gas ballast valve	1	

POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
48	1 mm Adapter	1	
49	M8 Screw	2	
50	M8 Nut flanged and knurled	2	
60	M8x65 Hex. socket head screw	2	
62	M6x30 Hex. socket head screw	4	
63	M8x16 Hex. screw flanged and knurled	2	
64	1/8"G Cu washer	1	4
65	1/8" Hollow bolt with non return valve	1	-
66	ø4/2 pipe for EM/B	-	1
67	Double hollow bolt for EM/B	-	1
68	Bolt with sized orifice and filter for EM/B	-	1
69	Pump name plate	1	
70	ø1.85x5 Rivet	2	

(*)Valid up to SN IT1542N097

POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
100	Complete inlet filter	1	
101	Filter body	1	
102	O-Ring	1	
103	Filtering cartridge	1	
104	Air filter housing	1	
105	Upper gasket	1	
106	Lower seal gasket	1	
107	O-Ring	1	
110	A2 M-M 1/2"G Nipple	1	
111	A10 M-F 1/2-1/2" Union elbow	1	
112	Fitting	1	
113	Vibration-damping foot	4	
114	M6 Nut flanged and knurled	4	

EM28 - EM28/B



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PART LIST
EM28 - EM28/B

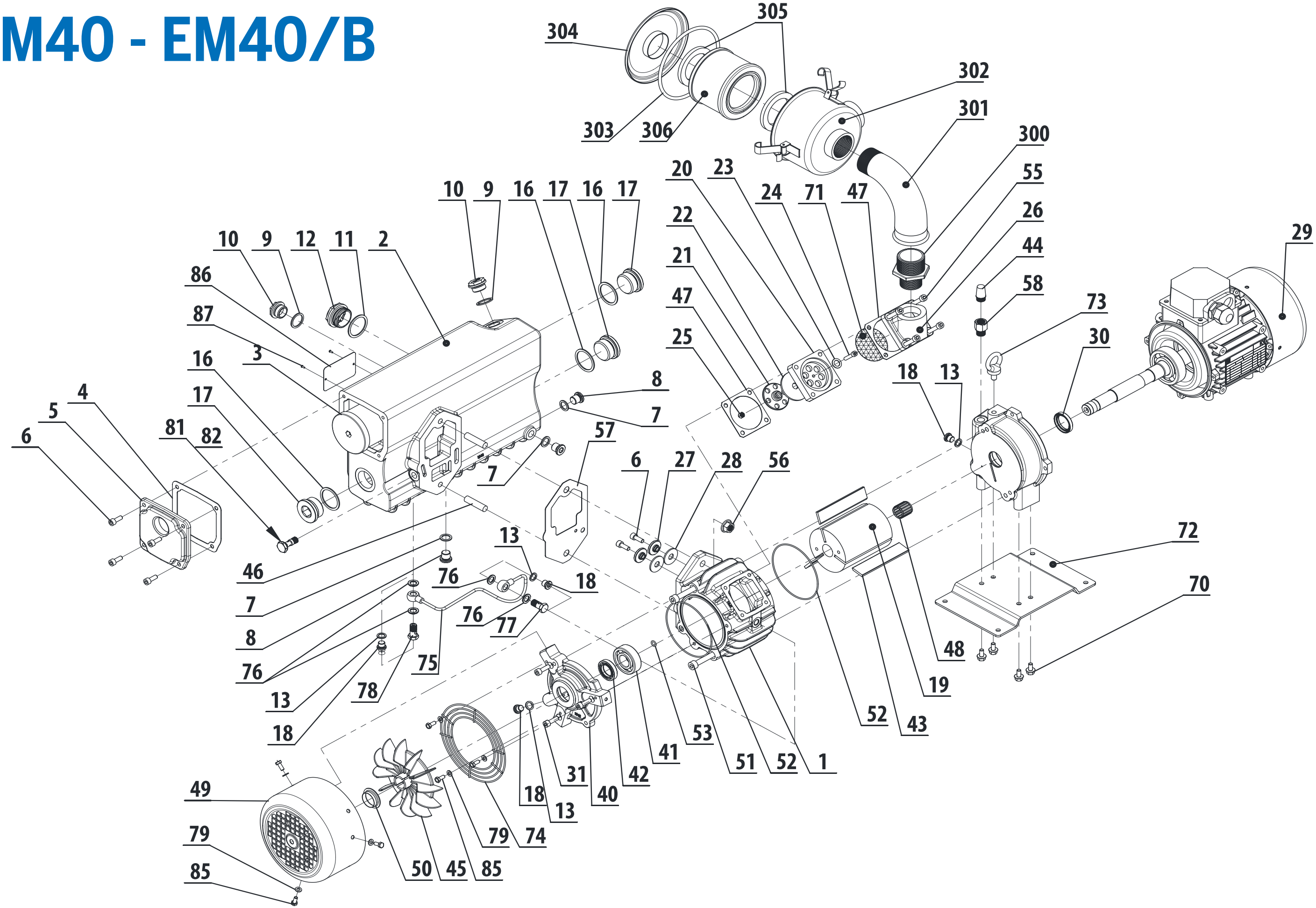
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump	1	
2	Tank	1	
3R	Exhaust filter	1	
4G	Tank cover gasket	1	
5	Tank cover	1	
6	M6x16 Hex. socket head screw	5	
7	1/2"G Washer	2	
8	1/2"G Plug	2	
9	1"G Washer	1	
10	1"G Oil sight glass	1	
11	1"G Al. Washer	3	
12	1"G Hex. socket head plug	3	
13	1/4"G Al. Washer	2	
14	1/4"G Hex. socket head plug	3	
15	Rotor	1	
16	Suction plate	1	
17	Support valve disk	1	
18G	ø48/10x3 Rubber disk	1	
19	ø5.3/8x1 Al. Washer	1	
30	M5x25 Hex. socket head screw	1	
31	M5 Locknut	1	
32	Inlet port	1	
33G	ø28/10x2 Rubber disk	1	
34	Motor side end plate / Motor flange	1	
35	Electric motor	1	
36G	BABSL 25x35x6 Seal ring	1	
37	Discharge valve disk	1	
38	Vane	3	
39	1/4"G Gas ballast valve	1	
40	M10x25 Screw	2	
41G	Inlet gasket	2	
42	BN22-522 Toleranzhulsen ring(*)	1	
43	M8x70 Hex. socket head screw	2	
44G	2375 O-Ring	2	
45G	106 O-Ring	1	
46	M6x35 Hex. socket head screw	4	
47	M6x20 Hex. socket head screw	3	

POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
48	M10 Nut flanged and knurled	2	
49	1/8"G Al. Washer	3	2
60	1/8"G Hex. socket head plug	2	2
61G	Tank-body of the pump gasket	1	
62	Fitting with non-return valve	1	
63	Filtering mesh	1	
64	External side cover	1	
65	Base plate	1	
66	M6x12 Hex. screw flanged and knurled	4	
67	1/8"Hollow bolt with non return valve	1	-
68	1/8"G Cu washer	1	4
69	EM/B Pipe	-	1
70	Double hollow bolt for EM/B	-	1
71	1/8"G Hollow bolt for EM/B	-	1
72	Pump name plate	1	
73	ø1.85x5 Rivet	2	

(*)Valid up to SN IT1527N003

POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
100	3/4"G Nipple	1	
101	3/4"G M-F union elbow	1	
102	F36 Complete inlet filter	1	
103	F36 Inlet filter housing	1	
104G	O-Ring	1	
105	F36 Inlet filter cover	1	
106G	V Gasket for inlet filter F36	1	
107R	Filtering cartridge for F36	1	
108	3/4"G Pipe fitting	1	
109	Vibration-damping foot	4	
110	M6 Nut flanged and knurled	4	
111	F036-3/4"G Inlet filter housing	1	

EM40 - EM40/B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PART LIST
EM40 - EM40/B

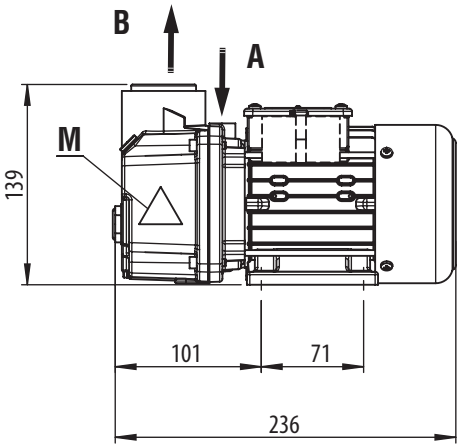
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
1	Body of pump	1	
2	Tank	1	
3R	Exhaust filter	1	
4G	Tank cover gasket	1	
5	Tank cover	1	
6	M6x16 Hex.socket head screw	6	
7	1/4"G Al. washe	3	
8	1/4"G Hex.socket head plug	3	
9	1/2"G Al washer	2	
10	1/2"G Plug	2	
11	1"G Washer	1	
12	1"G Oil sight glass	1	
13	1/8"G Al washer	4	2
16	1"G Al washer	3	
17	1"G Hex. socket head plug	3	
18	1/8"G Hex. socket head plug	4	2
19	Rotor	1	
20	Suction plate	1	
21	Support valve disk	1	
22G	ø48/10x3 Rubber disk	1	
23	ø5.3/8x1 Al Washer	1	
24	M5x25 Hex. socket head screw	1	
25	M5 Locknut	1	
26	Inlet port	1	
27	Discharge valve disk	2	
28G	ø28/10x2 Rubber disk	2	
29	Electric motor	1	
30G	BABSL 25X3X6 Seal ring	1	
31	M6x20 Hex.socket head screw	3	
40	External side cover	1	
41	6204 needle bearing	1	
42G	BABSL 20x35x7 Seal ring	1	
43	Vane	3	
44	1/4"G Gas ballast valve	1	
45	ø140 Fan	1	
46	M10x25 Screw	2	
47G	Inlet gaske	2	

