Installation, Maintenance and Operation Instruction

Aggregat – Series: SMG - VBR
(hp-Motor pump group)

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Contents

1 General Safety Notes

⚠ CAUTION	Indicates a potentially dangerous situation. If this is not avoided, small or light injury may result.
NOTICE	Indicates general information on a danger of property damage. Indicates general information on a danger of personal injury.

The notes for installation and maintenance are intended for a specialist!

Pursuant to DIN EN 12514-1 section 4.3.3., the operator of the complete system must provide a pressure controller, e.g. a pressure control device.

The operator shall responsible for complying with general accident prevention, safety and operating provisions.

1.1 Intended Use

In spite of careful safety optimization being performed, there is still some residual danger from operating the pump. The safety notes explained above and in the following must be observed under any case to prevent personal injury and / or damage to the pump. By complying with the instructions at all times, you will increase your pump's service life and retain full warranty claims towards the manufacturer in the case of damage.
Any pumps are subjected to a performance test after manufacture and are equipped with a test card.

2 General Information

2.1 Configuration SMG

Components of a SMG hp-Motor pump group are:

1. hp-Internal gear pump (with integrated overflow valve)
2. Electric motor (see manual – Electric motor)
3. Connector
4. Coupling

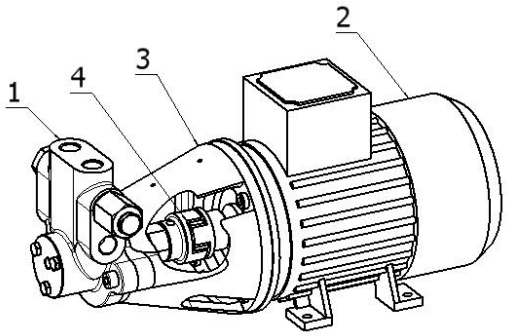


Fig. 1.

2.2 hp-Internal gear pump series VBR

The VBR series pumps are internal gear pumps. They have an integrated overflow valve. The flow rate for normal fuel oil at 20 °C (6 cSt) and motor speed of 1400/2800 min $^{-1}$ (depending on pump size) is 6700 l/h. The pressure range where the pump works depends on the chosen pressure stage (see Chapter 4). It ranges between 0,5 – 40 bar.
An internal geared rotor drives an eccentric mounted outer geared pinion. The pumping medium will conveyed between the tooth gaps of the two gears. For this purpose the conveyor rooms are sealed by a cap with an integrated crescent.
The VBR series pumps are intended for transporting heating oils (see chapter 8.2). Where other media has to be transported, this must be verified by the manufacturer. Otherwise, the pump's service life may be decreased.
For use with pre-heated media - which have a higher viscosity when cooled - the manufacturer recommends the use of an electrical standby and companion heating system H1 without thermostat (see Fig. 4). It is available as an accessory.

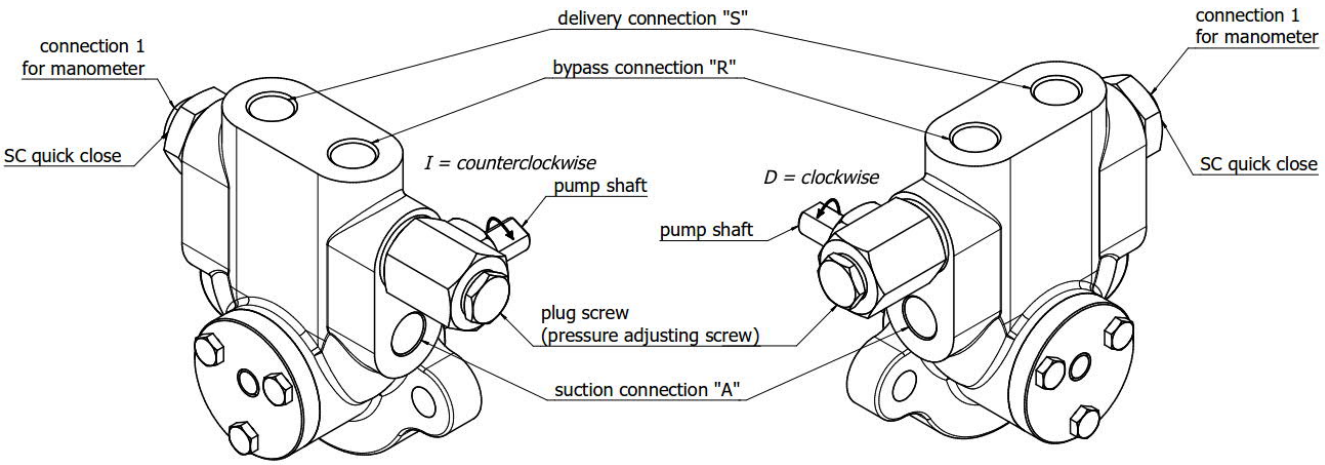


Fig. 2.

