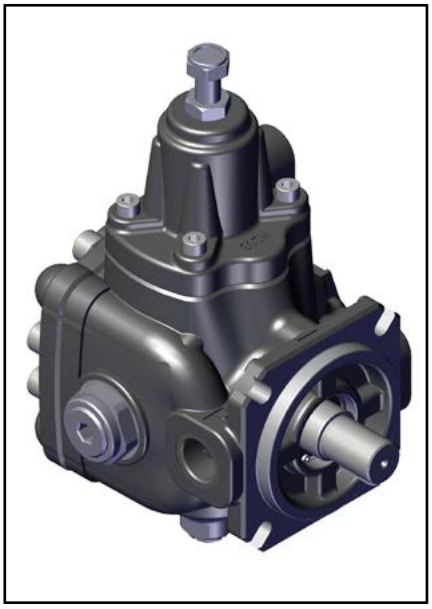
BERARMA
oleodinamica

General Catalogue

MODEL	SECTION
• **PLP Pump** Size 05: up to 16 cm^3/r – max. 120 bar Size 1: 20 - 25- 32 cm^3/r – max. 100 bar	**A**
• **PHP Pump** Size 05: up to 16 cm^3/r – max. 250 bar Size 1: 20 - 25- 32 cm^3/r – max. 250 bar	**B**
• **PVS Pump** Size 2: 40 - 50 cm^3/r – max. 100 bar Size 3: 63 - 80- 100 cm^3/r – max. 80 bar	**C**
• **PSP Pump** Size 2: 40 - 50 cm^3/r – max. 160 bar Size 3: 63 - 80- 100 cm^3/r – max. 150 bar	**D**
• **PSPK-type Pump (Constant Power)** Size 1: 16 - 20- 25 cm^3/r – max. 160 bar Size 2: 32 - 40- 50 cm^3/r – max. 160 bar Size 3: 63 - 80- 100 cm^3/r – max. 150 bar	**E**
• **GMP Integrated Motor-Pump Units** Up to 32 cm^3/r – max. 250 bar - up to 12.5 HP	**F**
• **NRV Non-Return Valves** Up to 350 L/min – max. 300 bar	**G**

Variable displacement vane pump (with mechanical pressure compensator)

PLP-Type



Key Features:

Rotation: Right (viewed from shaft end)
Mounting flanges: 4-hole flange (UNI ISO 3019/2) and Rectagular Flange as gear pump Size 2 (only for PLP Size 05)
Connections: GAS BSP (UNI ISO 228/1)
Integrated mechanical displacement limiter as standard on all pumps
Set-up for combined pumps on request

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
01-PLP-05-16	16	23	120
01-PLP-1-20	20	29	100
01-PLP-1-25	25	36	100
01-PLP-1-32	32	47	100

CONTENTS

WARNING

All Berarma pumps have been carefully checked during manufacture and subjected to stringent testing cycles before shipment. To achieve optimum performance, avoid problems and maintain the warranty, the installation instructions enclosed with each pump sold must be strictly observed.

NOTES

Before selection and/or use of any Berarma product, it is important that the purchaser carefully analyses all aspects of its application and reviews the information in the current Berarma Technical-Sales catalogues. Due to the many different operating conditions and applications for Berarma products, the purchaser, through their own analysis and testing, is solely responsible for making the final selection of the products and assuring that all performance and safety requirements are met.

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GENERAL DESCRIPTION

As a result of the constant research carried out in order to introduce innovative products to the market characterised by high technological content and reliability, BERARMA has launched the **new 01 PLP series of LOW PRESSURE variable displacement vane pumps equipped with a MECHANICAL pressure regulating device.**

The new series of 01 PLP pumps, like all other BERARMA variable displacement vane pumps, ensure
- SILENT RUNNING
- HIGH EFFICIENCY
- LONG WORKING LIFE
- MODULAR DESIGN
- ENERGY SAVING

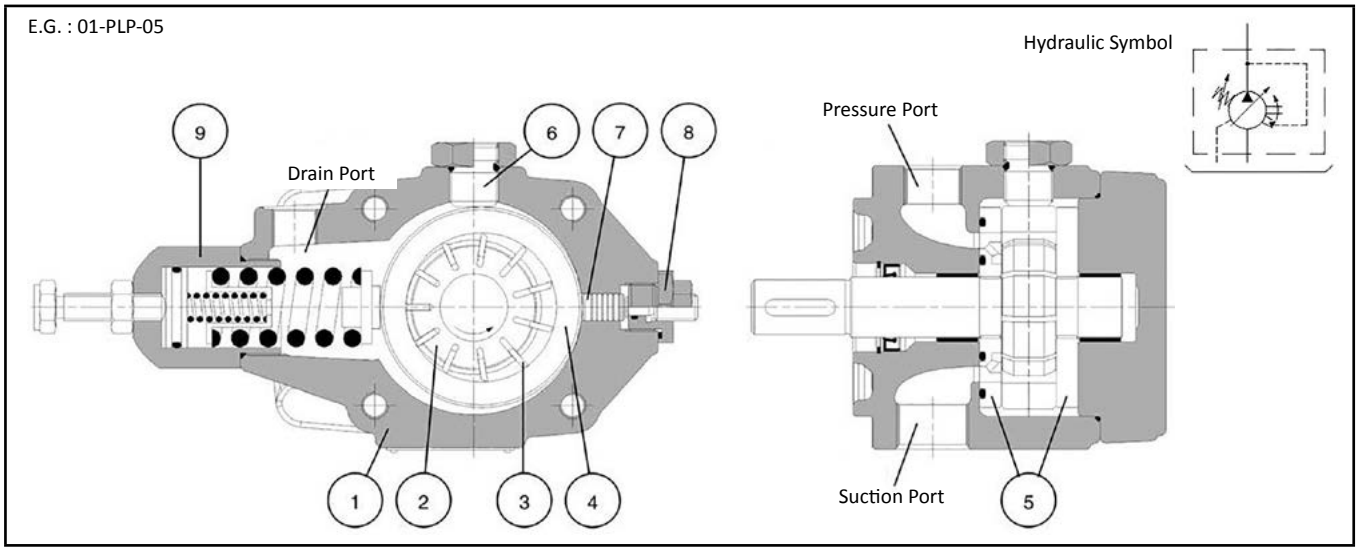
Moreover, the innovation related to the new series of vane pumps has led to an **IMPROVEMENT OF DISPLACEMENT CONTROL DYNAMICS and IMPROVED AXIAL BALANCING** thanks to the refinement of the hydrostatic compensation of the distribution plates. The PLP-1 pumps are come with dual inlet and outlet channels in the internal pump cartridge.

The new series of 01 PLP pumps is supplied with:
- ISO standard MOUNTING FLANGES
- GAS BSP standard PORT CONNECTIONS
- flow regulator unit in order to mechanically reduce pump displacement
- mechanical pressure regulating device
- (on request only) set-up for coupling to all BERARMA pumps or to the main others types of pump available on the fluid power market.

Based on the above features, the new series of PLP pumps is of great interest to the market.

What makes the new BERARMA 01 PLP series pumps interesting for the market?
- INNOVATIVE SHAPES AND DESIGN
- COMPACT OVERALL DIMENSIONS
- REDUCTION IN WEAR on internal pump cartridge parts

NOTES AND DEFINITION OF PUMP COMPONENTS
Body (1); Drive rotor (2) where the Vanes (3) flow; Stator (mobile ring with varying eccentricity and consequently displacement) (4); Side distribution plates (5); Guide block balancing adjustment screw (6) (**absolutely must not be tampered with by the user**); Displacement adjustment piston (7); Flow regulator unit (8); Pressure regulating device (9).



TECHNICAL DATA

NOMINAL SIZE		SIZE 05	SIZE 1		
Geometric displacement according to UNI-ISO 3662 (cm^3/r)		16	20	25	32
Actual displacement (cm^3/r)		17.9	24.2	29.4	34.5
Due to manufacturing tolerances, the value can vary by approx. ± 3%					
Maximum working pressure (bar)		120	100		
Pressure peak exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures					
Pressure setting range (bar)		H: 20 - 120	L: 15 - 50 H: 30 - 100		
Permitted maximum drain port pressure (bar)		1			
Inlet pressure (bar)		0.8 - 1.5 absolute			
Speed range (r/min)		800 - 1800			
Rotation direction (viewed from shaft end)		R - Right (clockwise)			
Loads on drive shaft		NO RADIAL OR AXIAL LOADS ALLOWED			
Maximum torque on primary shaft (Nm)	Tmax	**F** Flange 110	**FGR2** Flange 70	250	
Hydraulic fluid		HM hydraulic oil according to ISO 6743/4 HLP according to DIN 5124/2 for other fluids contact Berarma Technical-Sales Service			
Viscosity range (cSt, mm^2/s)		22 - 68 at operating temperature			
Starting viscosity under full flow conditions (cSt, mm^2/s)		400 max			
Viscosity index according to ISO 2909		100 min			
Inlet fluid temperature range (°C)		+15 / +60- pay attention to viscosity range			
Maximum acceptable fluid contamination level		20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638			
Recommended fluid contamination level for a longer pump working life		18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638			
Moment of inertia (kgm^2)		0.00012	0.00050		
Weight (kg)		7.4	18.3		
For further information and/or different operating conditions, please contact Berarma Technical-Sales Service					

ORDERING CODE

Series/ Name	Size Displacement	Flange	Pressure setting	Rotation	Seals	Combined pumps
01 PLP				**R**		

Code	Size	Displacement (cm^3/r)
05 - 16	05	16
1 - 20	1	20
1 - 25	1	25
1 - 32	1	32

Code	Flange	Thread
F	UNI ISO3019/2 - 4 holes	GAS BSP UNI ISO 228/1
FGR2 (only for size 05)	As for gear pump size 2	GAS BSP UNI ISO 228/1

Code	Pressure setting
H	20 - 120 bar (for Size 05) 30 - 100 bar (for Size 1)
L	15 - 50 bar (for Size 1 only)

Code	Rotation Direction
R	Right (viewed from shaft end)

Code	Seals
M	NBR
E	FPM (viton)

Code	Combined pumps
/	Omit for single pump
A	A - Primary and/or intermediate pump (available only for F flange)

Ordering code example:

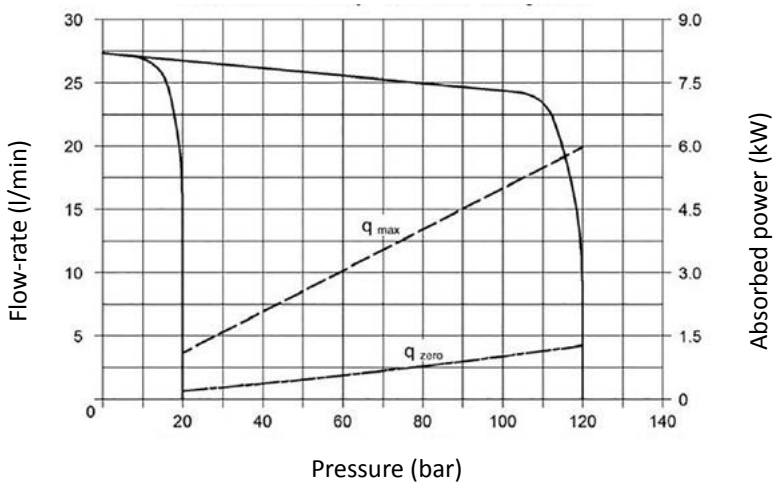
- 01 PLP 05-16 F H R M
- 01 PLP 05-16 F H R M A
- 01 PLP 05-16 FGR2 H R M
- 01 PLP 1-20 F L R M
- 01 PLP 1-32 F H R M A

CHARACTERISTIC CURVES

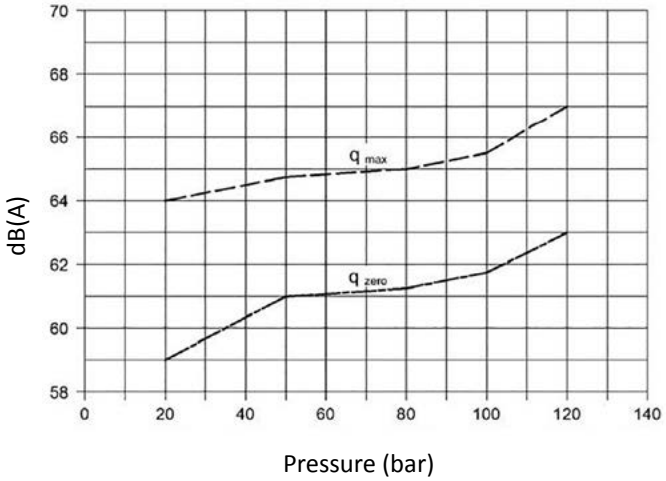
Indicative values measured on Berarma test machine, referring to 1500 rpm, with HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 48 °C.

01 PLP 05 16

Volumetric efficiency -zero flow setting curve

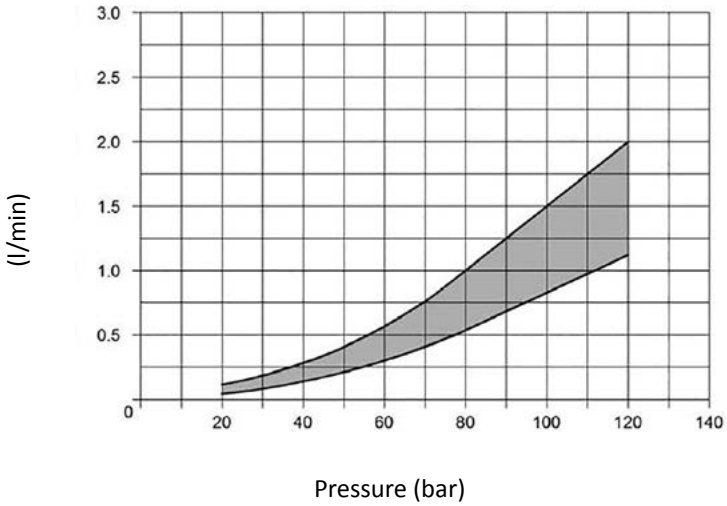


Noise level



Indicative maximum noise level values measured with sound-level meter placed one metre from the pump, with flexible coupling

Case drain (leakage) flow-rate

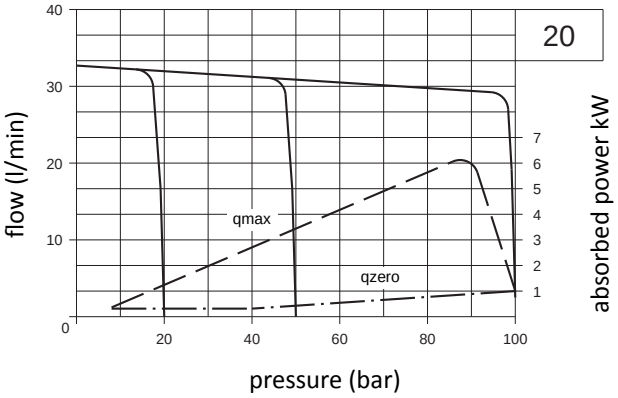


Pump under zero flow setting conditions

Indicative values measured on Berarma test machine, referring to 1500 rpm, with HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 48 °C.

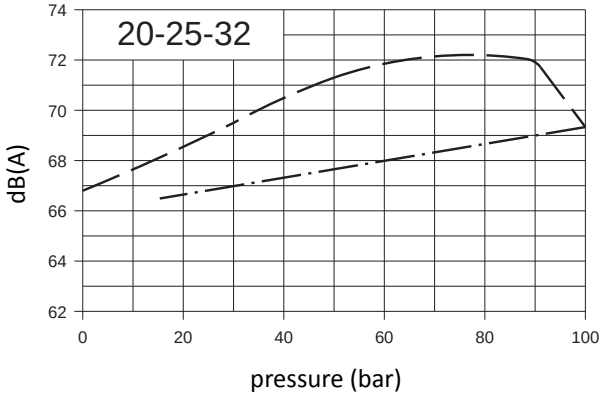
01 PLP 1 20-25-32

volumetric efficiency -zero flow setting curve

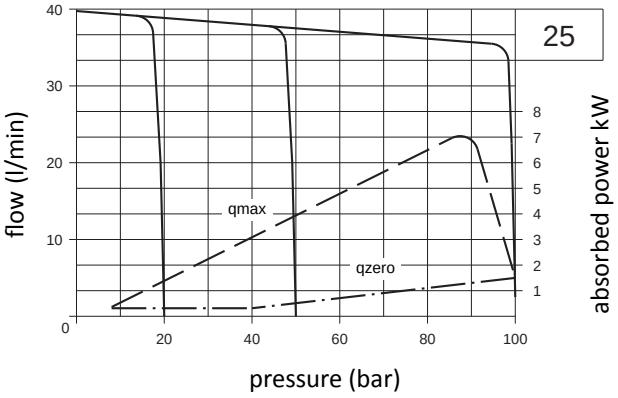


Noise level

Indicative maximum noise level measured on Berarma test bench with sound-level meter placed 1 metre from the pump, with flexible coupling.

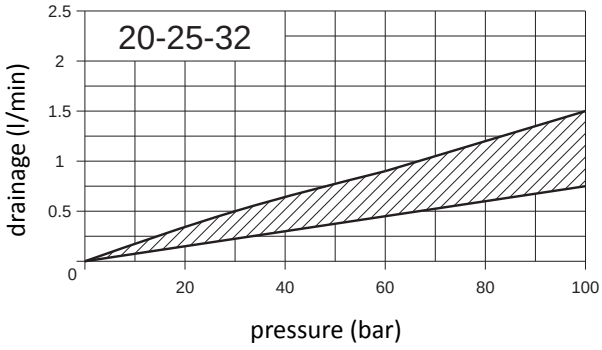


volumetric efficiency -zero flow setting curve

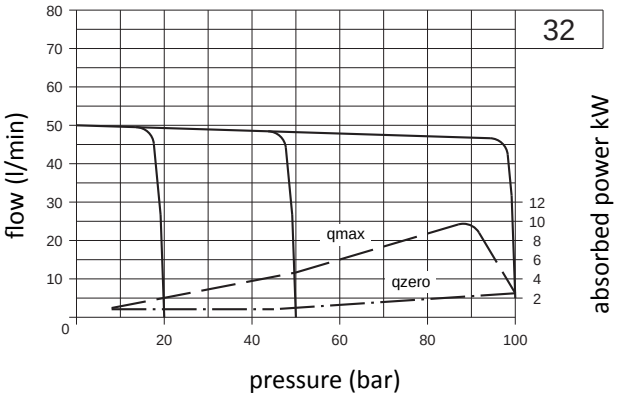


Case drain (leakage) flow-rate

data with pump under zero flow setting



volumetric efficiency -zero flow setting curve

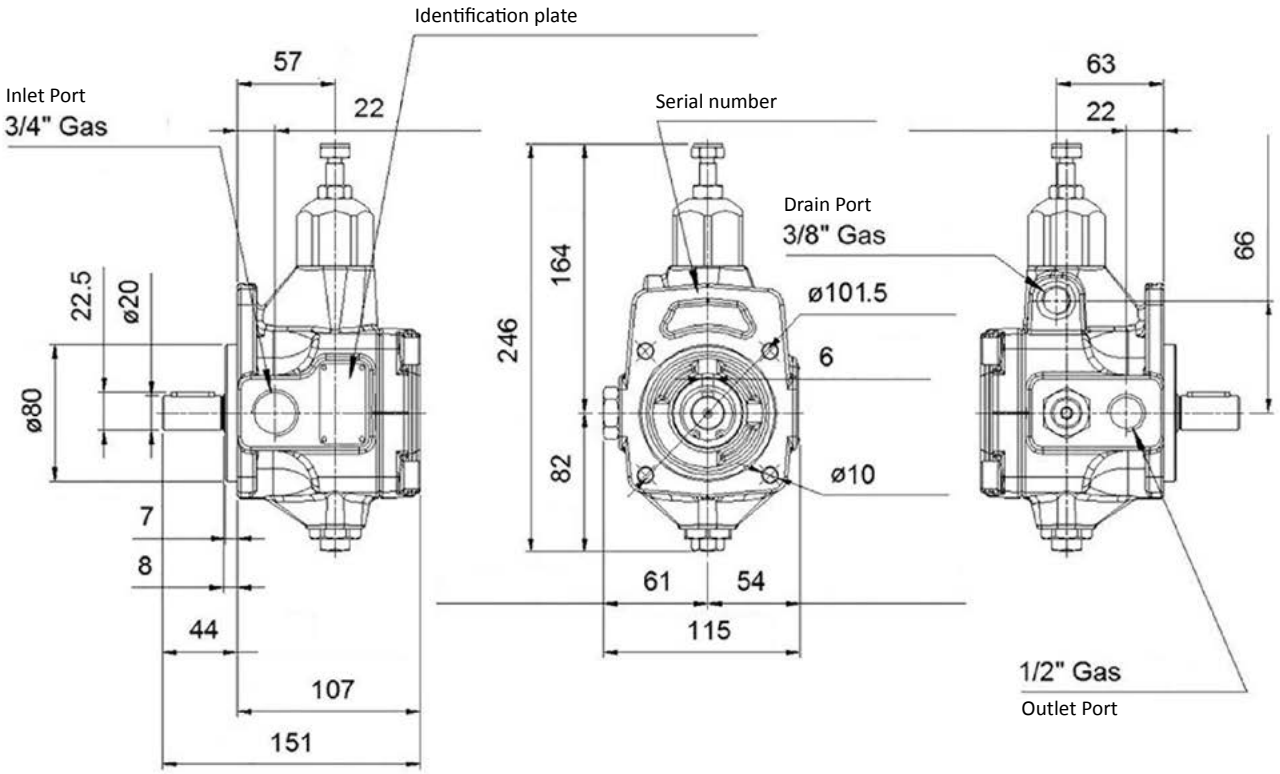


Power consumption with maximum flow

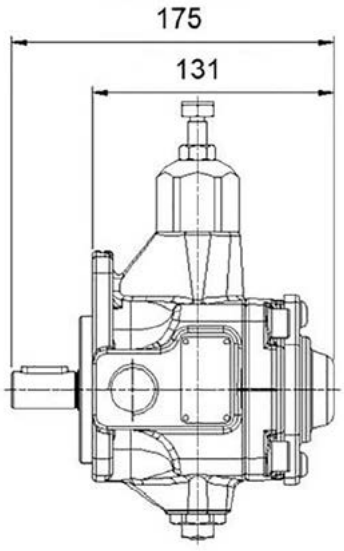
Power consumption with zero flow setting

OVERALL DIMENSIONS

01 PLP 05 16 F



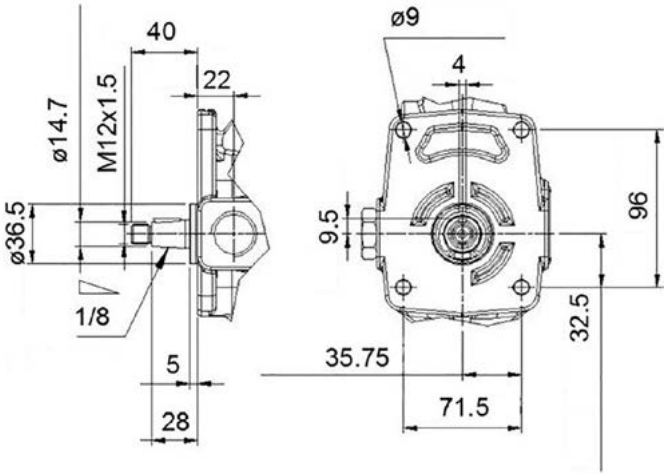
THRU-DRIVE SHAFT (-A)



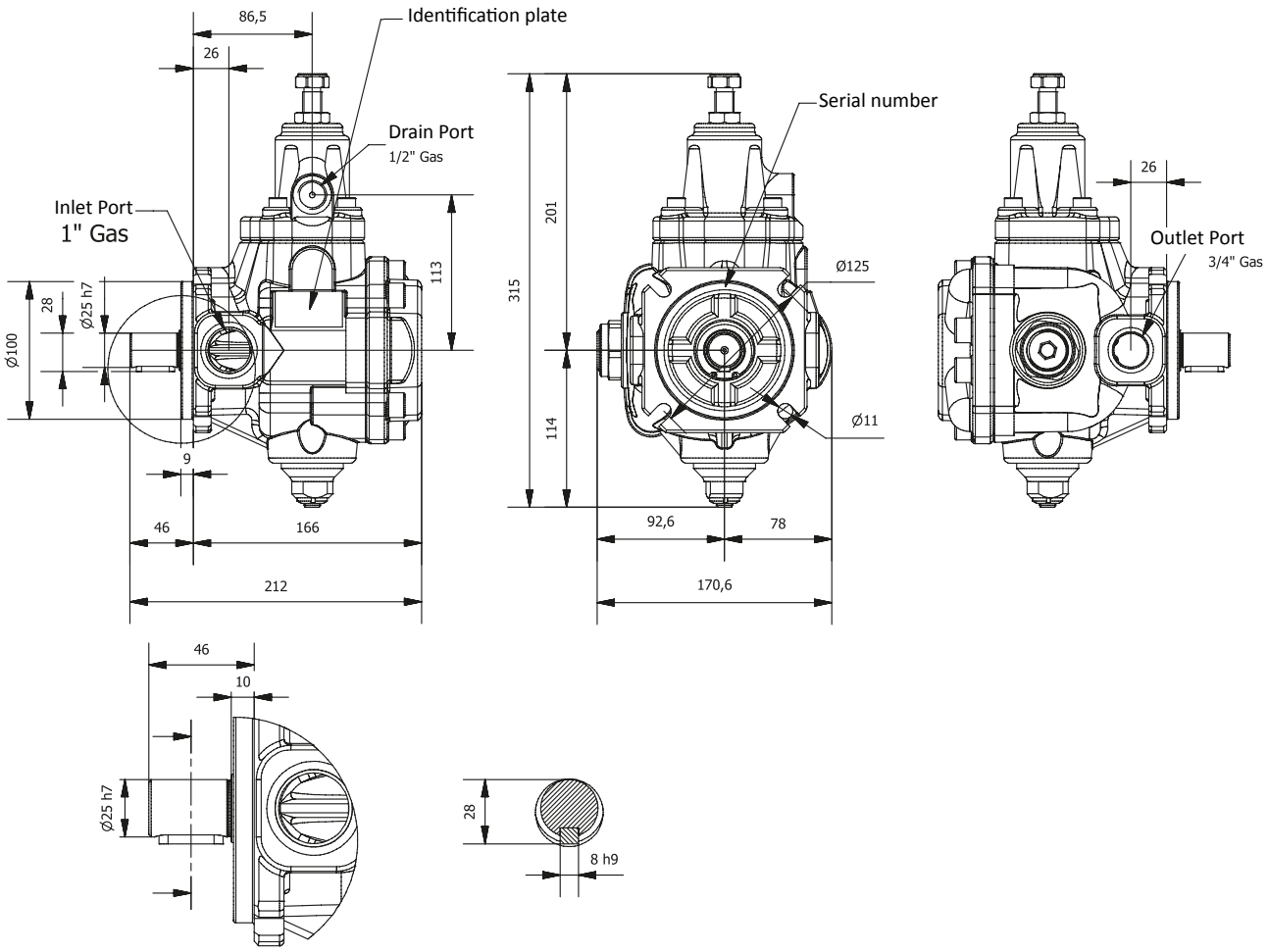
NOTE: Available only with **F** flange

For combined pump solutions, please see pages 10-12

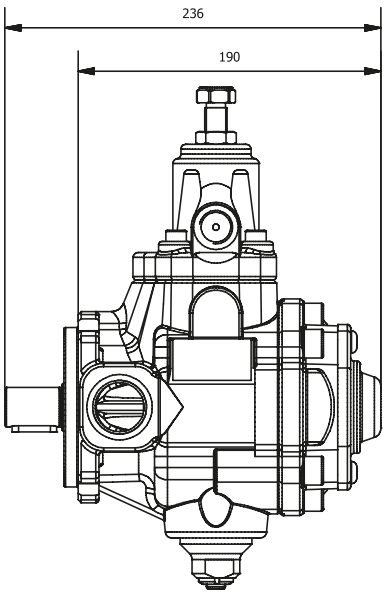
FLANGE AND SHAFT FGR2



01 PLP 1 20-25-32 F



THRU-DRIVE SHAFT (-A)



For combined pump solutions, please see pages 10-12

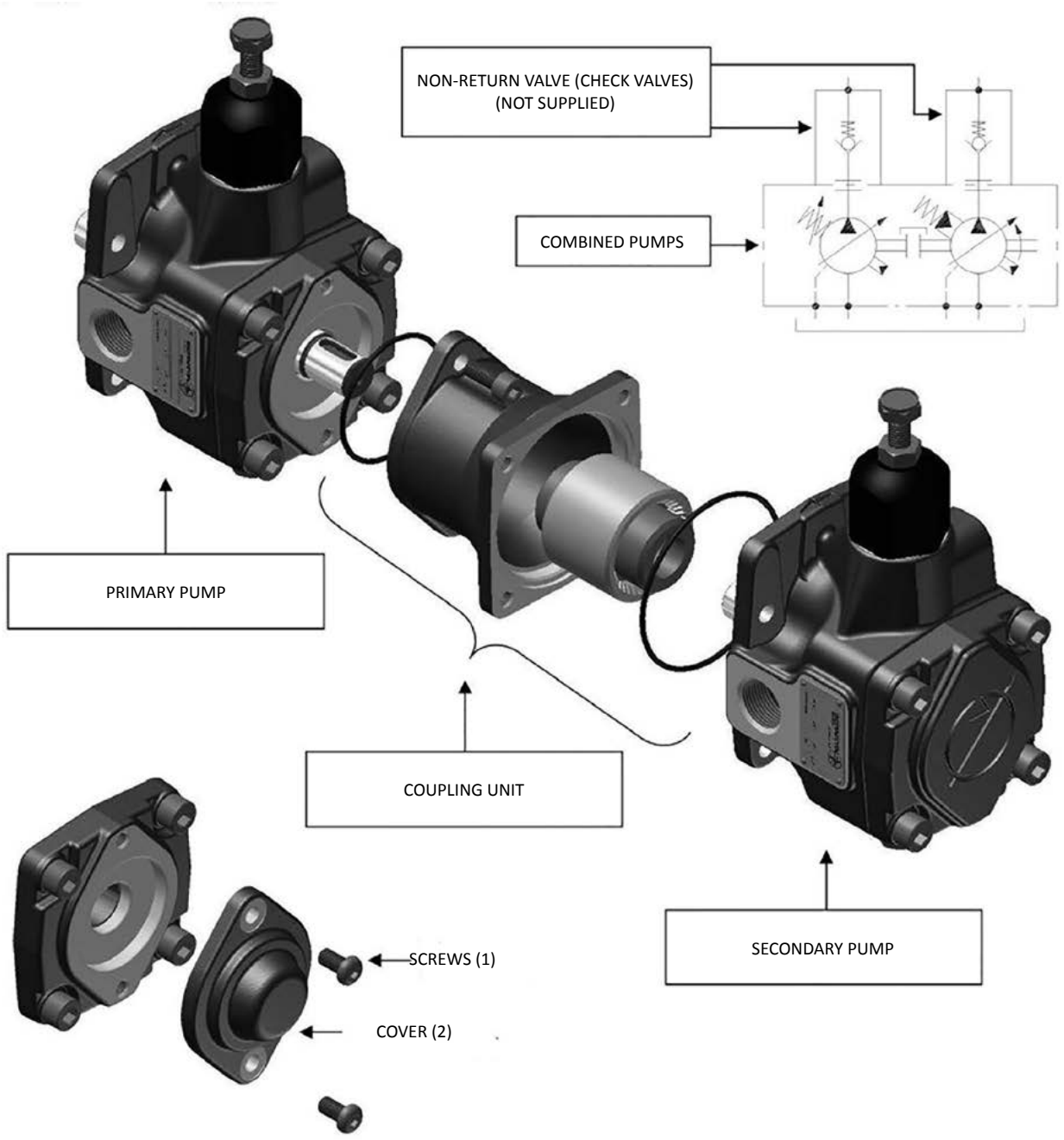
COMBINED PUMPS

On request, BERARMA pumps from the 01 PLP series can be set up for coupling:

- to pumps belonging to the same 01 PLP series;
- to pumps belonging to other BERARMA series (PVS, PSP, PSPK, PHP);
- to the main others types of pumps available on the fluid power market.

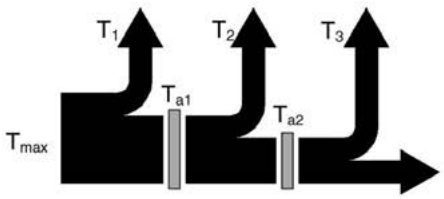
The 01 PLP series pumps set up for coupling are marked by the letter "**A**" in the ordering code. In these pumps, the shaft and the rear pump cover are set up for coupling to the various available coupling units.

- Unscrew the screws marked (1) from the primary pump (screws will not be re-installed)
- Remove the pump cover marked as (2) from the primary pump (cover will not be re-installed)
- Mount the coupling unit, paying attention to the seals (Note: primary pump drainage fluid will fill up the coupling bell-housing)
- Mount the secondary pump

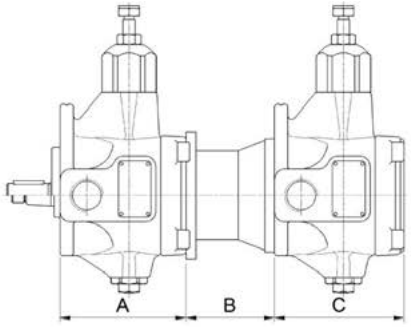


Combined pumps should be mounted in decreasing order of absorbed power, paying attention to the maximum acceptable torques (see diagram below).
The ordering code for a combined pump should be specified according to coupling sequence (primary pump code + coupling unit code + secondary pump code).