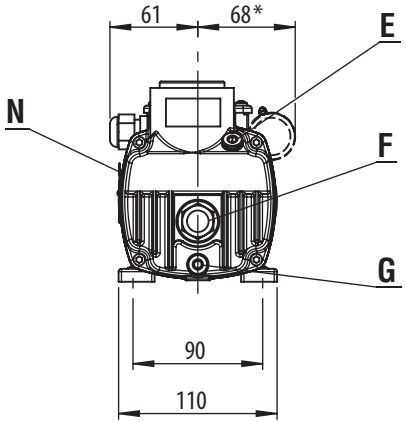
POS.	DESCRIPTION	Q.ty EM	Q.ty EM/B
48	BN22-522 Toleranzhulsen ring(*)	1	
49	Fan cover	1	
50	Ring	1	
51	M8x100 Hex. socket head screw	2	
52G	2375 O-Ring	2	
53G	106 O-Ring	1	
55	M6x35 Hex. socket head screw	4	
56	M10 Nut flanged and knurled	2	
57G	Tank-body of the pump gasket	1	
58	A5 M-F 1/4"-1/4" Extension	1	
70	M6x12 Hex. screw flanged and knurled	4	
71	Filtering mesh	1	
72	Base plate	1	
73	M8 Eyebolt	1	
74	Fan protection mesh	1	
75	EM40/B Oil recovery pipe	-	1
76	1/8"G Cu washer	-	4
77	1/8"G Hollow bolt	-	1
78	1/8"G Hollow bolt for EM40/B	-	1
79	ø5 Washer	6	
81	1/8"G Screw with non return valve	1	-
82	1/8"G Screw for EM/B	-	1
85	M5x12 Hex. Screw	6	
86	Pump name plate	1	
87	ø1.85x5 Rivet	2	

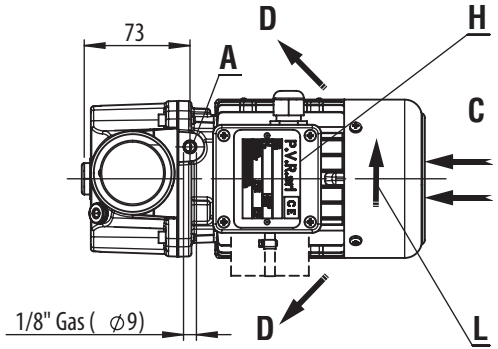
(*)Valid up to SN IT1530N064

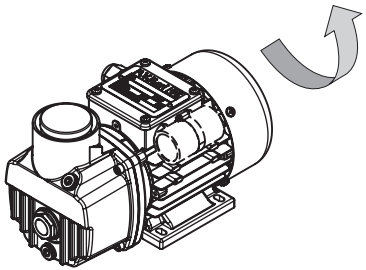
POS.	OPTIONALS	Q.ty EM	Q.ty EM/B
300	1"1/4 - 1"G Nipple	1	
301	1"1/4 M-F Union elbow	1	
302	F84 - 1"1/4G Inlet filter housing	1	
303G	201 O.Ring	1	
304	F84 Inlet filter cover	1	
305G	V Gasket for inlet filter F84	2	
306R	Filtering cartridge for F84	1	

EM4 - EM4/B





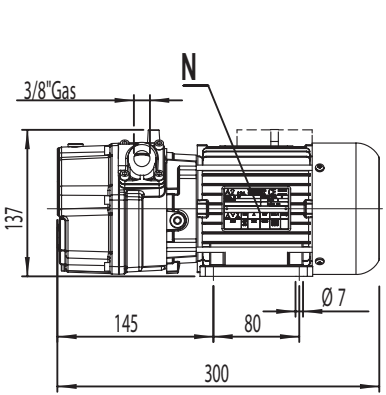


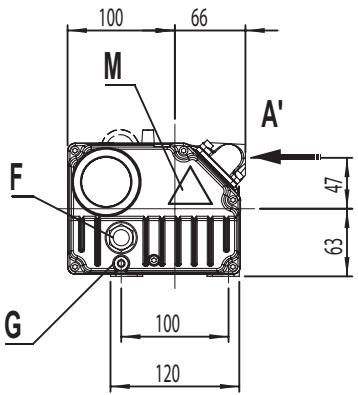


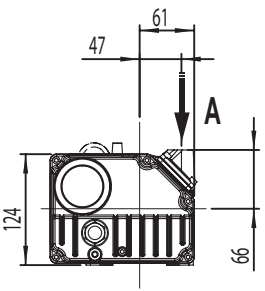
A	Aspirazione verticale Vertical inlet Aspiration verticale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Targhetta motore elettrico Electric motor plate Plaque moteur

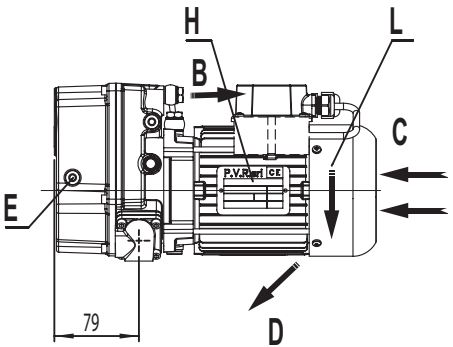
* Motore monofase
* Single-phase motor
*Moteur monophasé