The following information is engraved into the pump body:

- Exact description of the pump type
- manufacturing date – MM/YY
- Rotational direction arrow (corresponding to order)
- Manufacturer's pump number
- The side for suction connection will be marked with „A“
- The side for delivery connection will be marked with „S“
- The side for bypass connection will be marked with „R“.

The following information is engraved into the type plate of the SMG – hp-Motor pump group:

- Exact description of the Motor pump group
- Serieal number – MM/JJ/NNNN
- Max. permitted operating pressure
- Flow at max. operating pressure.

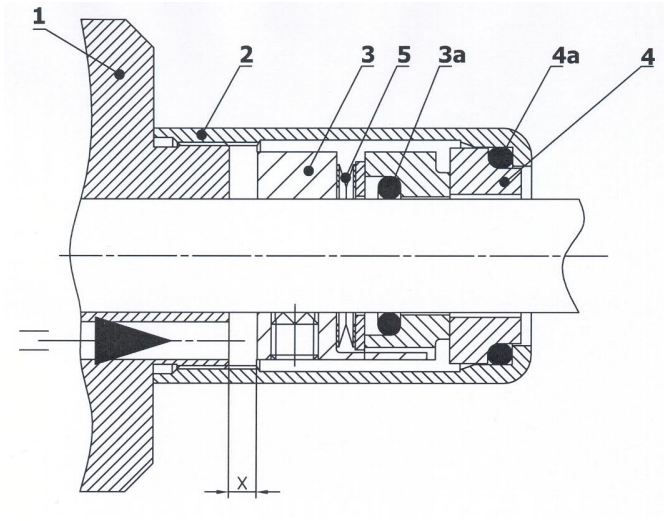
2.3 Operational Limits SMG – VBR

Flow	max. 6700 l/h
Max. pressure (adjustable with integrated overflow valve)	40 bar
Min. permitted pre-pressure	- 0,6 bar CAUTION! Gas secretions arise already at -0,4 bar.
Max. permitted pre-pressure	5,0 bar
Max. allowed pump RPM	1400 min^{-1} at 50 Hz
Temperature	Up to 150 °C
Permitted test pressure for approvals	Max. 60 bar with removed mech. seal (Sealing area closed by jack)

2.4 Materials used

Pump housing	EN-GJL-250
Rotor	EGT 88
Pinion gear	16MnCr5
Lower bearing	EN-GJL-250
Mechanical seal	Carbon/ SiC- Viton – CrNiMo-steel
Valve parts	Spring wire steel, 11SMnPb30+C, 16MnCrS5

2.5 Mechanical seal



1. Pump housing
2. Union nut

3a. O-Ring

3. Tapet

4a. O-Ring

4. Counter ring
5. Spring

X Installation size*

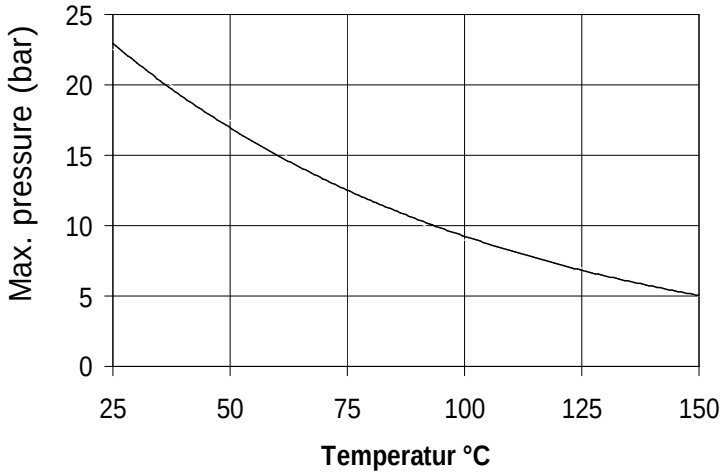
* - In case of replacement can be found in the documents accompanying the valid installation dimension

Item no. for shaft Ø12: 0190015
Item no. for shaft Ø18: 0190016
Item no. for shaft Ø22: 0190017

Fig. 3.

All hp pumps are equipped with axial face seals. They are temperature-resistant up to 150°C.
These axial face seals are relieved at the pump's suction side.
Maximum pressure load on the GLRD, i.e. suction side, against temperature (see adjacent figure).

For a new pump a max. leakage of 1 cm^3/day is regular.



