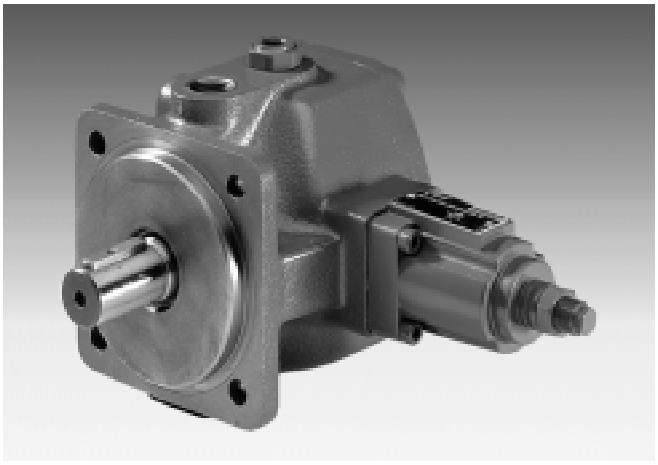
RE 10 521/02.99

engineering
mannesmann
Rexroth

Vane pump, direct actuated
Type PV7...A

Nominal sizes 20 to 25
Series 2X
Maximum operating pressure 100 bar
Displacement volume 20 to 25 cm^3



H/A/D 6096/98

Type PV7-2X/..RA01MA0-...

Overview of contents

Features

- Very short control times
- Low operating noise
- Mounting and connection dimensions to VDMA 24 560/1 and ISO 3019/2
- Good efficiency
- Long service life
- Adjustable displacement
- Also available as a completly assembled drive unit „MPU“ (motor + pump)

Ordering details

PV7 – 2X /	R	A	01		A	0 –	*

Series
Series 20 to 29 (20 to 29: unchanged installation and connection dimensions) **= 2X**

Frame size BG	Nominal size NS	
20	20 cm³	**= 20 – 20**
20	25 cm³	**= 20 – 25**

Direction of rotation
Clockwise (viewed on the drive shaft) **= R**

Drive shaft
Cylindrical drive shaft **= A**

Pipe connections
Suction and pressure connections, Pipe thread to ISO 228/1 **= 01**

Seals
M = NBR seals, suitable for mineral oil HLP to DIN 51 524
K = FKM shaft seal (other seals from NBR) suitable for use with HETG and HEES pressure fluids to VDMA 24 A/F

A = Direct actuated

Adjustment device
0 = Adjustment screw

Zero stroke pressure range
05 = up to 50 bar
10 = up to 100 bar

Further details in clear text

Ordering example: PV7-2X/20-25RA01MA0-05

Pumps with customer specific settings:

PV7-2X/20-25RA01MA0-10

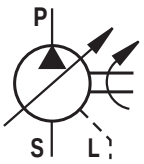
Details in clear text: $q_{V\,max}$ **= 20 L/min;** $p_{zero\ stroke}$ **= 70 bar;**

The pump will be set to the required values. The optimum operating noise will be set at the required zero stroke pressure. Without any clear test information the flow and the zero stroke pressure will be set to the relevant maximum values.

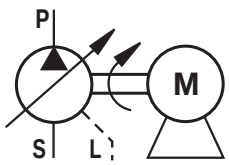
Preferred types (readily available)

Type	Material no.
PV7-2X/20-20RA01MA0-05	00950952
PV7-2X/20-20RA01MA0-10	00950953
PV7-2X/20-25RA01MA0-05	00950954
PV7-2X/20-25RA01MA0-10	00950955