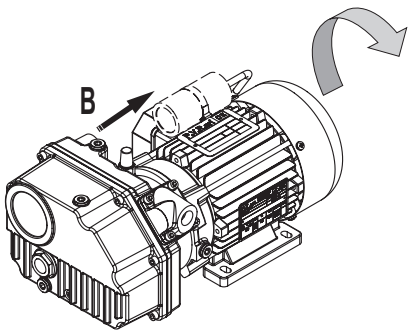
EM8 - EM8/B











A	Aspirazione verticale Vertical inlet Aspiration verticale
A'	Aspirazione orizzontale Horizontal inlet Aspiration horizontale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Targhetta motore elettrico Electric motor plate Plaque moteur

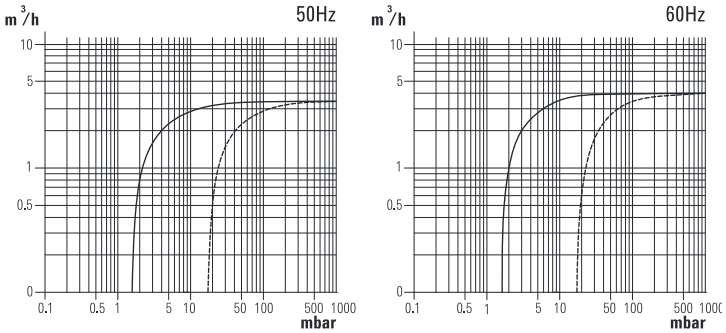
EM4 - EM4/B - EM8 - EM8/B

				EM4	EM4/B	EM8	EM8/B
Portata nominale* / Nominal speed* / Débit nominal*	m^3/h	50 Hz		4		8,5	
		60 Hz		4,8		10	
Pressione finale* (assoluta) / Ultimate pressure* (absolute) / Pression finale* (absolu)		mbar		2	20	2	20
		Pascal		200	2000	200	2000
Potenza motore**/ Numero di giri / Motor power**/ Rotation speed / Puissance moteur**/ Vitesse de rotation	kW min-1	50 Hz	~ 3	0,12 / 3000		0,25 / 3000	
			~ 1	0,12 / 3000		0,25 / 3000	
		60 Hz	~ 3	0,15 / 3600		0,30 / 3600	
			~ 1	0,12 / 3600		0,25 / 3600	
Caratteristiche motore elettrico / Electric motor characteristics / Caractéristiques moteur	V	50 Hz	~ 3	230 / 400 ± 10%		230 / 400 ± 10%	
			~ 1	230 ± 5%		230 ± 5%	
		60 Hz	~ 3	275 / 480 ± 5%		275 / 480 ± 5%	
			~ 1	230 ± 5%		230 ± 5%	
Livello di pressione acustica / Sound pressure level / Niveau de pression acoustique	dB(A) EN - ISO 2151	50 Hz		57		58	
		60 Hz		59		60	
Pressione max vapore H_2O ammissibile / Water vapour tolerance / Pression max de vapeur d'eau admissible	mbar			-		20	
Quantità vapore H_2O ammissibile / Water vapour pump capacity / Quantité de vapeur d'eau admissible	kg/h			-		0,125	
Carica olio / Oil capacity / Quantité d'huile	l			0,1		0,15	
Peso totale / Total weight / Poids total	kg			5,4		11,7	

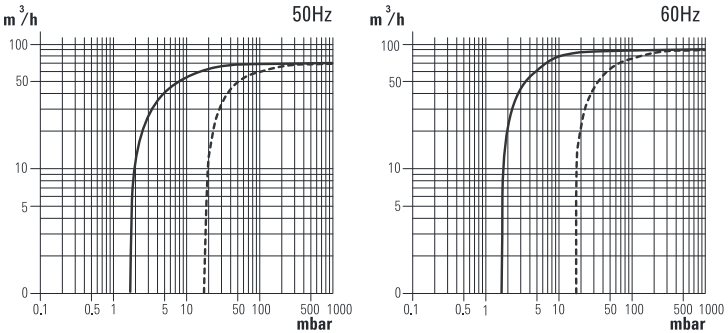
*Secondo accordi PNEUROP 6602 / *According to PNEUROP standard 6602 / *Selon PNEUROP 6602
**Valido per temperature fino a 40°C e altitudini inferiori a 1000 m. / **Valid for temperatures up to 40°C and altitudes lower than 1000 m. / **Pour des temperatures jusqu'à 40°C et une altitude infèrieure à 1000 m.