3 Installation SMG

- Before connecting the lines, all plastic caps must be removed.
- All connections and lines must be installed free of tension and tight. We recommend only using sealing rings made of copper, aluminium or plastics. Never use hemp or similar materials. The pipes must be cleaned from any dirt and metal particles before the pump is connected.
- In two-pipe-system, the return flow line must be led back to the tank and must never be closed off. Otherwise, the pump's overpressure protection will no longer work.
- The suction connection (see Fig. 2) of the pump is filled with oil. Then the suction line is connected to thread connection „A“.
- The pressure/delivery line connect to thread connection „S“ and the bypass line connect to thread connection „R“. When the pump is realized with SC (quick close) connection, the delivery line connect to SC. (Fig. 2).
- Remove the screw plug for connecting the manometer 1 (Fig. 2). The pressure gauge shows the delivery pressure. Observe using manometers with the right pressure range (according to the pump's pressure range).
- Before switching on the pump, check that all locking valves in the pipes and check whether the pump has sufficient medium is available.
- Ensure that the pump is operated in the intended rotational direction (engraved arrow – pump / direction arrow – electric motor).

- Connect the motor according to the information on the type place and switch it on. Preventively provide a motor protection switch with overload function!

⚠ CAUTION

Connecting of the electric motor must be done only by qualified personnel!

Note the direction of rotation!

Note the manufacturer manual for the electric motor!

- The pump shaft is sealed to the outside with a mechanical seal made of the materials carbon / SiC and Viton elastomer.

Pumps must never be used as a fix point for the connected pipes. Any forces and moments appearing, e.g.

- Tensions
- Expansion of pipe lines due to temperature influence or reaction forces must be avoided.
- To prevent possible heat expansion of pipe lines, we recommend installing compensators.
- The suction line must be designed so that the flow speed is between 0.5 und max. 1.0 m/sec.
- The pressure line must only reach a maximum of 2 – 2.5 m/sec.
- The suction line must be vacuum-tight and placed in a rising fashion.
- Ensure that the pump and pipe system is not contaminated, e.g. by purging.
- When testing the pipe system for tightness, the max. permissible shaft sealing supply pressure must not be exceeded.

NOTICE

Never use water as purging liquid!
Danger of corrosion!

4 Commissioning

⚠ CAUTION

Ensure that the pump does not start up dry. It must be filled with oil.

Mechanically abrasive and chemically aggressive components in the medium reduce the pump service life.

Clear your pipe lines from any dirt or metal particles before connecting it to the pump.

Ensure correct rotational direction (see engraved arrow).

Only perform the basic settings or adjustment of the pump pressure when the pressure line is closed.

- Before switching on the pump, check that all locking valves in the pipes and check whether the pump has sufficient medium is available.
- For pressure regulation, the plug screw (see Fig. 2) must be removed.
- After removing the cover screw, the pressure regulating screw with hexagon socket (6mm size) is visible. Use a hexagon wrench to:

  - Turn the setting screw to the right (clockwise) to increase the pressure
  - Turn the setting screw to the left (counterclockwise) to decrease the pressure

- When adjusting the desired operational pressure, observe that it may only be set within the permissible pressure range of the included pressure spring (pressure level 0 to 4).

Pressure level	Pressure range	Factory setting
0	von 0,5 - 1,5 bar	1 bar
1	von 1 - 4 bar	2 bar
2	von 2 - 9 bar	6 bar
3	von 6 - 25 bar	15 bar
4	von 15 - 40 bar	15 bar

Attention! Setting an operational pressure exceeding the pressure range will cause the spring to lock and lead to pressure surges and thus to pump outage after a short time.

For oil-burning applications, close the burner's solenoid valve before setting or resetting pump pressure.

- When the pressure is set, the pressure adjustment cover screw and its sealing must be replaced oil-tight.

NOTICE

Non-compliance with the max. pressure range may cause spring blockage. These in turn causes pressure surges and thus pump outage after a short time.

If the medium rotates within the pump for too long, this may cause damage to the valve, overheating and, as a result, mechanical damage.

For highly viscous media, a pump heating is prerequisite. To avoid cavitations and damage to the shaft sealings, the heating times must be observed under any circumstances (abaut 30min starting from 20°C).

Because of heat expansion, all valves must be open when heating.

5 Accessories

5.1 hp-Electrical standby and companion heater for hp-Industrial pumps

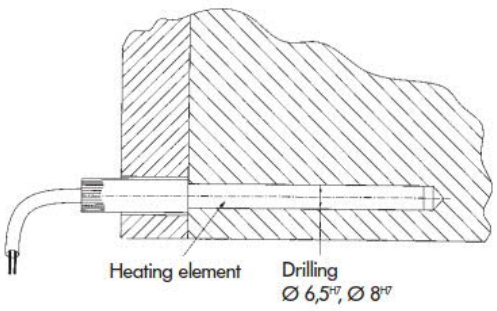


Fig. 4.

hp- Electrical standby and companion heaters

All hp-Pump models can be equipped with electrical heating system without thermostat at the factory.