Symbols

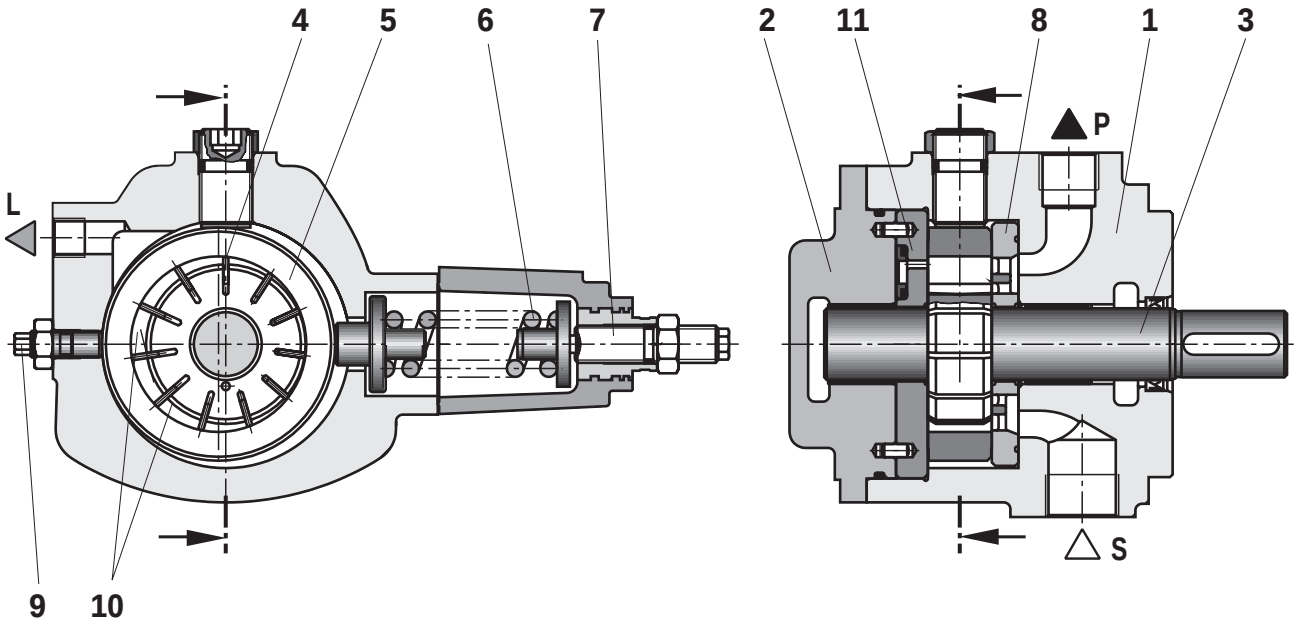


Single pump



Motor pump drive unit

Function, section



Types PV7...A hydraulic pumps are direct actuated vane pumps with an adjustable displacement volume.

They basically comprise of the housing (1), cover (2), rotor (3), vanes (4), stator ring (5), compression spring (6), adjustment screw (7) and control plate (8).

For limiting the maximum flow, the pump is fitted with an adjustment screw (9).

The driven rotor (3) rotates within the stator ring (5). The vanes (4) which are guided in the rotor (3) are pressed against the inner running surface of the stator ring (5) by centrifugal force.

Suction and displacement process

The chambers (10) which are required for the transport of the fluid are formed by the vanes (4), the rotor (3), the stator ring (5), the control plate (8) and the cover plate (11).

The chamber volume increases as the rotor (3) rotates and the chambers fill themselves with fluid via the suction channel (S). When the largest chamber volume is reached the chambers (10) are separated from the suction side. As the rotor (3) continues to rotate the connection to the pressure fluid side is opened, the chambers decrease in size and force the fluid into the system via the pressure port (P).

Pressure control

The stator ring (5) is held in its initial excentric position by spring (6). The maximum operating pressure required in the system is set at the adjustment screw (7) via the spring (6).

The pressure which builds up due to the work resistance acts on the pressure side of the inner running surface of the stator ring (5), against the force of the spring (6).

When the relevant pressure is reached, which is determined by the set spring force, the stator ring (5) is moved out of its excentric position in the direction of the zero position. The flow adjusts itself to the value which is being demanded at that time. When the highest set pressure, which has been set at the spring (6), has been reached then the pump regulates the flow back to virtually zero. The operating pressure is maintained and only the leakage fluid is replaced. Losses and heating of the fluid is thereby minimised.

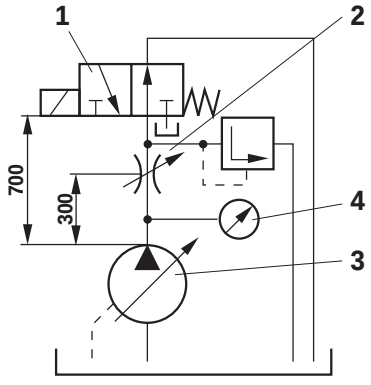
Technical data (for applications outside these parameters, please consult us!)

Design			vane pump, adjustable displacement volume	
Type			PV7...A	
Mounting style			flange mounting	
Pipe connections			pipe thread to ISO 228/1	
Installation			optional, preferably horizontal	
Shaft loading			radial and axial forces can **not** be taken up	
Direction of rotation			clockwise (viewed on the drive shaft)	
Drive speed	n	min^{-1}	1000 to 1800	
Frame size	BG		20	20
Nominal size / displacement volume	V	cm^3	20	25
Max. permissible drive torque	T	Nm	90	90
Max. flow [1] (at n = 1450 min^{-1}; p = 10 bar; ν = 41 mm^2/s)	q_V	L/min	29	36
Operating pressure, absolute				
– Inlet	p	bar	0,8 bis 2,5	
– Outlet	p	bar	100	
– Leakage outlet	p	bar	2	
– Leakage flow at zero stroke (at operating pressure, output = $p_{max.\ zero\ stroke}$)	q_V	L/min	1,2	2,4
Pressure fluid			HLP – mineral oil to DIN 51 524 Teil 2 **Please take into account our specifications stated within catalogue sheet RE 07 075!**	
Pressure fluid temperature range	ϑ	° C	– 10 to +70 (take the permissible viscosity range into account!)	
Viscosity range	ν	mm^2/s	16 to 160 at operating temperature max. 800 when starting under displacement conditions max. 200 when starting under zero stroke conditions	
Degree of contamination			Max. permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We, therefore, recommend a filer with a minimum retention rate of $\beta_{10} \geq 100$.	
Weight	m	kg	11.4	