- The sum of individual torques of all pumps in the complete pump combination must not exceed the maximum permissible torque value applicable to the primary pump shaft (T_{max} see page 4).
- Secondary pump torque (or sum of torques for more than one secondary pump) must not exceed the coupling unit maximum thru drive torque (T_a, see table below).



$$\begin{cases} T_1 + T_2 + T_3 < T_{max} \\ T_2 + T_3 < T_{a1} \\ T_3 < T_{a2} \end{cases}$$



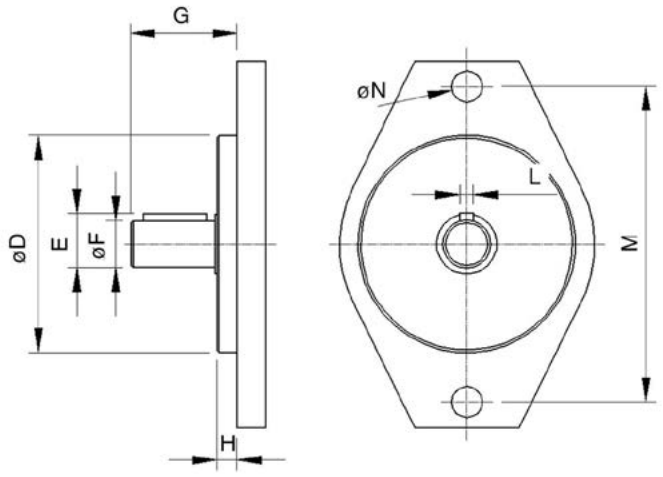
PRIMARY PUMP		SECONDARY PUMP		COUPLING UNIT		
Pump type	**A**	**Pump type**	**C**	**Code**	**B**	**Maximum thru drive torque T_a**
01 PLP 05 16 FHRM A	104	01 PLP 05 16 F	107	3000010200	73	55 Nm
		01 PLP 05 16 FGR2	107	3000011200	72	
		01 PHP 05 16 F	145	3000010200	73	
		01 PHP 05 16 FGR2	145	3000011200	72	
		SAE "A"	(*)	3100000100	88.5	
		GEAR PUMP SIZE 1P	(**)	3000011000	64	
		GEAR PUMP SIZE 1	(**)	3000011100	64	
		GEAR PUMP SIZE 2	(**)	3000011200	72	
01 PLP 1 (20-25-32) F.A	163	01 PLP 05 16 F	107	3000010200	73	
		01 PLP 05 16 FGR2	107	3000011200	72	
		01 PHP 05 16 F	145	3000010200	73	
		01 PHP 05 16 FGR2	145	3000011200	72	
		SAE "A"	(*)	3100000100	88.5	
		GEAR PUMP SIZE 1P	(**)	3000011000	64	
		GEAR PUMP SIZE 1	(**)	3000011100	64	
		GEAR PUMP SIZE 2	(**)	3000011200	72	
		01 PLP 1 (20-25-32) F	166	3000010100	75	
		01 PHP 1 (20-25-32)F	166	3000010100	75	

(*) For the secondary pump SAE A flange dimensions please see page 12.
In order to find out the secondary SAE flange pump axial dimension please see the manufacturer's catalogue.

(**) For the secondary gear pump flange dimensions please see page 12.
In order find out the secondary gear pump axial dimension please see the manufacturer's catalogue.

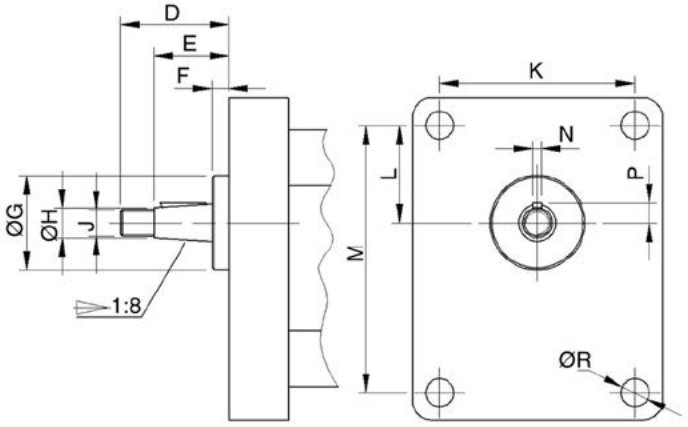
For other coupling unit types, please contact Berarma Technical-Sales Service.

SAE A FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary pump with SAE "A" flange should conform to the dimensions below							
	Ø D	E	Ø F	G		H	L	M	Ø N
				min	max				
SAE "A"	Ø82.5	21.1	Ø19.05	32	59	7	4.8	106.4	11.1

GEAR PUMP FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary gear pumps should conform to the dimensions below											
	D	E	F	Ø G	Ø H	J	K	L	M	N	P	Ø R
gear pump 1P	29	20	4	25.4	8	M7	52.4	26.2	71.9	2.4	5.3	7.5
gear pump 1	35	23.5	5.5	30	12	M10x1	56	24.5	73	3	7.9	6.5
gear pump 2	40	28	5	36.5	14.7	M12x1.5	71.5	32.5	96	4 (*)	9.7	8.5

INSTRUCTIONS FOR INSTALLATION AND USE

Pumps from the 01 PLP series can be mounted in any position.
When the pump is installed over the reservoir fluid level, pay attention to the inlet pressure (see page 4).
Cleanliness is essential during assembly!

Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. When assembling make sure that:

- **the distance between the half-couplings strictly falls within the specified values (see page 14);**
- **the pump shaft and the motor shaft are accurately aligned: concentricity within 0.05 mm, angular displacement within 0.2° (see drawing below);**
- **strictly no radial or axial loads on the pump shaft.**

Other types of motor-pump couplings are not permitted.

The fluid tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate (tank capacity approximately 4 times the flow rate per minute of the pump). In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended. The pressure on the drain port must never exceed the value specified on page 4.
Fluid temperature must not exceed 60°C under any circumstances.
To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C.

Suction pipe. The suction pipe should be as short as possible, with a small number of bends and without internal section changes. The pipe-end inside the tank should be cut at 45°, should have a minimum distance from the tank bottom of not less than 50 mm, and there should always be a minimum height of suction of 100 mm. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. **The suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump.**

Drain pipe. The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum fluid level to avoid generating foam and to prevent emptying when the pump is not running. Moreover, the drain pipe must also be at the highest possible position in relation to the pump in order to always prevent fluid emptying from the pump, and must be free of restrictions. **The drain pipe should be as far as possible from the suction pipe to prevent hot fluid being circulated.**

Pressure line. Ensure that the pressure line is strong enough. It is recommended that a non-return valve (check valve) is installed on the pump pressure line as well as an automatic air bleed valve, for trouble free operation.

Ensure that any valves, taps and gate valves on the suction and pressure pipes are fully opened and all protective caps removed. Fill the pump through the case drain port and replace the drain pipework. Check that the reservoir is full of fluid.

Ensure that the pump shaft can be rotated manually without any resistance.

Check that the motor rotation direction is the same as the pump rotation direction: right-hand rotation (clockwise) viewed from shaft end of the pump.

Start the motor (in jogging mode), allowing free circulation of fluid to the tank in order to facilitate priming.
The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

During INITIAL INSTALLATION, the pump must run under maximum flow conditions (P connected to T), with the fluid flowing directly into the tank, without pressure for several minutes. Care should be taken **to eliminate all the air from the system during this process**.

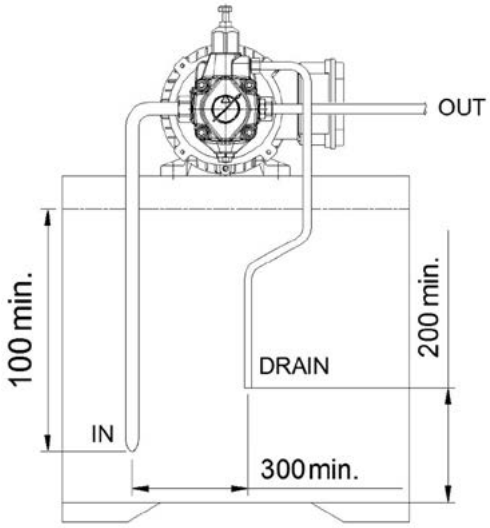
Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with fluid.

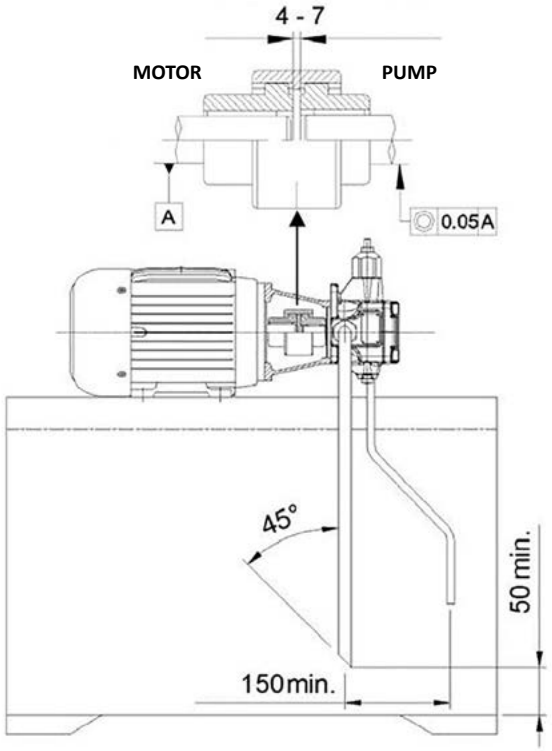
If the flow regulator unit is set to less than 50% of the nominal flow-rate, the pump can only start on condition that the system and the pump are completely filled with fluid.

During the initial and subsequent starting operations, it is necessary that the pump (ambient) and fluid temperature do not differ by more than 20°C. If this is the case, the pump should be switched on only for short intervals of approximately 1-2 seconds (start/stop mode) without pressure, until the temperatures are balanced.

All Berarma products are covered by a **1 YEAR WARRANTY** for manufacturing or material defects effective from the shipment date, but in any case **NO LONGER THAN 18 MONTHS FROM THE PRODUCTION BATCH DATE**. The warranty is for the exclusive benefit of the original purchaser of the products.

For further information, please contact the Berarma Technical-Sales Service.

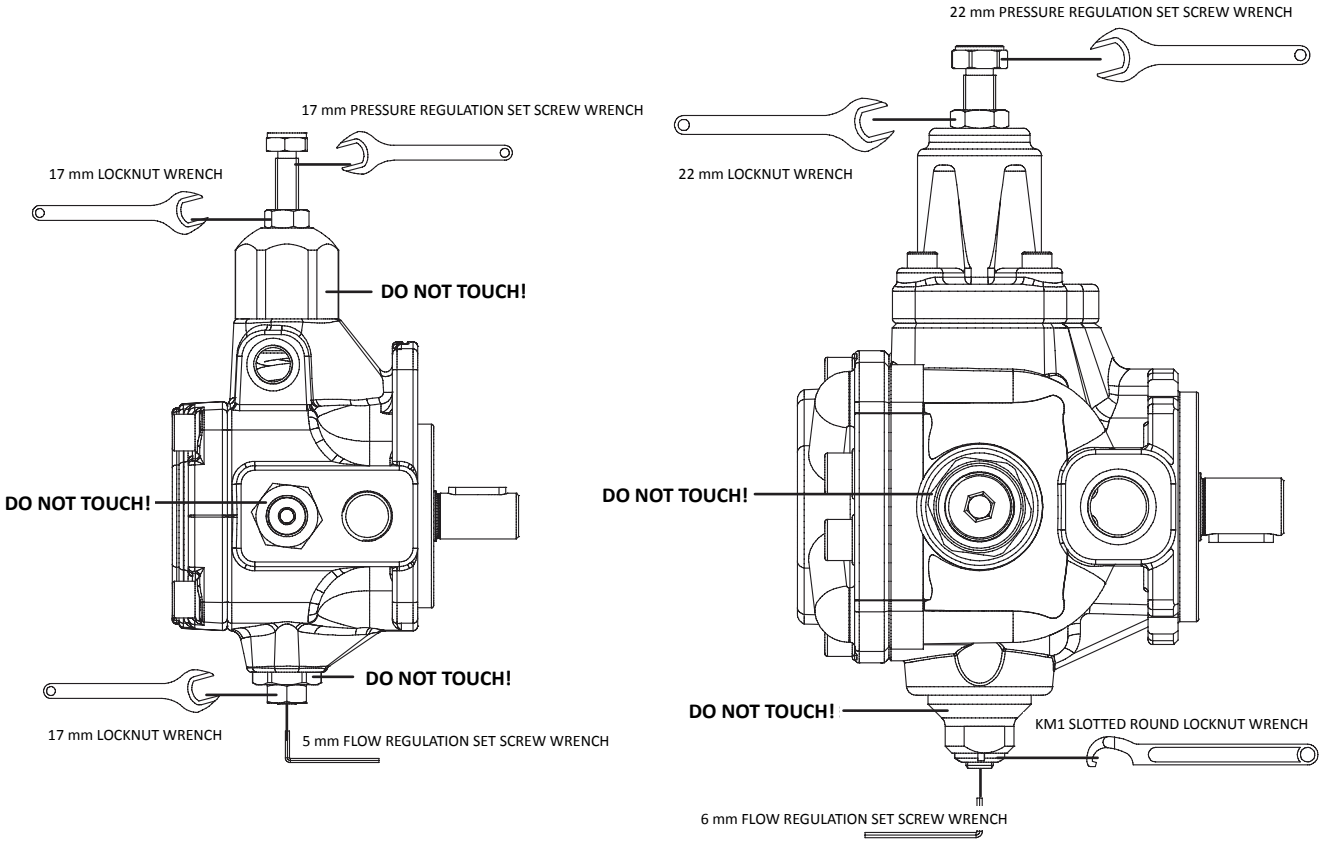




SETTINGS

Pressure adjustment
All BERARMA 01 PLP series pumps are equipped with a mechanical pressure adjustment unit. This allows the pump pressure to be set at the zero-flow setting. Clockwise rotation increases pressure (pay attention to avoid going out of the pressure setting range specified on page 4).

Warning: During the first run, make sure that the pressure adjustment screw is tight enough to ensure the correct priming of the pump.



Flow regulator
All BERARMA 01 PLP series pumps are equipped with a flow regulator unit. This allows the mechanical reduction of the pump displacement in relation to the nominal value. Clockwise rotation decreases the pump displacement.

Warning: If the flow regulator unit is set to less than 50% of the nominal displacement, the pump can only start on condition that the system and pump are completely filled with fluid.

Nominal size	Actual displacement	Reduced displacement by screw turn	Minimum achievable displacement
Size 05 - 16	17.9 cm^3	9.7 cm^3	3.1 cm^3
Size 1 - 20	24.2 cm^3	12.8 cm^3	14 cm^3
Size 1 - 25	29.4 cm^3	12.8 cm^3	19.1 cm^3
Size 1 - 32	34.5 cm^3	12.8 cm^3	24.2 cm^3

Indicative values influenced by manufacturing tolerances.

Variable displacement vane pumps (with hydraulic pressure compensator)

PHP Type

Key Features:

Rotation: Right (viewed from shaft end)
Mounting flanges: 4-hole flange (UNI ISO 3019/2) and flange
Rectangular like gear pump Size 2 (only for size 05)
Connections: GAS BSP (UNI ISO 228/1)

Integrated mechanical displacement limiter as standard on all pumps
Set-up for combined pumps on request
Wide choice of pressure and flow regulation controls

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
01-PHP-05-16	16	23	250
01-PHP-1-20	20	29	250
01-PHP-1-25	25	36	250
01-PHP-1-32	32	47	250

CONTENTS

WARNING

All Berarma pumps have been carefully checked during manufacture and subjected to stringent testing cycles before shipment. To achieve optimum performance, avoid problems and maintain the warranty, the installation instructions enclosed with each pump sold must be strictly observed.

NOTES

Before selection and/or use of any Berarma product, it is important that the purchaser carefully analyses all aspects of its application and reviews the information in the current Berarma Technical-Sales catalogues. Due to the many different operating conditions and applications for Berarma products, the purchaser, through their own analysis and testing, is solely responsible for making the final selection of the products and assuring that all performance and safety requirements are met.

Berarma S.r.l. accepts no responsibility for any editing mistakes in this catalogue.
Berarma S.r.l. reserves the right to modify the products and data contained in this catalogue at any time and without prior notice.

GENERAL DESCRIPTION

As a result of the constant research carried out in order to introduce innovative products to the market characterised by high technological content and reliability, BERARMA has launched the **new series of HIGH WORKING PRESSURE variable displacement vane pumps, known as 01 PHP.**

The new series of 01 PHP pumps combines the characteristics of other BERARMA variable displacement vane pumps with
- SILENT RUNNING
- HIGH EFFICIENCY
- LONG WORKING LIFE
- ECONOMY AND SIMPLIFICATION OF HYDRAULIC SYSTEM
- MODULAR DESIGN
- ENERGY SAVING

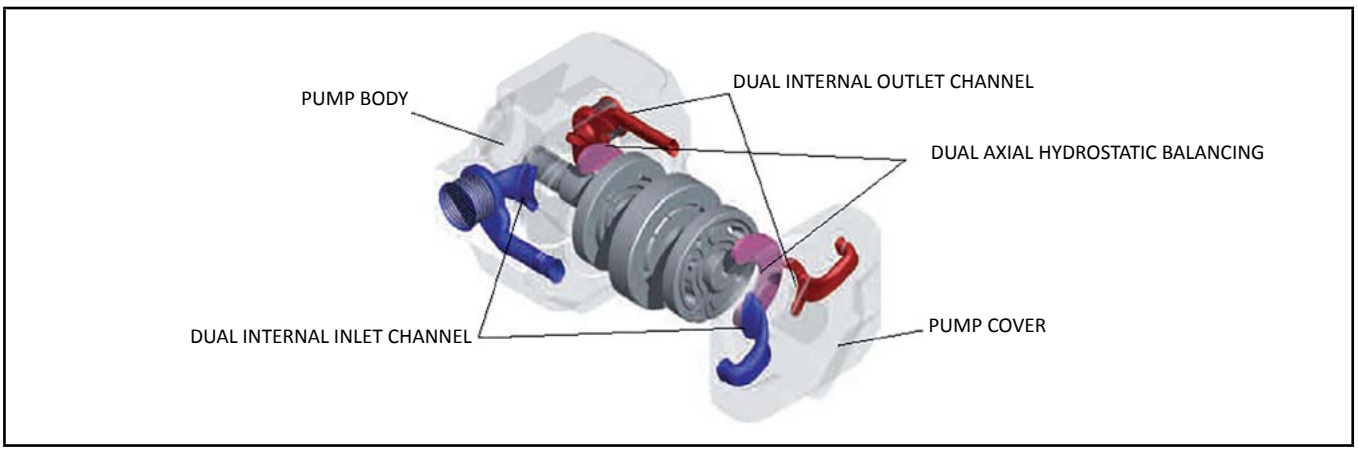
with significant improvements in performance due to
- **HIGH WORKING PRESSURE**
- **EXCELLENT DYNAMICS OF DISPLACEMENT CONTROL**

The main innovation of the new series of 01 PHP pumps is the internal pump cartridge, designed to obtain perfect axial balancing, both in terms of hydrostatic compensation of the distribution plates and the fluid flow-rate from inlet to outlet.

The new series of 01 PHP pumps is supplied with:
- ISO standard MOUNTING FLANGES
- GAS BSP standard PORT CONNECTIONS
- flow regulator unit in order to mechanically reduce pump displacement
- various types of hydraulic, electrical and proportional adjustment devices in order to control the pump flow-rate and/or pressure
- (on request only) set-up for coupling to all BERARMA pumps or to the main others types of pump available on the fluid power market.

Considering the features outlined above, the new series of PHP pumps is one of a kind, suitable for applications that require higher performances than the standard use of variable displacement vane pumps.

What makes the new BERARMA 01 PHP series of pumps unique?
- 250 bar working pressure
- DUAL INLET AND OUTLET CHANNELS in the internal pump cartridge
- DUAL AXIAL HYDROSTATIC BALANCING on the distribution plates
- "FORCED" HYDRODYNAMIC LUBRICATION on journal bearings
- NEW FUNCTIONAL DESIGN OF THE PRESSURE COMPENSATOR DEVICE (reduction in pressure overshoots and pressure stabilization time)
- REDUCTION IN WEAR on internal pump cartridge parts
- INNOVATIVE SHAPES AND DESIGN



TECHNICAL DATA

NOMINAL SIZE		SIZE 05	SIZE 1		
Geometric displacement according to UNI-ISO 3662 (cm^3/r)		16	20	25	32
Actual displacement (cm^3/r)		17.9	24.2	29.4	34.5
Due to manufacturing tolerances, the value can vary by approx. ± 3%					
Maximum working pressure (bar)		250			
Pressure peak exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures					
Pressure setting range (bar)		H: 20 - 250			
Permitted maximum drain port pressure (bar)		1			
Inlet pressure (bar)		0.8 - 1.5 absolute			
Speed range (r/min)		800 - 1800			
Rotation direction (viewed from shaft end)		R - Right			
Loads on drive shaft		NO RADIAL OR AXIAL LOADS ALLOWED			
Maximum torque on primary shaft (Nm)	Tmax	130	250		
Hydraulic fluid		HM hydraulic oil according to ISO 6743/4 HLP according to DIN 5124/2 for other fluids contact Berarma Technical-Sales Service			
Viscosity range (cSt, mm^2/s)		22 - 68 at operating temperature			
Starting viscosity under full flow conditions (cSt, mm^2/s)		400 max			
Viscosity index according to ISO 2909		100 min			
Inlet fluid temperature range (°C)		+15 / +60 - pay attention to viscosity range			
Maximum acceptable fluid contamination level		20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638			
Recommended fluid contamination level for a longer pump working life		18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638			
Moment of inertia (kgm^2)		0.00019	0.00050		
		Single pump weight (kg)			
Single stage pressure compensator		16.5	18.5		
PCS002		18.5	20.5		
PCS003		18.0	20		
PCS004		19.0	21.3		
PCS005		18.0	20		
PCLS001		19.0	21		
PCLS002		19.5	21.3		
PCLS003		19.0	21		
PCLS004		20.0	22		
PCLS005		19.0	21		
For further information and/or different operating conditions, please contact Berarma Technical-Sales Service					

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ORDERING CODE

Series/ Name	Size Displacement	Flange	Pressure setting	Rotation	Seals	Combined pumps	Pressure controls
01 PHP			**H**	**R**			

Code	Size	Displacement (cm^3/r)
05 - 16	05	16
1 - 20	1	20
1 - 25	1	25
1 - 32	1	32

Code	Flange	Thread
F	UNI ISO3019/2 - 4 holes	GAS BSP UNI ISO 228/1
FGR2 (only for size 05)	As for gear pump size 2	GAS BSP UNI ISO 228/1

Code	Pressure setting
H	20 – 250 bar

Code	Rotation Direction
R	Right (viewed from shaft end)

Code	Seals
M	NBR
E	FPM (viton)

Code	Combined pumps
/	Omit for single pump
A	Primary pump and/or intermediate pump (available only for F flange)

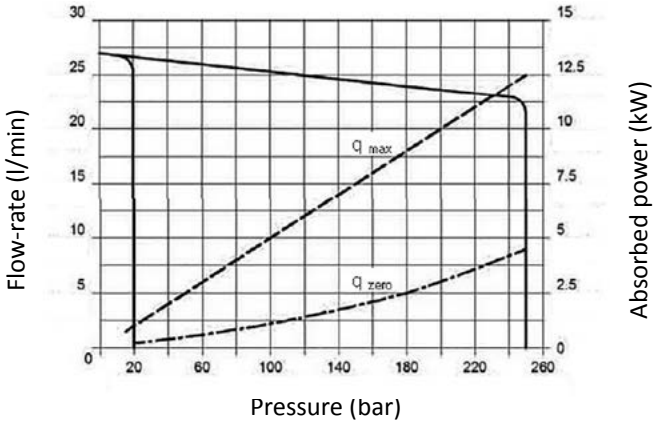
Code	Pressure controls
/	Omit for single stage pressure compensator
PCS002	Pump with remote pressure control
PCS003	Pump with two-stage pressure control, one with fixed setting
PCS004	Pump with two-stage pressure control, both adjustable
PCS005	Pump with proportional pressure control
PCLS001	LOAD SENSING pump with single-stage pressure compensator
PCLS002	LOAD SENSING pump with remote pressure control
PCLS003	LOAD SENSING pump with two-stage pressure control, one with fixed setting
PCLS004	LOAD SENSING pump with two adjustable pressure stages
PCLS005	LOAD SENSING pump with proportional pressure control
For further information regarding pressure control solutions, please see pages 10 ÷ 19	

CHARACTERISTIC CURVES

Indicative values measured on Berarma test machine, referring to 1500 rpm, with HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 48°C.

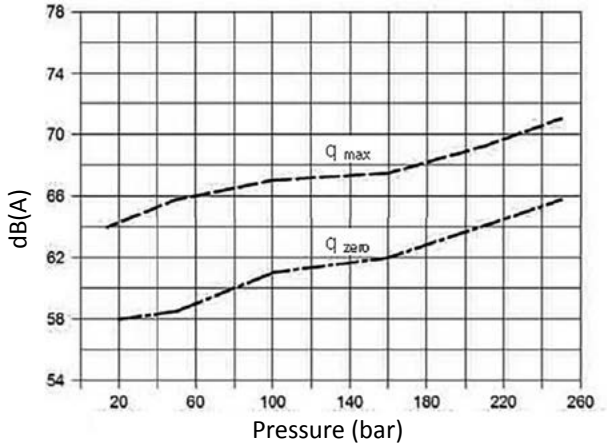
01 PHP 05 16 FHRM

Volumetric efficiency – zero flow setting curve



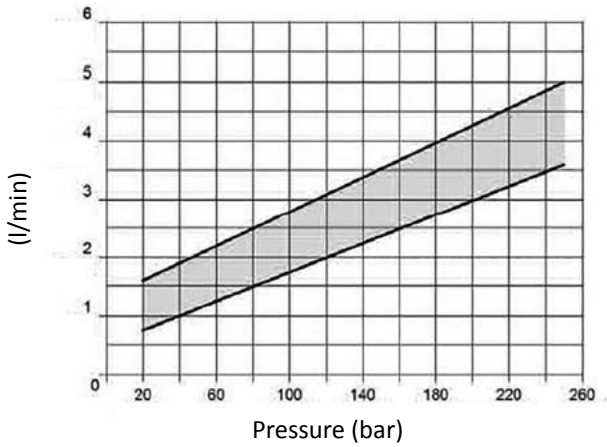
Noise level

Indicative maximum noise level values measured with sound-level meter placed one metre from the pump, with flexible coupling



Drainage (leakage) flow-rate

Pump under zero flow setting conditions



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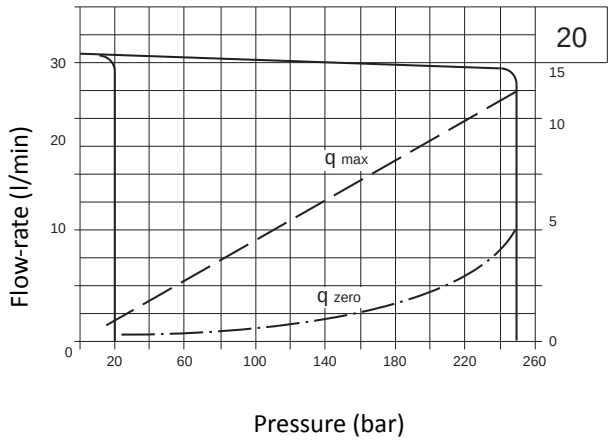
Indicative values measured on Berarma test machine, referring to 1500 rpm, with HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 48°C.

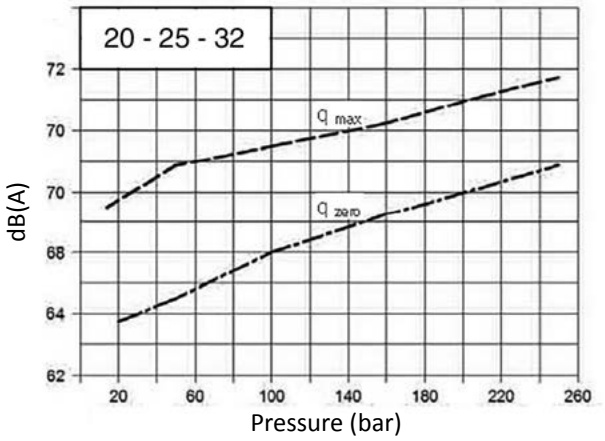
01 PHP 1 20-25-32 F

volumetric efficiency - zero flow setting curve

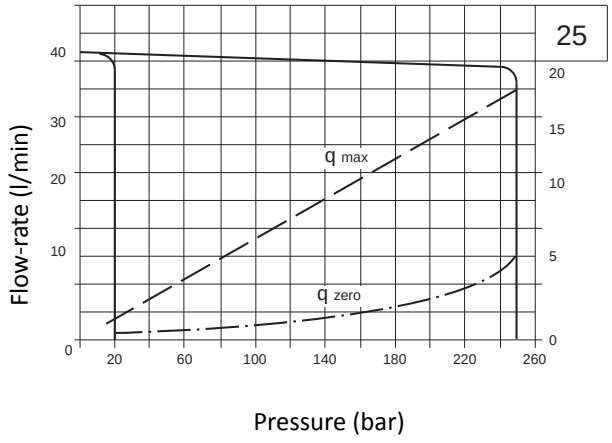


Noise level

Indicative maximum noise level values measured with sound-level meter placed one metre from the pump, with flexible coupling

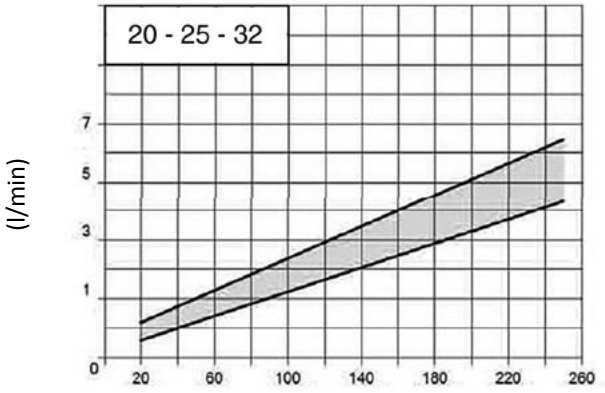


volumetric efficiency - zero flow setting curve

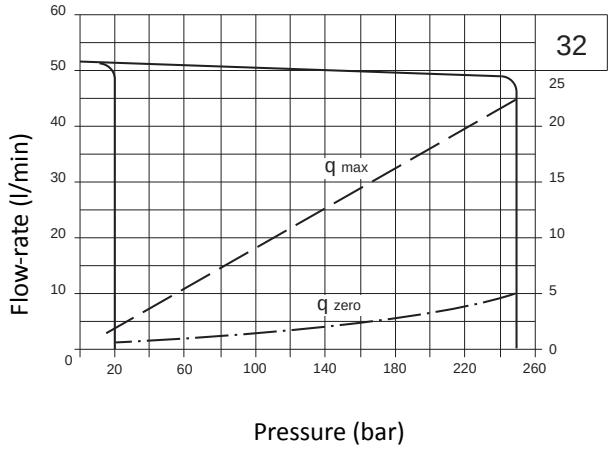


Drainage (leakage) flow-rate

Pump under zero flow setting conditions



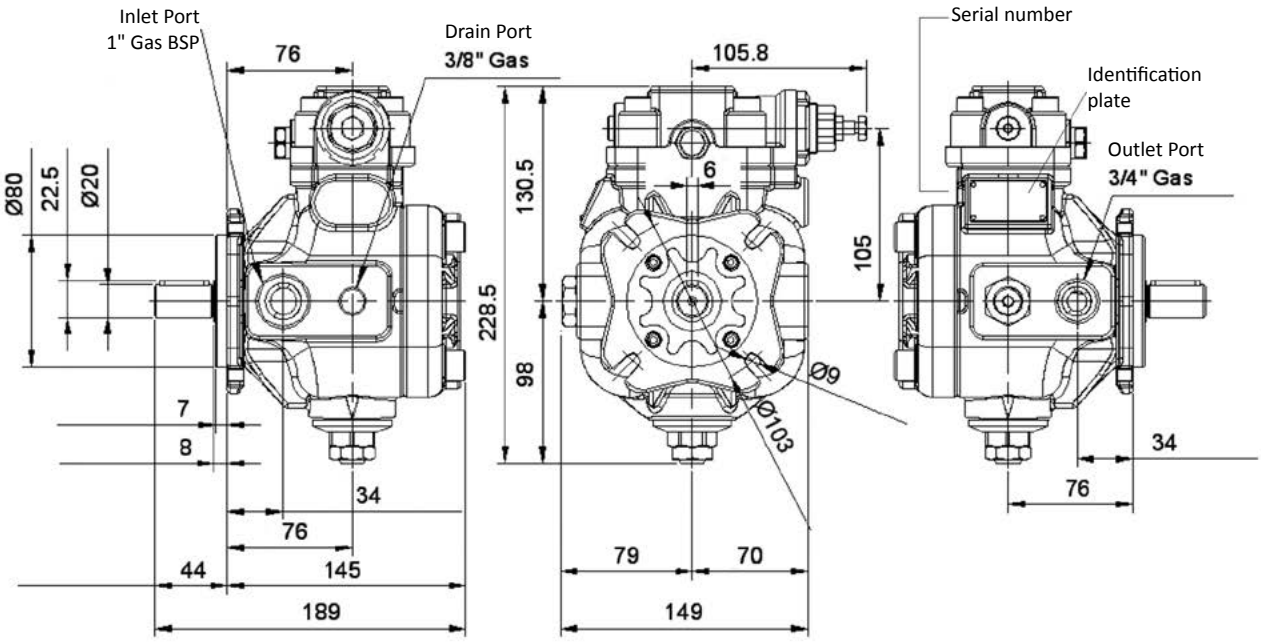
volumetric efficiency - zero flow setting curve



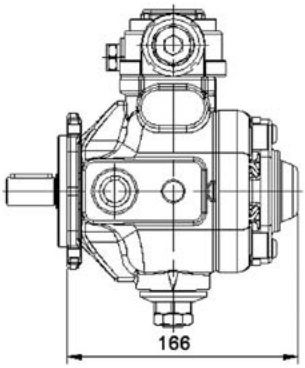
OVERALL DIMENSIONS

OVERALL DIMENSIONS

01 PHP 05 16 FHRM

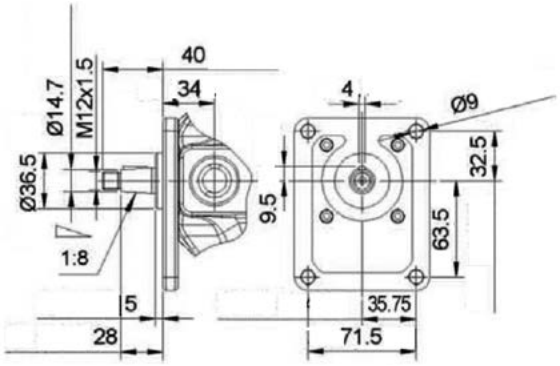


THRU-DRIVE SHAFT (-A)

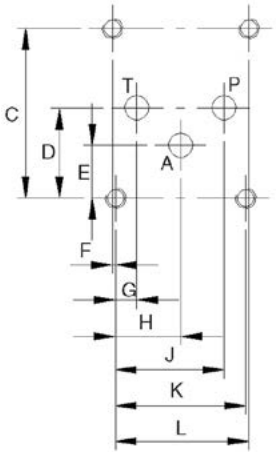


For combined pump solutions, please see pages 20-22

FGR2 FLANGE AND SHAFT (not available on -A version)