Using this option is strictly recommend for using the pumps with "heavy fuel oil"!

5.2 Oil filter

The pump is provided with a suction filter integrated in the suction line. The filter must be checked for dirt regularly and replaced if required. The mesh width of the filter element depends on the viscosity of the transported medium. Transported media with a high viscosity (heavy heating oil) require a filter element with a mesh width of 500 µm and alternative for media with a low viscosity a filter element with mesh width 100 µm is recommend. The pump supply must be within a pressure range of -0.6 to 5 bar.

5.3 hp-Electrical standby and companion heaters for oil filter

The oil filter can be equipped with electrical heating without thermostat.

The manufacturer recommended strongly using this option, when using "heavy fuel oil"!

For the safe installation of the SMG - Motor pump group recommended the manufacturer using an oil drip pan "WA". As a complement to the oil drip pan is the leakage sensor "LH" recommended.

6 Operation

6.1 Inspection and Maintenance

6.1.1 Oil filter

Check the system's suction filter regularly for dirt and replace it if required.

NOTICE

Filter elements must be disposed of under environmental considerations.

6.1.2 hp-Electrical standby and companion heaters for hp-Industrial pumps

When replacing a defect electrical heater it is strongly recommended to insert only electrical heaters designed by the manufacturer. Otherwise:

- the medium can be heated to excessively high temperatures. Consequence thereof is e.g. gas release of the medium.
- The required operating temperature cannot be reached. Consequence thereof is e.g. the required engine power is greater than the available maximum engine power.
- Result of the too low or too high a temperature is, e.g. outage of the mechanical seal after a shorter time.

6.1.3 hp-Electric standby and companion heaters for oil filter

When replacing a defect electric heater it is strongly recommended to insert only electric heater designed by the manufacturer. Otherwise:

- the medium can be heated to excessively high temperatures. Consequence thereof is e.g. gas release of the medium.
- The required operating temperature cannot be reached. Consequence thereof is e.g. the required engine power is greater than the available maximum engine power.

6.1.4 Coupling

When replacing a defect coupling:

- dismantle the connected lines to the pump
- loosen the grub screws on the clutch, so that the two coupling halves are movable
- Unscrew the hexagon socket head screws for connecting the pump with the bellhousing and remove the pump in axial direction
- replace the coupling. The axial clearance between the two halves of the coupling must be max. 1,5 mm. Tarnishing of rotating parts at fixed pump or motor parts is not allowed.
- install the other components in reverse order.

NOTICE

Install only from Manufacturer approved couplings. Risk of possible imbalance and undesirable forces, that can lead to outage of the motor pump group.

6.1 Preservation

After the test run, testing oil remains in the pump to preserve it. The parts not treated ex works must be re-treated by the operator according to the local conditions.
If the pump is inactive for an extended period or stored, it must be preserved with acid-free non-resinous oil and stored dryly.

6.2 Troubleshooting

Errors appearing		Possible cause
The pump does not prime		1, 2, 3, 4, 5, 12
The pump does not work at full capacity		3, 4, 5, 8, 9, 10, 11, 17, 18
The pump is operating noisily		3, 4, 5, 6, 7, 10, 11, 13, 17
The motor heats up		9, 10, 13
Uneven transport		3, 5, 8, 10, 11
Shaft seal is not tight		7, 10, 14, 15, 16
No.	Possible cause	Removal
1.	No medium in the pump	Fill pump with medium
2.	Pump has the wrong rotational direction	Set rotational direction according to the engraved arrow
3.	Filter element, valve or lines are clogged	Check and clean parts
4.	Suction line or shaft seal are leaking	Check suction line, connection points and valves or shaft face seal
5.	Suction head too large	- Decrease height difference - Shorten line - Increase line diameter - Decrease medium viscosity by heating
6.	Axis error	Pump, coupling and motor: - Align shaft end precisely - Balance coupling
7.	Vibrations and pulsations in the system	- Use elastic bearings for the aggregate - Use hoses for connections
8.	The overflow valve is jammed or set too low	Check or adjust valve
9.	Wrong speed	- Check motor speed and power consumption - Compare voltage and frequency to the type plate
10.	Medium too viscous	- Increase medium temperature - Lower speed
11.	Air inclusions or gas formation in the medium	- Remove leakages - Decrease suction height - Increase feed pressure
12.	Pump does not vent	Vent pressure line at the highest point
13.	Motor bearing damaged	Renew motor bearings
14.	Shaft seal damaged	Replace shaft seal
15.	Feed pressure too high or too low	- Decrease feed pressure in the system - Insert check valve on the pressure side
16.	Cold start when transporting heavy oil	Install pump heating and observe pre-heating time
17.	Overflow valve fluttering	Set opening pressure higher by turning the setting screw clockwise.
18.	Overflow valve leaking	Clean overflow valve

NOTICE

For economic reasons, we recommend providing a reserve pump right at the burner.