[1] Flow deviations due to manufacturing tolerances of a max. of + 6% is possible

Dynamics characteristics, measurement build-up (measured at n = 1450 min^{-1}, ν = 41 mm^2/s and ϑ = 50 °C)

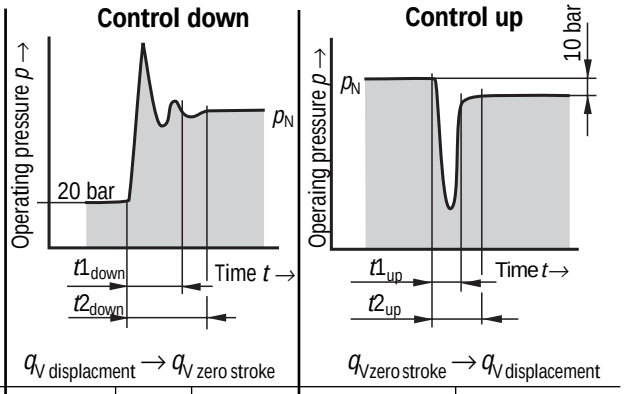
The control times are valid for the measurement build-up as shown. For other set-ups and line lengths the control times will change.



Control times
(average value)

t_{down} / t_{up}

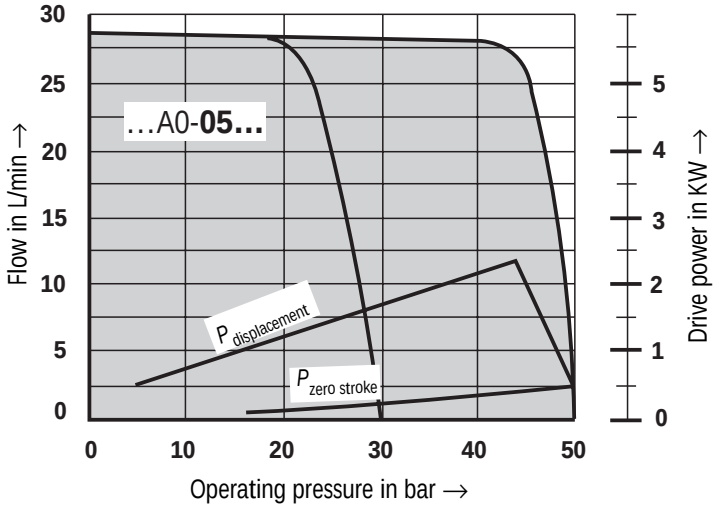
1 Directional valve (switching time 30 ms)
2 Throttle for setting the pressure during displacement
3 Hydro pump
4 Pressure measurement point

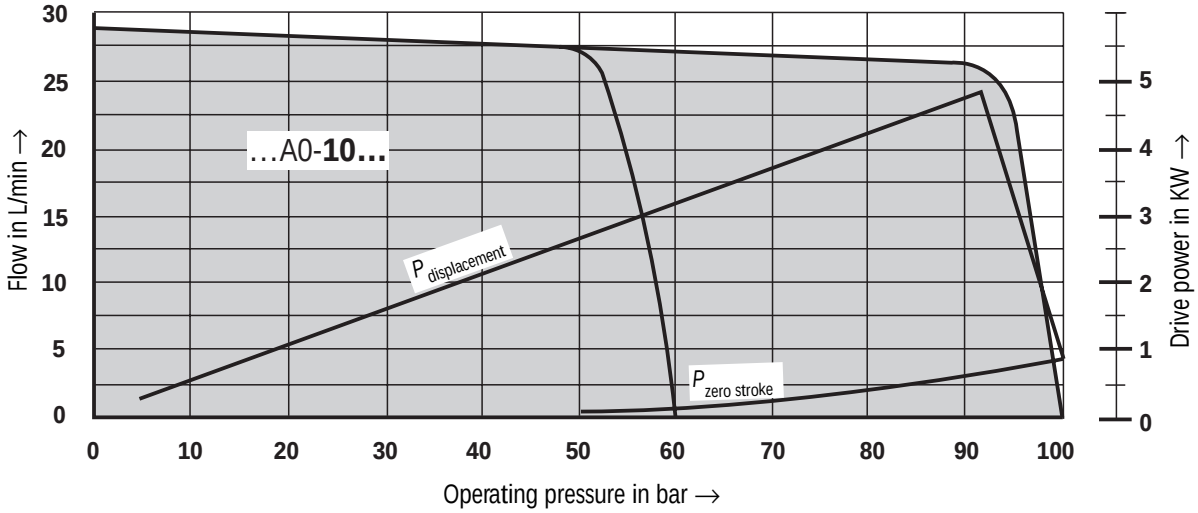


Zero stroke pressure Version	p_N in bar	$t1_{down}$	$t2_{down}$	p_{max} [2]	$t1_{up}$	$t2_{up}$
...05...	50	60	85	120	20	40
...10...	100	80	125	170	25	45