Mounting surface ISO 4401-03 (CETOP 03) for pressure/flow-rate controls PCS 003/004 and PCLS 003/004 (pages 12, 13, 17, 18)



Designation	Dimension
C	40.5
D	21.5
E	12.7
F	0.75
G	5.1
H	15.5
J	25.9
K	31
L	31.75
Note: "A" port is available only for PCS004 and PCLS004 controls	

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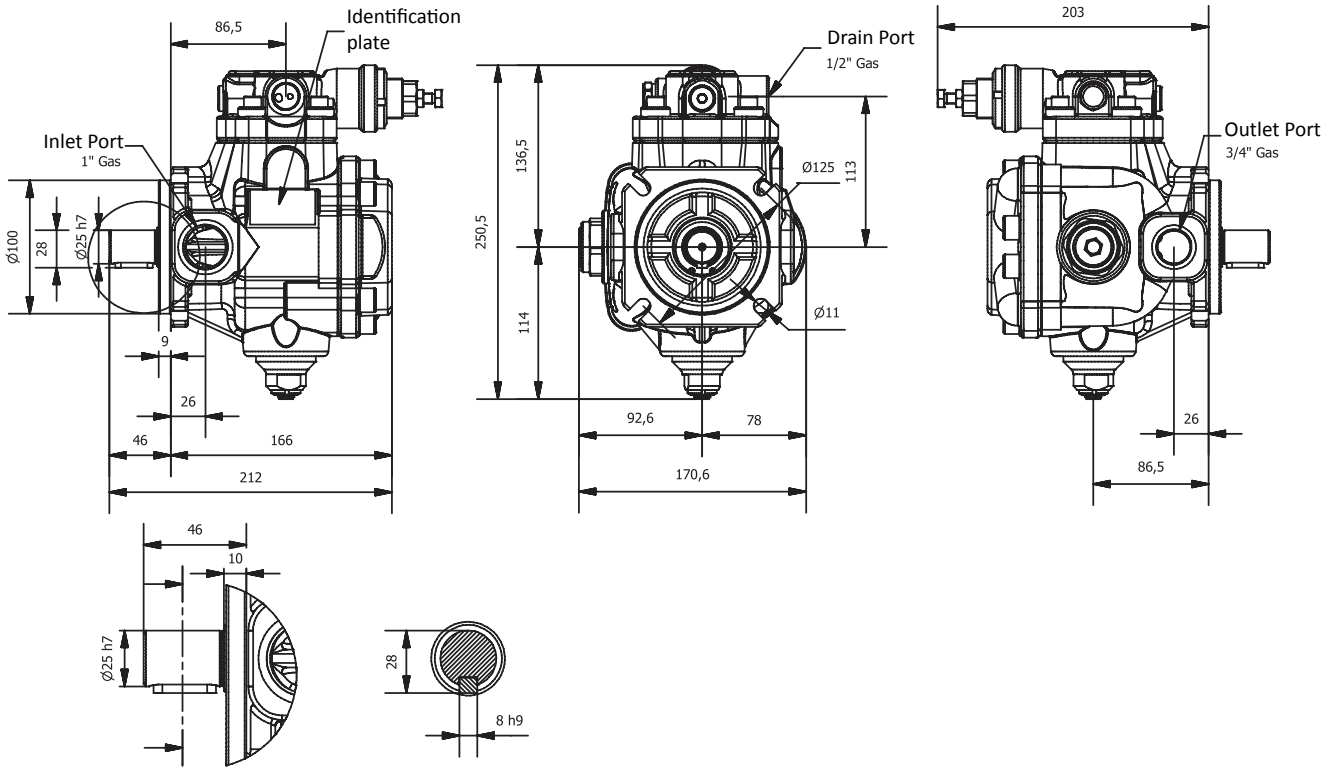
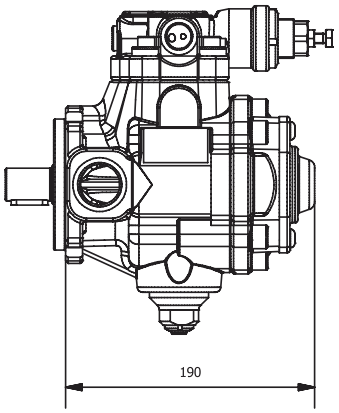
01 PHP 1 20-25-32 F

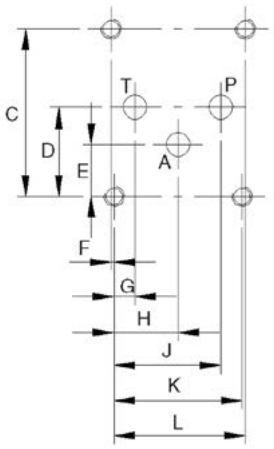


THRU-DRIVE SHAFT (-A)



For combined pump solutions, please see pages 20-22

Mounting surface ISO 4401-03 (CETOP 03) for pressure/flow-rate controls PCS 003/004 and PCLS 003/004 (pages 12, 13, 17, 18)



Designation	Dimension
C	40.5
D	21.5
E	12.7
F	0.75
G	5.1
H	15.5
J	25.9
K	31
L	31.75
Note: "A" port is available only for PCS004 and PCLS004 controls	

PRESSURE/FLOW-RATE CONTROLS

STANDARD CONTROL

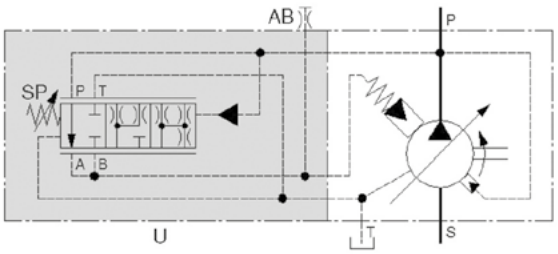
Hydraulic single-stage pressure control.
This standard control enables the pump displacement to be adjusted (until "zero flow setting" condition) according to the flow-rate required by the hydraulic system, keeping the working pressure constant and equal to the value set on the compensator device.
The pressure setting of the compensator device is adjusted by means of the "SP" pressure setting screw and locked using the corresponding locknut.

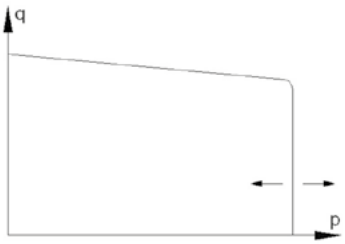
Properties	
Pressure setting range	20 – 250 bar

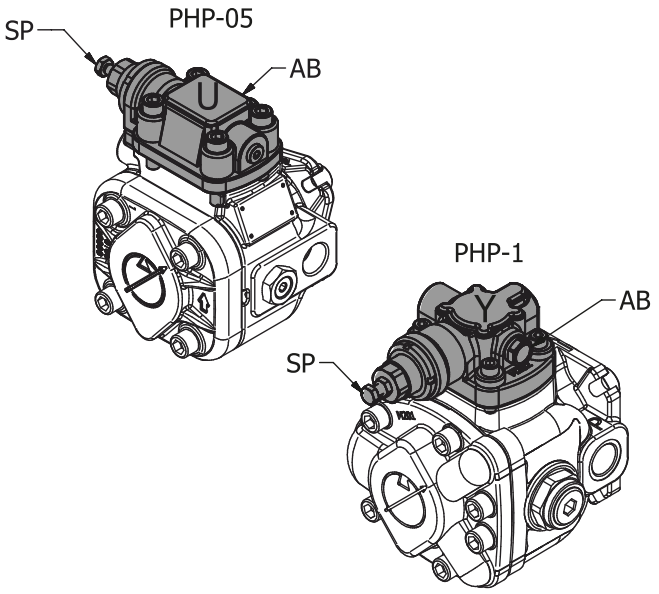
Control Devices	
"U" "Y"	Standard pressure compensator device

Pressure setting	
Pressure setting screw	CH 13 mm HEX
Pressure setting locknut	CH 13 mm HEX
Clockwise rotation increases the pressure setting	

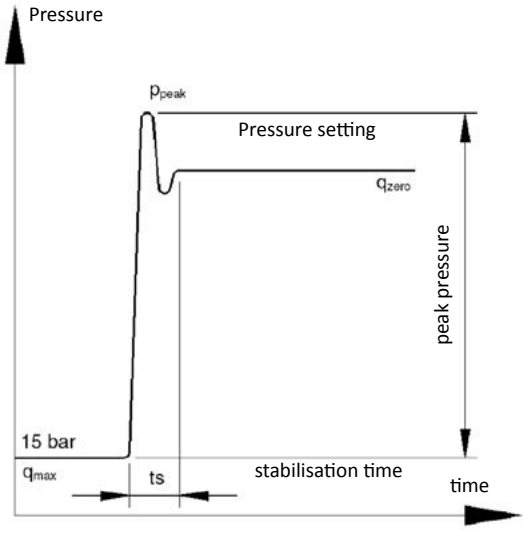
Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
■	Supplied port closed







For overall dimensions please see pages 8-9



Dynamic characteristics of pressure compensator device				
Test: full flow → zero flow setting condition				
Pump type	15 → 210 bar		15 → 250 bar	
	ppeak	ts	ppeak	ts
01 PHP 05	250 bar	50 ms	285 bar	40 ms
01 PHP 1	270 bar	80 ms	320 bar	60 ms

Testing conditions on Berarma test machine:

- Dynamic response curves obtained by abruptly closing the pump outlet using a solenoid operated directional valve located around 0.5 m from the pump outlet port.
- HM hydraulic fluid according to ISO 6743/4, ISO VG32 according to ISO 3448, temperature 48°C, 1500 rpm
- **PRESSURE PEAKS EXCEEDING 30% OF THE MAXIMUM OPERATING PRESSURE MUST BE ELIMINATED**

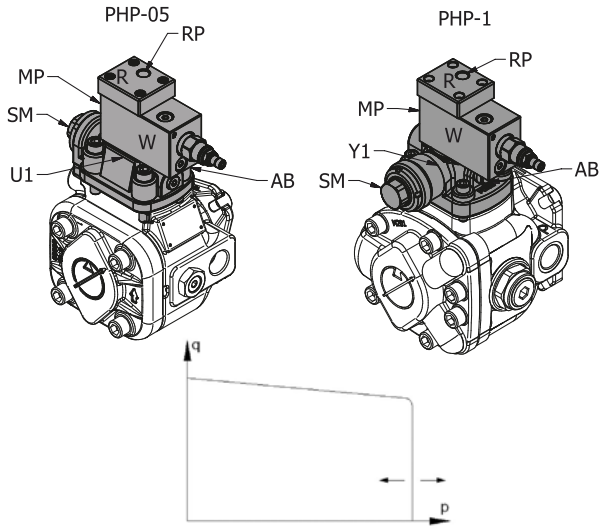
PCS002 CONTROL

Hydraulic control with remote pressure setting.

The function of this control is the same as the standard control function with the addition of the possibility of adjusting the working pressure by means of an additional maximum pressure relief valve "RV" installed in a remote position, far from the pump.

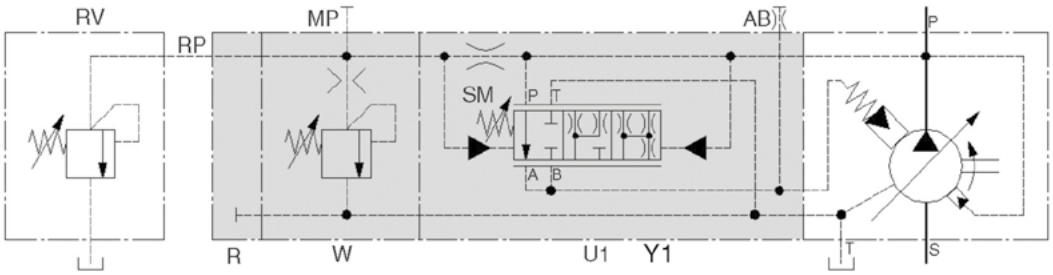
Control performances depends on the additional valve type and on its distance from the pump.

Properties	
Pressure setting range	20 – 250 bar

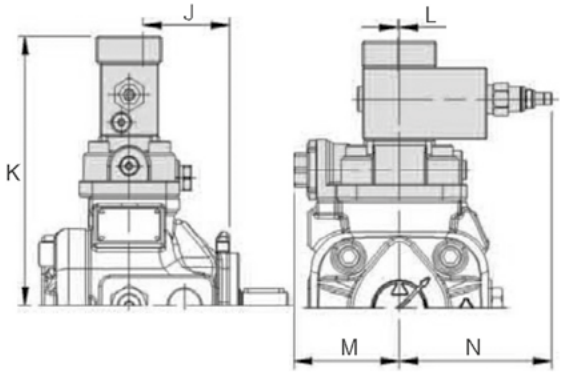


Control Devices	
"U1" "Y1"	Pressure compensator device for additional controls
"SM"	"Minimum pressure" spring adjustment (factory preset at 20 bar – do not tamper)
"W"	Maximum pressure relief valve (factory preset at maximum value 250 bar)
"R"	Remote control block
"RV"	Additional remote maximum pressure relief valve (Properties: 0 - 5 l/min **(not supplied)**)

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
"RP" – Remote control port	1/4" Gas BSP □
The pilot pipe length between the pump and the additional valve "RV" must not exceed 5m.	
□	Must be connected
■	Supplied port closed



Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	66	76
K	203	204
L	1.3	1.3
M	81	-
N	117	117
Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



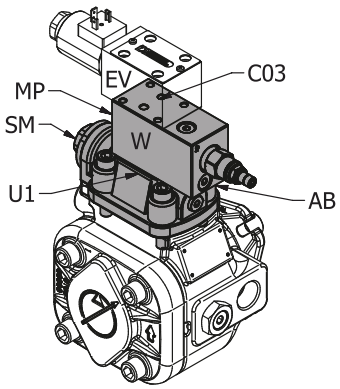
PCS003 CONTROL

Hydraulic two-stage pressure control, one with fixed setting.
The function of this control is the same as the standard control with the addition of the option to mount a directional control valve "EV" on the top of the compensator in order to switch between two working pressure levels, one of which is fixed. Control performance depends on the type of additional directional control valve.

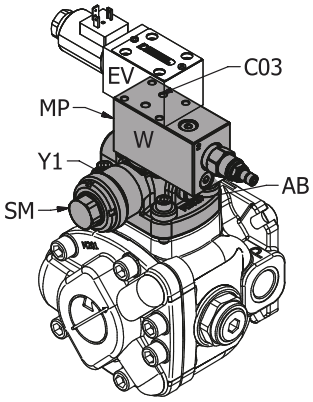
Properties	
1st pressure level	Factory fixed preset at 20 bar – Do not tamper
2nd adjustable pressure level	20 – 250 bar

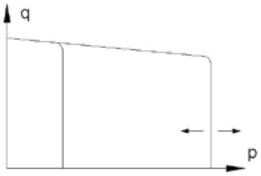
Control Devices	
"U1" "Y1"	Pressure compensator device for additional controls
"SM"	"Minimum pressure" spring adjustment (1st pressure level at fixed pressure setting) Do not tamper
"W"	Maximum pressure relief valve (2nd adjustable pressure level)
"EV"	Directional control valve **(supplied only on request)** For information please contact Berarma Technical-Sales Service.

PHP-05

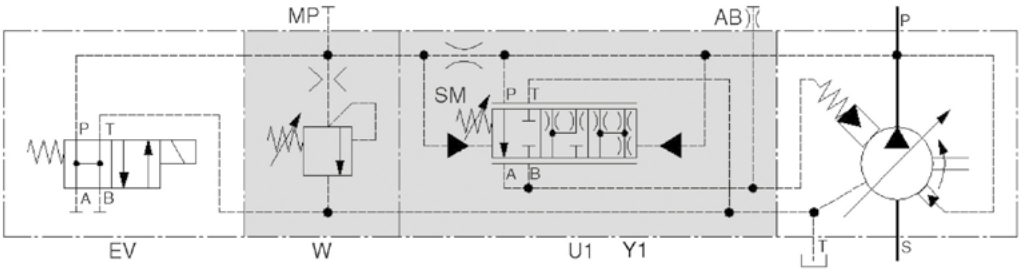


PHP-1



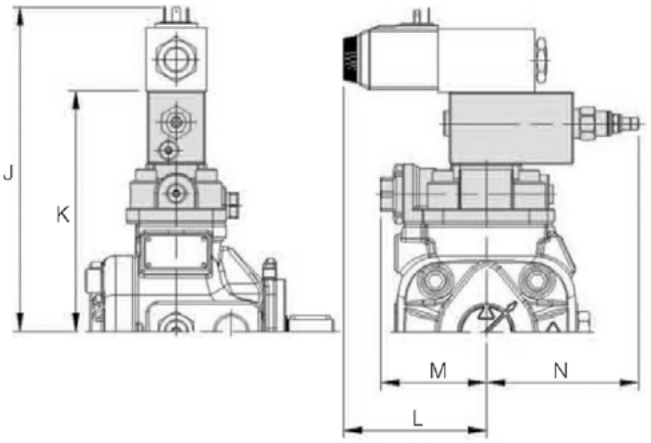


Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
Surface – "C03" (See pages 8-9)	ISO 4401-03 (CETOP 03) □
■	Supplied port closed
□	Must be connected



Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	(*)	(*)
K	183	184
L	(*)	(*)
M	81	-
N	117	117

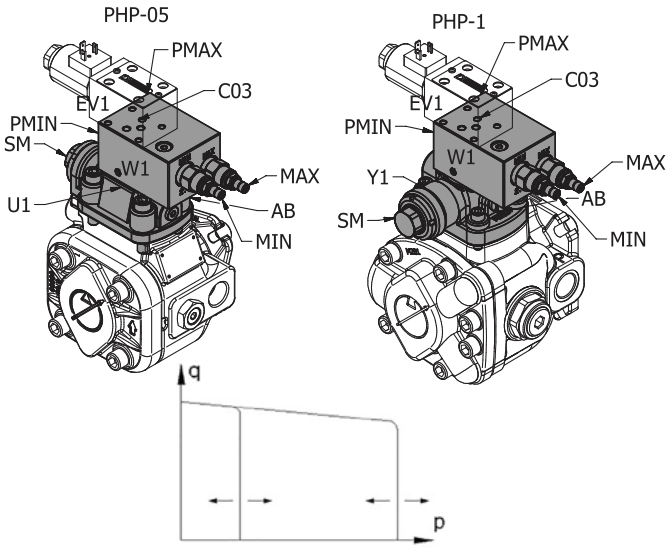
(*): Please consult the directional control valve catalogue Indicative dimensions. For further information please contact Berarma Technical-Sales Service.



PCS004 CONTROL

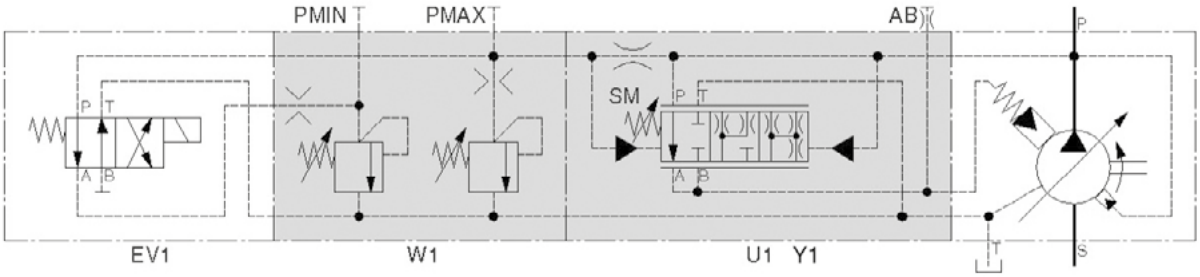
Hydraulic two-stage pressure control, both adjustable.
The function of this control is the same as the standard control with the addition of the option to mount a directional control valve "EV1" on the top of the compensator in order to switch between two adjustable working pressure levels.
Control performance depends on the type of additional directional control valve.

Properties	
1st adjustable pressure level	20 – 250 bar
2nd adjustable pressure level	20 – 250 bar
Note: 1st adjustable pressure level < 2nd adjustable pressure level	

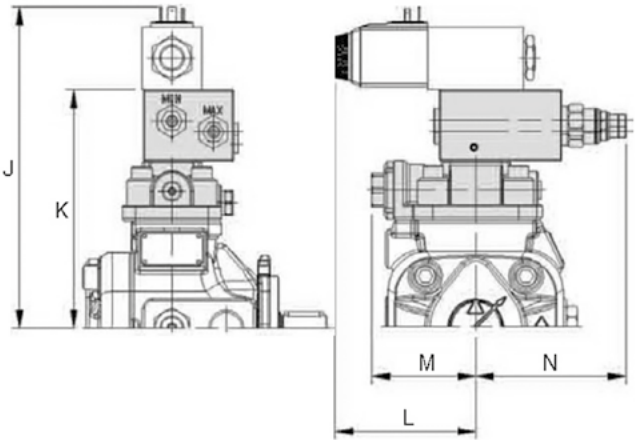


Control Devices	
"U1" "Y1"	Pressure compensator device for additional controls
"SM"	"Minimum pressure" spring adjustment (factory preset at 20 bar – do not tamper)
"W1"	Maximum pressure relief valve block **"MIN"** 1st adjustable pressure level **"MAX"** 2nd adjustable pressure level
"EV1"	Directional control valve **(supplied only on request)** For information please contact Berarma Technical-Sales Service.

Connections		
"AB" – Air Bleed		1/4" Gas BSP ■
Pressure gauge	"PMIN" "PMAX"	1/4" Gas BSP ■
Surface – "C03" (See pages 8-9)		ISO 4401-03 (CETOP 03) □
■	Supplied port closed	
□	Must be connected	



Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	(*)	(*)
K	183	184
L	(*)	(*)
M	81	-
N	117	117
(*): Please consult the directional control valve catalogue Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



PCS005 CONTROL

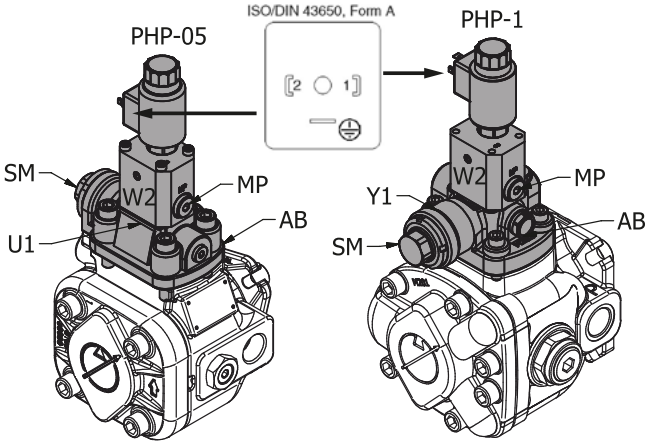
Hydraulic control with proportional pressure adjustment.
This control, with integrated proportional valve "W2" mounted on top of the compensator, enables the pump working pressure to be adjusted proportionally by means of an electrical signal.
Control performance depends on the type of electronic control unit for the proportional valve **(unit supplied on request only)**.

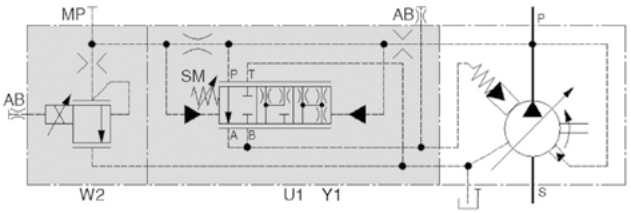
Properties	
Pressure setting range	20 – 250 bar

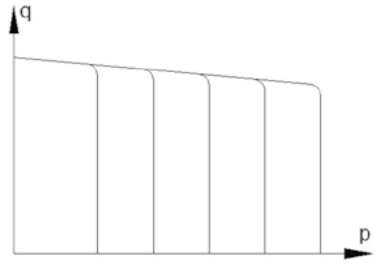
Electrical properties	
Voltage	24 VDC ±10%
Maximum current	590 mA
Power consumption	22 Watt
Nominal coil resistance at 50°C	37.2 Ω ±5%
Nominal coil resistance at 20°C	26.2 Ω ±5%
Maximum coil temperature at 20°C	105°C
Protection class	IP65
Recommended Dither frequency	160 – 200 Hz (*)
Linearity, Hysteresis, Repeatability	< 5% (*)
Connections	ISO/DIN 43650, Form A
(*): Depends on electronic control unit for the proportional valve For available electronic control unit types, please contact Berarma Technical-Sales Service.	

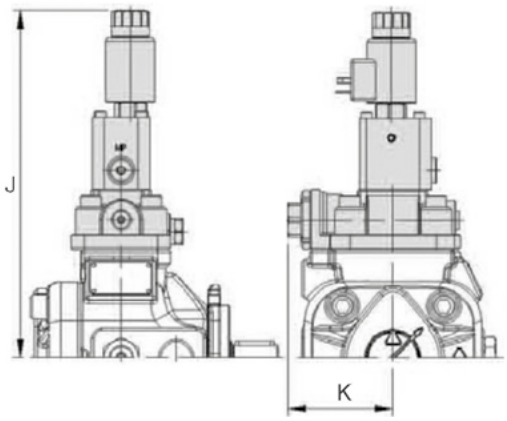
Control Devices	
"U1" "Y1"	Pressure compensator device for additional controls
"SM"	"Minimum pressure" spring adjustment (factory preset at 20 bar do not tamper)
"W2"	Proportional maximum pressure relief valve

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
■	Supplied port closed









Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	272	272
K	81	-
Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		

PCLS001 CONTROL

Hydraulic control with Load Sensing device and single-stage pressure control.

The Load Sensing control system adds to the pressure setting adjustment system of the compensator device the option of regulating the pump flow-rate according to the pressure difference Δp measured on either side of a throttle valve.

The pilot pressure of the Load Sensing compensator device is taken from the pump outlet line after throttle valve "Z" (manual or proportional) and before the actuators. Changing the position of the throttle valve, with a fixed pressure drop equal to the "differential pressure Δp" value, the Load Sensing system automatically adjusts the pump displacement independently of pressure variations that occur in the hydraulic system.

The Load Sensing control produces a notable reduction in displaced power and is recommended for use in applications where there are significant variations in torque (force) and speed.

In the PCLS001 control system, the adjustment of the single-stage pressure setting of the compensator device occurs by means of the maximum pressure relief valve "W".

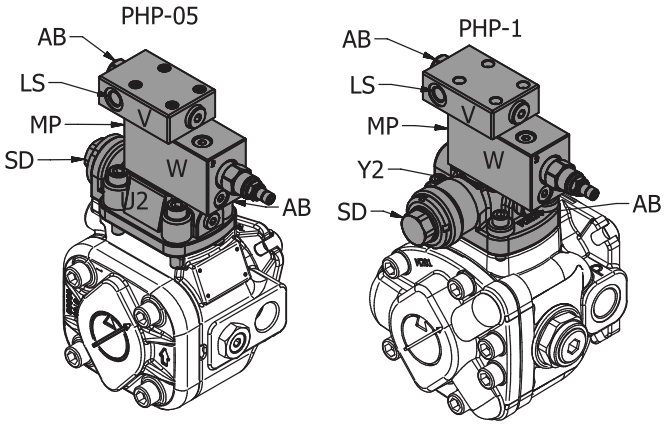
Note: when the throttle valve "Z" is completely closed, the pump will be in "zero flow setting condition", keeping the working pressure constant and equal to the "differential pressure Δp" value.

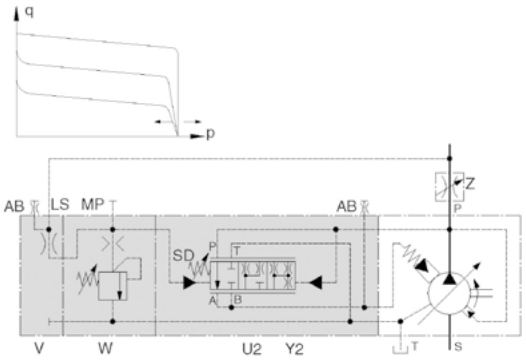
Control performance depends on the type of throttle valve "Z" and on the length / dimensions of the Load Sensing pilot pressure line.

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
"LS" – Load Sensing port	1/4" Gas BSP □
The length between the throttle valve and the Load Sensing port must not exceed 5m.	
■	Supplied port closed
□	Must be connected

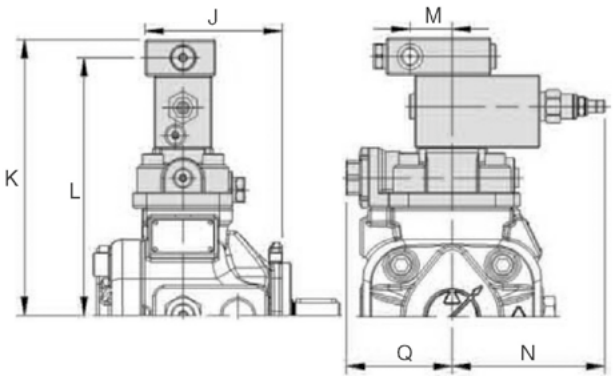
Properties	
Pressure setting range	20 – 250 bar
Differential pressure Δp	≥ 20 bar

Control Devices	
"U2" "Y2"	Load Sensing pressure compensator device
"SD"	Differential pressure Δp adjustment
"W"	Maximum pressure relief valve
"V"	Load Sensing Block
"Z"	Throttle valve (manual or proportional) **(not supplied)**





Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	105	115
K	211	212
L	197	198
M	32	32
N	117	117
Q	81	-
Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



PCLS002 CONTROL

Hydraulic control with Load Sensing device and remote pressure setting.

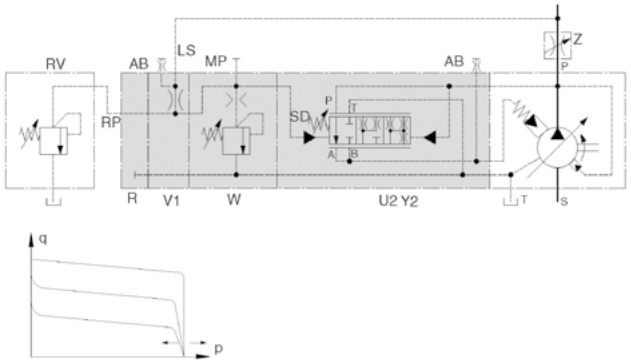
The function of this control is the same as the standard control function with the addition of the possibility of adjusting the working pressure by means of an additional maximum pressure relief valve "RV" installed in a remote position, far from the pump.

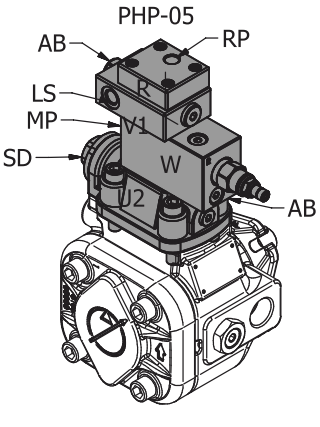
Control performance depends on type of throttle valve "Z", on the length / dimensions of the Load Sensing pilot pressure line, on the type of additional valve "RV", and on its distance from the pump.

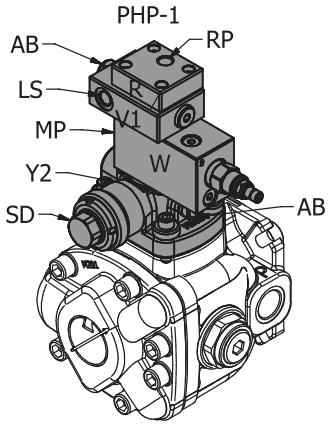
Properties	
Pressure setting range	20 – 250 bar
Differential pressure Δp	≥ 20 bar

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
"LS" – Load Sensing port	1/4" Gas BSP □
The length between the throttle valve and the Load Sensing port must not exceed 5m.	
"RP" – Remote control port	1/4" Gas BSP □
The length of the remote pilot pipe between the pump and the additional valve "RV" must not exceed 5m.	
■	Supplied port closed
□	Must be connected

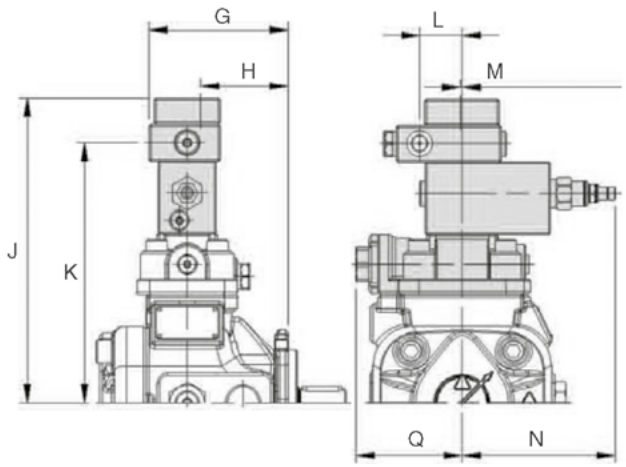
Control Devices	
"U2" "Y2"	Load Sensing pressure compensator device
"SD"	Differential pressure Δp adjustment
"W"	Maximum pressure relief valve (factory preset at maximum value 250 bar)
"V1"	Load Sensing Block for additional controls
"R"	Remote control block
"Z"	Throttle valve (manual or proportional) **(not supplied)**
"RV"	Additional remote maximum pressure relief valve (Properties: 0 - 5 l/min **(not supplied)**)







Designation	Dimensions	
	SIZE 05	**SIZE 1**
G	105	115
H	66	76
J	231	232
K	197	198
L	32	32
M	1.3	1.3
N	117	117
Q	81	-
Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



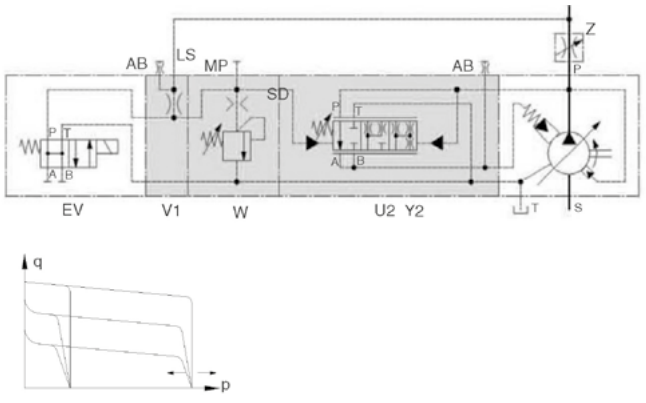
PCLS003 CONTROL

Hydraulic control with Load Sensing device and two-stage pressure control, one with fixed setting.
The function of this control is the same as the Load Sensing standard control with the addition of the option to mount a directional control valve "EV" on the top of the compensator in order to switch between two working pressure levels, one of which is fixed. Control performance depends on the type of throttle valve "Z", on the length / dimensions of the Load Sensing pilot pressure line, and on the type of additional directional control valve.