7 Environment

Of course, hp-TECHNIK focuses on Environmental protection for its development work! To ensure that the environment does not take damage from our products - caused, e.g. by environmentally harmful media escaping unnoticed - we will even increase our efforts for the further development of our hp- Program.
We are continuously working to decrease effects on the environment as well as energy and resource consumption - far exceeding the measure required for compliance with environmental protection laws and regulations.

Environmentally compatible actions are not only a task for each and every employee, but must also be supported continuously by the management. We ensure that our environmental policy is effectively implemented. The technical and organizational procedures required for this are inspected regularly and continuously developed.
We support our customers in the environmentally compatible use of our products.

8 General Information

8.1 Application Risk

In case of failure or leakage may occur hazards to humans and the environment.

8.2 Usable fuel

Liquid fuels, mainly fuel oils derived from crude oil distillation, qualities according to DIN 51603 Part 1 – 5.
FAME – mix with fuel oil according to DIN 51603 Part 6 (FAME = Fatty Acid Methyl Ester)
FAME 100% DIN EN 14214 respectively EN 14213
Crude oils (max. fluid temperature 90°C)
Marine fuel ISO 8217 (HFO, MDF Kategorie ISO-F-DMX, DMA, DMB)
Cold-pressed bio fuel according to DIN V 51605

Characteristics for different fuels (reference value)

Fuel	Density (at 20 °C)	Kin. viscosity (at 40°C)	Max. temperature at spraying viscosity *)
Unit	[kg/m^3]	[mm^2/s]	[°C]
Fuel oil (DIN 51603-1)	max. 856	max. 3,6	15
Havy fuel oil (DIN 51603-3)		max. 1150	160
Re – raffinate (DIN 51603-4)		<45	90
Fuel oil (DIN 51603-6)	max. 860	max. 3,6	15
Marine Fuels (ISO 8217)	890 (15°C)	min: 1,4; max. 11	80
RME (DIN EN 14213)	856,6-896,6	3,5 – 5,0	28
Rape oil (DIN V 51605)	896,6-926,6	max. 36,0	85
Ecoil (Basis Rapsöl)	923,3	39,3	85 – 90
Palm oil	947,6	85,9	100 – 105

*) temperature values are approximate
Chemical resistance of all parts for specified types of fuel. Non-standard fuels are excluded from the warranty.

8.1 Painting

Standard
Gentian blue RAL 5010.
Quick-drying, high-quality, Nitro combination paint.
Safety Data Sheet according 91/155/EWG, Nr. S000494

According to the requisitions, the executed painting may vary from the standard paint.