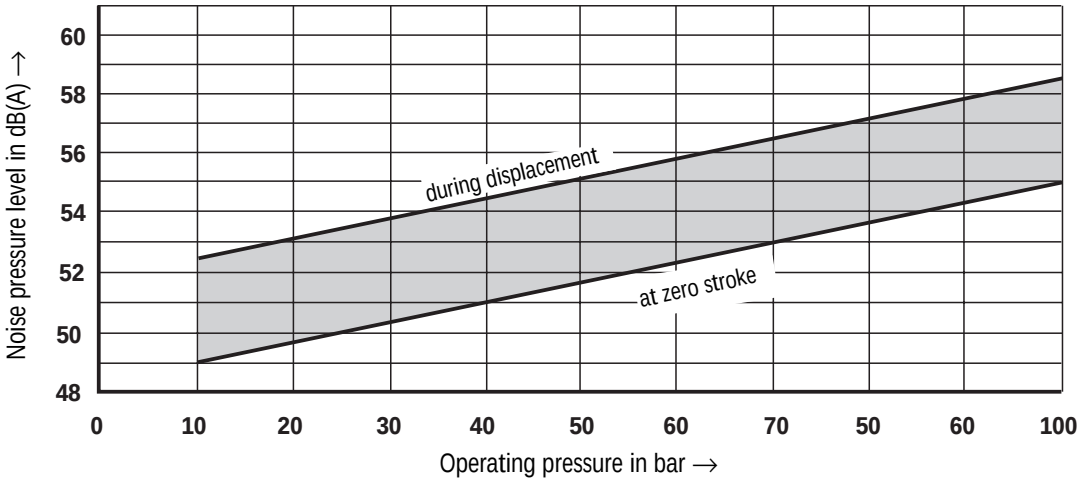
[2] Permissible pressure peaks

Characteristic curves: type PV7/20–20, (measured at n = 1450 min^{-1}, ν = 41 mm^2/s and ϑ = 50 °C)