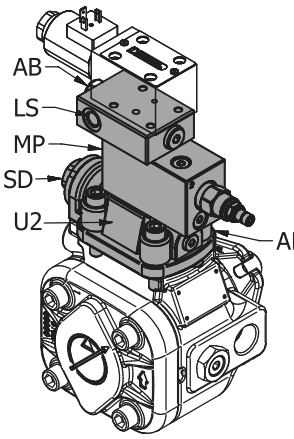
Properties	
Differential pressure Δp (1st pressure level)	Factory fixed preset at ≥ 20 bar
2nd adjustable pressure level	20 – 250 bar

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
"LS" – Load Sensing port	1/4" Gas BSP □
The length between the throttle valve and the Load Sensing port must not exceed 5m.	
Surface – "C03" (See pages 8-9)	ISO 4401-03 (CETOP 03) □
■	Supplied port closed
□	Must be connected

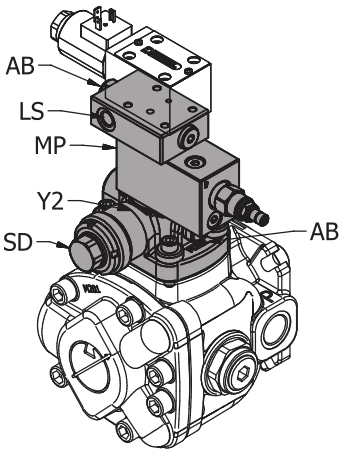
Control Devices	
"U2" "Y2"	Load Sensing pressure compensator device
"SD"	Differential pressure Δp adjustment (1st pressure level at fixed pressure setting)
"W"	Maximum pressure relief valve (2nd adjustable pressure level)
"V1"	Load Sensing Block for additional controls
"EV"	Directional control valve **(supplied only on request)** For information please contact Berarma Technical-Sales Service
"Z"	Throttle valve (manual or proportional) **(not supplied)**



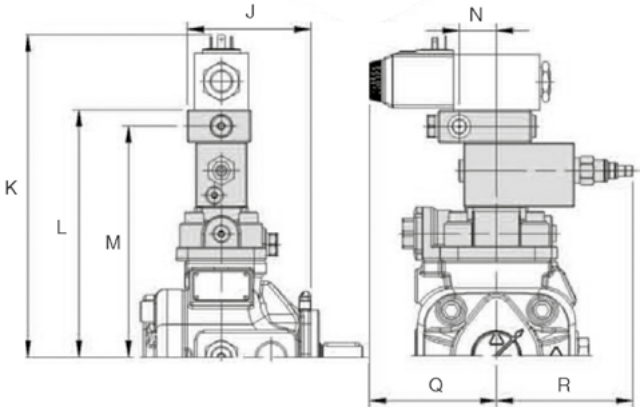
PHP-05



PHP-1



Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	105	115
K	(*)	(*)
L	211	212
M	197	198
N	32	32
Q	(*)	(*)
R	117	117
(*): Please consult the directional control valve catalogue Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



PCLS004 CONTROL

Hydraulic control with Load Sensing device and two-stage pressure control, both adjustable.

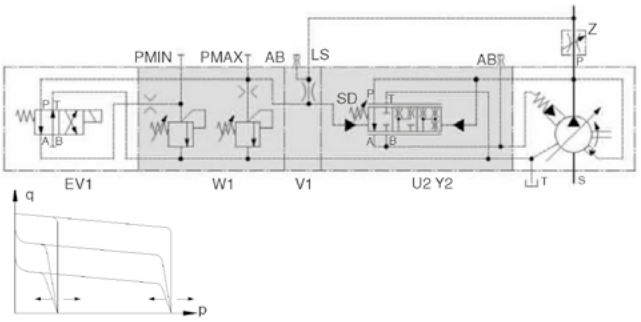
The function of this control is the same as the Load Sensing standard control with the addition of the option to mount a directional control valve "EV1" on the top of the compensator in order to switch between two adjustable working pressure levels.

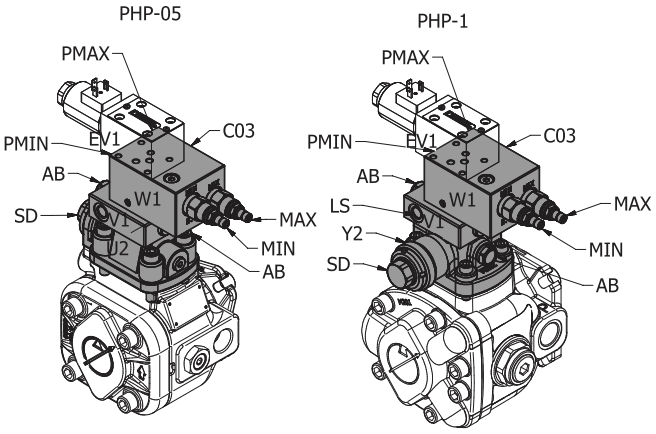
Control performance depends on the type of throttle valve "Z", on the length / dimensions of the Load Sensing pilot pressure line, and on the type of additional directional control valve.

Properties	
1st adjustable pressure level	20 – 250 bar
2nd adjustable pressure level	20 – 250 bar
Note: 1st adjustable pressure level < 2nd adjustable pressure level	
Differential pressure Δp	≥ 20 bar

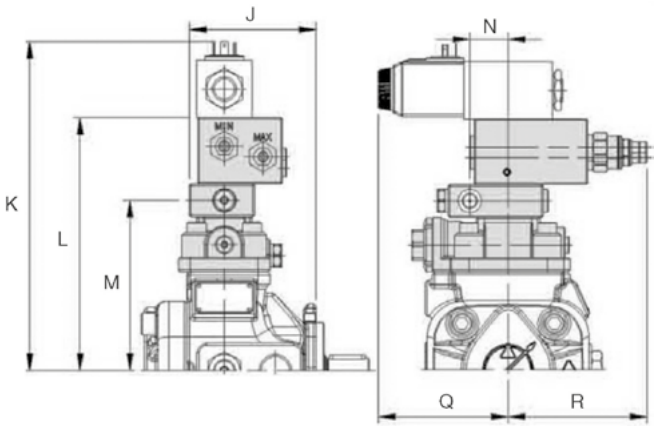
Control Devices	
"U2" "Y2"	Load Sensing pressure compensator device
"SD"	Differential pressure Δp adjustment
"W1"	Maximum pressure relief valve block **"MIN"** 1st adjustable pressure level **"MAX"** 2nd adjustable pressure level
"V1"	Load Sensing Block for additional controls
"EV1"	Directional control valve **(supplied only on request)** For information please contact Berarma Technical-Sales Service
"Z"	Throttle valve (manual or proportional) **(not supplied)**

Connections		
"AB" – Air Bleed		1/4" Gas BSP ■
Pressure gauge	"PMIN" "PMAX"	1/4" Gas BSP ■
"LS" – Load Sensing port		1/4" Gas BSP □
The length between the throttle valve and the Load Sensing port must not exceed 5m.		
Surface – "C03" (See pages 8-9)		ISO 4401-03 (CETOP 03) □
■	Supplied port closed	
□	Must be connected	





Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	105	115
K	(*)	(*)
L	211	212
M	142	143
N	32	32
Q	(*)	(*)
R	117	117
(*): Please consult the directional control valve catalogue Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



PCLS005 CONTROL

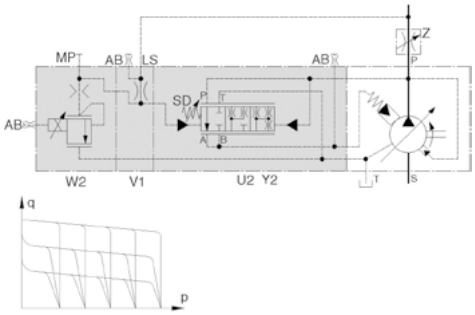
Hydraulic control with Load Sensing device and proportional pressure adjustment.
This control, with integrated proportional valve "W2" on the top of the compensator, adds to the adjustment of the pump flow-rate through the Load sensing system the possibility of proportionally setting the pump working pressure by means of an electrical signal.
Control performance depends on the type of throttle valve "Z", on the length / dimensions of the Load Sensing pilot pressure line, and on the proportional valve electronic control unit **(unit supplied only on request)**.

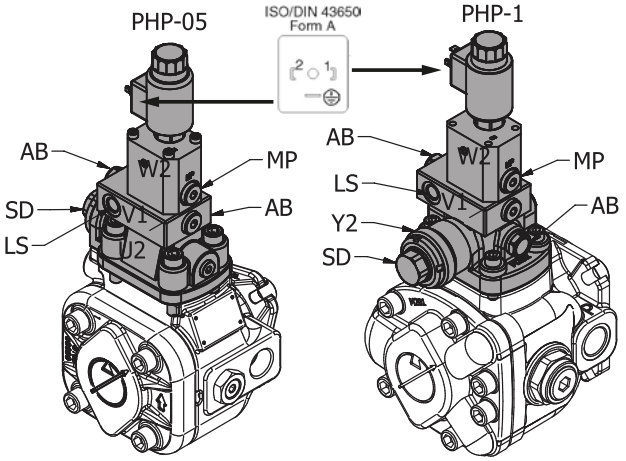
Properties	
Pressure setting range	20 – 250 bar
Differential pressure Δp	≥ 20 bar

Electrical properties	
Voltage	24 VDC ±10%
Maximum current	590 mA
Power consumption	22 Watt
Nominal coil resistance at 50°C	37.2 Ω ±5%
Nominal coil resistance at 20°C	26.2 Ω ±5%
Maximum coil temperature at 20°C	105°C
Protection class	IP65
Recommended Dither frequency	160 – 200 Hz (*)
Linearity, Hysteresis, Repeatability	< 5% (*)
Connections	ISO/DIN 43650, Form A
(*): Depends on electronic control unit for the proportional valve For available electronic control unit types, please contact Berarma Technical-Sales Service.	

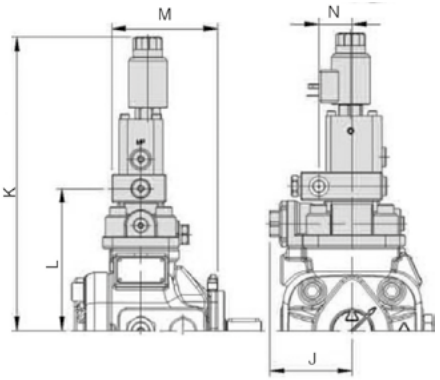
Control Devices	
"U2" "Y2"	Load Sensing pressure compensator device
"SD"	Differential pressure Δp adjustment
"W2"	Proportional maximum pressure relief valve
"V1"	Load Sensing Block for additional controls
"Z"	Throttle valve (manual or proportional) **(not supplied)**

Connections	
"AB" – Air Bleed	1/4" Gas BSP ■
"MP" – Pressure gauge	1/4" Gas BSP ■
"LS" – Load Sensing port	1/4" Gas BSP □
The length between the throttle valve and the Load Sensing port must not exceed 5m.	
■	Supplied port closed
□	Must be connected





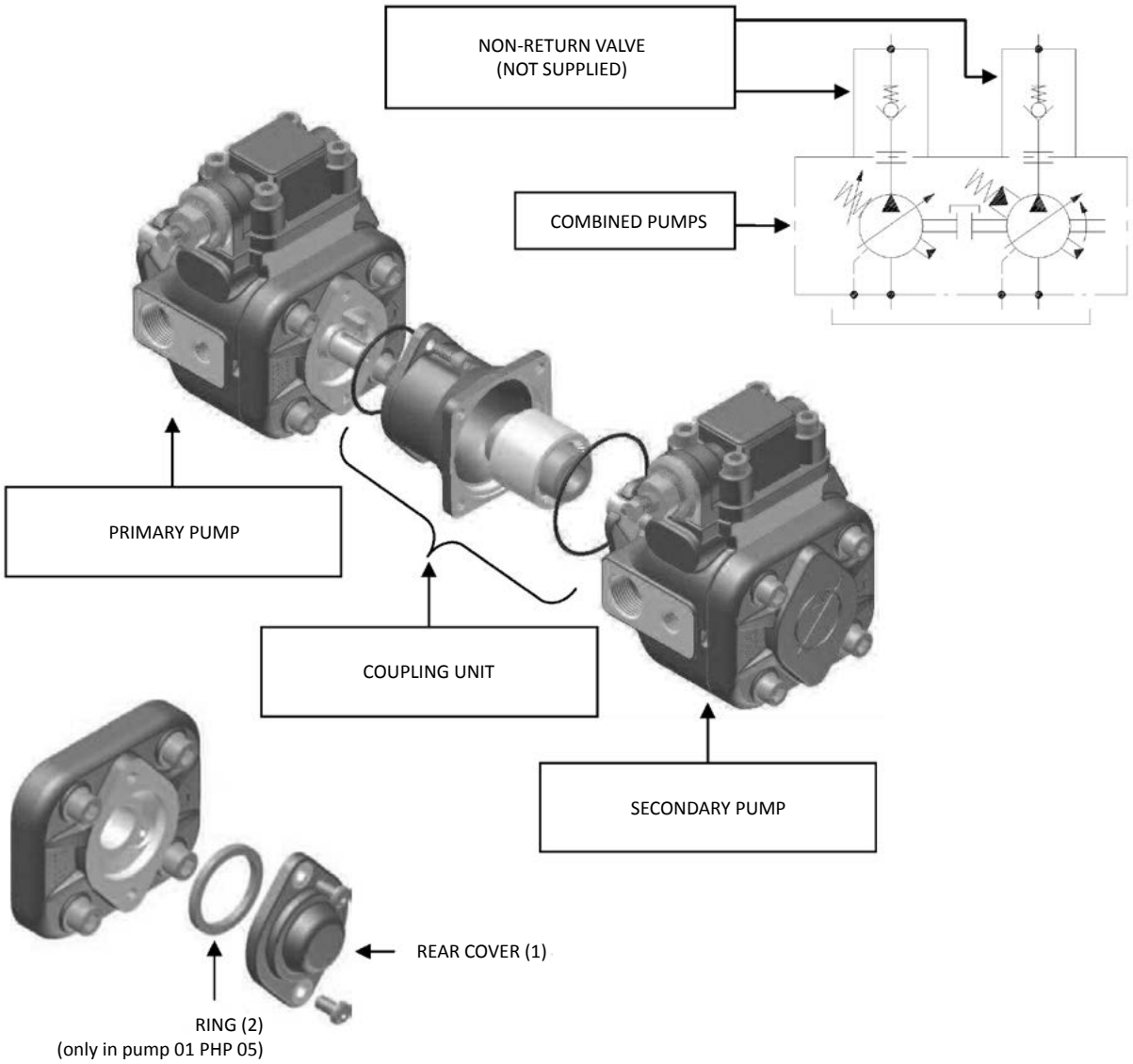
Designation	Dimensions	
	SIZE 05	**SIZE 1**
J	81	-
K	300	301
L	142	143
M	105	115
N	32	32
Indicative dimensions. For further information please contact Berarma Technical-Sales Service.		



COMBINED PUMPS

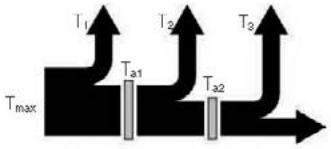
On request, BERARMA pumps from the 01 PHP series can be set up for coupling:
- to pumps belonging to the same 01 PHP series;
- to pumps belonging to other BERARMA series;
- to the main others types of pumps available on the fluid power market.

The 01 PHP series pumps set up for coupling are marked by the letter "**A**" in the ordering code. In these pumps, the shaft and the rear pump cover are set up for coupling to the various available coupling units. Unscrew the screws marked (1) from the primary pump (screws will not be re-installed)
- Remove the pump cover marked as (1) from the primary pump (cover will not be re-installed)
- remove the ring marked (2) from the primary pump (ring will not be re-installed) (only for pump PHP 05)
- Mount the coupling unit, paying attention to the seals (Note: primary pump drainage fluid will fill up the coupling bell-housing)
- Mount the secondary pump

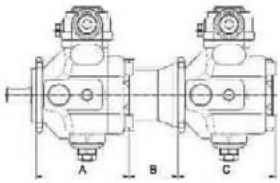


Combined pumps should be mounted in decreasing order of absorbed power, paying attention to the maximum acceptable torques (see diagram on the following page).
The ordering code for a combined pump should be specified according to coupling sequence (primary pump code + coupling unit code + secondary pump code).

- The sum of individual torques of all pumps in the complete pump combination must not exceed the maximum permissible torque value applicable to the primary pump shaft (T_{max} see page 4).
- Secondary pump torque (or sum of torques for more than one secondary pump) must not exceed the coupling unit maximum thru drive torque (T_a, see table below).



$$\begin{cases} T_1 + T_2 + T_3 < T_{max} \\ T_2 + T_3 < T_{a1} \\ T_3 < T_{a2} \end{cases}$$



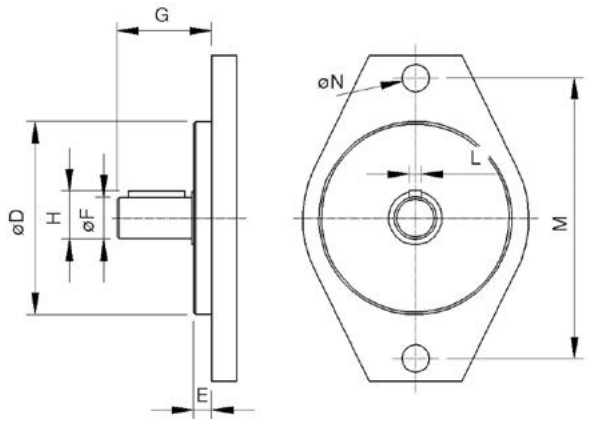
PRIMARY PUMP		SECONDARY PUMP		COUPLING UNIT		
Pump type	**A**	**Pump type**	**C**	**Code**	**B**	**Maximum thru drive torque T_a**
01 PHP 05 16 FHRM A	139	01 PLP 05 16 F	107	3000010200	73	55 Nm
		01 PLP 05 16 FGR2	107	3000011200	72	
		01 PHP 05 16 F	145	3000010200	73	
		01 PHP 05 16 FGR2	145	3000011200	72	
		SAE "A"	(*)	3100000100	88.5	
		GEAR PUMP SIZE 1P	(**)	3000011000	64	
		GEAR PUMP SIZE 1	(**)	3000011100	64	
		GEAR PUMP SIZE 2	(**)	3000011200	72	
		01 PLP 1 (20-25-32)F	**166**	3000010100	75	
01 PHP 1 (20-25-32) F...A	163	01 PLP 05 16 F	107	3000010200	73	
		01 PLP 05 16 FGR2	107	3000011200	72	
		01 PHP 05 16 F	145	3000010200	73	
		01 PHP 05 16 FGR2	145	3000011200	72	
		SAE "A"	(*)	3100000100	88.5	
		GEAR PUMP SIZE 1P	(**)	3000011000	64	
		GEAR PUMP SIZE 1	(**)	3000011100	64	
		GEAR PUMP SIZE 2	(**)	3000011200	72	
		01 PLP 1 (20-25-32) F	166	3000010100	75	
		01 PHP 1 (20-25-32)F	166	3000010100	75	

(*) For the secondary pump flange dimensions please see page 22.
To find out the secondary pump axial dimension please see the manufacturer's catalogue.

(**) For the secondary gear pump flange dimensions please see page 22.
In order find out the secondary gear pump axial dimension please see the manufacturer's catalogue.

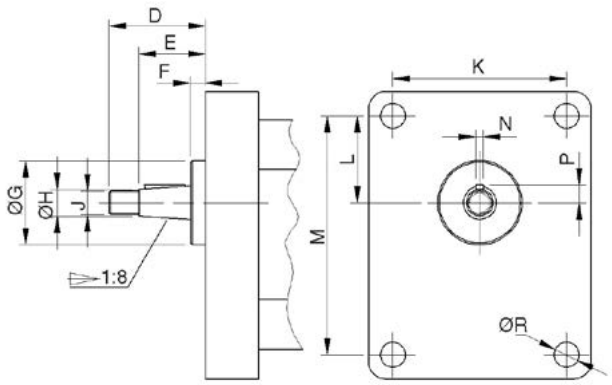
For other coupling unit types, please contact Berarma Technical-Sales Service.

SAE FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary pump with SAE flange should conform to the dimensions below								
	Ø D	E	Ø F	G		H	L	M	Ø N
				min	max				
SAE "A"	Ø82.5	7	Ø19.05	32	59	21.1	4.8	106.4	11.1

GEAR PUMP FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary gear pumps should be conform to the dimensions below											
	D	E	F	Ø G	Ø H	J	K	L	M	N	P	Ø R
gear pump 1P	29	20	4	25.4	8	M7	52.4	26.2	71.9	2.4	5.3	7.5
gear pump 1	35	23.5	5.5	30	12	M10x1	56	24.5	73	3	7.9	6.5
gear pump 2	40	28	5	36.5	14.7	M12x1.5	71.5	32.5	96	4 (*)	9.7	8.5

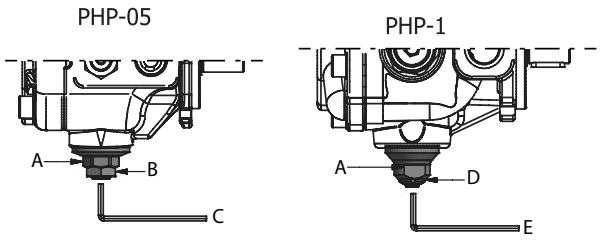
SETTINGS

Flow regulator unit

All BERARMA 01 PHP series pumps are equipped with a flow regulator unit. This allows the mechanical reduction of the pump displacement in relation to the nominal value.

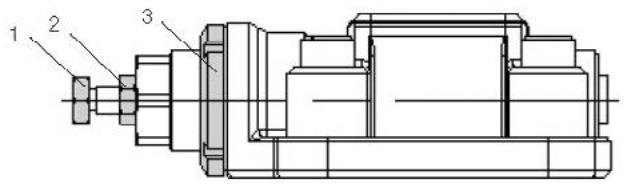
Warning: If the flow regulator unit is set to less than 50% of the nominal displacement, the pump can only start on condition that the system and pump are completely filled with fluid.

Rated Displacement	Actual displacement	Reduced displacement by screw turn	Minimum achievable displacement
Size 05 - 16	17.9 cm^3	11.0 cm^3	3.3 cm^3
Size 1 - 20	24.2 cm^3	12.8 cm^3	14 cm^3
Size 1 - 25	29.4 cm^3	12.8 cm^3	19.1 cm^3
Size 1 - 32	34.5 cm^3	12.8 cm^3	24.2 cm^3
Indicative values influenced by manufacturing tolerances			

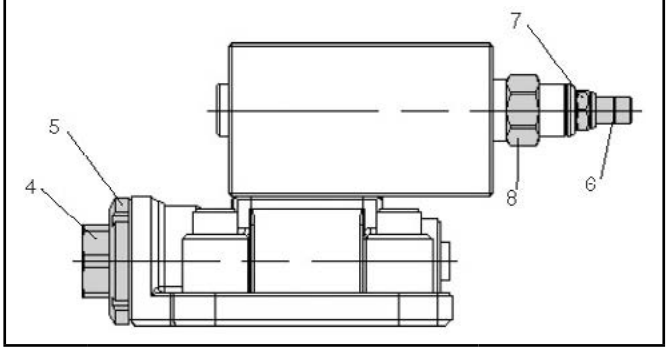


A - DO NOT TOUCH
B - LOCKNUT: 24 mm WRENCH
C - ADJUSTMENT: 8 mm WRENCH
D - KM1 SLOTTED ROUND LOCKNUT
E - ADJUSTMENT: 6 mm WRENCH

Standard pressure compensator device		
1	Pressure setting screw Clockwise rotation increases pressure setting	CH 13 mm HEX
2	Pressure setting locknut	CH 13 mm HEX
3	Slotted round locknut - Do not tamper	5 mm slot



Pressure compensator device for additional controls Load Sensing pressure compensator device		
4	**Controls PCS002, PCS003; PCS004, PCS005** Minimum pressure spring adjustment - Do not tamper **Controls PCLS001, PCLS002, PCLS003; PCLS004, PCLS005** Differential pressure Δp adjustment	CH 26 mm HEX
5	Slotted round locknut	5 mm slot
6	Maximum pressure relief valve Pressure setting screw Clockwise rotation increases pressure setting	CH 5/32" HEX
7	Pressure setting locknut	CH 9/16" HEX
8	Do not tamper	CH 7/8" HEX



INSTRUCTIONS FOR INSTALLATION AND USE

Pumps from the 01 PHP series can be mounted in any position.
When the pump is installed over the reservoir fluid level, pay attention to the inlet pressure (see page 4).
Cleanliness is essential during assembly!

Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. When assembling make sure that:

- **the distance between the half-couplings strictly falls within the specified values (see page 25);**
- **the pump shaft and the motor shaft are accurately aligned: concentricity within 0.05 mm, angular displacement within 0.2° (see drawing);**
- **strictly no radial or axial loads on the pump shaft.**

Other types of motor-pump couplings are not permitted.

The fluid tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate (tank capacity approximately 4 times the flow rate per minute of the pump). In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended. The pressure on the drain port must never exceed the value specified on page 4.
Maximum operating temperature must not exceed 60°C under any circumstances.
To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C.

Suction pipe. The suction pipe should be as short as possible, with a small number of bends and without internal section changes. The pipe-end inside the tank should be cut at 45°, should have a minimum distance from the tank bottom of not less than 50 mm, and there should always be a minimum height of suction of 100 mm. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. **The suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump.**

Drain pipe. The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum fluid level to avoid generating foam and to prevent emptying when the pump is not running. Moreover, the drain pipe must also be at the highest possible position in relation to the pump in order to always prevent fluid emptying from the pump, and must be free of restrictions. **The drain pipe should be as far as possible from the suction pipe to prevent hot fluid being circulated.**

Pressure line. Ensure that the pressure line is strong enough. It is recommended that a non-return valve (check valve) is installed on the pump pressure line as well as an automatic air bleed valve, for trouble free operation.

Ensure that any valves, taps and gate valves on the suction and pressure pipes are fully opened and all protective caps removed. Fill the pump through the case drain port and replace the drain pipework. Check that the reservoir is full of fluid.

Ensure that the pump shaft can be rotated manually without any resistance.

Check that the motor rotation direction is the same as the pump rotation direction: right-hand rotation (clockwise) viewed from shaft end of the pump.

Start the motor (in jogging mode), allowing free circulation of fluid to the tank in order to facilitate priming.
The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

During INITIAL INSTALLATION, the pump must run under maximum flow conditions (P connected to T), with the fluid flowing directly into the tank, without pressure for several minutes. Care should be taken **to eliminate all the air from the system during this process**. To facilitate this operation, there is an air bleed port on the pressure compensator device: unscrew the cap to bleed the air and then close the cap.

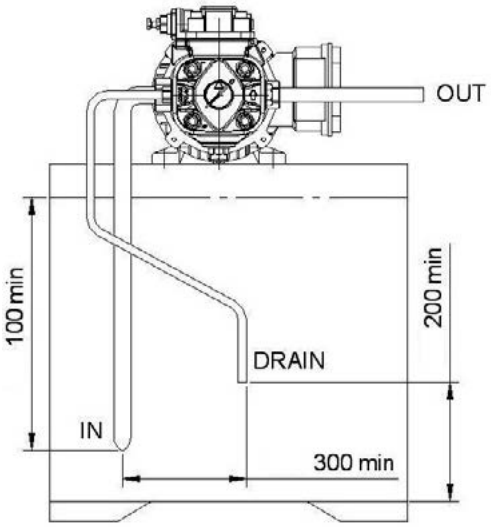
Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with fluid.

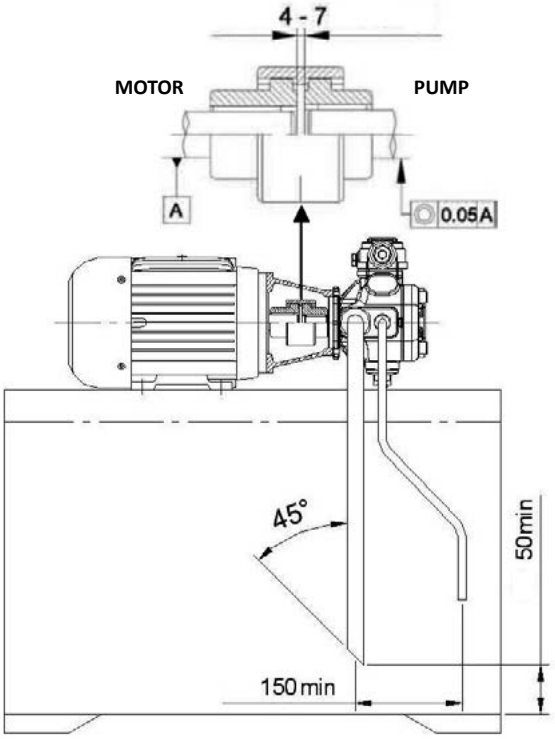
If the flow regulator unit is set to less than 50% of the nominal flow-rate, the pump can only start on condition that the system and the pump are completely filled with fluid.

During the initial and subsequent starting operations, it is necessary that the pump (ambient) and fluid temperature do not differ by more than 20°C. If this is the case, the pump should be switched on only for short intervals of approximately 1-2 seconds (start/stop mode) without pressure, until the temperatures are balanced.

All Berarma products are covered by a **1 YEAR WARRANTY** for manufacturing or material defects effective from the shipment date, but in any case **NO LONGER THAN 18 MONTHS FROM THE PRODUCTION BATCH DATE**. The warranty is for the exclusive benefit of the original purchaser of the products.

For further information, please contact the Berarma Technical-Sales Service.

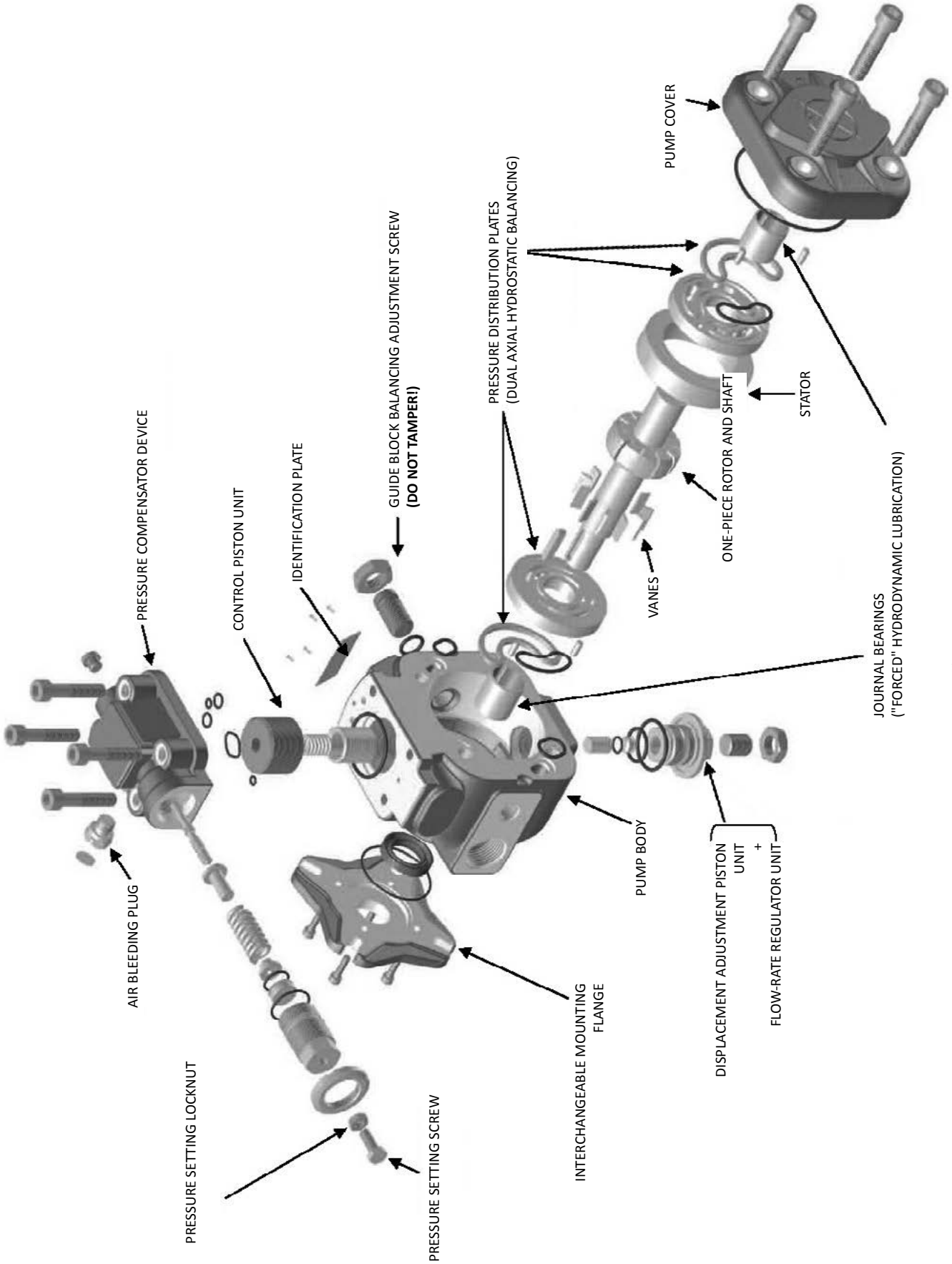




ASSEMBLY

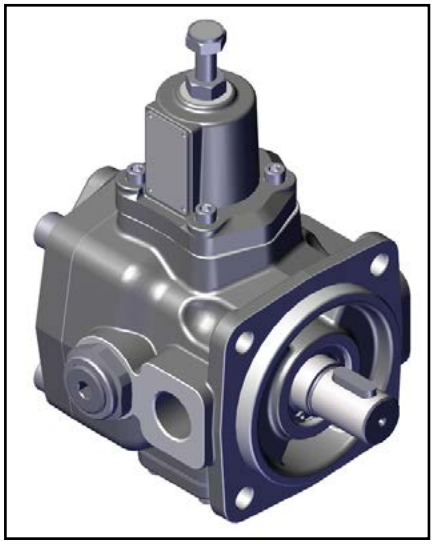
ASSEMBLY

E.G. 01-PHP-05-16-FHRM



Variable displacement vane pump (with mechanical pressure compensator)

PVS-Type



Key Features:

Rotation: Right (viewed from shaft end)
Mounting flanges: 4-hole flange (UNI ISO 3019/2)
Connections: GAS BSP (UNI ISO 228/1) and SAE
Mechanical displacement limiter "Q" on request
All pumps are already set up as standard to be coupled to each other and with other types of pump

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
02-PVS-2-40	40	58	100
02-PVS-2-50	50	73	100
02-PVS-3-63	63	91	80
02-PVS-3-80	80	116	80
02-PVS-3-100	100	145	80

CONTENTS

CONTENTS

WARNING

All Berarma pumps have been carefully checked during manufacture and subjected to stringent testing cycles before shipment. To achieve optimum performance, avoid problems and maintain the warranty, the installation instructions enclosed with each pump sold must be strictly observed.