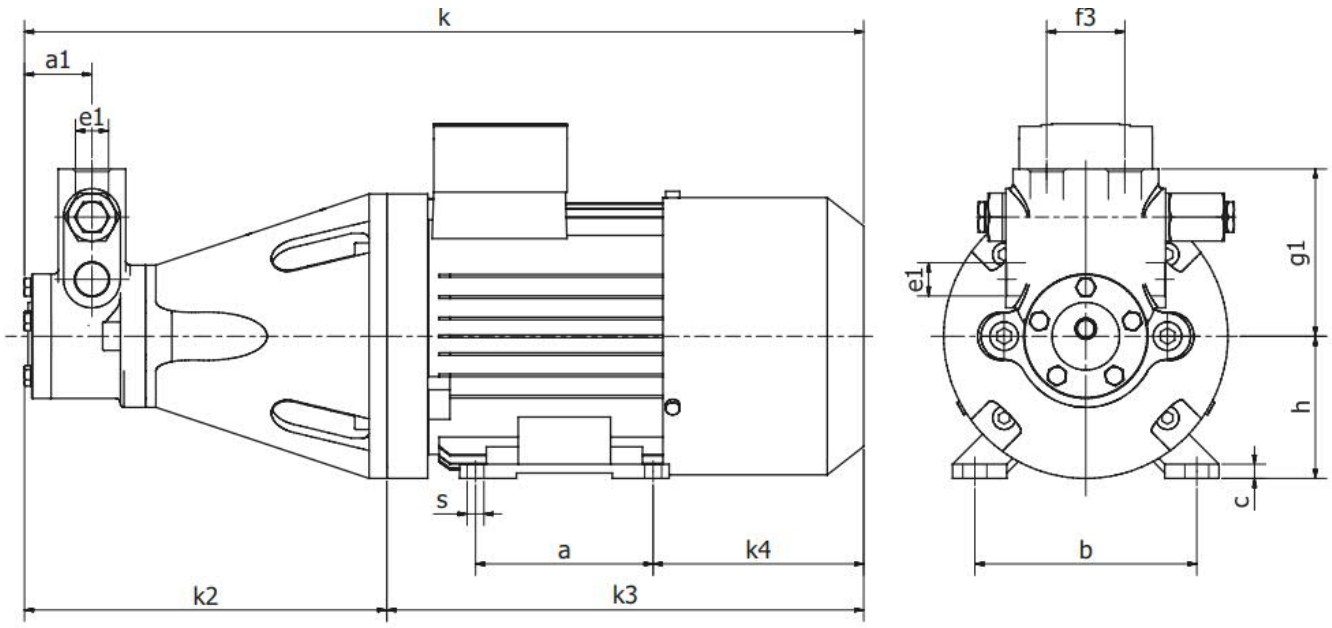
8.2 Directives

PED 97/23/EG
MD 2006/42/EG
EMC 2004/108/EG (89/336/EWG)
LVD 2006/95/EG (73/23/EWG)
ROHS 2000/53/EG
EU MEPS
WEEE 2002/95/EC
Observe the relevant national regulations.

8.1 Documentation

Test report on leak and functional testing.
Installation, maintenance and operating instructions with dimensional drawing and flow characteristics.
Manual – Electric motor.

9 Dimensional drawing SMG with VBR – Industrial pump



Series size	Pump model	Discharge	Motor power	Dimensions												
				regardless of motor										for IE-3		
				a	a1	b	c	e1	f3	g1	h	k2	s	k	k3	k4
SMG 1601	VBRP	45 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1602	VBRM	80 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1603	VBRG	120 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1604	VBRF	160 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1605	VBGRP	300 l/h	0.18 kW	80	40	100	7	G 1/2"	44	94	63	179	7	359	180	60
SMG 1606	VBGRM	450 l/h	0.37 kW	90	40	112	7	G 1/2"	44	94	71	186	7	396	210	82
SMG 1607	VBGRG	600 l/h	0.37 kW	90	40	112	7	G 1/2"	44	94	71	186	7	396	210	82
SMG 1608	VBHRP	1000 l/h	0.75 kW	100	49	125	8	G 3/4"	67	115	80	268	9.5	555	287	137
SMG 1609	VBHRM	1500 l/h	0.75 kW	100	49	125	8	G 3/4"	67	115	80	268	9.5	555	287	137
SMG 1610	VBHRG	2000 l/h	1.1 kW	100	49	140	10	G 3/4"	67	115	90	278	10	615	337	181
SMG 1611	VBHGRP	3000 l/h	1.5 kW	125	63	140	10	G 1" [1]	80	120	90	340	10	677	337	156
SMG 1611 -1	VBHGRPZ	3700 l/h	1.5 kW	125	63	140	10	G 1" [1]	80	120	90	340	10	677	337	156
SMG 1612	VBHGRM	4500 l/h	2.2 kW	140	63	160	12	G 1" [1]	80	120	100	350	12	714	364	160
SMG 1613	VBHGRG	6000 l/h	3.0 kW	140	63	160	12	G 1" [1]	80	120	100	350	12	714	364	160
SMG 1621	VBRP	45 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1622	VBRM	80 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1623	VBRG	120 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1624	VBRF	160 l/h	0.37 kW	90	36	112	7	G 3/8"	38	90	71	172	7	382	210	82
SMG 1625	VBGRP	300 l/h	0.37 kW	90	40	112	7	G 1/2"	44	94	71	186	7	396	210	82
SMG 1626	VBGRM	450 l/h	0.75 kW	100	40	125	8	G 1/2"	44	94	80	206	9.5	493	287	137
SMG 1627	VBGRG	600 l/h	0.75 kW	100	40	125	8	G 1/2"	44	94	80	206	9.5	493	287	137
SMG 1628	VBHRP	1000 l/h	1.5 kW	125	49	140	10	G 3/4"	67	115	90	278	10	615	337	156
SMG 1629	VBHRM	1500 l/h	2.2 kW	140	49	160	12	G 3/4"	67	115	100	288	12	652	364	160
SMG 1630	VBHRG	2000 l/h	3.0 kW	140	49	160	12	G 3/4"	67	115	100	288	12	652	364	160
SMG 1631	VBHGRP	3000 l/h	4.0 kW	140	63	190	12	G 1" [1]	80	120	112	349	12	697	347	137
SMG 1631 -1	VBHGRPZ	3700 l/h	4.0 kW	140	63	190	12	G 1" [1]	80	120	112	350	12	697	347	137
SMG 1632	VBHGRM	4500 l/h	5.5 kW	140	63	216	15	G 1" [1]	80	120	132	370	12	790	420	199
SMG 1633	VBHGRG	6000 l/h	7.5 kW	178	63	216	15	G 1" [1]	80	120	132	370	12	790	420	153
SMG 1942	VBRM	80 l/h	0.18 kW	80	36	100	7	G 3/8"	38	90	63	165	7	345	180	60
SMG 1943	VBRG	120 l/h	0.37 kW	90	36	112	7	G 3/8"	38	90	71	172	7	382	210	82
SMG 1944	VBRF	160 l/h	0.37 kW	90	36	112	7	G 3/8"	38	90	71	172	7	382	210	82
SMG 1945	VBGRP	300 l/h	0.75 kW	100	40	125	8	G 1/2"	44	94	80	206	9.5	493	287	137
SMG 1946	VBGRM	450 l/h	1.1 kW	100	40	140	10	G 1/2"	44	94	90	206	10	543	337	181
SMG 1947	VBGRG	600 l/h	1.5 kW	125	40	140	10	G 1/2"	44	94	90	206	10	543	337	156
SMG 1948	VBHRP	1000 l/h	2.2 kW	140	49	160	12	G 3/4"	67	115	100	288	12	652	364	160
SMG 1949	VBHRM	1500 l/h	3.0 kW	140	49	160	12	G 3/4"	67	115	100	288	12	652	364	160
SMG 1950	VBHRG	2000 l/h	4.0 kW	140	49	190	12	G 3/4"	67	115	112	288	12	635	347	137
SMG 1951	VBHGRP	3000 l/h	5.5 kW	140	63	216	15	G 1" [1]	80	120	132	370	12	790	420	199
SMG 1951 -1	VBHGRPZ	3700 l/h	5.5 kW	140	63	216	15	G 1" [1]	80	120	132	370	12	790	420	199
SMG 1952	VBHGRM	4500 l/h	7.5 kW	178	63	216	15	G 1" [1]	80	120	132	370	12	790	420	153