EM4 - EM4/B - EM8 - EM8/B

EM4 - EM4/B

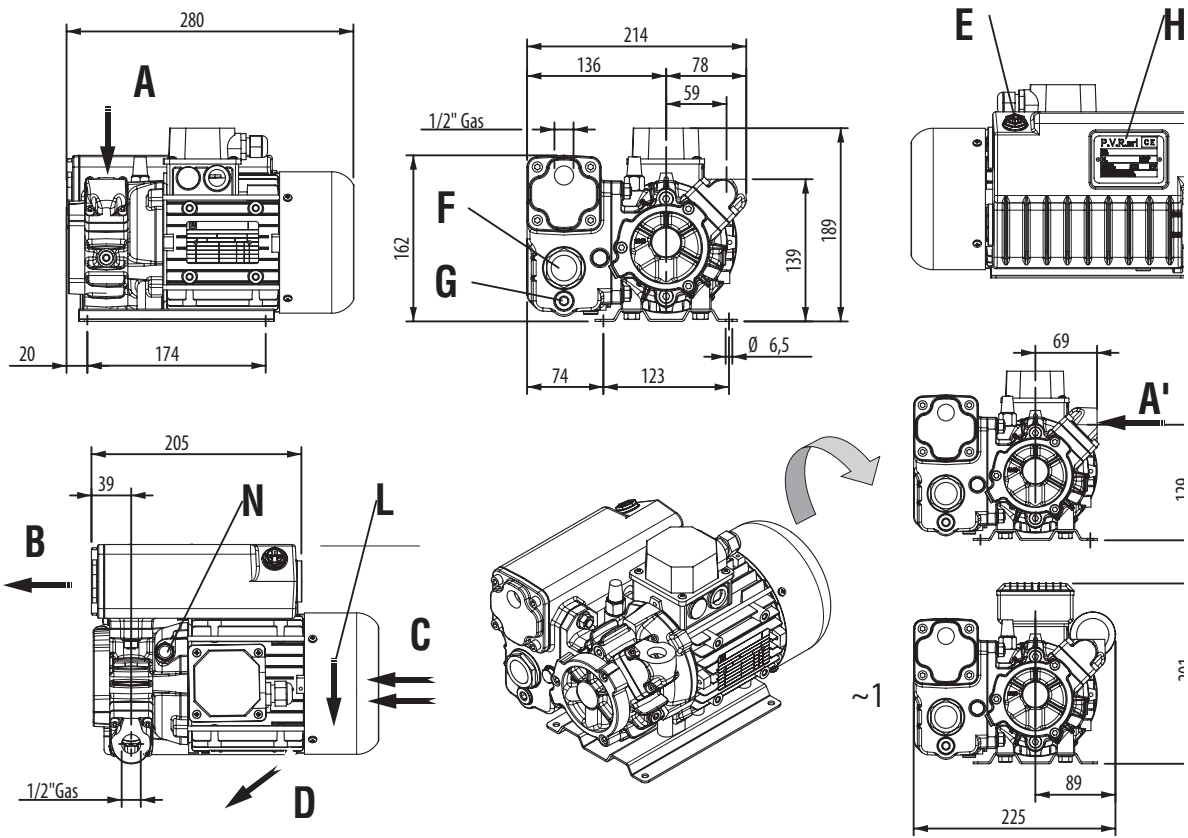


EM8 - EM8/B



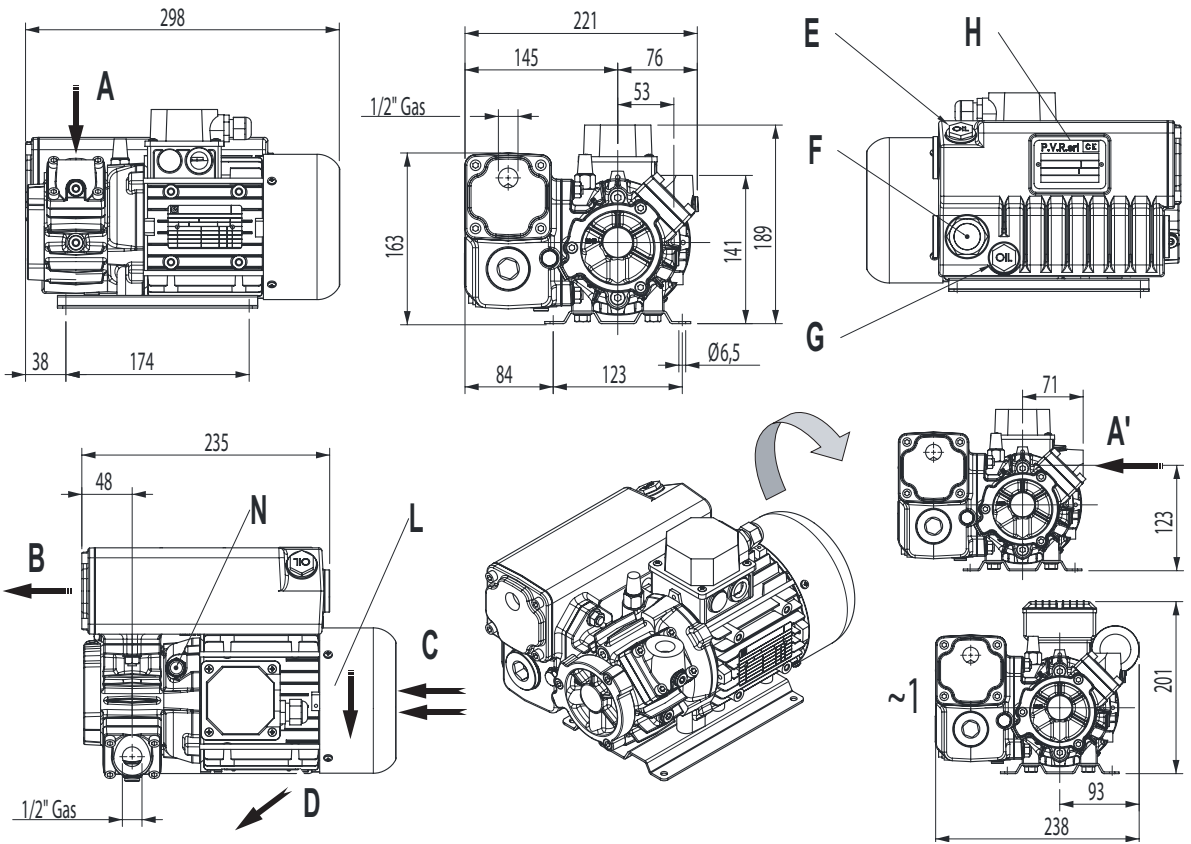
Legenda/Key/Légende
——EM ----EM/B

EM12 - EM12/B



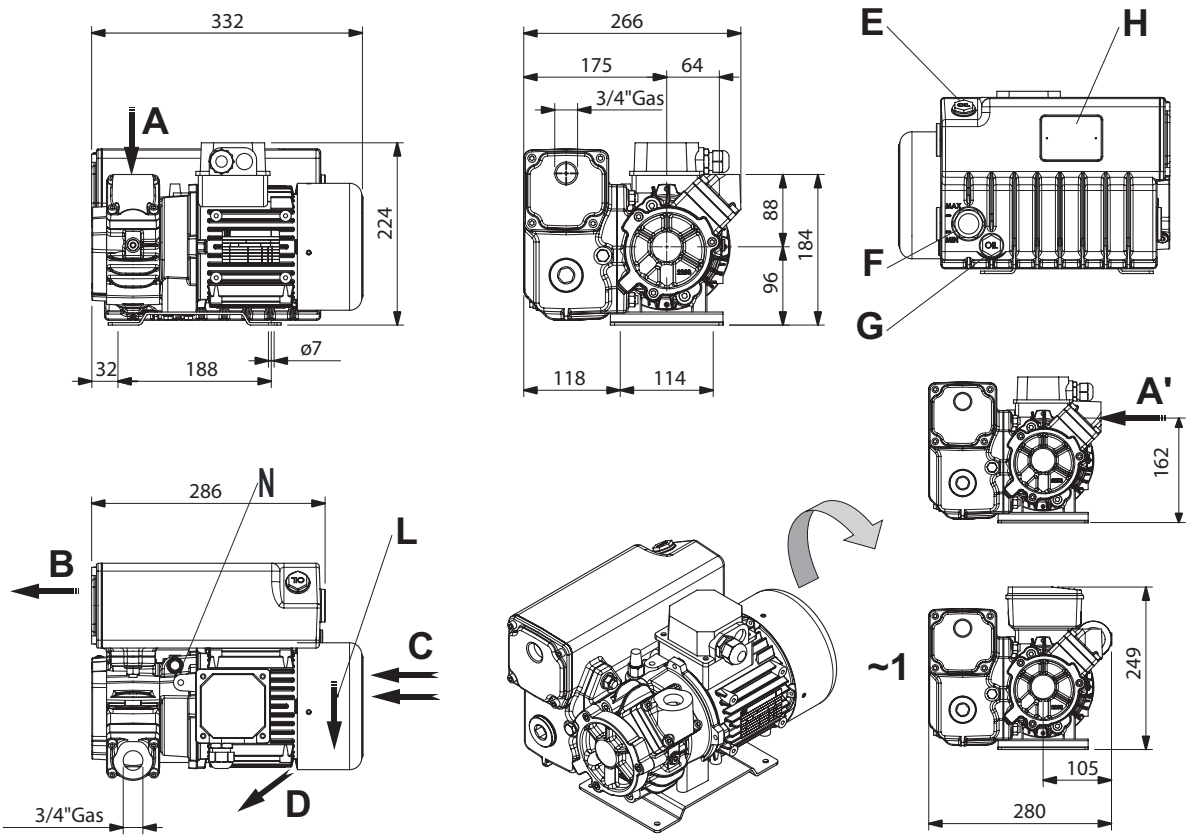
A	Aspirazione verticale Vertical inlet Aspiration verticale
A'	Aspirazione orizzontale Horizontal inlet Aspiration horizontale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Zavorratore Gas ballast valve Vanne de lest d'air