NOTES

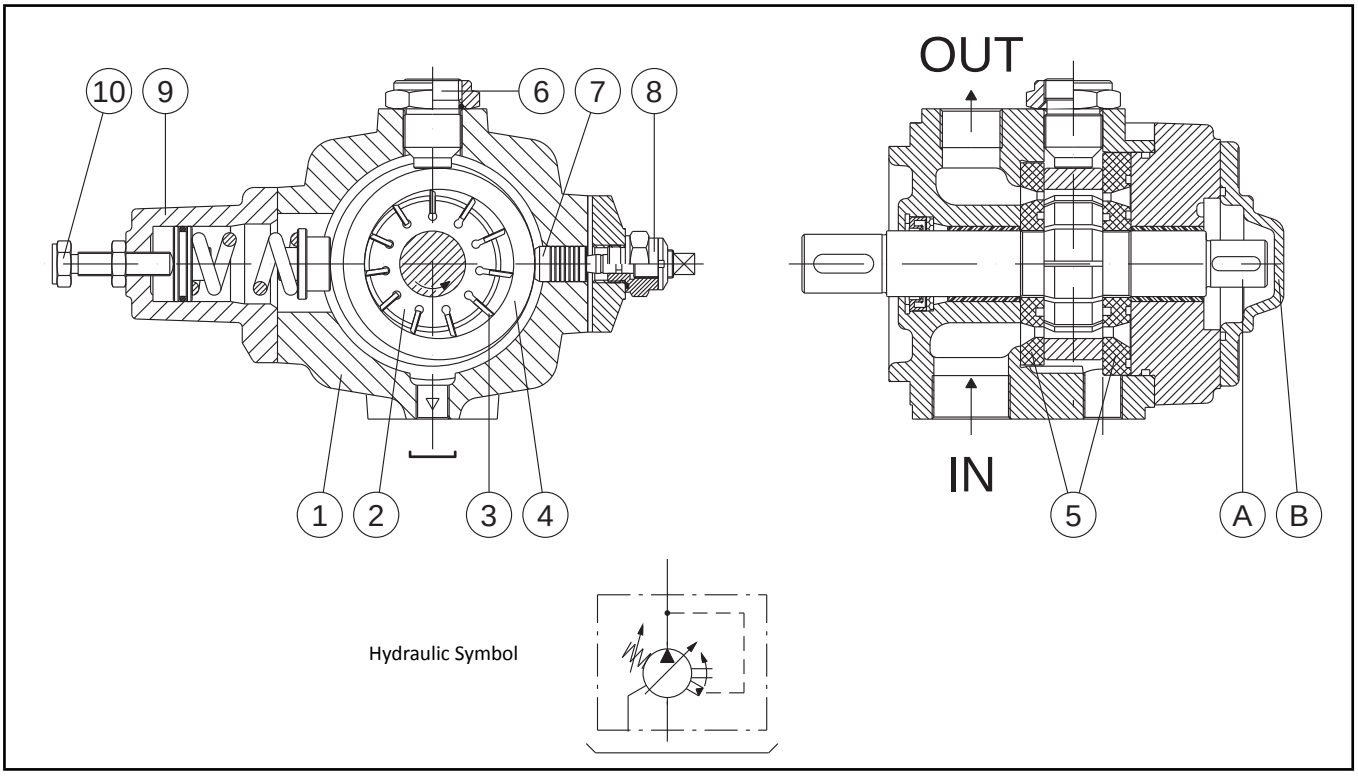
Before selection and/or use of any Berarma product, it is important that the purchaser carefully analyses all aspects of its application and reviews the information in the current Berarma Technical-Sales catalogues. Due to the many different operating conditions and applications for Berarma products, the purchaser, through their own analysis and testing, is solely responsible for making the final selection of the products and assuring that all performance and safety requirements are met.

Berarma S.r.l. accepts no responsibility for any editing mistakes in this catalogue.
Berarma S.r.l. reserves the right to modify the products and data contained in this catalogue at any time and without prior notice.

GENERAL DESCRIPTION

Berarma PVS variable displacement vane pumps come in 2 nominal sizes: Size 2-3.

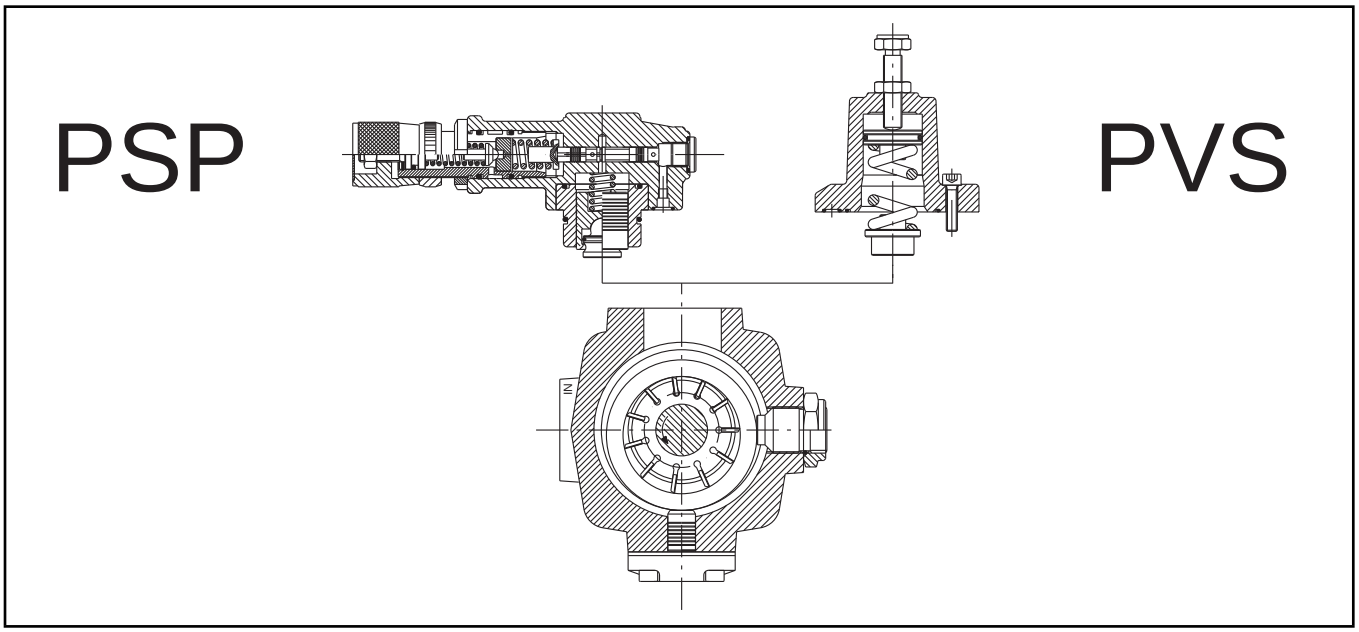
The PVS low pressure pumps (100 bar) are equipped with a MECHANICAL pressure regulating device.
Pump components include: a body (1), a drive rotor (2) which houses the vanes (3), vanes that transport the fluid into the inlet and outlet chambers; a stator (4) (mobile circular ring) for varying eccentricity and consequently displacement; side distribution plates with AXIAL HYDROSTATIC COMPENSATION (5) which delimit the inlet and outlet chambers; a guide block balancing adjustment screw (6) (absolutely must not be tampered with by the user); a displacement adjustment piston (7), a maximum volume adjustment screw (8) (available on request); a pressure control device (9); and a pressure regulator (10).



CHARACTERISTICS

CHARACTERISTICS

- SILENT RUNNING from 60 to 72 dB(A)
- HIGH EFFICIENCY
- LONG WORKING LIFE thanks to quality materials and state-of-the-art manufacturing technology: hydrodynamic lubrication of bearings and hydrostatic balancing of distribution plates
- ECONOMY AND SIMPLIFICATION OF HYDRAULIC SYSTEM
- The pumps can be supplied with various proportional devices for flow, pressure and power control
- ISO standard MOUNTING FLANGES
- GAS (BSP), SAE standard PORT CONNECTIONS
- MODULAR DESIGN - All Berarma pumps feature modular design for maximum flexibility and adaptability.
  The pumps comprise a body, common to each size, on which the various types of compensator devices (mechanical and hydraulic for pressure
  and volume control) can be mounted.
  The pump can therefore be converted from PVS to PSP and vice versa without any special modification, using the same standard pump body.



ORDERING CODE

Series/ Name	Size Displacement	Flange	Pressure setting	Rotation	Seals	Options
02 PVS				**R**		

Code	Size	Displacement (cm^3/r)
2 - 40	2	40
2 - 50	2	50
3 - 63	3	63
3 - 80	3	80
3 - 100	3	100

Code	Flange	Thread
F	UNI ISO3019/2 - 4 holes	GAS UNI ISO 228/1; SAE

Code	Pressure setting
H	30 - 100 bar (for Size 2) 30 - 80 bar (for Size 3)
L	15 – 50 bar

Code	Rotation Direction
R	Right (viewed from shaft end)

Code	Seals
M	NBR
E	FPM (viton)

Code	Options
KL	Key-Lock Compensator
Q	Displacement adjustment

Ordering code example:

- 02 PVS 2-40 F H R M
- 02 PVS 3-80 F H R M Q
- 02 PVS 3-100 F L R M

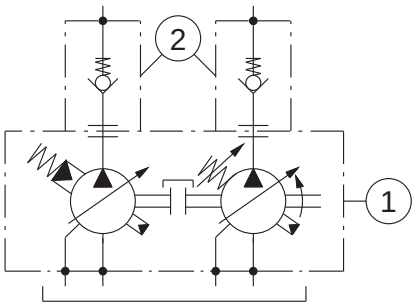
TECHNICAL DATA

NOMINAL SIZE	SIZE 2	SIZE 3
Geometric displacement according to UNI-ISO 3662 (cm^3/r)	40-50	63-80-100
Actual displacement (cm^3/r)	42.8-53.1	69-86.2-105.5
Maximum working pressure (bar)	100	80
Pressure setting range	L - 15 / 50 bar H - 30 / 100 bar	L - 15 / 50 bar H - 30 / 80 bar
Permitted maximum drain port pressure (bar)	1	
Inlet pressure (absolute - bar)	0.8 - 1.5	
Speed range (r/min)	800 - 1800	
Rotation direction (viewed from shaft end)	Right (clockwise) R	
Loads on drive shaft	NO RADIAL OR AXIAL LOADS ALLOWED	
Maximum torque on primary shaft (Nm)	400	740
Hydraulic fluid	HM hydraulic oil according to ISO 6743/4; HLP hydraulic oil according to DIN 51524/2; organic ester HFD-U according to ISO 6743/4 (Quintolubric 888); for other fluids contact Berarma Technical-Sales Service	
Viscosity range (cSt, mm2/s)	22 - 68	
Starting viscosity under full flow conditions (cSt, mm^2/s)	400 max	
Viscosity index according to ISO 2909	100 min	
Inlet fluid temperature range (°C)	-10 - +50	
Maximum acceptable fluid contamination level	20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638	
Recommended fluid contamination level for a longer pump working life	18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638	
Weight (kg)	32	44
For different operating conditions, please contact Berarma Technical Service		

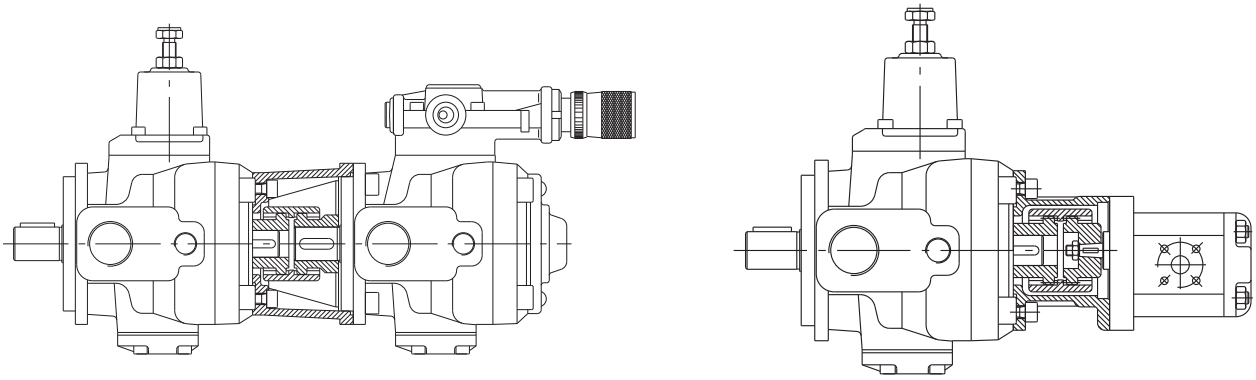
COMBINED PUMPS

BERARMA pumps are already set up for coupling to one another or to other types of pump (see table of possible combinations). The standard rotor shaft is set up for coupling (see pump section view, detail "A", on page 3). After removal of cover "B", the pump can be fitted with the different units already set up for coupling. With this solution BERARMA intends to avoid pumps with non-standard special applications, in order to simplify interchangeability and pump combination.

For solutions different to the ones described, please contact Berarma Technical Service.



1) Combined Pumps
2) Non return valves - recommended installation (supplied on request)

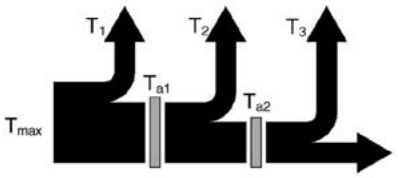


The ordering code should be specified according to the coupling sequence

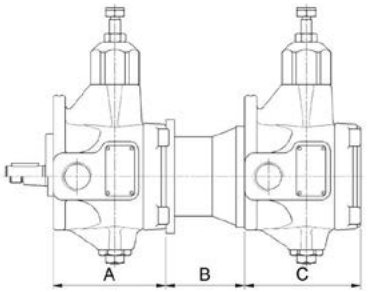
PRIMARY PUMP CODE	+	COUPLING UNIT CODE	+	SECONDARY PUMP CODE

Combined pumps should be mounted in decreasing order of absorbed power, paying attention to the maximum acceptable torques (see diagram below).
The ordering code for a combined pump should be specified according to coupling sequence (primary pump code + coupling unit code + secondary pump code).

- The sum of individual torques of all pumps in the complete pump combination must not exceed the maximum permissible torque value applicable to the primary pump shaft (T_{max} see page 6).
- Secondary pump torque (or sum of torques for more than one secondary pump) must not exceed the coupling unit maximum thru drive torque (T_a, see table below).



$$\begin{cases} T_1 + T_2 + T_3 < T_{max} \\ T_2 + T_3 < T_{a1} \\ T_3 < T_{a2} \end{cases}$$



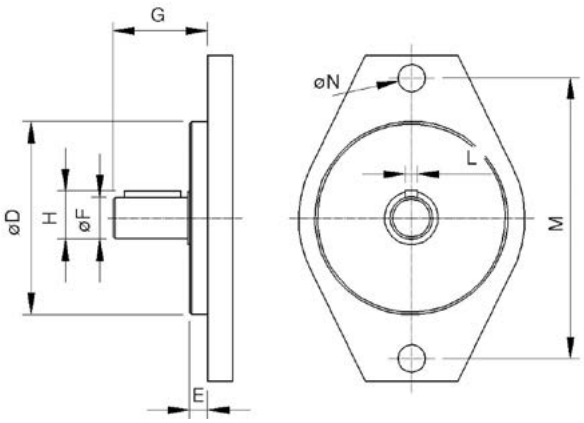
PRIMARY PUMP		SECONDARY PUMP		COUPLING UNIT		
Pump type	**A**	**Pump type**	**C**	**Code**	**B**	**Maximum thru drive torque T_a**
02 PVS 2 (40-50) F	173	GEAR PUMP SIZE 1P	(*)	3000022000	90	110 Nm
		GEAR PUMP SIZE 1	(*)	3000022100	90	
		GEAR PUMP SIZE 2	(*)	3000022200	90	
		GEAR PUMP SIZE 3	(*)	3000022300	90	
		01 PLP 05 16 F	107	3000020400	85	
		01 PLP 05 16 FGR2	107	3000022200	90	
		01 PHP 05 16 F	145	3000020400	85	
		01 PHP 05 16 FGR2	145	3000022200	90	
		01 PLP 1 (20-25-32) F	166	3000020100	87	
		01 PHP 1 (20-25-32)F	166	3000020100	87	
		02 PVS 2 (40-50) F	220	3000020200	102	
		02 PSP 2 (40-50) F	220	3000020200	102	
		SAE "A"	(*)	3100000200	100.5	
		SAE "B"	(*)	3100000300	126.5	
02 PVS 3 (63-80-100) F	198	GEAR PUMP SIZE 1P	(*)	3000022000	90	
		GEAR PUMP SIZE 1	(*)	3000022100	90	
		GEAR PUMP SIZE 2	(*)	3000022200	90	
		GEAR PUMP SIZE 3	(*)	3000022300	90	
		01 PLP 05 16 F	107	3000020400	85	
		01 PLP 05 16 FGR2	107	3000022200	90	
		01 PHP 05 16 F	145	3000020400	85	
		01 PHP 05 16 FGR2	145	3000022200	90	
		01 PLP 1 (20-25-32) F	166	3000020100	87	
		01 PHP 1 (20-25-32)F	166	3000020100	87	
		02 PVS 2 (40-50) F	220	3000020200	102	
		02 PSP 2 (40-50) F	220	3000020200	102	
		SAE "A"	(*)	3100000200	100.5	
		SAE "B"	(*)	3100000300	126.5	
		02 PVS 3 (63-80-100) F	245	3000020300	117	180 Nm
		02 PSP 3 (63-80-100) F	245	3000020300	117	

(*) For the secondary pump SAE A flange dimensions please see page 9.
In order to find out the secondary SAE flange pump axial dimension please see the manufacturer's catalogue.

(**) For the secondary gear pump flange dimensions please see page 9.
In order find out the secondary gear pump axial dimension please see the manufacturer's catalogue.

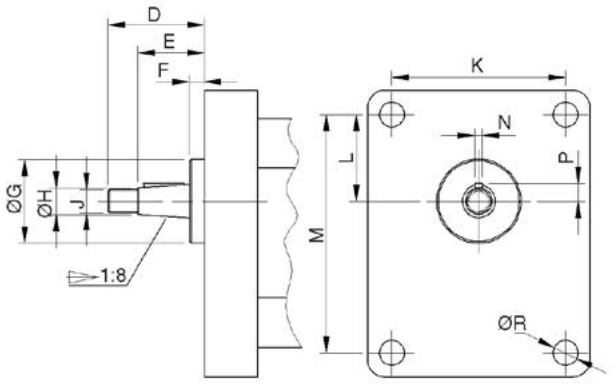
For other coupling unit types, please contact Berarma Technical-Sales Service.

SAE FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary pump with SAE flange should conform to the dimensions below								
	Ø D	E	Ø F	G		H	L	M	Ø N
				min	max				
SAE "A"	Ø82.5	7	Ø19.05	32	59	21.1	4.8	106.4	11.1
SAE "B"	Ø101.6	9.5	Ø22.2	41	71	25.1	6.375	146	14.3
						25.5	4.8		

GEAR PUMP FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



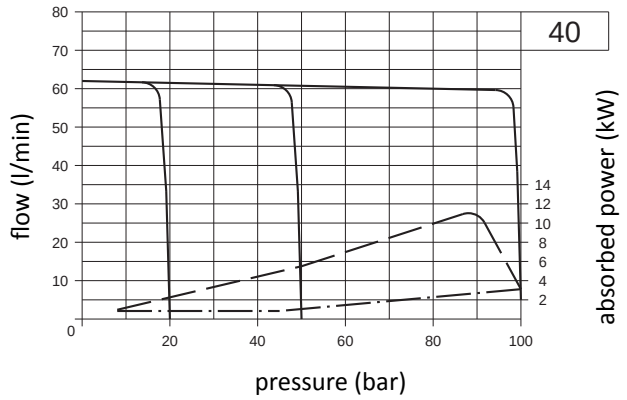
Secondary pump	Secondary gear pumps should conform to the dimensions below											
	D	E	F	Ø G	Ø H	J	K	L	M	N	P	Ø R
gear pump 1P	29	20	4	25.4	8	M7	52.4	26.2	71.9	2.4	5.3	7.5
gear pump 1	35	23.5	5.5	30	12	M10x 1	56	24.5	73	3	7.9	6.5
gear pump 2	40	28	5	36.5	14.7	M12x1.5	71.5	32.5	96	4 (*)	9.7	8.5
gear pump 3	47	33	5	50.8	19	M14x1.5	98.5	43	128	4	12.2	11

CHARACTERISTIC CURVES

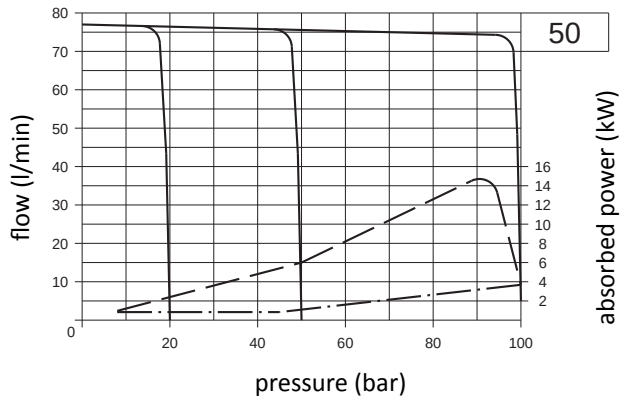
Indicative values related to 1450 r/min., HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 50°C

02 PVS 2 40-50

volumetric efficiency -zero flow setting curve



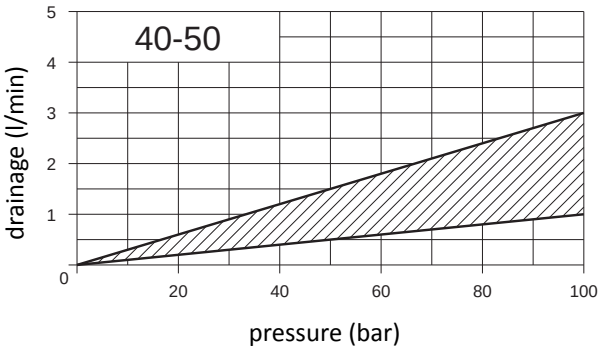
volumetric efficiency -zero flow setting curve



Power consumption with maximum flow

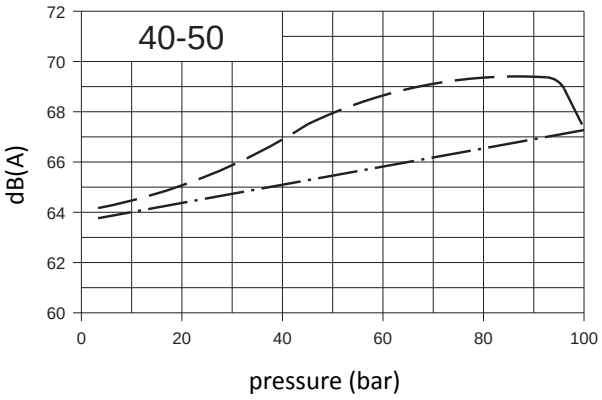
Power consumption with zero flow setting

data with pump under zero flow setting

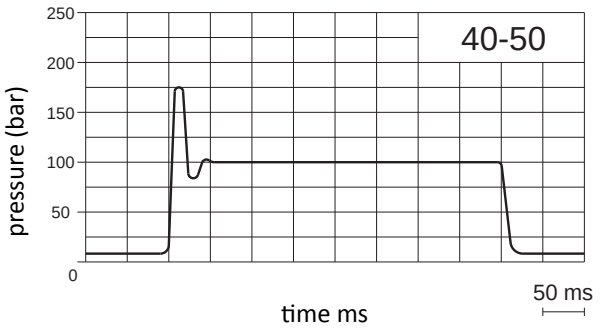


Noise level

Maximum noise level measured on Berarma test bench with sound-level meter placed 1 metre from the pump, with flexible coupling



Response time and pressure peak

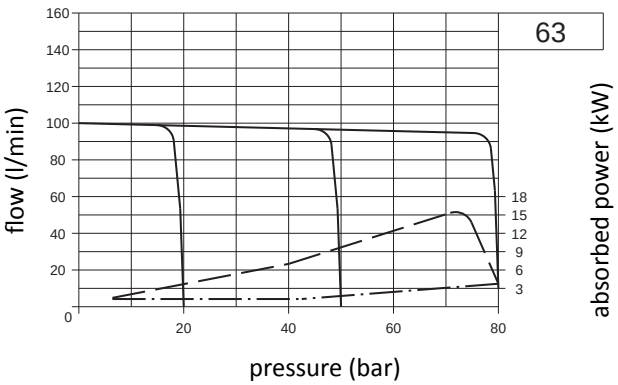


Pressure peaks are due to the test system. Pressure peaks exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures.

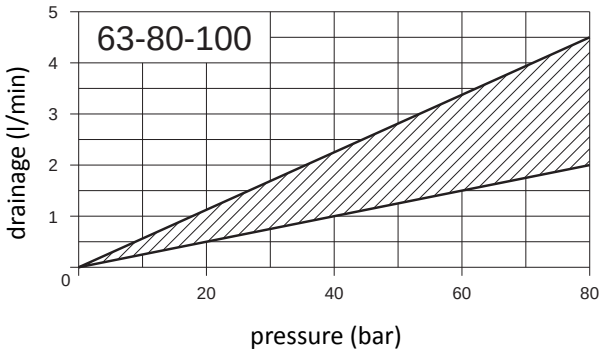
Indicative values related to 1450 r/min., HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 50°C

02 PVS 3 63-80-100

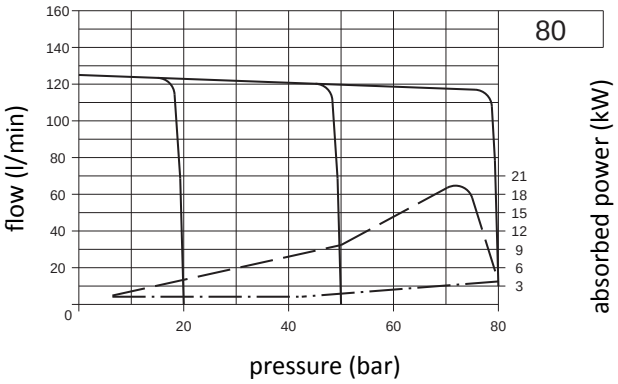
volumetric efficiency -zero flow setting curve



data with pump under zero flow setting

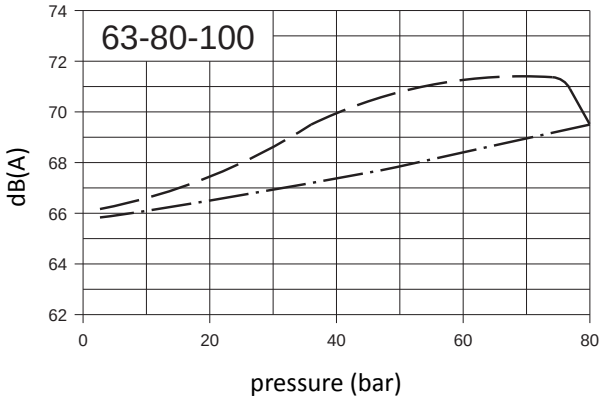


volumetric efficiency -zero flow setting curve

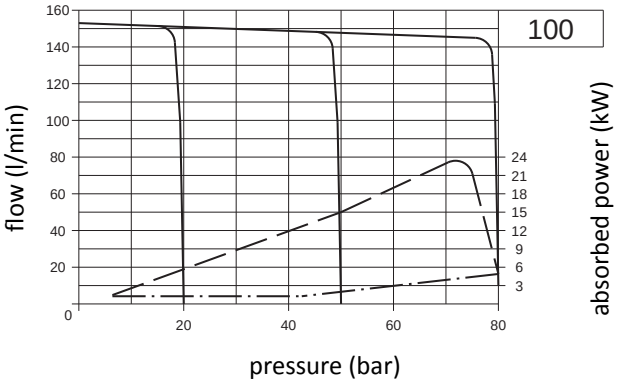


Noise level

Maximum noise level measured on Berarma test bench with sound-level meter placed 1 metre from the pump, with flexible coupling



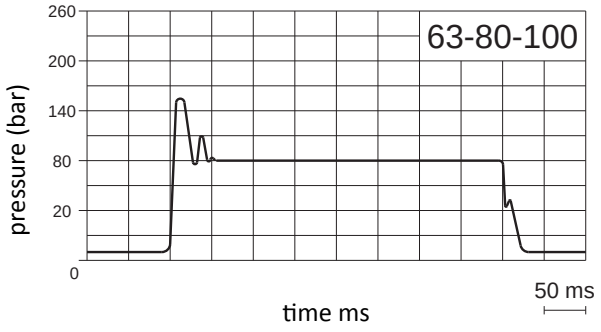
volumetric efficiency -zero flow setting curve



Power consumption with maximum flow

Power consumption with zero flow setting

Response time and pressure peak

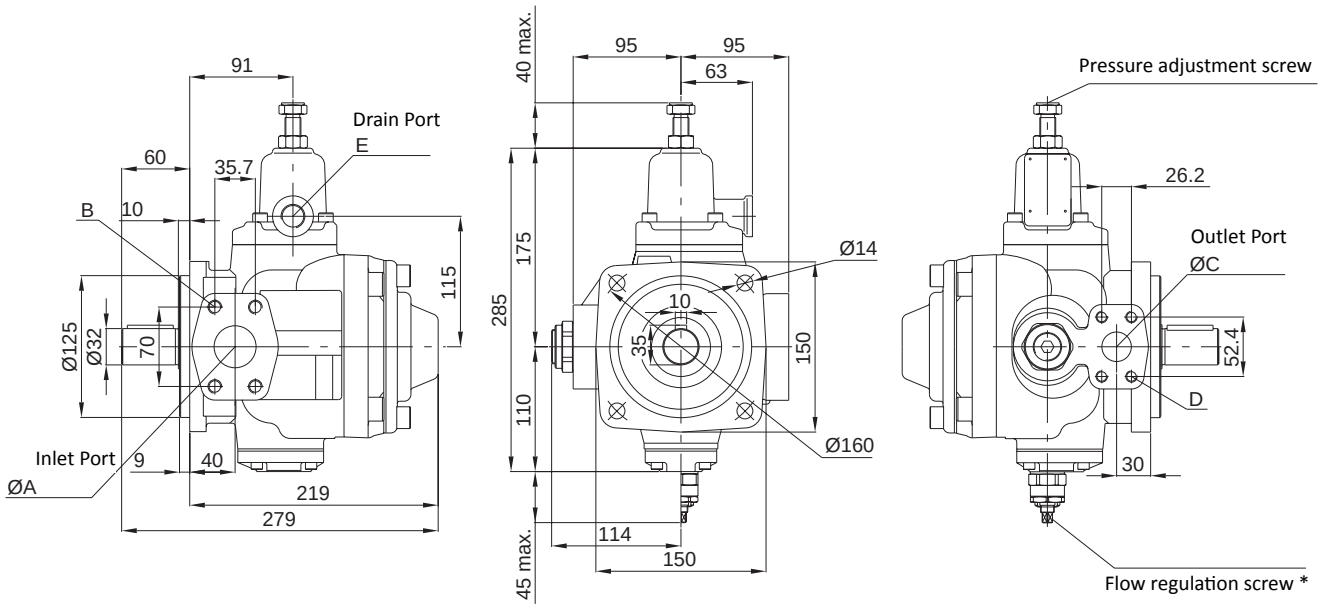


Pressure peaks are due to the test system. Pressure peaks exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures.