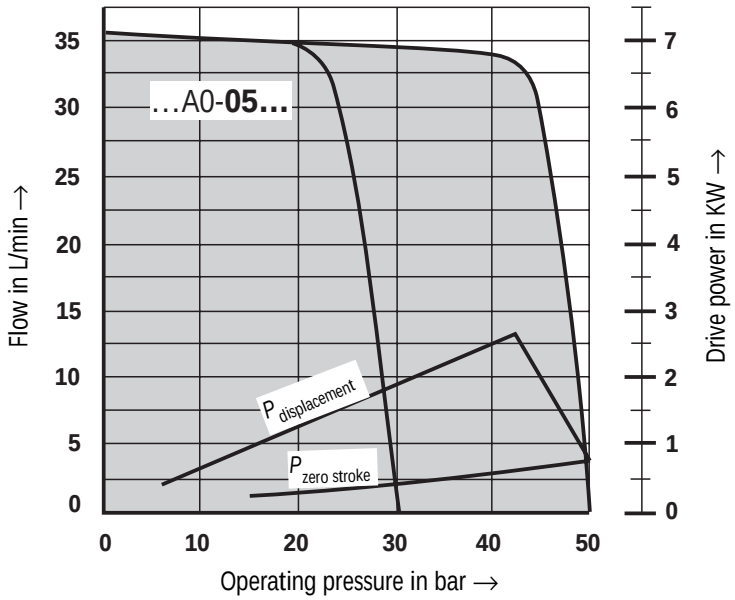
Noise pressure level

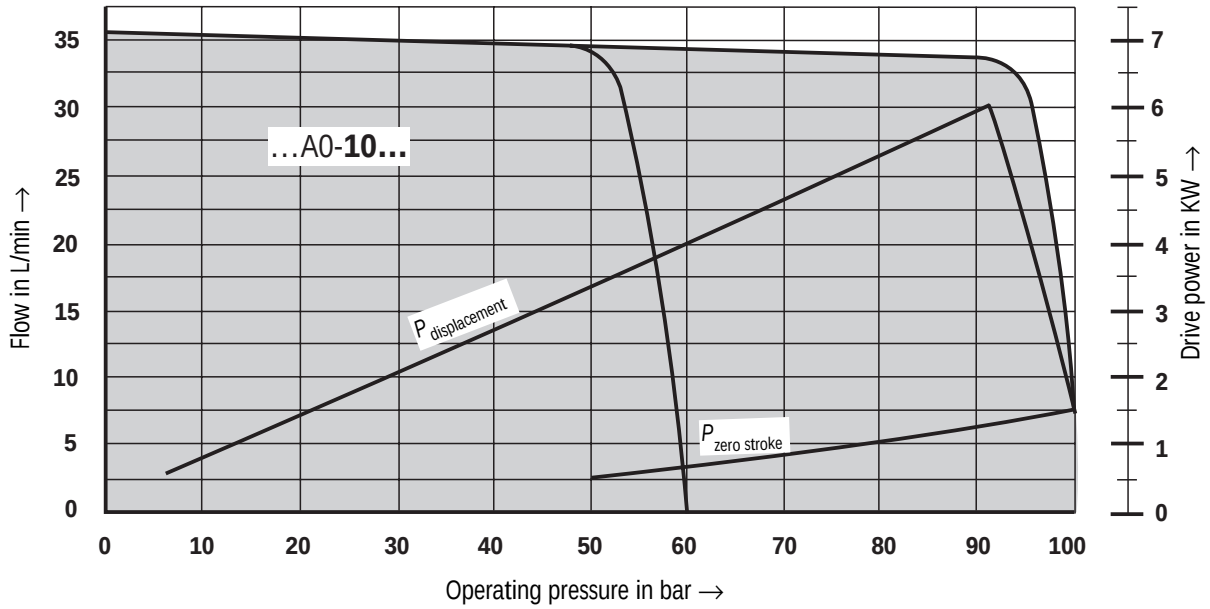


Measured in anechoic chamber to DIN 45 635, page 26

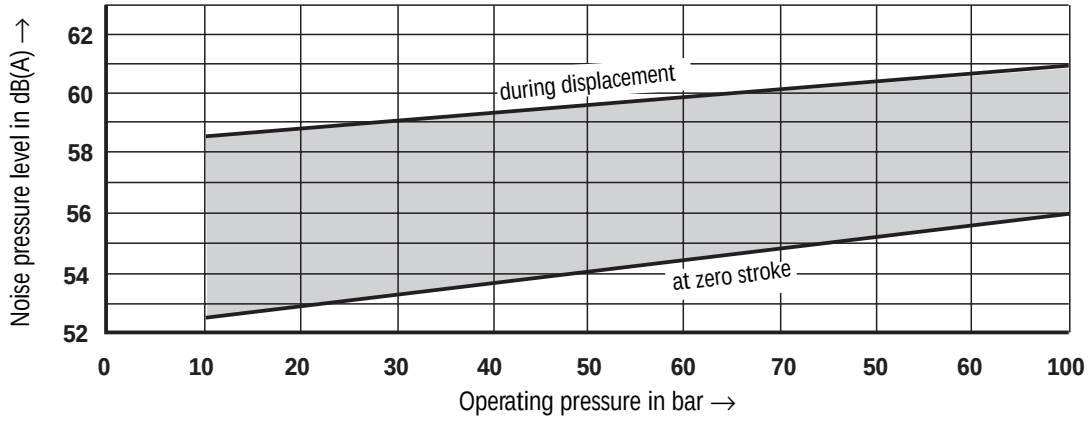
Distance: noise sensor – pump = 1m

Characteristic curves: type PV7/20–25, (measured at n = 1450 min^{-1}, ν = 41 mm^2/s and ϑ = 50 °C)