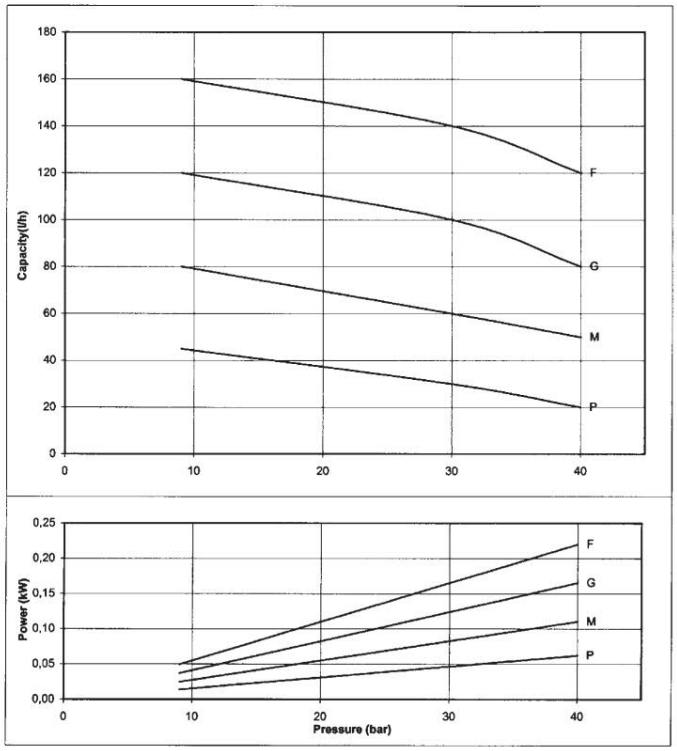
The dimensional specifications of the electric motors vary according to manufacturer, therefore the dimensions of the motor pump units are not binding.