OVERALL DIMENSIONS

OVERALL DIMENSIONS

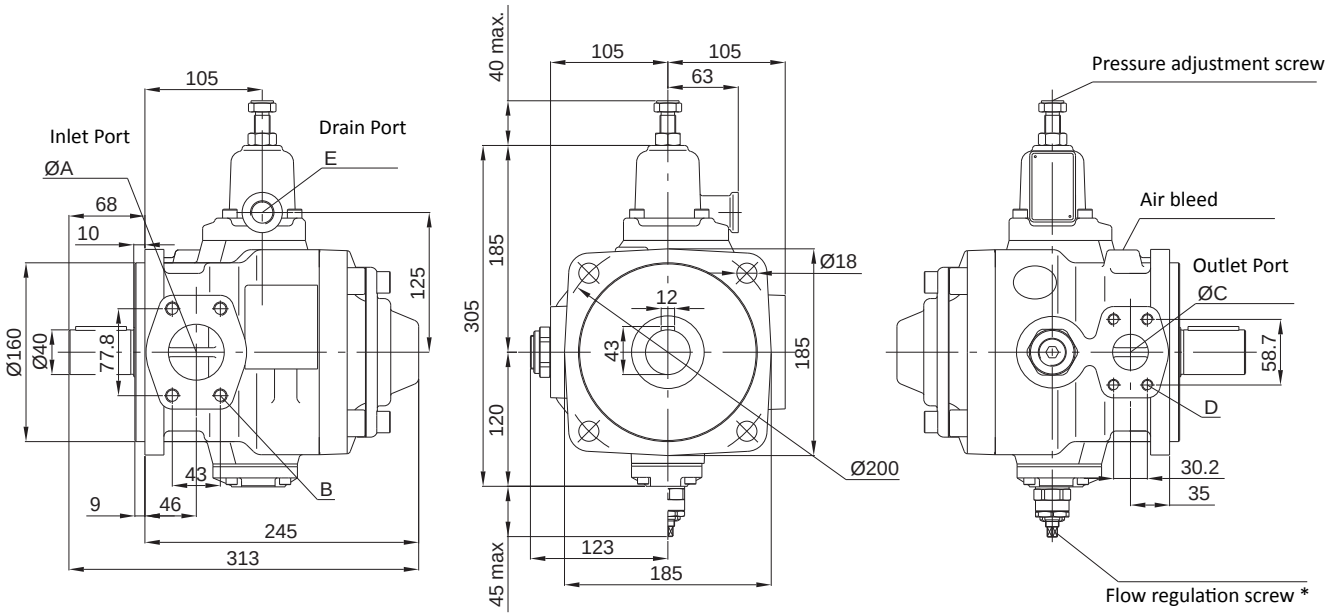
02 PVS 2 40-50 (F)



*- Supplied on request (see page 14)

Flange	ØA	B	ØC	D	E
F (ISO)	38	SAE (3000) 1"1/2 M12 x 45	25	SAE (3000) 1" M10 x 35	1/2" Gas (BSP)

02 PVS 3 63-80-100 (F)



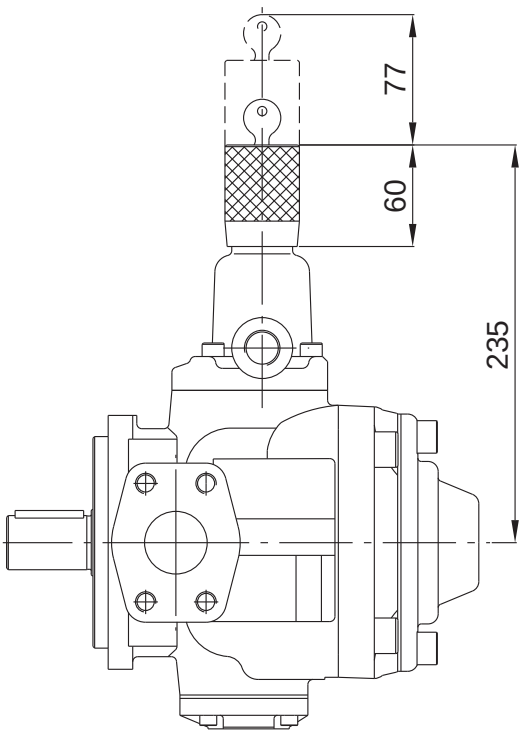
*- Supplied on request (see page 14)

Flange	ØA	B	ØC	D	E
F (ISO)	51	SAE (3000) 2" M12 x 45	32	SAE (3000) 1"1/4 M10 x 40	1/2" Gas (BSP)

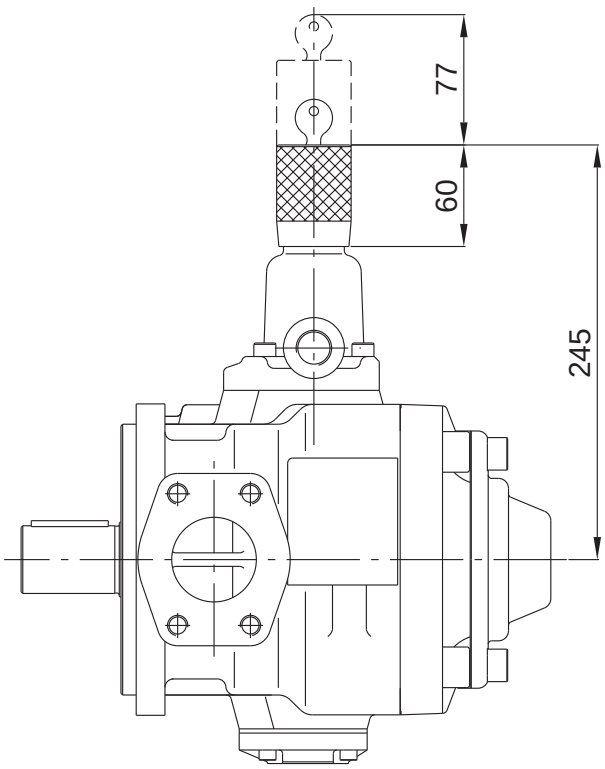
ACCESSORIES

KEY-LOCK PRESSURE COMPENSATOR DEVICE

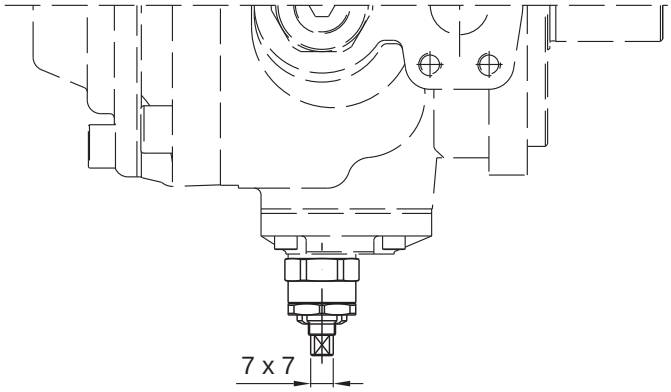
02 PVS 2 ....-KL



02 PVS 3 ....-KL



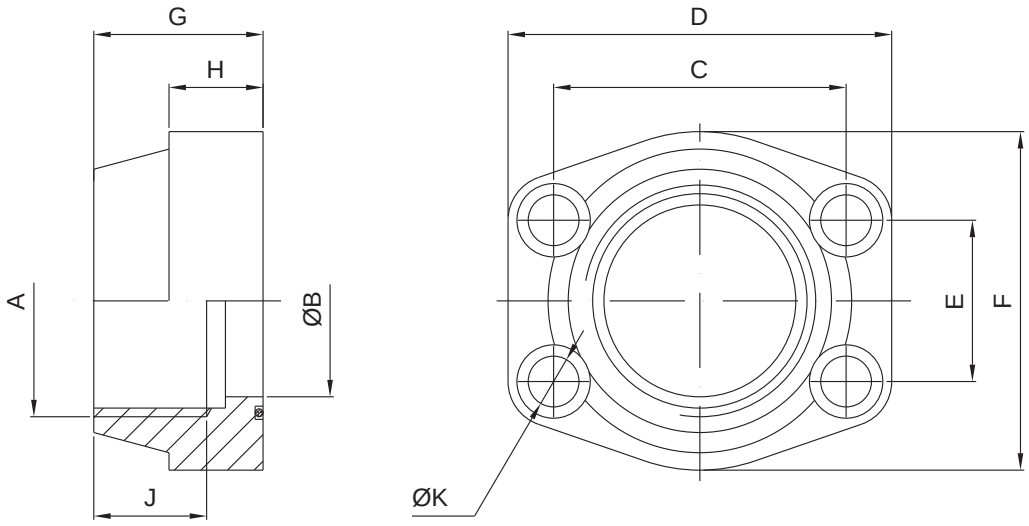
FLOW-RATE REGULATOR UNIT



If the pump is supplied with flow-rate regulator unit "Q", set to less than 50% of the nominal flow, the pump can only start on condition that the system and pump are completely filled with fluid.

Pump type Indicative data that can change from pump to pump	02 PVS 2-40	02 PVS 2-50	02 PVS 3-63	02 PVS 3-80	02 PVS 3-100
MAX flow at 1450 r/min (l/min)	62	78	100	125	152
MIN flow at 1450 r/min (l/min)	14.3	30.3	14	39	66
Reduced flow by screw turn (l/min)	23.8	23.8	34.5	34.5	34.5

FLANGES SAE J518 (3000 SERIES) SUPPLIED WITH SCREWS AND O-RING



Pump type	Ordering code	Nominal size	A	ØB	C	D	E	F	G	H	J	ØK	Screws	O-Ring
02 PVS PSP 2	5540000102	1"	1" Gas (BSP)	25	52.4	70	26.2	52	38	18	19	11	M10	OR 4131 NBR
	5540000106	1" 1/2	1"½ Gas (BSP)	38	70	93	35.7	78	44	25	24	13.5	M12	OR 4187 NBR
02 PVS PSP 3	5540000104	1" 1/4	1"¼ Gas (BSP)	32	58.7	79	30.2	68	41	21	22	11.5	M10	OR 4150 NBR
	5540000108	2"	2" Gas (BSP)	51	77.8	102	42.9	90	45	25	30	13.5	M12	OR 4225 NBR

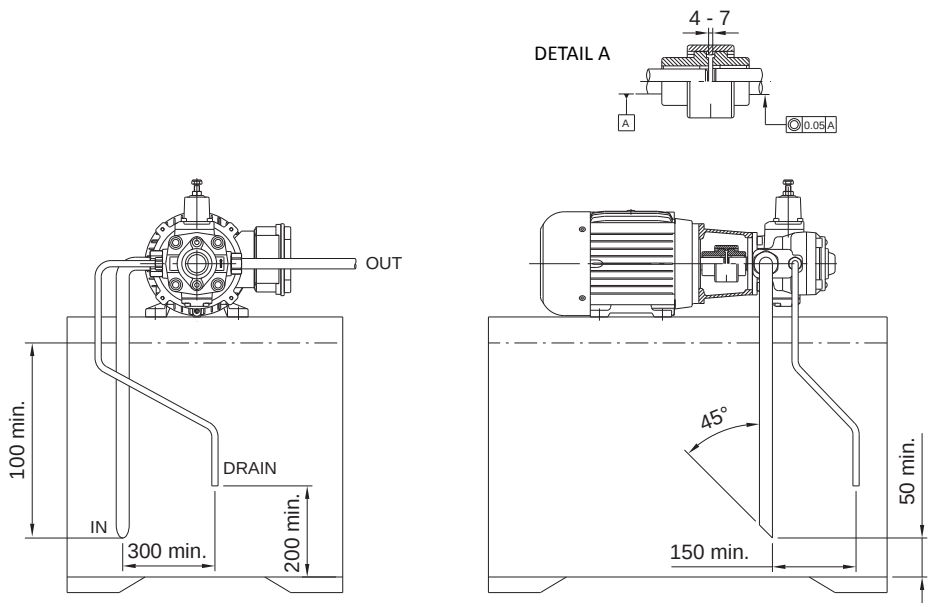
INSTRUCTIONS FOR INSTALLATION AND USE

1) Sizes 2 and 3 PVS pumps must be mounted with the shaft along a horizontal axis and with the compensator device facing upward (see figure).
   When the pump is installed above the tank oil level, pay attention to the inlet pressure (see page 6).
   The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. The inlet pipes should be as short as possible, with a small number of bends and without internal section changes.

2) All return and drain pipes must be positioned so that the oil cannot be sucked back directly by the pump (see figure).
   The oil tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate.
   To ensure the maximum pump working life, the inlet oil temperature must never be above 50°C. In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended.
   The pressure on the drain port must never exceed the specified value (page 6).
   The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum oil level to avoid generating foam. Moreover, the drain pipe must be free of restrictions and as far as possible from the inlet pipe.

3) Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. When assembling, maximum attention must be given to the distance between the half-couplings which must strictly fall within the values specified in the diagram below (detail "A").
   Other types of motor-pump couplings are not permitted.
   No induced RADIAL or AXIAL LOADS are allowed on the pump shaft.

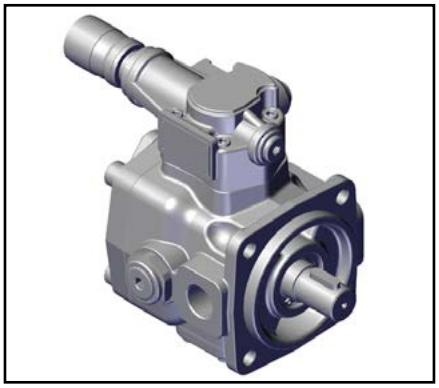
4) During initial installation, the pump must be run under maximum flow conditions (P connected to T), with the oil flowing directly into the tank, in order to induce air bleeding. This phase must run for several minutes.
   Pump priming (delivery of oil to the outlet) must occur within a few seconds, otherwise the pump must be turned off and the operation repeated. Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with oil.
   During the initial and subsequent starting operations, the difference between the oil temperature and the ambient temperature (body pump temperature) must not exceed 20°C.



For further information, please consult the leaflet "Installation and start-up instructions for variable displacement vane combined pumps".

Variable displacement vane pumps (with hydraulic pressure compensator)

PSP-Type



Key Features:

Rotation: Right (viewed from shaft end)
Mounting flanges: 4-hole flange (UNI ISO 3019/2)
Connections: GAS BSP (UNI ISO 228/1) and SAE
Mechanical displacement limiter "Q" on request
All pumps are already set up as standard to be coupled to each other and with other types of pump
Wide choice of pressure and flow regulation controls

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
02-PSP-2-40	40	58	160
02-PSP-2-50	50	73	160
02-PSP-3-63	63	91	150
02-PSP-3-80	80	116	150
02-PSP-3-100	100	145	150

CONTENTS

WARNING

All Berarma pumps have been carefully checked during manufacture and subjected to stringent testing cycles before shipment. To achieve optimum performance, avoid problems and maintain the warranty, the installation instructions enclosed with each pump sold must be strictly observed.

NOTES

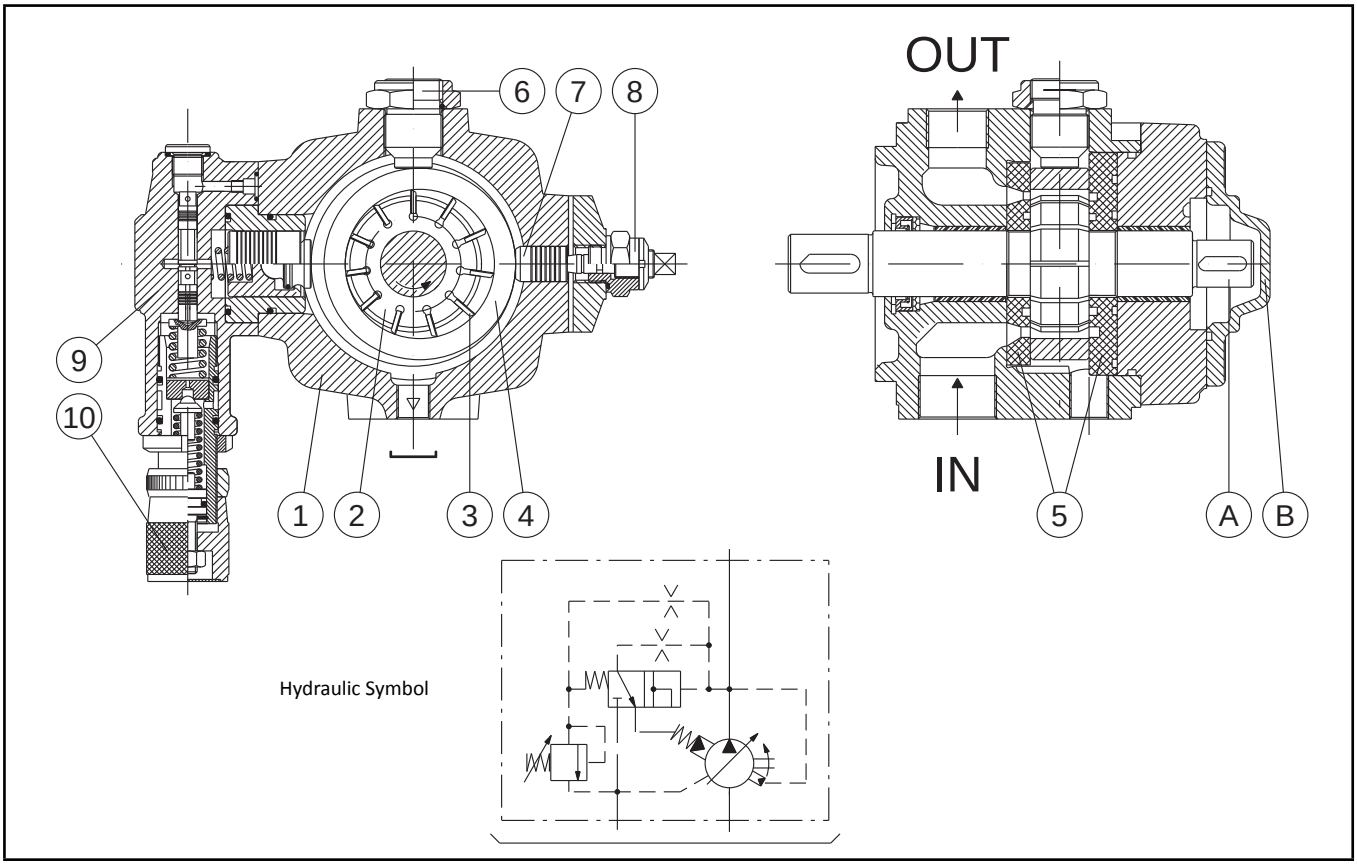
Before selection and/or use of any Berarma product, it is important that the purchaser carefully analyses all aspects of its application and reviews the information in the current Berarma Technical-Sales catalogues. Due to the many different operating conditions and applications for Berarma products, the purchaser, through their own analysis and testing, is solely responsible for making the final selection of the products and assuring that all performance and safety requirements are met.

Berarma S.r.l. accepts no responsibility for any editing mistakes in this catalogue.
Berarma S.r.l. reserves the right to modify the products and data contained in this catalogue at any time and without prior notice.

GENERAL DESCRIPTION

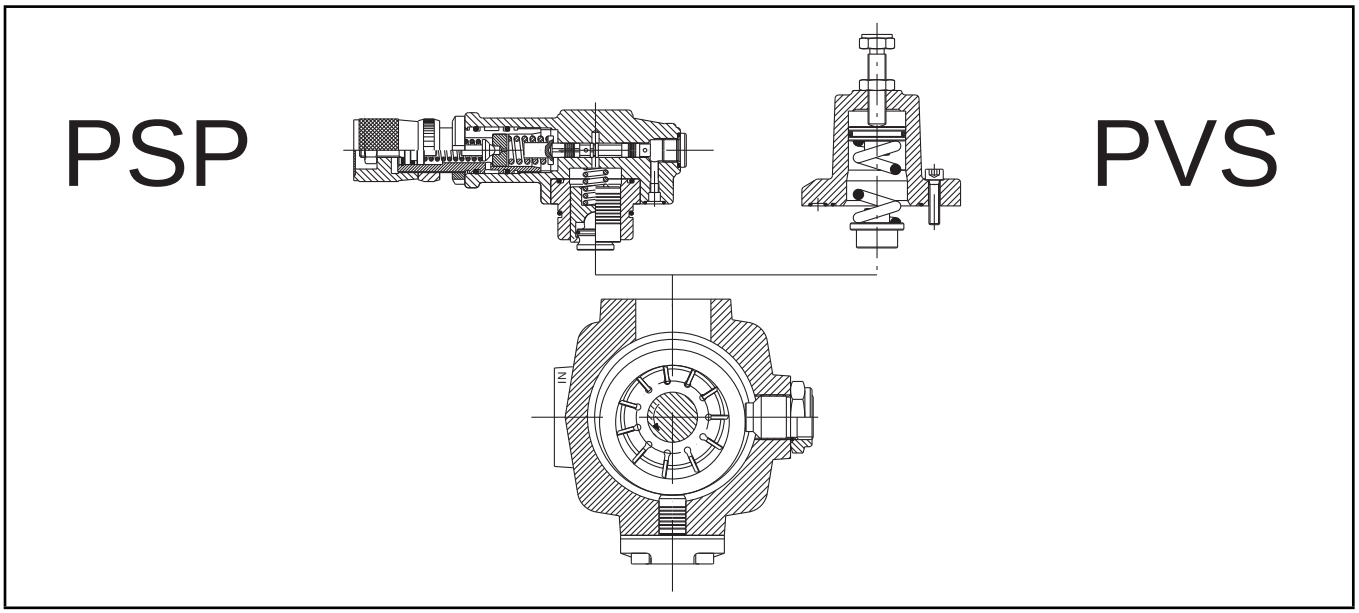
Berarma PSP variable displacement vane pumps come in two nominal sizes: Size 2-3. The PSP high pressure pumps (160 bar) are equipped with a HYDRAULIC pressure regulating device.

Pump components include: a body (1), a drive rotor (2) which houses the vanes (3), vanes that transport the fluid into the inlet and outlet chambers; a stator (4) (mobile circular ring) for varying eccentricity and consequently displacement; side distribution plates with AXIAL HYDROSTATIC COMPENSATION (5) which delimit the inlet and outlet chambers; a guide block balancing adjustment screw (6) (absolutely must not be tampered with by the user); a displacement adjustment piston (7), a maximum flow regulation screw (8) (available on request); a pressure control device (9); and a pressure regulator (10).



CHARACTERISTICS

- SILENT RUNNING from 63 to 72 dB(A)
- HIGH EFFICIENCY
- LONG WORKING LIFE
- The pumps can be supplied with various proportional devices for flow, pressure and power control
- ISO standard MOUNTING FLANGES
- GAS (BSP), SAE standard PORT CONNECTIONS
- MODULAR DESIGN: All Berarma pumps feature modular design for maximum flexibility and adaptability.
  The pumps comprise a body, common to each size, on which the various types of compensator devices (mechanical and hydraulic for pressure and flow control) can be mounted.
  The pump can therefore be converted from PVS to PSP and vice versa without any special modification, using the same standard pump body.



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ORDERING CODE

Series/ Name	Size Displacement	Flange	Pressure setting	Rotation	Seals	Controls Pressure	Options
02 PSP			**H**	**R**			

Code	Size	Displacement (cm^3/r)
2 - 40	2	40
2 - 50	2	50
3 - 63	3	63
3 - 80	3	80
3 - 100	3	100

Code	Flange	Thread
F	UNI ISO3019/2 - 4 holes	GAS UNI ISO 228/1; SAE

Code	Pressure setting
H	30 - 160 bar (for Size 2) 30 - 150 bar (for Size 3)

Code	Rotation Direction
R	Right (viewed from shaft end)

Code	Seals
M	NBR
E	FPM (viton)

Code	Size
/	Omit for single stage pressure compensator
PCS002	Pump with remote pressure control
PCS003	Pump with two-stage pressure control, one with fixed setting
PCS004	Pump with two-stage pressure control, both adjustable
PCS005	Pump with proportional pressure control
PCLS001	LOAD SENSING pump with single-stage pressure compensator
PCLS002	LOAD SENSING pump with remote pressure control
PCLS003	LOAD SENSING pump with two-stage pressure control, one with fixed setting
PCLS004	LOAD SENSING pump with two adjustable pressure stages
PCLS005	LOAD SENSING pump with proportional pressure control

Code	Options
KL	Key-Lock Compensator
Q	Displacement adjustment

Ordering code example:

- 02 PSP 2-40 F H R M
- 02 PSP 3-80 F H R M Q PCS002
- 02 PSP 3-100 F H R M

TECHNICAL DATA

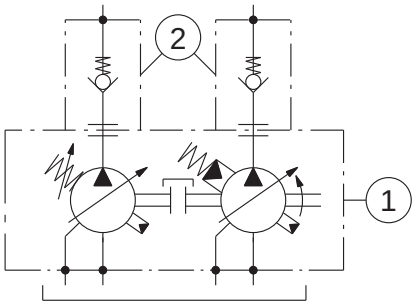
NOMINAL SIZE	Size 2	Size 3
Geometric displacement according to UNI-ISO 3662 (cm^3/r)	40 - 50	63 - 80 - 100
Actual displacement (cm^3/r)	42.8 - 53.1	69 - 86.2 - 105.5
Maximum working pressure (bar)	160	150
Pressure setting range (bar)	H: 30 - 160	H: 30 - 150
Permitted maximum drain port pressure (bar)	1	
Inlet pressure (absolute - bar)	0.8 - 1.5	
Speed range (r/min)	800 - 1800	
Rotation direction (viewed from shaft end)	Right (clockwise) R	
Loads on drive shaft	NO RADIAL OR AXIAL LOADS ALLOWED	
Maximum torque on primary shaft (Nm)	400	740
Hydraulic fluid	HM hydraulic oil according to ISO 6743/4; HLP hydraulic oil according to DIN 51524/2; organic ester HFD-U according to ISO 6743/4 (Quintolubric 888); for other fluids contact Berarma Technical-Sales Service	
Viscosity range (cSt, mm2/s)	22 - 68	
Starting viscosity under full flow conditions (cSt, mm^2/s)	400 max	
Viscosity index according to ISO 2909	100 min	
Inlet fluid temperature range (°C)	-10 - +50	
Maximum acceptable fluid contamination level	20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638	
Recommended fluid contamination level for a longer pump working life	18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638	
Weight (kg)	33	45
For different operating conditions, please contact Berarma Technical Service		

COMBINED PUMPS

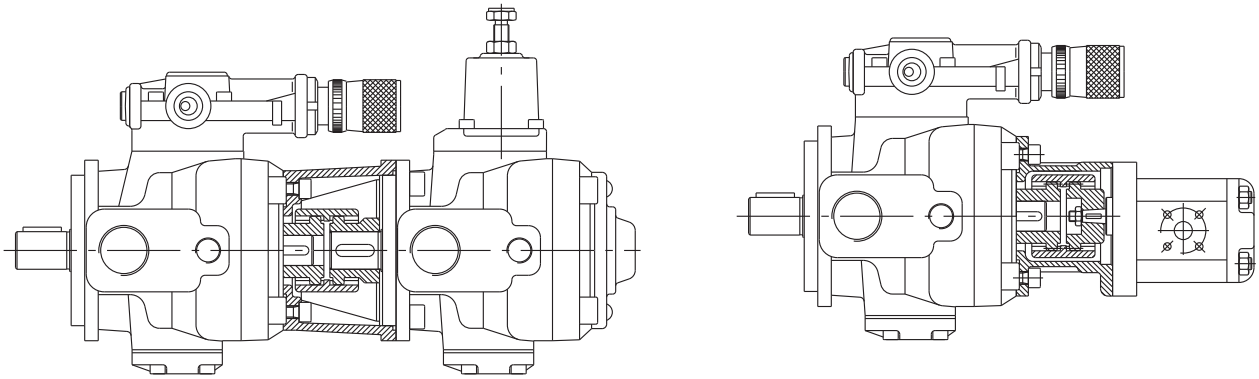
BERARMA pumps are already set up for coupling to one another or to other types of pump (see table of possible combinations). The standard rotor shaft is set up for coupling (see pump section view, detail "A", on page 3). After removal of cover "B", the pump can be fitted with the different units already set up for coupling.

With this solution BERARMA intends to avoid pumps with non-standard special applications, in order to simplify interchangeability and pump combination.

For solutions different to the ones described, please contact Berarma Technical Service.



1) Combined Pumps
2) Non return valves - recommended installation (supplied on request)

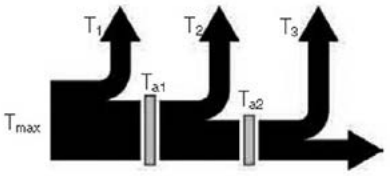


The ordering code should be specified according to the coupling sequence

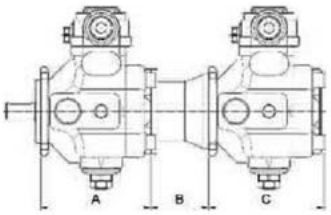
PRIMARY PUMP CODE	+	COUPLING UNIT CODE	+	SECONDARY PUMP CODE

Combined pumps should be mounted in decreasing order of absorbed power, paying attention to the maximum acceptable torques (see diagram below).
The ordering code for a combined pump should be specified according to coupling sequence (primary pump code + coupling unit code + secondary pump code).

- The sum of individual torques of all pumps in the complete pump combination must not exceed the maximum permissible torque value applicable to the primary pump shaft (T_{max} see page 6).
- Secondary pump torque (or sum of torques for more than one secondary pump) must not exceed the coupling unit maximum thru drive torque (T_a, see table below).



$$\begin{cases} T_1 + T_2 + T_3 < T_{max} \\ T_2 + T_3 < T_{a1} \\ T_3 < T_{a2} \end{cases}$$



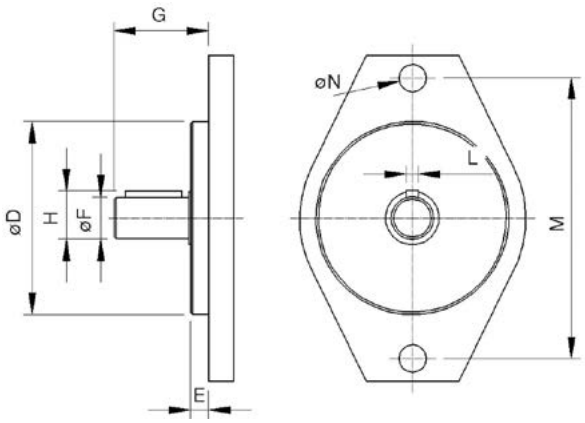
PRIMARY PUMP		SECONDARY PUMP		COUPLING UNIT		
Pump type	**A**	**Pump type**	**C**	**Code**	**B**	**Maximum thru drive torque T_a**
02 PSP 2 (40-50) F	173	GEAR PUMP SIZE 1P	(*)	3000022000	90	110 Nm
		GEAR PUMP SIZE 1	(*)	3000022100	90	
		GEAR PUMP SIZE 2	(*)	3000022200	90	
		GEAR PUMP SIZE 3	(*)	3000022300	90	
		01 PLP 05 16 F	107	3000020400	85	
		01 PLP 05 16 FGR2	107	3000022200	90	
		01 PHP 05 16 F	145	3000020400	85	
		01 PHP 05 16 FGR2	145	3000022200	90	
		01 PLP 1 (20-25-32) F	166	3000020100	87	
		01 PHP 1 (20-25-32)F	166	3000020100	87	
		02 PVS 2 (40-50) F	220	3000020200	102	
		02 PSP 2 (40-50) F	220	3000020200	102	
		SAE "A"	(*)	3100000200	100.5	
		SAE "B"	(*)	3100000300	126.5	
02 PSP 3 (63-80-100) F	198	GEAR PUMP SIZE 1P	(*)	3000022000	90	
		GEAR PUMP SIZE 1	(*)	3000022100	90	
		GEAR PUMP SIZE 2	(*)	3000022200	90	
		GEAR PUMP SIZE 3	(*)	3000022300	90	
		01 PLP 05 16 F	107	3000020400	85	
		01 PLP 05 16 FGR2	107	3000022200	90	
		01 PHP 05 16 F	145	3000020400	85	
		01 PHP 05 16 FGR2	145	3000022200	90	
		01 PLP 1 (20-25-32) F	166	3000020100	87	
		01 PHP 1 (20-25-32)F	166	3000020100	87	
		02 PVS 2 (40-50) F	220	3000020200	102	
		02 PSP 2 (40-50) F	220	3000020200	102	
		SAE "A"	(*)	3100000200	100.5	
		SAE "B"	(*)	3100000300	126.5	
		02 PVS 3 (63-80-100) F	245	3000020300	117	180 Nm
		02 PSP 3 (63-80-100) F	245	3000020300	117	

(*) For the secondary pump SAE A flange dimensions please see page 9.
In order to find out the secondary SAE flange pump axial dimension please see the manufacturer's catalogue.

(**) For the secondary gear pump flange dimensions please see page 9.
In order find out the secondary gear pump axial dimension please see the manufacturer's catalogue.

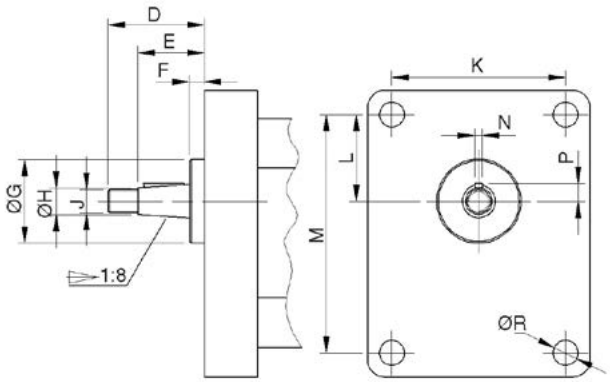
For other coupling unit types, please contact Berarma Technical-Sales Service.

SAE FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



Secondary pump	Secondary pump with SAE flange should conform to the dimensions below								
	Ø D	E	Ø F	G		H	L	M	Ø N
				min	max				
SAE "A"	Ø82.5	7	Ø19.05	32	59	21.1	4.8	106.4	11.1
SAE "B"	Ø101.6	9.5	Ø22.2	41	71	25.1	6.375	146	14.3
						25.5	4.8		

GEAR PUMP FLANGE DIMENSIONS FOR BERARMA COUPLING KIT



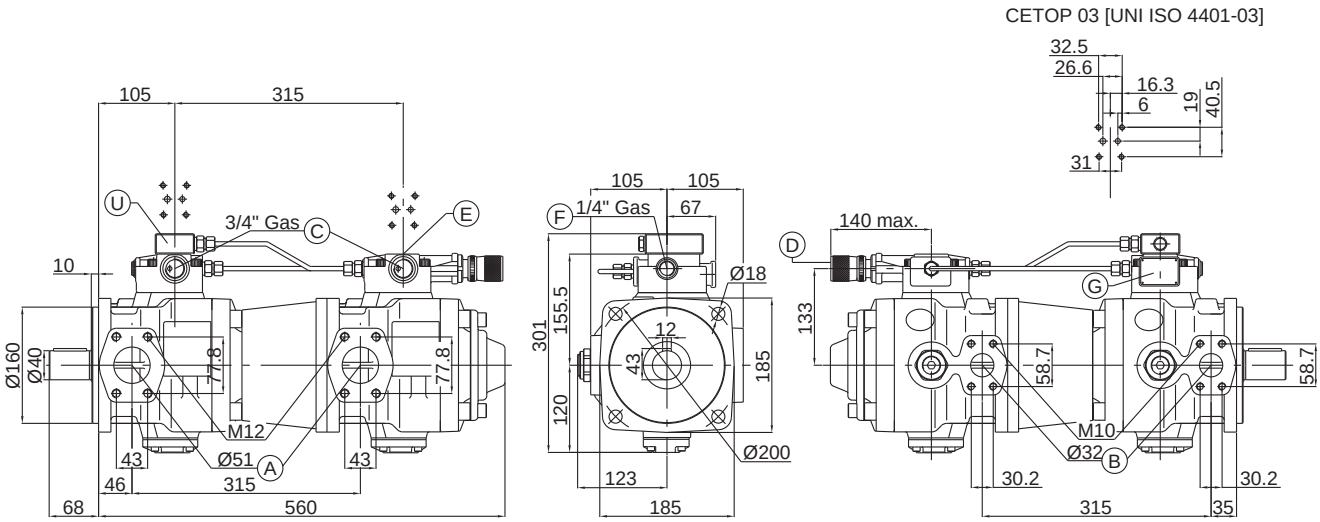
Secondary pump	Secondary gear pumps should conform to the dimensions below											
	D	E	F	Ø G	Ø H	J	K	L	M	N	P	Ø R
gear pump 1P	29	20	4	25.4	8	M7	52.4	26.2	71.9	2.4	5.3	7.5
gear pump 1	35	23.5	5.5	30	12	M10x1	56	24.5	73	3	7.9	6.5
gear pump 2	40	28	5	36.5	14.7	M12x1.5	71.5	32.5	96	4 (*)	9.7	8.5
gear pump 3	47	33	5	50.8	19	M14x1.5	98.5	43	128	4	12.2	11

COMBINED PUMPS WITH SINGLE PRESSURE CONTROL DEVICE

In response to market demand, Berarma has widened its range of products to cater to the request for higher displacement pumps.
In fact, rather than developing large displacement pumps as such, Berarma has obtained the same results by combining standard SIZE 3 pumps controlled by a single hydraulic device for pressure regulation.