Noise pressure level

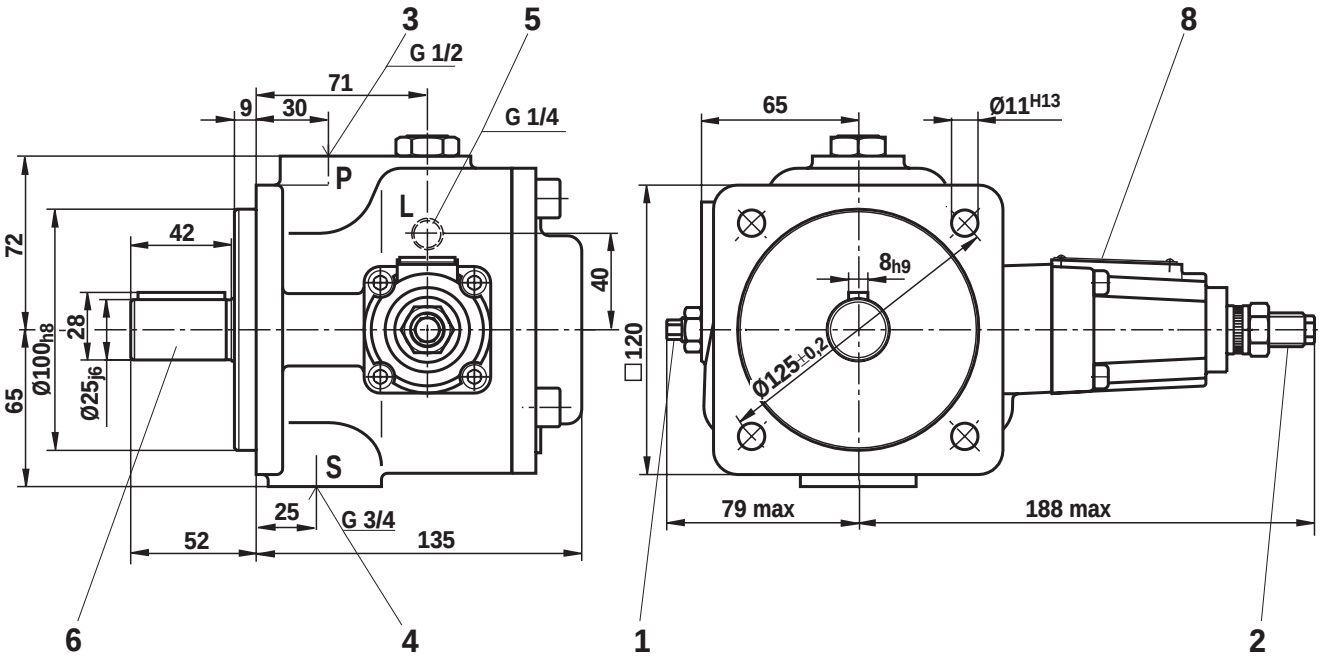


Measured in anechoic chamber to DIN 45 635, page 26

Distance: noise sensor – pump = 1m

Unit dimensions

(Dimensions in mm)



1 Flow adjustment
Adjustment guidelines:
– With clockwise rotation, the flow decreases
– With anti-clockwise rotation, the flow increases

2 Pressure adjustment
Adjustment guidelines:
– With clockwise rotation, the operating pressure increases
– With anti-clockwise rotation, the operating pressure decreases

3 Pressure connection

4 Suction connection

5 Drain connection

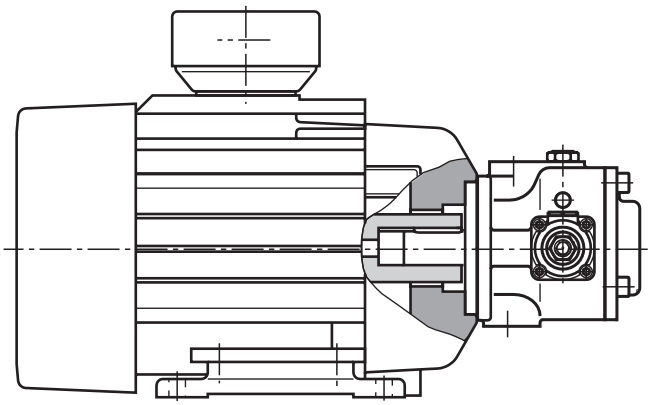
6 Drive shaft

Motor-pump drive unit: design, section

The electric motor and vane pump are connected **without** a coupling and pump mounting bracket. This results in the unit being very compact and cost effective.

Due to the omission of the electric motor flange bearing alignment stresses on the bearing points are avoided.

The motor design which has a hollow shaft and key-way permits standard pumps to be fitted.



Ordering details

MPU | 1 – – / +

Motor-pump drive unit

Fitted with a single pump **= 1**

Pump material no.
(for preferred types see page 2)

Electric motor material no.
(see below)
further electric motors on request!

For fitting pump type:	Motor	
	Design	Frame size
Types PV7/20-20 and PV7/20-25	**= V716**	**= 90L** **= 112M** **= 132M**

Ordering example:
MPU1-V716-90L/00025194+00950952

Reference to the EC machine guidelines 89/392 EWG, annex II, section B:

The MPU drive units are manufactured in accordance with the harmonised standards EN 982, EN 983, DIN EN 292 and DIN EN 60 204-1.

Commissioning cannot be carried out until it has been ensured that the machine, into which the MPU drive is to be fitted, complies with the regulations stated in the EC guidelines.

Selection table / ordering details: electric motor (available variants)

	Motor voltage 230/400 V			**Motor voltage 400/690 V**	
El. motor frame size	**90L**	**112M**		**132M**	
Power in kW	1.8	4.0	5.5	7.5	9.2
Pump frame size	**Ordering details / Material no. of the available motor variants**				
PV7/20 -20 and PV7/20-25	00025194	00026503 00070760	00025362	00025397	00026696

The nominal powers stated in the above table are valid for continuous operation to VDE 0530 and at a frequency of 50 Hz, medium temperature of 40 °C and at a height up to 1000 m above sea level.