EM20 - EM20/B



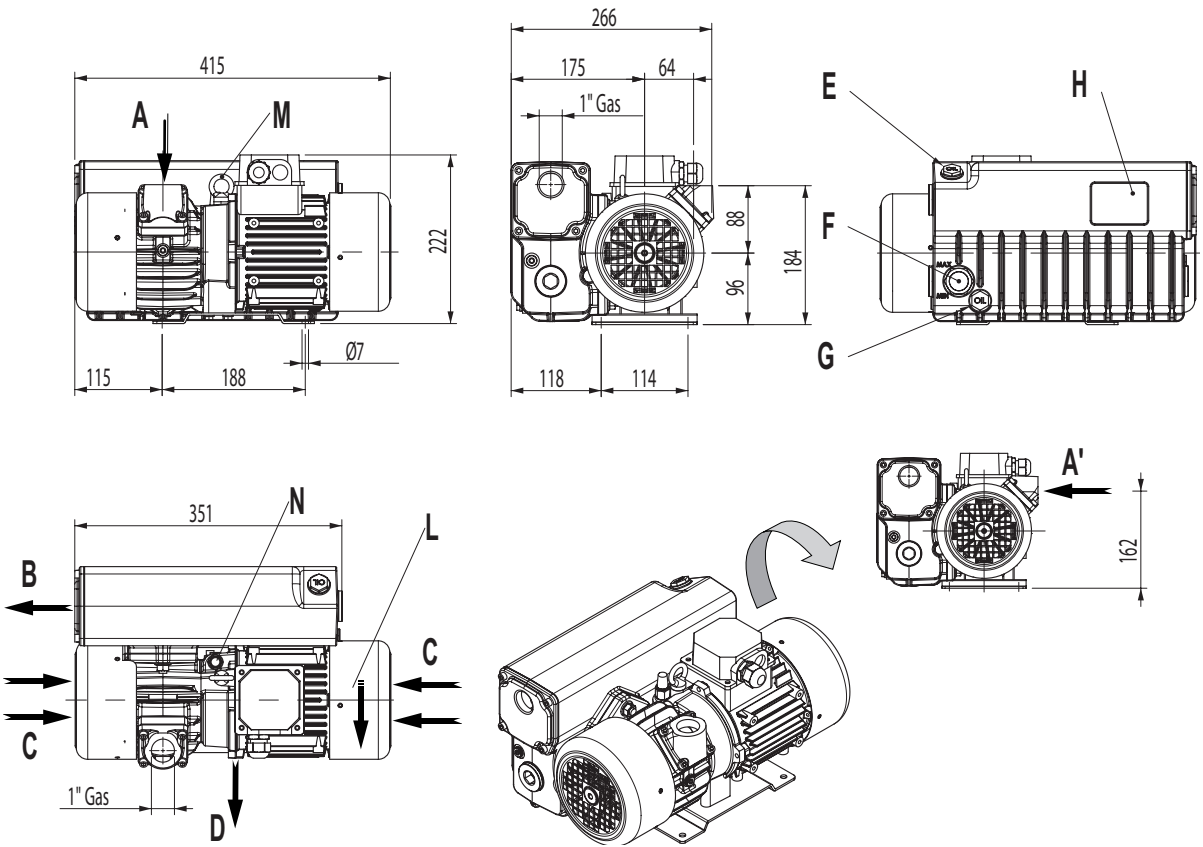
A	Aspirazione verticale Vertical inlet Aspiration verticale
A'	Aspirazione orizzontale Horizontal inlet Aspiration horizontale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Zavorratore Gas ballast valve Vanne de lest d'air

EM28 - EM28/B



A	Aspirazione verticale Vertical inlet Aspiration verticale
A'	Aspirazione orizzontale Horizontal inlet Aspiration horizontale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Zavorratore Gas ballast valve Vanne de lest d'air

EM40 - EM40/B



A	Aspirazione verticale Vertical inlet Aspiration verticale
A'	Aspirazione orizzontale Horizontal inlet Aspiration horizontale
B	Scarico aria Exhaust Refoulement
C	Entrata aria raffreddamento Cooling air inlet Entrée air de refroidissement
D	Uscita aria raffreddamento Cooling air outlet Sortie air de refroidissement
E	Tappo carico olio Oil filling plug Bouchon de remplissage d'huile
F	Spia livello olio Oil level sight glass Voyant visuel de niveau d'huile
G	Tappo scarico olio Oil drain plug Bouchon de vidange huile
H	Targhetta identificazione Pump name plate Plaque d'identification
L	Targhetta rotazione Rotation plate Sens de rotation
N	Zavorratore Gas ballast valve Vanne de lest d'air