This solution:
- reduces noise level
- cuts down production costs

OVERALL DIMENSIONS



A -	SAE flange inlet port.
B -	SAE flange outlet port.
C -	GAS (BSP) thread drain ports.
D -	Pressure regulating knob. Rotate clockwise to increase pressure.
E -	Set-up for pressure control system with CETOP 03 [UNI ISO 4401-03] mounting surface.
F -	1/4" GAS (BSP) port connection for pressure gauge.
G -	Identification plate.
U -	Manifold block, with CETOP 03 [UNI ISO 4401-03] mounting surface, for solenoid operated directional control valve to vent air.

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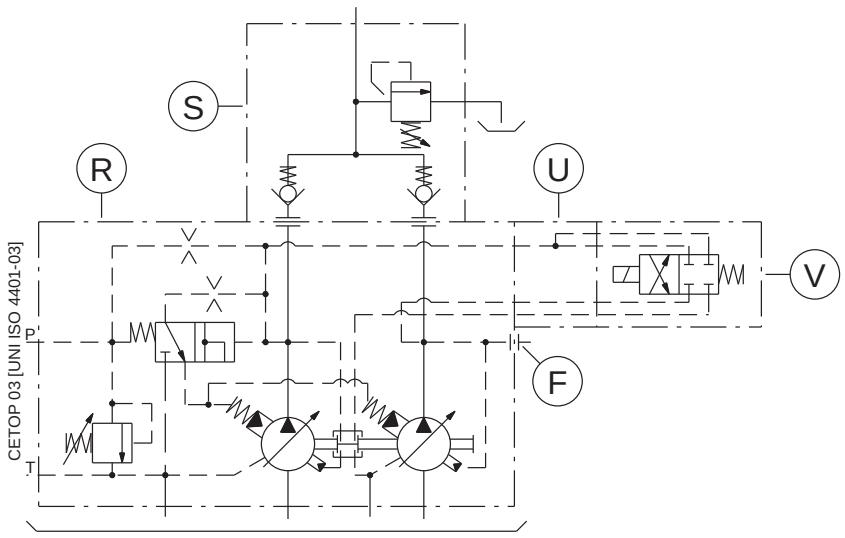


For further information, please consult the leaflet "Installation and start-up instructions for PSPC-type variable displacement vane combined pumps with single pressure control device".

Geometric displacement (cm^3/r)	126	143	160	180	200
Actual displacement (cm^3/r)	138	155.2	172.4	191.7	211

R -	Combined pumps with single pressure control device.
S -	Outlet manifold with check valves and maximum pressure relief valve. Supplied on request. Installation recommended.
F -	1/4" GAS (BSP) port connection for pressure gauge.
U -	Manifold block, with CETOP 03 [UNI ISO 4401-03] mounting surface, for solenoid operated directional control valve to vent air.
V -	Solenoid operated directional control valve to vent air. Supplied on request (specify coil type). Must be installed in case of starting under zero flow setting conditions.

ORDERING CODE

	1	2	3	4	5	6	7	8	9	10
	SERIES	NAME	SIZE	DISPLACEMENT	FLANGE	PRESS. SETTING	ROTATION	SEALS	PRESS. CONTROLS	OPTIONS
E.G.	**02**	**PSPC**	**3**	**200**	**F**	**H**	**R**	**M**	**PCS...**	**KL**

1 PUMP SERIES = 02

2 PUMP NAME = PSPC

3 PUMP SIZE = 3

4 DISPLACEMENT CM^3/R = 126, 143, 160, 180, 200

5 FLANGE AND PORT CONNECTIONS=
F (Flange: UNI ISO 3019/2
Inlet-Outlet: flange SAE J518
Drain port: GAS BSP UNI ISO 228/1 thread)

6 PRESSURE SETTING = H 30-120 bar

7 ROTATION = R (Right-hand [clockwise] rotation viewed from shaft end)

8 SEALS = M (NBR)

9 PRESSURE-FLOW CONTROL SOLUTIONS page 13
PCS002
PCS003
PCS004
PCS005

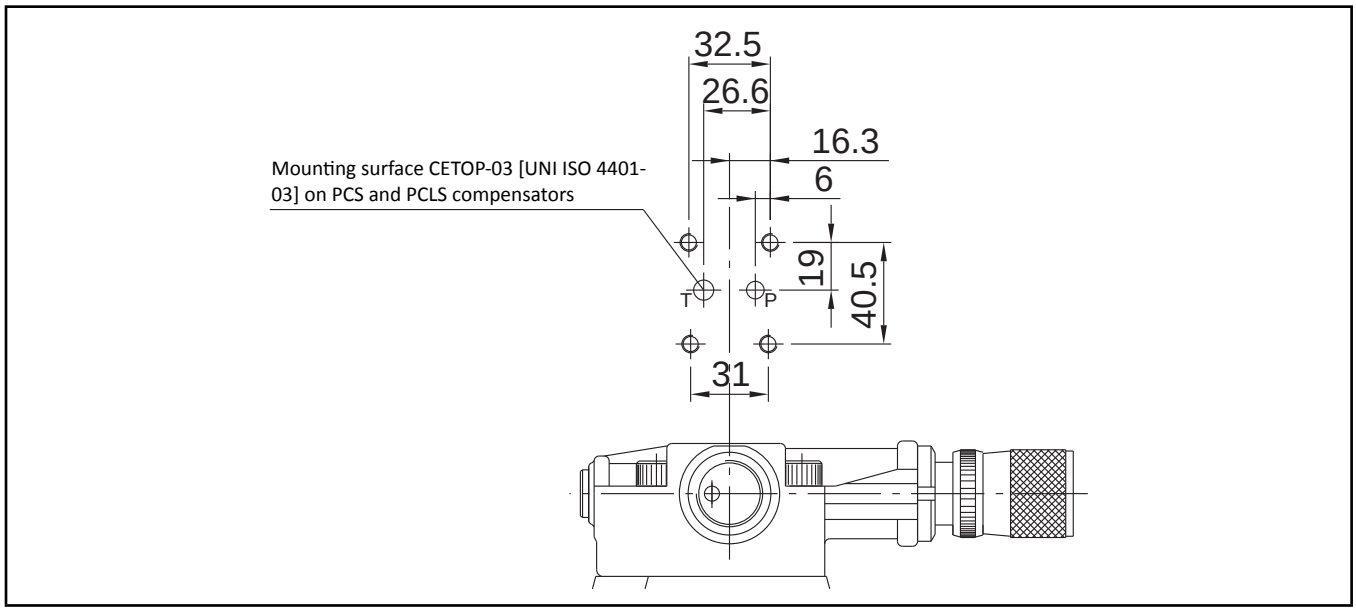
10 OPTIONS = KL (Key lock compensator)

PRESSURE-FLOW CONTROL SOLUTIONS

PSP pumps can be supplied with a wide range of electro-hydraulic devices for pressure and flow control.
In addition to its various pressure regulating systems, Berarma has developed a LOAD-SENSING device for its pumps (see diagrams with characteristic curves).
This solution make Berarma pumps suitable to be used in energy saving systems.

LOAD - SENSING
The LOAD-SENSING flow regulating system is relatively simple; the signal for the compensator is picked up from the pump pressure line after a restriction and before an actuator.
The regulating system (restriction) may comprise: throttle, manual or proportional type, or quick/slow units. As the extent of the restriction (at a fixed pressure drop Δp=20 bar [*]) changes, pump displacement is automatically varied by the system regardless of pressure variations in the circuit. The LOAD-SENSING system enables the notable limitation of power dissipation and is particularly suitable for applications with considerable torque (or force) and speed variations.

[*] Note: For different operating conditions, please contact Berarma Technical Service.



BERARMA oleodinamica

PRESSURE-FLOW CONTROL SOLUTIONS

Diagrams and characteristic curves for pressure regulation

1 Pump with standard pressure compensator

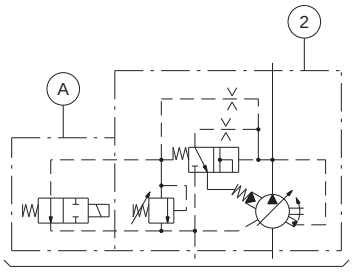
2 Pump with pressure compensator with CETOP 03 [UNI ISO 4401-03]

P	CS002
P	CS003
P	CS004

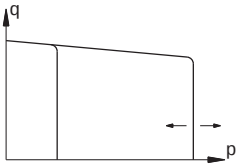
3 Pump with pressure compensator for proportional regulation with CETOP 03 [UNI ISO 4401-03]

P	CS005

Pump with two-stage pressure control, one of which is fixed (at the minimum pressure setting of the pump)

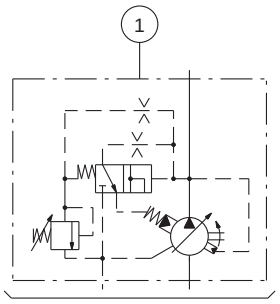


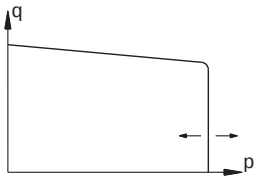
Code	P	CS003



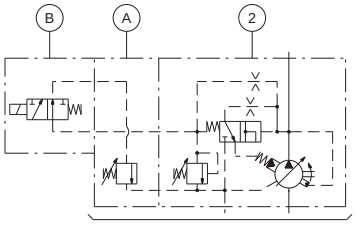
A - Solenoid valve supplied only on request (please specify coil type)

Standard pump

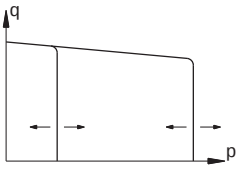




Pump with two-stage pressure control, both adjustable

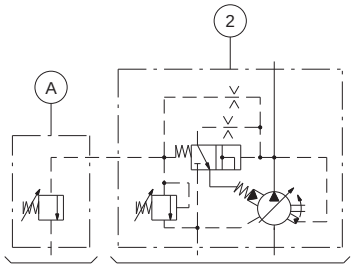


Code	P	CS004

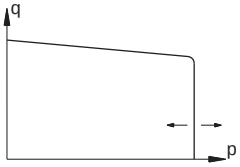


A - Berarma pressure relief valve supplied factory-assembled and tested
B - Solenoid valve supplied only on request (please specify coil type)

Pump with remote pressure control



Code	P	CS002

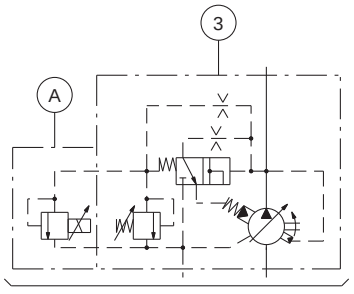


A - Maximum pressure relief valve (0-5 l/min) not supplied

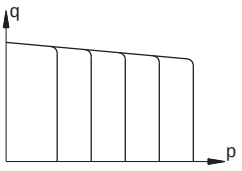
Note

- The length of the pilot pipe between the compensator and the valve must not exceed 5 m
- Remote control port 1/4" Gas (BSP) or 1/2"-20 UNF 2B

Pump with proportional pressure control



Code	P	CS005



A - Pressure control proportional valve supplied only on request

Diagrams and characteristic curves for combined LOAD SENSING and pressure regulation

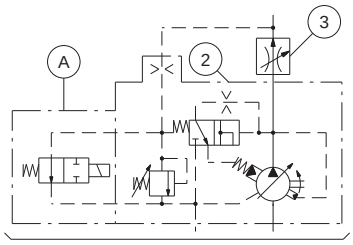
1 LOAD SENSING pump with standard pressure regulation — P | CLS001

2 LOAD SENSING pump with CETOP 03 mounting surface [UNI ISO 4401-03] — P | CLS002-3-4-5

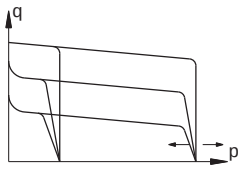
3 Manual-electrical-proportional flow regulator not supplied

Note
- The length of the individual pipe between the flow regulator and the LOAD SENSING device must not exceed 5 m
- Load Sensing signal connection 1/4" Gas

LOAD SENSING pump with two-stage pressure control, one of which is fixed (at the minimum pressure setting of the pump)

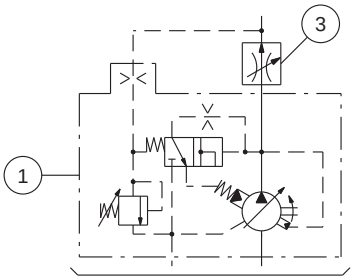


Code	P	CLS003

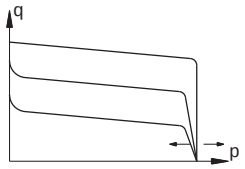


A - Solenoid valve supplied only on request (please specify coil type)

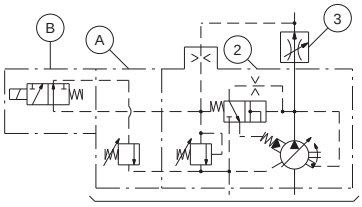
LOAD SENSING pump with standard pressure regulation



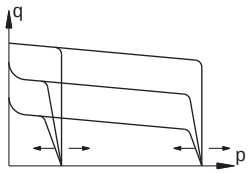
Code	P	CLS001



LOAD SENSING pump with two adjustable pressure stages

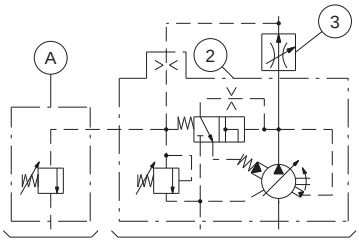


Code	P	CLS004

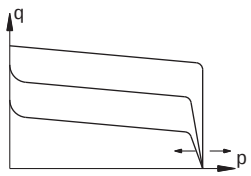


A - Berarma pressure relief valve supplied factory-assembled and tested
B - Solenoid valve supplied only on request (please specify coil type)

LOAD SENSING pump with remote pressure control



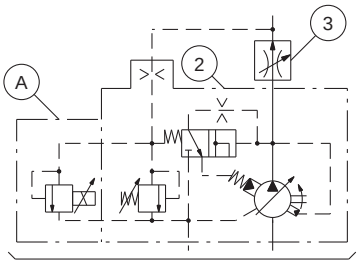
Code	P	CLS002



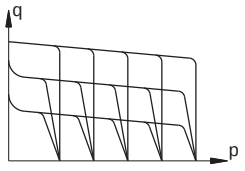
A - Maximum pressure relief valve (0-5 l/min) not supplied

Note
- The length of the pilot pipe between the compensator and the valve must not exceed 5 m
- Remote control port 1/4" Gas (BSP)

LOAD SENSING pump with proportional pressure control



Code	P	CLS005



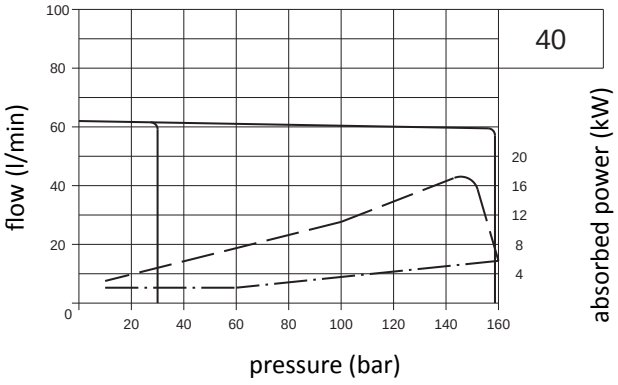
A - Pressure control proportional valve supplied only on request

CHARACTERISTIC CURVES

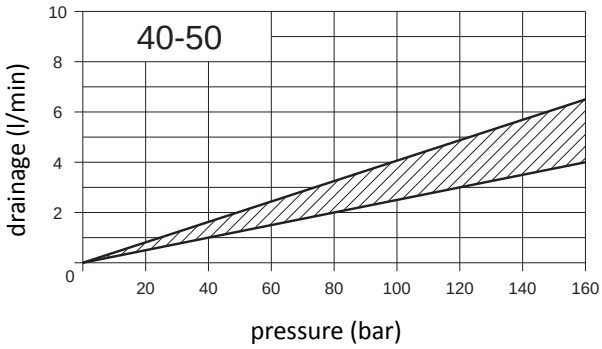
Indicative values related to 1450 r/min., HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 50°C

02 PSP 2 40-50

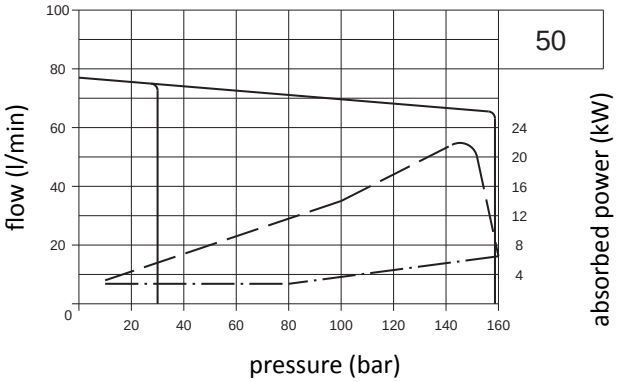
Volumetric efficiency -zero flow setting curve



values established with zero flow setting



Volumetric efficiency -zero flow setting curve

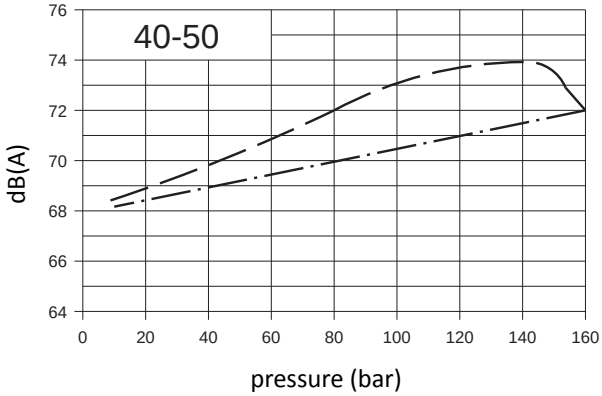


Power consumption with maximum flow

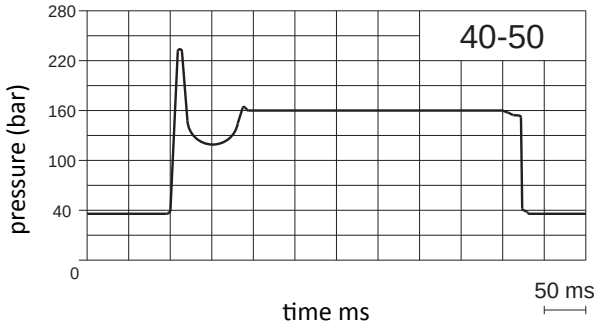
Power consumption with zero flow setting

Noise level

Maximum noise level measured on Berarma test bench with sound-level meter placed 1 metre from the pump, with flexible coupling



Response time and pressure peak



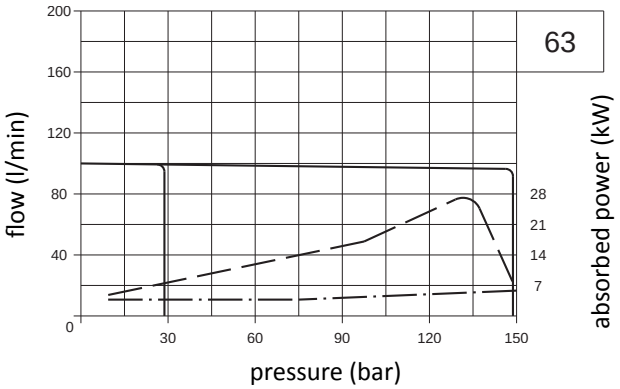
Pressure peaks are due to the test system. Pressure peaks exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures.

CHARACTERISTIC CURVES

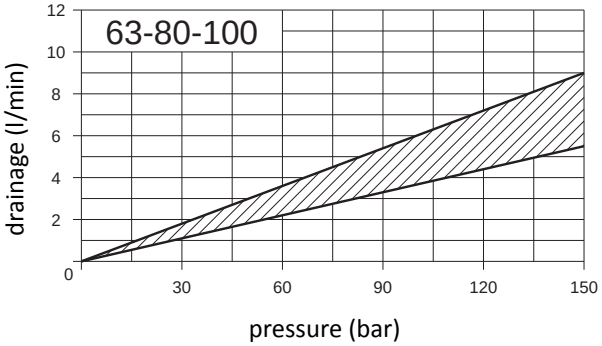
Indicative values related to 1450 r/min., HM hydraulic oil according to ISO 6743/4, ISO VG 32 according to ISO 3448, temperature 50°C

02 PSP 3 63-80-100

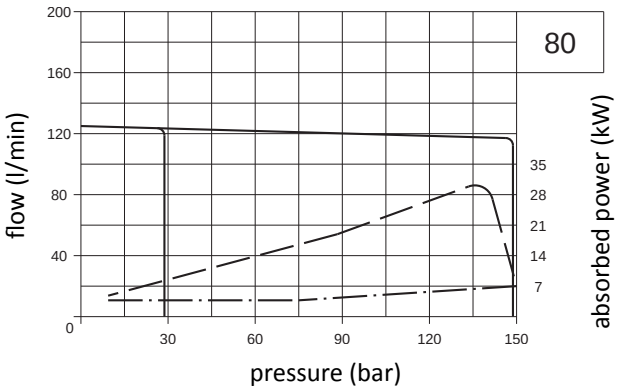
volumetric efficiency -zero flow setting curve



values established with zero flow setting

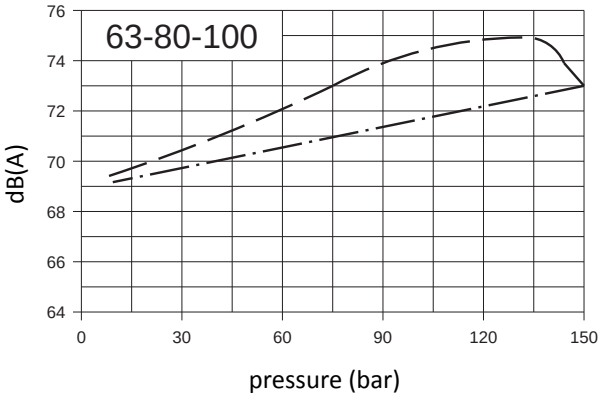


volumetric efficiency -zero flow setting curve

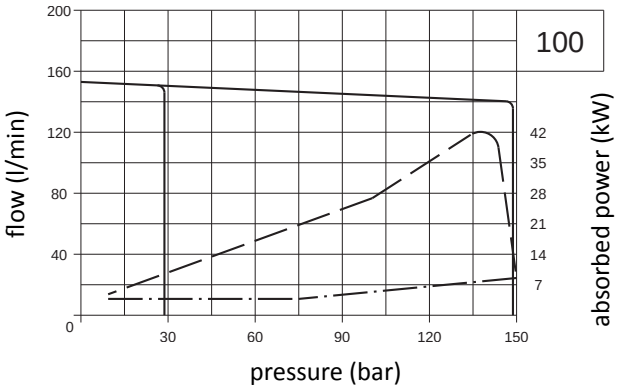


Noise level

Maximum noise level measured on Berarma test bench with sound-level meter placed 1 metre from the pump, with flexible coupling



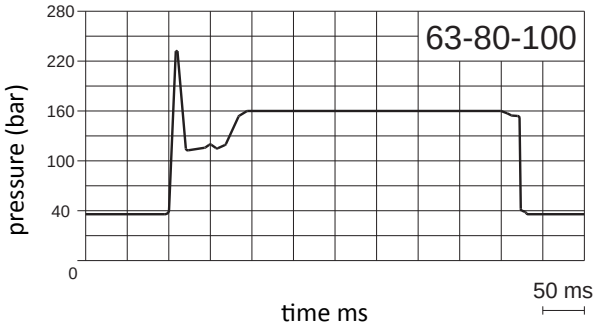
volumetric efficiency -zero flow setting curve



Power consumption with maximum flow

Power consumption with zero flow setting

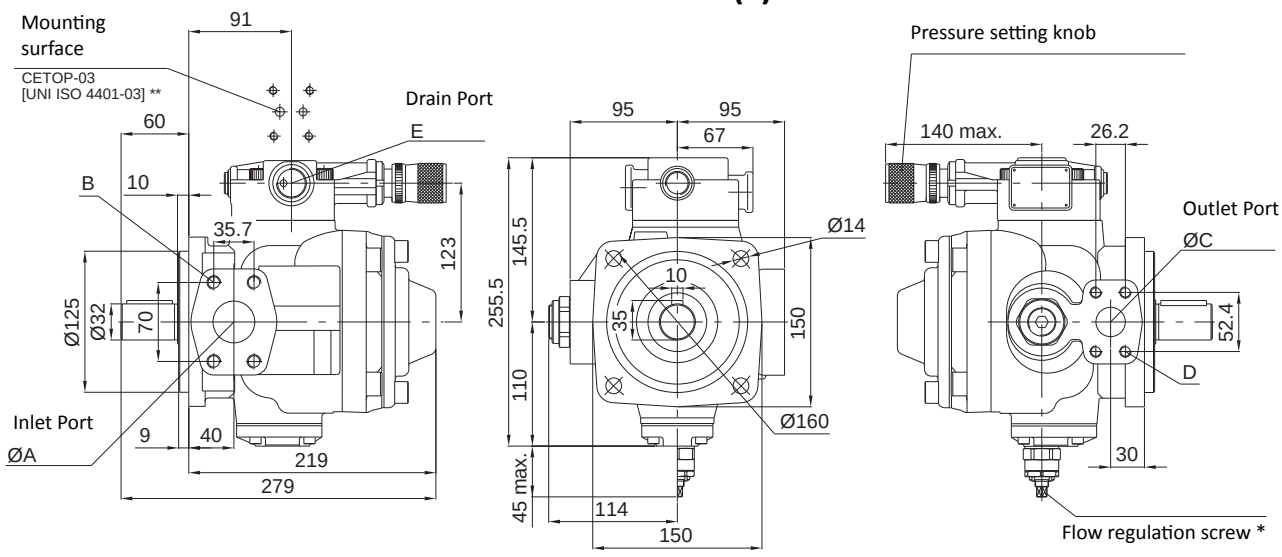
Response time and pressure peak



Pressure peaks are due to the test system. Pressure peaks exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures.

OVERALL DIMENSIONS

02 PSP 2 40-50 (F)

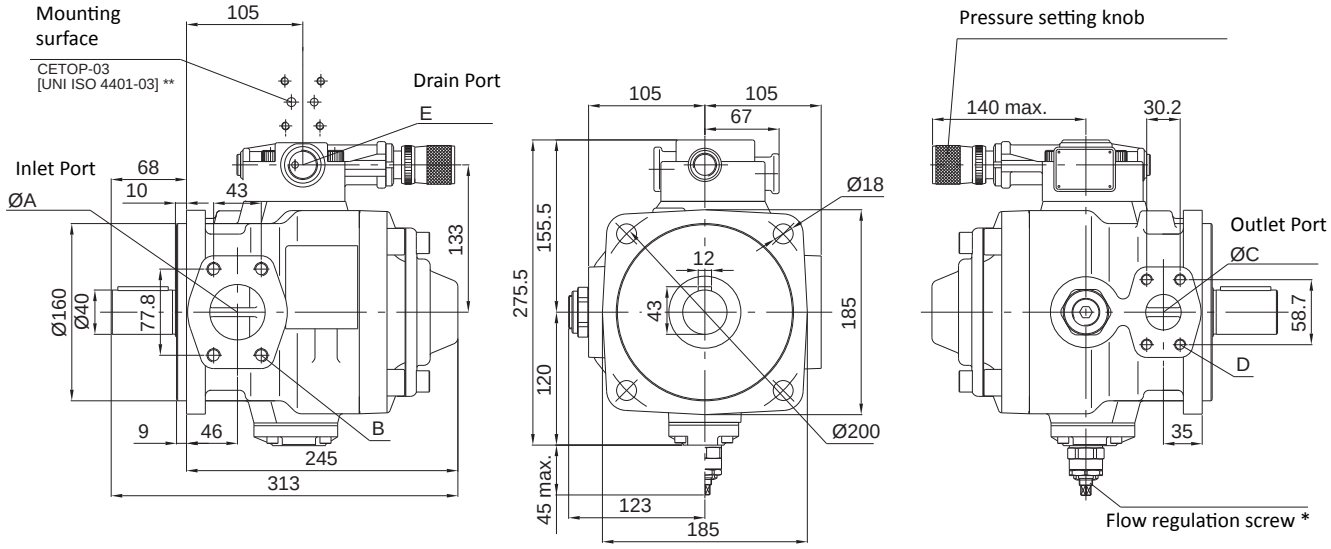


*- Supplied on request (see page 15)

** - Supplied on request (dimensions: see page 12)

Flange	ØA	B	ØC	D	E
F (ISO)	38	SAE (3000) 1"1/2 M12x45	25	SAE (3000) 1" M10x35	3/4" Gas (BSP)

02 PSP 3 63-80-100 (F)



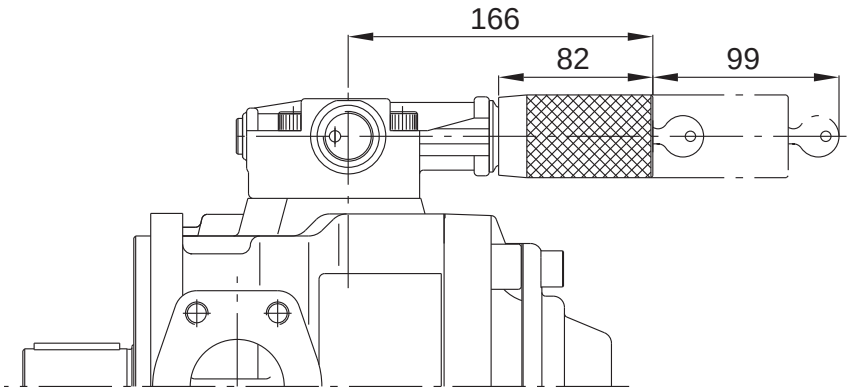
*- Supplied on request (see page 15)

** - Supplied on request (dimensions: see page 12)

Flange	ØA	B	ØC	D	E
F (ISO)	51	SAE (3000) 2" M12x45	32	SAE (3000) 1"1/4 M10x40	3/4" Gas (BSP)

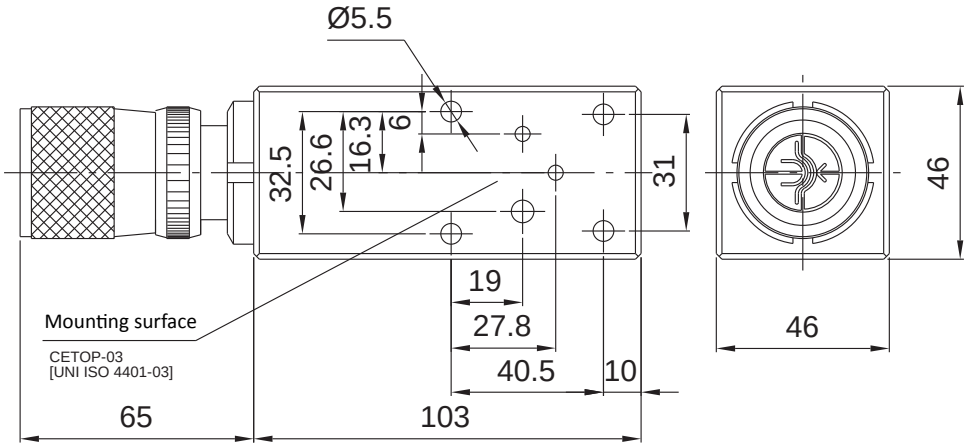
ACCESSORIES

KEY-LOCK PRESSURE COMPENSATOR DEVICE

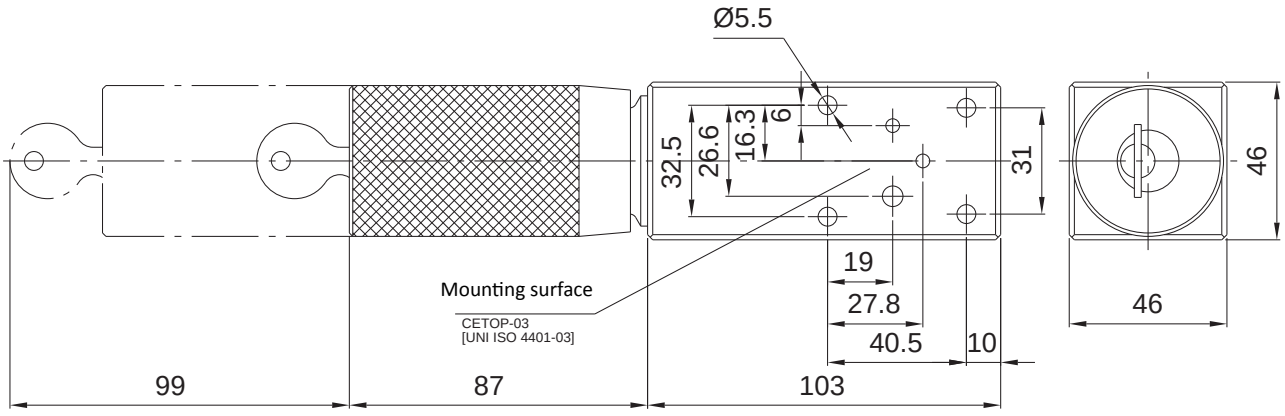


Note: In the case of combined pumps with Key-Lock pressure compensator, please contact Berarma Technical Service.