Technical data: electric motor

Design			surface cooled 3-phase AC caged motor
Frame type			B3 with hollow shaft and mounting flange
Motor type			B3/MPU
Electrical connection			Pg fitting and earth connection in the terminal box
Isolation			isolation class F
Protection to VDE 0530			IP54
No. of pole pairs			4
Voltage to IEC 38		V	230/400
		V	400/690
Frequency		Hz	50 or 60
RPM	At 50 Hz	min^{-1}	1500
	At 60 Hz	min^{-1}	1800
Installation			horizontal

Switching of the electric motor

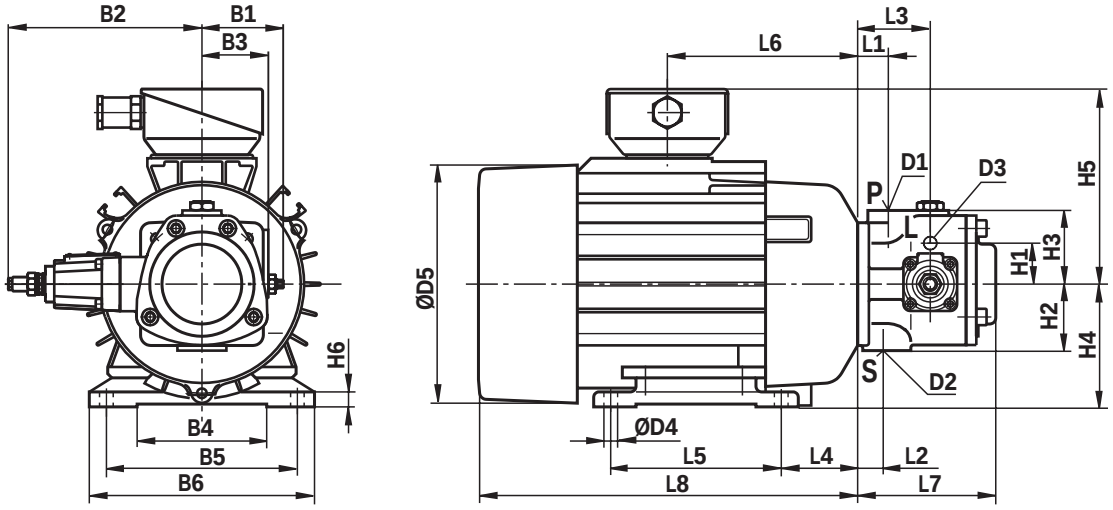
Winding version Volt	Operating voltage Volt	for direct starting Volt	For Y Δ starting Volt
230 Δ / 400 Y	220...240 380...415	220...240 Δ 380...416 Y	220...240 Δ
400 Δ / 690 Y	380...415 660...725	380...415 Δ 660...726 Y	380...415 Δ

Motors with winding for 50 Hz and connected to a 60 Hz supply

El. motor wound for 50 Hz	Voltage V winding version		Conversion factor at 60 Hz	
	230/400	400/690	Nominal RPM n_{nom}	Nom. power P_{nom}
Connection to 60 Hz	230	400	1.2	1.0
	400	690	1.2	1.0
		440	1.2	1.15
		460	1.2	1.2

Unit dimensions

(Dimensions in mm)



Pump	Dimensions												
Frame size	D1	D2	D3	L1	L2	L3	L7	H1	H2	H3	B1	B2	B3
20	G 1/2	G 3/4	G 1/4	30	25	71	135	40	65	72	79	188	65

El. motor	Dimensions											
Frame size	ØD4	ØD5	L4	L5	L6	L8	H4	H5	H6	B4	B5	B6
90L	10	174.5	56	125	140	278	90	143	11	95	140	165
112M	11	218	70	140	98	326	112	151	14	129	190	235
132M	11	258	89	178	114	407	132	195	16	160	216	260

Project guidelines

Comprehensive instruections and proposals can be found in the Hydrauclic Trainer, Volume 3 RE 00 281, "Planning and design of hydraulic power systems".
When using vane pumps we recommend that the following guidelines are partically taken into account.

Technical data
All the technical data are dependent on manufacturing tolerances and are valid with certain operating conditions.

Please take into account that minor variations are possible and technical data can be affected by differeing conditions (e.g. viscosity).

Characteristic curves
Characteristic curves for flow and absorbed power:
Please take into account when dimensioning the drive motor the maximum possible application data.

Noise
The noise pressure level values given on pages 5 and 6 are measured according to DIN 45 635 part 26. This means that only the noise emission of the pump is given. Ambient influences (such as place of installation, piping, etc.) are not taken into consideration. The value refer to only one pump

Attention! The power unit design and the influences at the unit's final place of installation, in general, result in the fact that the noise pressure levels lie 5 to 10 dB(A) higher than that of the pump alone.

Leakage fluid
On page 4 the average external leakage of the pump is stated. Please note that these values are only intended for use as projecting guidelines when defining cooler sizes and pipe sizes. When determining the size of the oil reservoir the appropriate value to be used is the zero stroke power (see pages 5 to 7). Changes in cross-section and the use of a leakage oil cooler can result in there being unpermissibley high pressure peaks in the leak-oil line.