CARATTERISTICHE TECNICHE / TECHNICAL CHARACTERISTICS / CARACTÈRISTIQUES TECHNIQUES

EM12 - EM12/B - EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B

				EM12	EM12/B	EM20	EM20/B	EM28	EM28/B	EM40	EM40/B
Portata nominale* / Nominal speed* / Débit nominal*	m^3/h	50 Hz		12,5		18		28		42	
		60 Hz		15		21		33		51	
Pressione finale* (assoluta) / Ultimate pressure* (absolute) / Pression finale* (absolu)		mbar		2	20	2	20	2	20	2	20
		Pascal		200	2000	200	2000	200	2000	200	2000
Potenza motore**/ Numero di giri / Motor power**/ Rotation speed / Puissance moteur**/ Vitesse de rotation	kW min-1	50 Hz	~ 3	0,37 / 3000		0,55 / 3000		0,75 / 3000		1,1 / 3000	
			~ 1	0,37 / 3000		0,55 / 3000		1,1 / 3000		1,4 / 3000	
		60 Hz	~ 3	0,44 / 3600		0,66 / 3600		0,9 / 3600		1,3 / 3600	
			~ 1	0,44 / 3600		0,66 / 3600		1,3 / 3600		-	
Caratteristiche motore elettrico / Electric motor characteristics / Caractéristiques moteur	V	50 Hz	~ 3	230 / 400 ± 10%		230 / 400 ± 10%		230 / 400 ± 10%		230 / 400 ± 10%	
			~ 1	230 ± 5%		230 ± 5%		230 ± 5%		230 ± 5%	
		60 Hz	~ 3	275 / 480 ± 5%		275 / 480 ± 5%		275 / 480 ± 5%		275 / 480 ± 5%	
			~ 1	230 ± 5%		230 ± 5%		230 ± 5%		-	
Livello di pressione acustica / Sound pressure level / Niveau de pression acoustique	dB(A) EN - ISO 2151	50 Hz		65		66		65		68	
		60 Hz		66		67		67		69	
Pressione max vapore H_2O ammissibile / Water vapour tolerance / Pression max de vapeur d'eau admissible	mbar			30		30		30		30	
Quantità vapore H_2O ammissibile / Water vapour pump capacity / Quantité de vapeur d'eau admissible	kg/h			0,2		0,45		0,65		0,9	
Carica olio / Oil capacity / Quantité d'huile	l			0,3		0,5		0,8		1	
Peso totale / Total weight / Poids total	kg			13		17		26		30	

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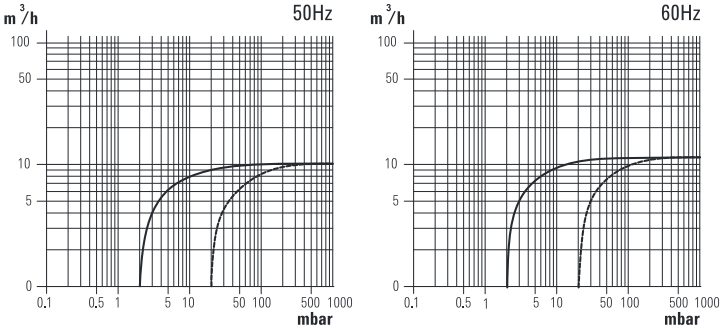
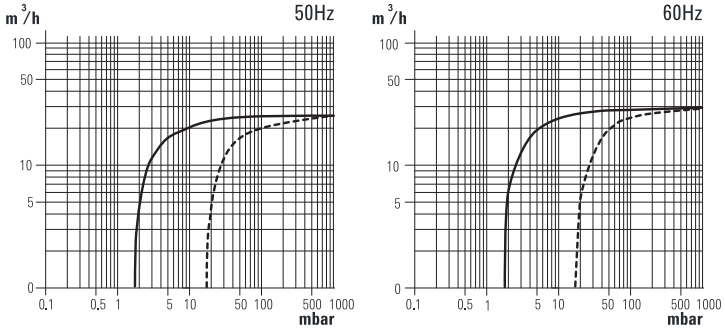
**Valido per temperature fino a 40°C e altitudini inferiori a 1000 m. / **Valid for temperatures up to 40°C and altitudes lower than 1000 m. / **Pour des temperatures jusqu'à 40°C et une altitude infèrieure à 1000 m.

EM12 - EM12/B - EM20 - EM20/B - EM28 - EM28/B - EM40 - EM40/B

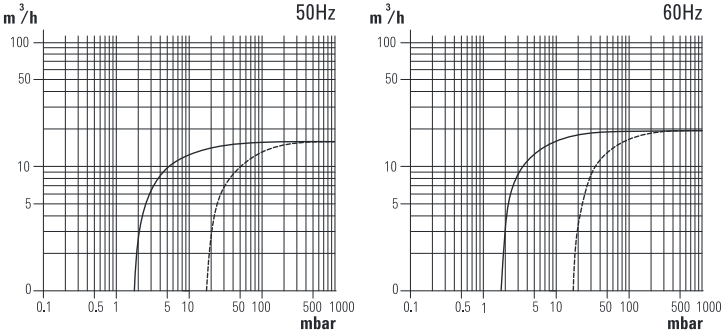
EM12 - EM12/B



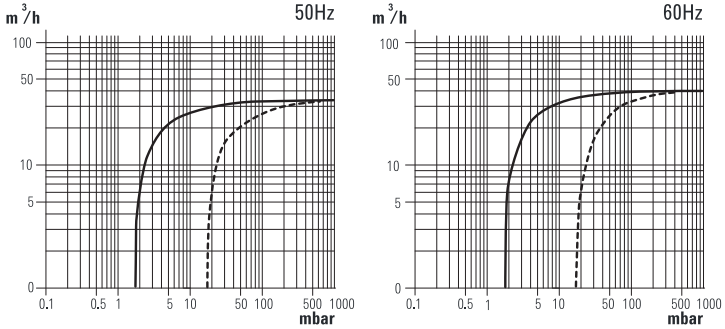
EM28 - EM28/B



EM20 - EM20/B



EM40 - EM40/B



Legenda/Key/Légende
——EM ----EM/B

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