10 Flow characteristics for hp-pumps series VBR

Flow characteristics VBR for fuel oil L/EL

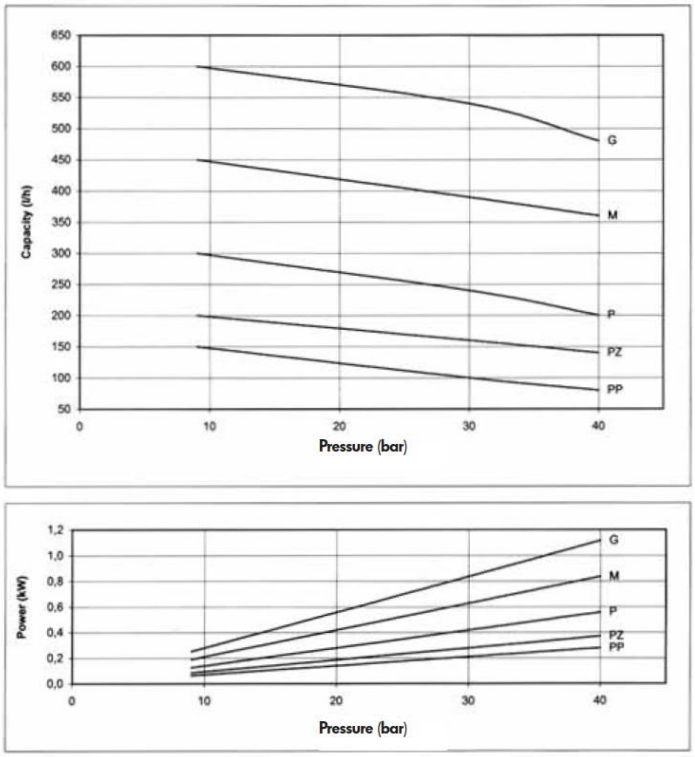
Gear rotor size Ø25

at 1400 min^{-1}

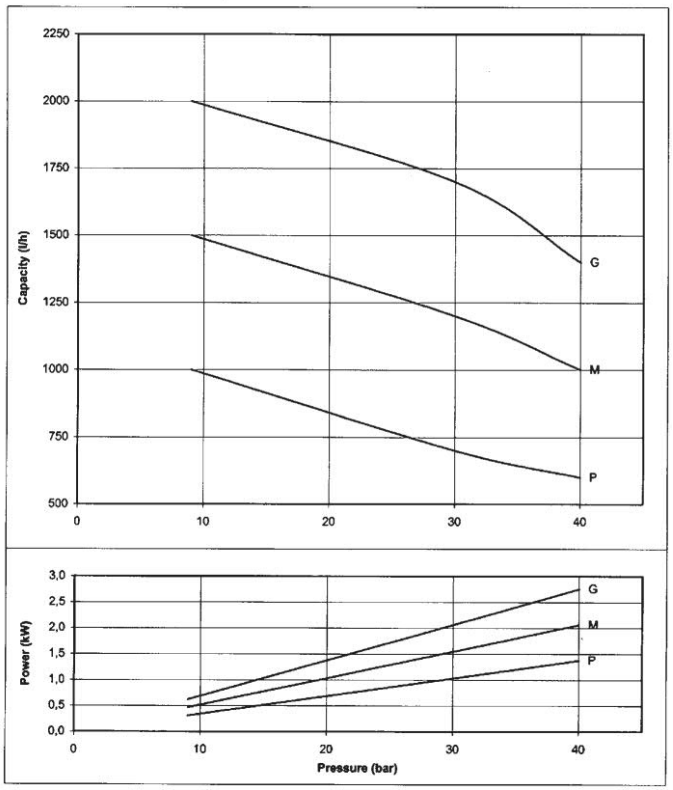


Gear rotor size Ø38

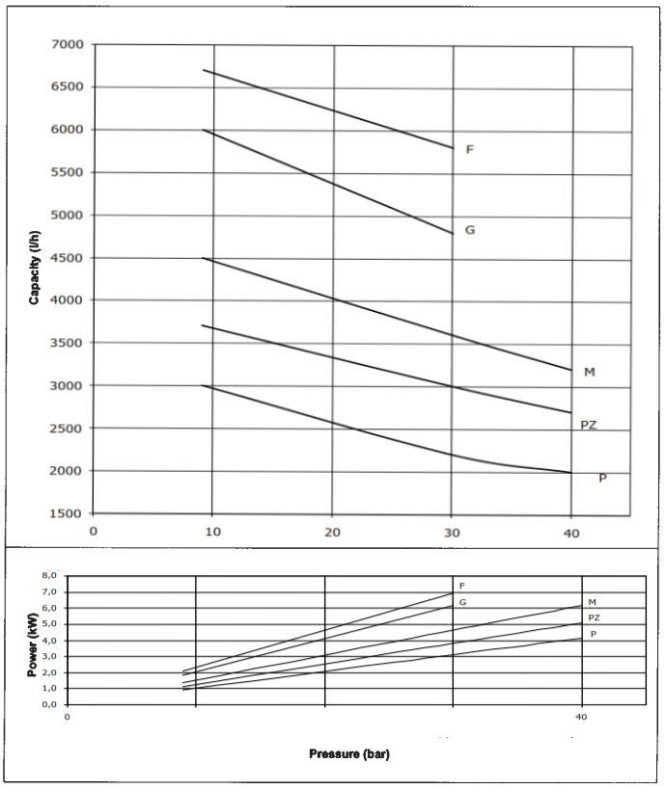
at 1400 min^{-1}



Gear rotor size-Ø 56 at 1400 min^{-1}



Gear rotor size-Ø 75 at 1400 min^{-1}



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