Commissioning guidelines

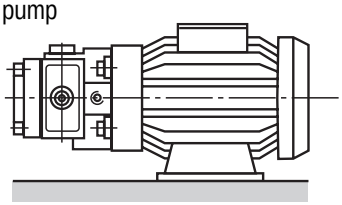
Bleeding
- All of the PV7...A type vane pumps are self-priming.
- Before commissioning for the first time, the pump has to be bled so that it is protected against damage.
- During the first commissioning we recommend that the housing is filled via the leakage connection. Take into account the filter rating! This increases operating safety and prevents wear in the case of infavourable installation conditions
- If the pump after approx. 20 seconds does not displace oil without any bubbles then the system has to be rechecked. After the operating values have been reached, check the pipe connections for leakage and check the operating temperature.

Commissioning
- Check to see if the system has been carefully, correctly and cleanly assembled.
- Take into account the motor and pump direction of rotation arrows.
- Start the pump without load and let it displace oil without pressure for a few seconds in order to provide sufficient lubrication.
- **Never run the pump without oil!**

Important guidelines
- Adjustment, maintenance and servicing of the pump must only be carried out by authorised, trained and instructed personnel!
- Only use original Rexroth spare parts!
- The pump must only be operated within the permitted limits.
- The pump may only be operated in a sound condition!
- When carrying out any work on the pump (e.g. removing and refitting) switch the system to zero pressure and isolate from the mains supply!
- Unauthorised conversions and modifications which affect the safety and function of the pump are not permitted!
- Provide protective measures (e.g. coupling guard)!
- Do not remove any existing protective devices!
- The general valid safety and accident prevention regulations must be adhered to!

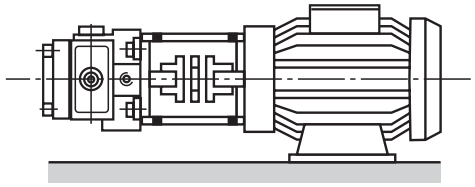
Installation guidelines

Drive: Variant 1
MPU drive unit (is supplied completely assembled)
El. motor and pump



– Very short design
– Cost-effective solution (coupling and pump mounting bracket is not required)
– No assembly required
– For further information see page 8 to 10

Drive: Variant 2
El. motor + pump mounting bracket + coupling + pump

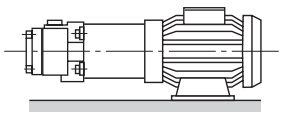


– Radial and axial forces on the pump drive shaft are not permitted!
– Motor and pump must be exactly aligned!
– Use flexible couplings

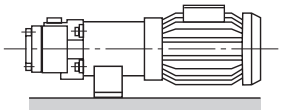
Installation positions

– Horizontal position preferred

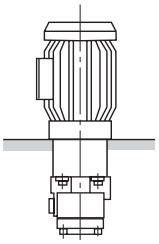
B3



B5



V1



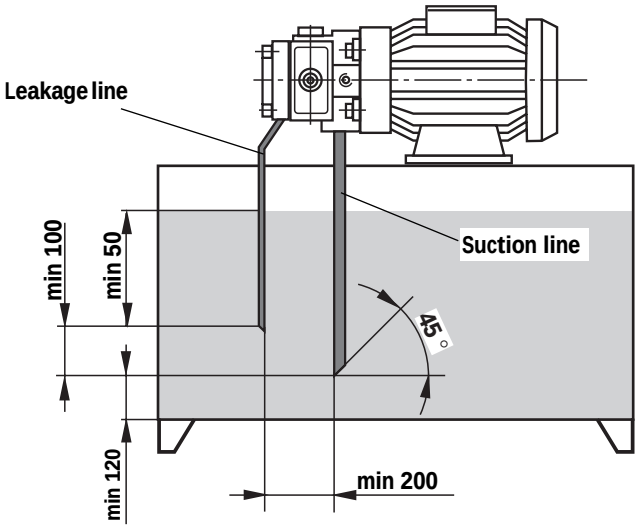
Fluid reservoir

– Match the service capacity of the reservoir to the operating conditions.
– The permissible fluid temperature must not be exceeded, if required, provide a cooler!

Lines and connections

– Remove protective plugs from the pump.
– We recommend the use of seamless precision steel pipes to DIN 2391 and removable pipe connections.
– Select the inside diameter of the pipes according to the ports.
– Throughly clean pipes and fitings before assembly.

Piping recommendations (dimensions in mm)



– The leakage line is to be so fitted that the pump **cannot** drain!
– **Under no circumstances** must leakage and return fluid be directly taken up by the pump!

Filter

– Whenever possible, use return line or pressure filters.
(Suction filter only in conjunction with low pressure switch/ clogging indicator)

Pressure fluid

– Please take into account the specifications stated in catalogue sheet RE 07 075.
– We recommend brand name fluids.
– Do not mix hydraulic fluids of different types since this can result in decomposition and deterioration of the lubricating quality!
– The fluid must be replaced at regualr intervals according to the operating conditions. In connection with this, the tank must also be cleaned of residues.

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