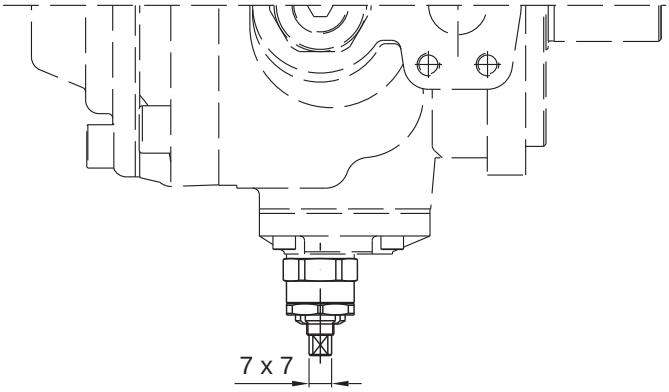
PRESSURE RELIEF VALVE FOR PSP PUMP (CODE 2010500600)



KEY-LOCK PRESSURE RELIEF VALVE FOR PSP PUMP (CODE 2010500700)



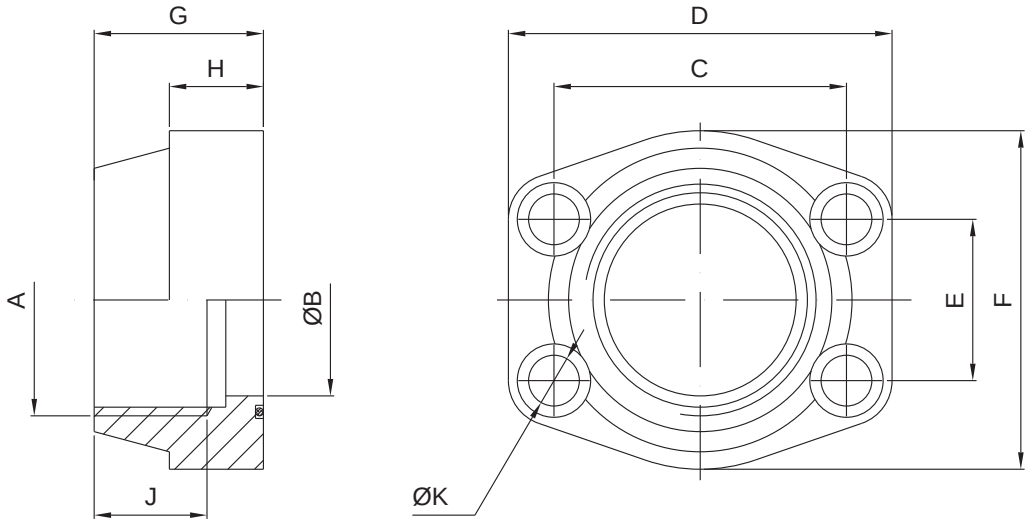
FLOW-RATE REGULATOR UNIT



If the pump is supplied with flow-rate regulator unit "Q", set to less than 50% of the nominal flow, the pump can only start on condition that the system and pump are completely filled with fluid.

Pump type Indicative data that can change from pump to pump	02PSP 2-40	02PSP 2-50	02PSP 3-63	02PSP 3-80	02PSP 3-100
MAX flow at 1450 r/min (l/min)	62	78	100	125	152
MIN flow at 1450 r/min (l/min)	14.3	30.3	14	39	66
Reduced flow by screw turn (l/min)	23.8	23.8	34.5	34.5	34.5

FLANGES SAE J518 (3000 SERIES) SUPPLIED WITH SCREWS AND O-RING



Pump type	Ordering code	Nominal size	A	ØB	C	D	E	F	G	H	J	ØK	Screws	O-Ring
02 PVS PSP 2	5540000102	1"	1" Gas (BSP)	25	52.4	70	26.2	52	38	18	19	11	M10	OR 4131 NBR
	5540000106	1" 1/2	1"½ Gas (BSP)	38	70	93	35.7	78	44	25	24	13.5	M12	OR 4187 NBR
02 PVS PSP 3	5540000104	1" 1/4	1"¼ Gas (BSP)	32	58.7	79	30.2	68	41	21	22	11.5	M10	OR 4150 NBR
	5540000108	2"	2" Gas (BSP)	51	77.8	102	42.9	90	45	25	30	13.5	M12	OR 4225 NBR

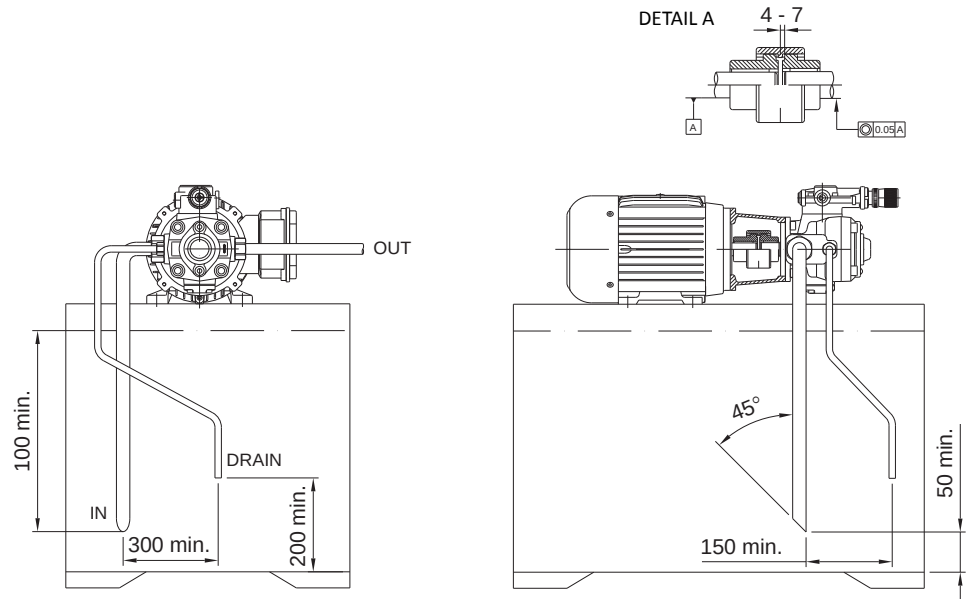
INSTRUCTIONS FOR INSTALLATION AND USE

1) Sizes 2 and 3 PSP pumps must be mounted with the shaft along a horizontal axis and with the compensator device facing upward (see figure).
   When the pump is installed above the tank oil level, pay attention to the inlet pressure (see page 6).
   The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. The inlet pipes should be as short as possible, with a small number of bends and without internal section changes.

2) All return and drain pipes must be positioned so that the oil cannot be sucked back directly by the pump (see figure).
   The oil tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate.
   To ensure the maximum pump working life, the inlet oil temperature must never be above 50°C. In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended.
   The pressure on the drain port must never exceed the specified value (page 6).
   The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum oil level to avoid generating foam. Moreover, the drain pipe must be free of restrictions and as far as possible from the inlet pipe.

3) Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. When assembling, maximum attention must be given to the distance between the half-couplings which must strictly fall within the values specified in the diagram below (detail "A").
   Other types of motor-pump couplings are not permitted.
   No induced RADIAL or AXIAL LOADS are allowed on the pump shaft.

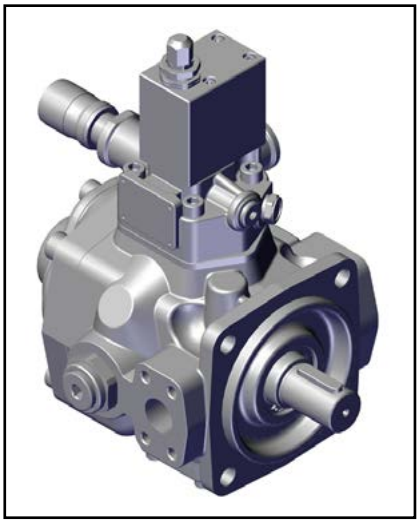
4) During initial installation, the pump must be run under maximum flow conditions (P connected to T), with the oil flowing directly into the tank, in order to induce air bleeding.
   For sizes 2 and 3 there is an air bleed on the compensator.
   This phase must run for several minutes. Pump priming (delivery of oil to the outlet) must occur within a few seconds, otherwise the pump must be turned off and the operation repeated. Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with oil.
   During the initial and subsequent starting operations, the difference between the oil temperature and the ambient temperature (body pump temperature) must not exceed 20°C.



For further information, please consult the leaflet "Installation and start-up instructions for variable displacement vane combined pumps".

Variable displacement vane pumps (with hydraulic pressure compensator with horse power limiter device)

PSPK-Type



Key Features:

Rotation: Right (viewed from shaft end)
Mounting flanges: 4-hole flange (UNI ISO 3019/2)
Connections: GAS BSP (UNI ISO 228/1) and SAE
Mechanical displacement limiter "Q" on request
All pumps are already set up as standard to be coupled to each other and with other types of pump
Wide choice of pressure and flow regulation controls

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
02-PSPK-1-16	16	23	160
02-PSPK-1-20	20	29	160
02-PSPK-1-25	25	36	160
02-PSPK-2-31	31	45	160
02-PSPK-2-40	40	58	160
02-PSPK-2-50	50	73	160
02-PSPK-3-63	63	91	150
02-PSPK-3-80	80	116	150
02-PSPK-3-100	100	145	150

CONTENTS

WARNING

All Berarma pumps have been carefully checked during manufacture and subjected to stringent testing cycles before shipment. To achieve optimum performance, avoid problems and maintain the warranty, the installation instructions enclosed with each pump sold must be strictly observed.

NOTES

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GENERAL DESCRIPTION

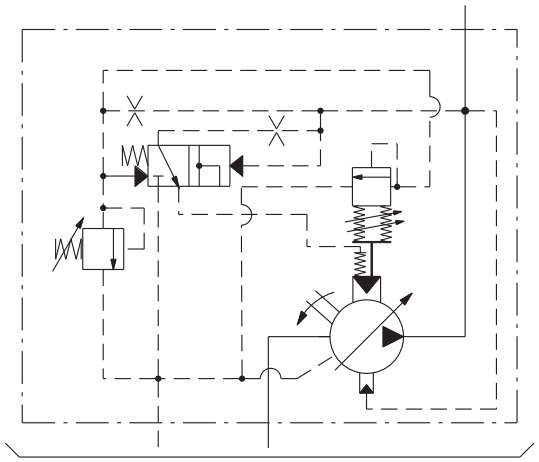
BERARMA is continually looking for solutions which would allow it to offer increasingly advanced systems and components to its users.
Therefore, BERARMA has designed a "CONSTANT POWER" control device for its PSP-type variable displacement vane pumps. This device allows the optimum usage of absorbed power.
The operating principle is based on maintaining the flow-pressure product (q x p) practically constant,
so that when the pressure increases, the flow decreases and vice versa, according to a characteristic hyperbolic-type curve.

BERARMA pumps with "CONSTANT POWER" control are especially suited for those systems with a work cycle consisting of two operating phases:

- a first phase characterized by a quick-approach at low pressure;
- a second phase characterized by low speed and high pressure (e.g. forming, drawing, blanking presses, etc.).

In this way, it is possible to set up a system using only one pump, where previously two pumps were required, resulting in obvious cost savings.

Hydraulic Symbol



TECHNICAL DATA

Nominal size	SIZE 1	SIZE 2	SIZE 3
Geometric displacement according to UNI ISO 3662 (cm^3/r)	16 - 20 - 25	31.5 - 40 - 50	63 - 80 - 100
Actual displacement (cm^3/r)	17.9 - 22.1 - 26.9	34.5 - 42.8 - 53.1	69 - 86.2 - 105.5
Mounting flange - Port Connections	F (UNI ISO 3019/2 - GAS BSP thread)		
Maximum working pressure (bar)	160	160	150
Pressure setting range	H - 30 / 160 bar		H - 30 / 150 bar
Permitted maximum drain port pressure (bar)	1		
Inlet pressure (absolute - bar)	0.8 - 1.5		
Speed range (r/min)	800 - 1800		
Rotation direction (viewed from shaft end)	Right (clockwise) R		
Loads on drive shaft	NO RADIAL OR AXIAL LOADS ALLOWED		
Maximum torque on primary shaft (Nm)	197	400	740
Hydraulic fluid	HM hydraulic oil according to ISO 6743/4; HLP hydraulic oil according to DIN 51524/2; organic ester HFD-U according to ISO 6743/4 (Quintolubric N822-300); for other fluids contact Berarma Technical-Sales Service		
Viscosity range (cSt, mm2/s)	22 - 68		
Starting viscosity under full flow conditions ($cSt, mm^2/s$)	400 max		
Viscosity index according to ISO/DIS 2909	100 min		
Inlet fluid temperature range (°C)	-10 - +50		
Maximum acceptable fluid contamination level	20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638		
Recommended fluid contamination level for a longer pump working life	18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638		
Weight (approximate value for standard configuration pump - Kg)	15	35	47

- For different operating conditions, please contact Berarma Technical Service
- For further PSPK pump technical data (noise level, ...) please consult the "Variable displacement vane pump type 02 PSP" BERARMA catalogue

HOW TO ORDER

The PSPK pump can be ordered in two different ways:

1) starting from the power value of the motor (contact BERARMA Technical Service to find out the available power values) and from the maximum working pressure, thus obtaining a characteristic curve making it possible for the pump to optimize installed power usage;

2) starting from the minimum flow value to be obtained at the previously defined maximum working pressure. In this way the motor power and the characteristic curve are determined from defined operating conditions.

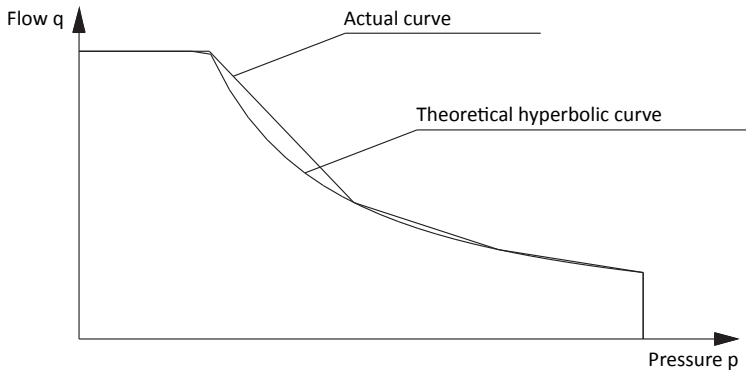
Starting from the motor power value and maximum working pressure value indicated in the ordering code, BERARMA performs the bench calibration of the constant power device so that the actual characteristic curve of the pump approximates the theoretical hyperbolic curve.

Note: the pressure setting of the constant power device must not be changed by users.

The pump absorbed power can be calculated using the following formula:

$$P\ [kW] = \frac{p\ [bar] \times [q\ [l/min]}{600 \times \eta}$$

where:
η = pump total efficiency (η ~ 0.88, purely indicative).

Example of a characteristic curve	

ORDERING CODE

ORDERING CODE

	1	2	3	4	5	6	7	8	9	10	11	12
	SERIES	NAME	SIZE	DISPLACEMENT	FLANGE	PRESS. SETTING	ROTATION	SEALS	PRESS. CONTROLS	MAX POWER	MAX PRESSURE	OPTIONS
E.G.	02	PSPK	1	16	F	H	R	M	PCS...	9	160	Q-KL

1 PUMP SERIES = 02

2 PUMP NAME = PSPK

3 PUMP SIZE = 1, 2, 3

4 DISPLACEMENT CM^3/R = 16 - 20 - 25 (SIZE 1)
31 - 40 - 50 (SIZE 2)
63 - 80 - 100 (SIZE 3)

5 FLANGE AND PORT CONNECTIONS =
F (UNI ISO 3019/2 - GAS BSP thread)

6 PRESSURE SETTING = H — 30-160 bar for SIZE 1-2; 30-150 bar for SIZE 3

7 ROTATION = R (Right-hand [clockwise] rotation viewed from shaft end)

8 SEALS = M (NBR); E (FPM-Viton)

9 PRESSURE CONTROL SOLUTIONS =
PCS002 Remote pressure control
PCS003 Two pressure stages
PCS005 Proportional press. control

10 MAX POWER = ... kW

11 MAX PRESSURE = ... bar

12 OPTIONS = KL (Key lock compensator); Q (Flow regulation screw)

Note:

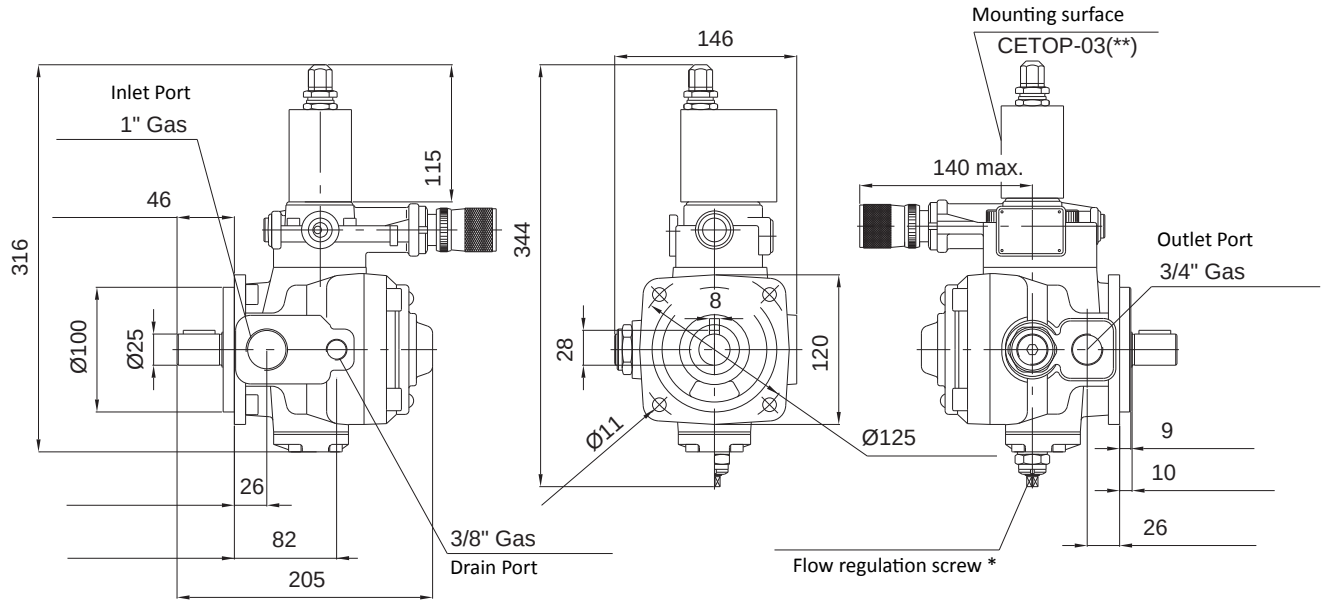
1) In the PCS002, PCS003 and PCS005 configurations, the PSPK pump is supplied with the CETOP 03 mounting surface. For further information about pressure control solutions, please consult the "Variable displacement vane pump type 02 PSP" BERARMA catalogue.

2) BERARMA PSPK pumps are already set up as standard to be coupled to each other. For further information, please contact BERARMA Technical Service.

3) For further information about point 12 of the ordering code, please consult the "Variable displacement vane pump type 02 PSP" BERARMA catalogue.

OVERALL DIMENSIONS

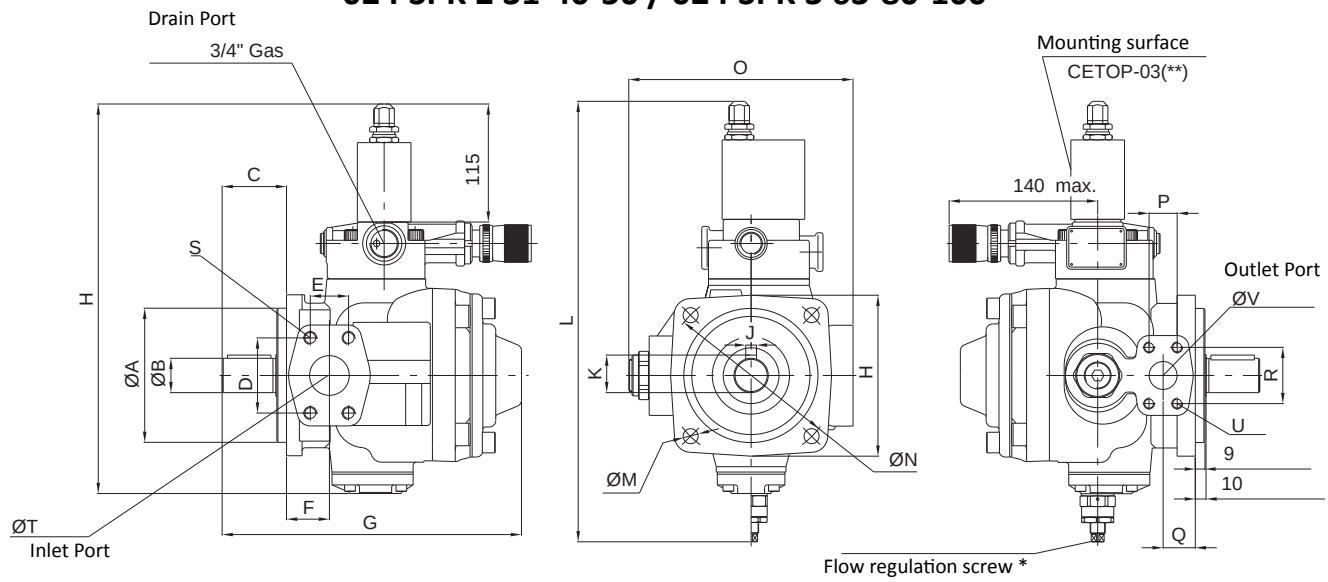
02 PSPK 1 16-20-25



*- Option

** - PCS002, PCS003, PCS005 Pressure Control Solutions

02 PSPK 2 31-40-50 / 02 PSPK 3 63-80-100



*- Option

(**) - PCS002, PCS003, PCS005 Pressure Control Solutions

Inlet and outlet port connections: SAE 3000

	ØA	ØB	C	D	E	F	G	H	J	K	L	ØM	ØN	O	P	Q	R	S	ØT	U	ØV
SIZE 2	125	32	60	70	35.7	40	279	371	10	35	416	14	160	209	26.2	30	52.4	SAE1"1/2 M12x45	38	SAE1" M10x35	25
SIZE 3	160	40	68	77.8	43	46	313	391	12	43	436	18	200	228	30.2	35	58.7	SAE2" M12x45	51	SAE1"1/4 M10x40	32

Notes:

- For further information about pumps dimensions, please consult the "Variable displacement vane pump type 02 PSP" BERARMA catalogue

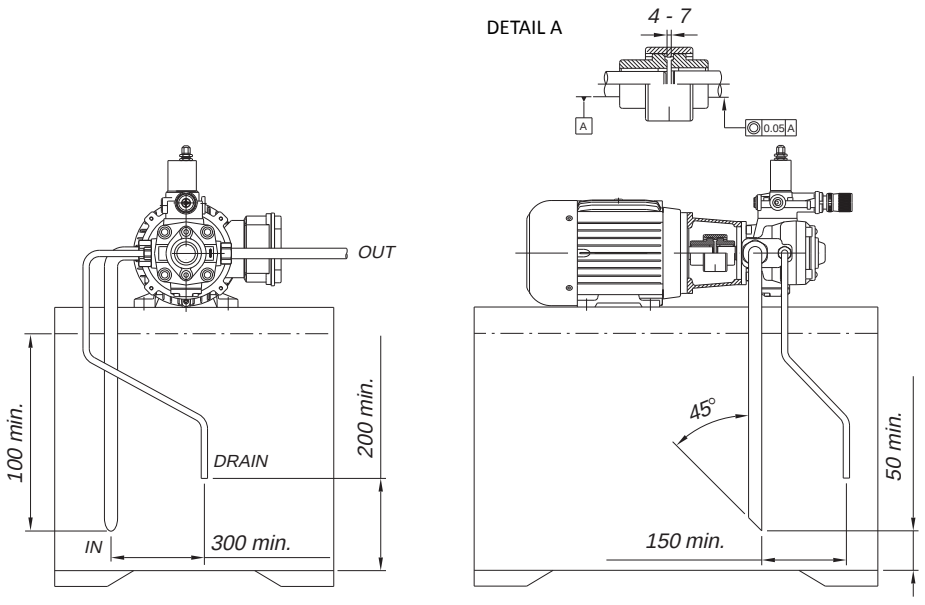
INSTRUCTIONS FOR INSTALLATION AND USE

1) Size 1 PSPK pumps can be mounted in any position.
   Sizes 2 and 3 PSPK pumps must be mounted with the shaft along a horizontal axis and with the constant power device facing upward (see figure).
   When the pump is installed above the tank oil level, pay attention to the inlet pressure (page 4).
   The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. The inlet pipes should be as short as possible, with a small number of bends and without internal section changes.

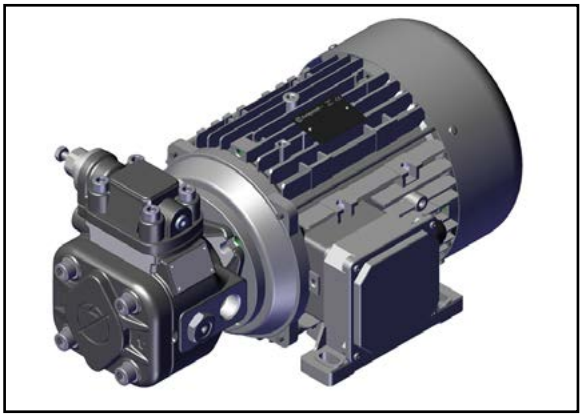
2) All return and drain pipes must be positioned so that the oil cannot be sucked back directly by the pump (see figure).
   The oil tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate.
   To ensure the maximum pump working life, the inlet oil temperature must never be above 50°C. In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended.
   The pressure on the drain port must never exceed the specified value (page 4).
   The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum oil level to avoid generating foam. Moreover, the drain pipe must be free of restrictions and as far as possible from the inlet pipe.

3) Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. When assembling, maximum attention must be given to the distance between the two half-couplings which must strictly fall within the values specified in the diagram below (detail "A").
   Other types of motor-pump couplings are not permitted.
   No induced RADIAL or AXIAL LOADS are allowed on the pump shaft.

4) During initial installation, the pump must be run under maximum flow conditions (P connected to T), with the oil flowing directly into the tank, in order to induce air bleeding.
   For sizes 2 and 3 there is an air bleed on the compensator.
   This phase must run for several minutes. Pump priming (delivery of oil to the outlet) must occur within a few seconds, otherwise the pump must be turned off and the operation repeated. Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with oil.
   During the initial and subsequent starting operations, the difference between the oil temperature and the ambient temperature (body pump temperature) must not exceed 20°C.



GMP-Type



Key Features:

Direct coupling between motor and pump
Rotation: Right (viewed from shaft end)
Electric motor mounting type: special B3-B14 (IEC 34-7)
Rated Voltage: 230/400 V +/-10% at 50 Hz - 266/460 V +/-10% at 60 Hz
Efficiency Class: IE3
Available power: from 0.75kW (1HP) to 7.5kW (10 HP)

Series/Name	Rated Displacement (cm^3/r)	Maximum Flow Capacity at 1450 rpm (L/min)	Maximum Pressure (bar)
GMP-16	16	23	250
GMP-20	20	29	250
GMP-25	25	36	250
GMP-32	32	46	250

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CONTENTS

WARNING
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NOTES
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GENERAL DESCRIPTION

In its constant search for solutions that cut costs, dimensions and simplify the application of its products, Berarma has developed Integrated Motor Pump Units, known as GMPs, with direct drive. The direct coupling system allows all parts between the pump and motor to be eliminated (couplings, bell-housing, supports etc.) and ensures perfect concentricity between the two shafts, avoiding dangerous not-alignment which can cause abnormal wear.

GMPs are produced using Berarma SIZE 05 and SIZE 1 pumps (displacement up to 32 cm^3/r, a maximum working pressure up to 250 bar) and with asynchronous three-phase electric motors with special mounting flange (rated power 0.75 - 7.5 kW).

The GMP is easy and quick to install and can be mounted directly on the powerpack (anti-vibration mounts are recommended).

ORDERING CODE

Series/ Name	Displacement	Pump type	Pressure setting	Motor type
GMP				

Code	Size	Displacement (cm^3/r)
16	05	16
20	1	20
25	1	25
32	1	32

Code	Pressure Compensator
PLP	Mechanical
PHP	Hydraulic

Code	Pressure setting
H	See Page 4
L	

Code	Motor type
MRE	See Page 5

Ordering code example:

- GMP 25 PLP H MRE 112 a4

NOTE: For further information and/or special operating conditions of the pumps and electric motors, please consult the relevant Berarma catalogues or contact Berarma Technical Service.

PUMP TECHNICAL DATA

Pump type - Nominal size	PLP 05	PHP 05	PLP 1	PHP 1
Geometric displacement according to UNI-ISO 3662 (cm^3/r)	16	16	20 - 25 - 32	20 - 25 - 32
Actual displacement (cm^3/r)	17.9	17.9	24.2 - 29.4 - 34.5	24.2 - 29.4 - 34.5
Due to manufacturing tolerances, the value can vary by approx. ± 3%				
Maximum working pressure (bar)	120	250	100	250
Pressure peaks exceeding 30% of the maximum operating pressure must be eliminated by adopting the appropriate measures				
Control pressure setting (bar)	H - 20/120	H - 20/250	L - 15/50 H - 30/100	H - 20/250
Mounting flange and port connections	4-hole flange (UNI-ISO 3019/2) - GAS-BSP threads (UNI-ISO 228/1)			
Permitted maximum drain port pressure (bar)	1			
Inlet pressure (bar)	0.8 - 1.5 absolute			
Speed range (r/min)	800 - 1600			
Rotation direction (viewed from shaft end)	R - Right			
Loads on drive shaft	NO RADIAL OR AXIAL LOADS ALLOWED			
Maximum torque on primary shaft (Nm)	110	130	250	250
Hydraulic fluid	HM hydraulic oil according to ISO 6743/4; HLP hydraulic oil according to DIN 51524/2; for other fluids contact Berarma Technical-Sales Service			
Viscosity range (cSt, mm^2/s)	22 - 68 at operating temperature			
Starting viscosity under full flow conditions (cSt, mm^2/s)	400 max			
Viscosity index according to ISO 2909	100 min			
Inlet fluid temperature range (°C)	+15 / +60- pay attention to viscosity range			
Maximum acceptable fluid contamination level	20/18/15 according to ISO 4406/99, CLASS 9 according to NAS 1638			
Recommended fluid contamination level for a longer pump working life	18/16/13 according to ISO 4406/99, CLASS 7 according to NAS 1638			

ELECTRIC MOTOR TECHNICAL DATA

The motors described in this catalogue are built according to international standards. Each dimension is calculated with reference to the tables in standard IEC 72-1. The power output for each size at 1500 - 1000 r/min has been established by UNEL/IEC documents, which define the values.

Asynchronous three-phase motors are closed, externally ventilated, with cage rotor and dynamically balanced.

Mounting type	special B3 - B14 (IEC 34-7)
Rated voltage	230/400V ±10% at 50Hz 266/460V ±10% at 60Hz
Efficiency class	IE3
Insulation class	F (IEC 34-1)
Degree of protection	IP 55 (EN 60529)
CE mark	European Community Directives 2014/25/EC & 2014/30/EC
Duty service	S1 (IEC 34-1)
Ventilation	Bidirectional fan with radial blades made of plastic to resist high temperatures. Fan housing is made of sheet metal
Frame, flanges and shields	Die-casting aluminium alloy Without coating
Terminal box position	Right (viewed from shaft end) Left or top position on request
Options	Thermal protection against peak loads Protection against peak currents CSA-C/US mark Electric motors with different voltage/frequency ATEX Certification

4 poles- 1500 r/min - 50Hz

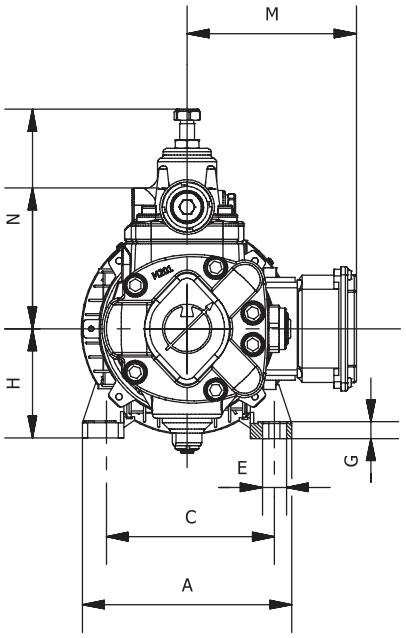
type	power kW (HP)	rpm	η %	current A (400 v)	power factor FI	rated torque Cn Nm	torque ratio Cs/Cn	torque ratio As/An
MRE80 a	0.75 (1.0)	1430	82.5	1.8	0.76	5	3.1	6.2
MRE80 b	1.1 (1.5)	1420	84.1	2.4	0.82	7.4	3.5	6.2
MRE90 La	1.1 (1.5)	1430	84.3	2.5	0.77	7.3	4.1	7.5
MRE90 Lb	1.5 (2.0)	1430	85.3	3.5	0.74	10	4.3	7.5
MRE100	2.2 (3.0)	1440	86.7	5	0.75	14.6	3.3	7.8
MRE112 a	3.0 (4.0)	1460	87.9	6.5	0.76	19.5	4.7	10.8
MRE112 b	4.0 (5.5)	1440	88.6	8.2	0.8	26	3.6	7.8
MRE132 La	5.5 (7.5)	1460	90	11.3	0.79	36.1	4	8.5
MRE132 Lb	7.5 (10.0)	1450	90.4	14.9	0.81	49.3	3.8	8

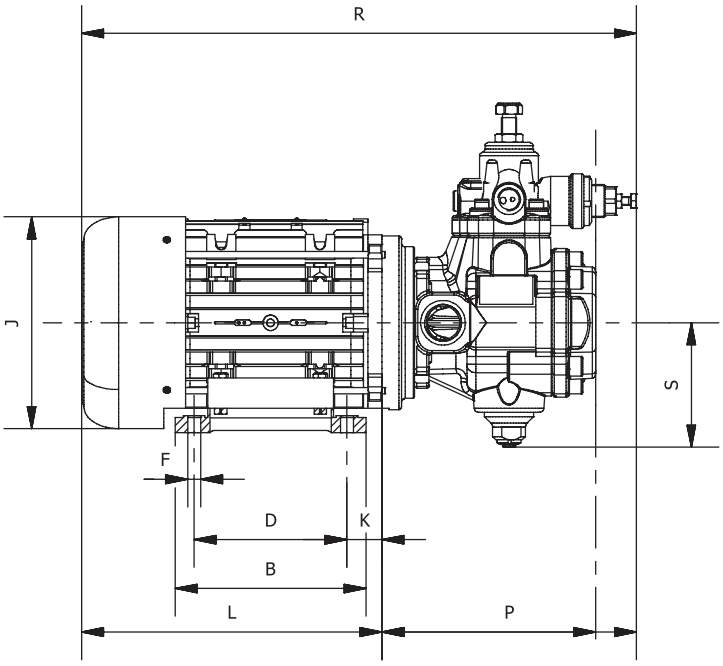
The performances indicated refer to the following ambient conditions:

- altitude below 1000 m above sea level
- ambient temperature +5°C / +40°C (Pn <0.6 kW)
- ambient temperature -15° / +40°C (Pn >0.6 kW)
- relative humidity 30% / 95% (without condensation)

OVERALL DIMENSIONS

OVERALL DIMENSIONS





For complete pump dimensions, please refer to the corresponding technical catalogue.

Pump	Motor	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S
PLP 05	MRE80	154	125	125	100	17.5	9.5	11	80	156	52	237	141	164	107	344	82
PHP 05														131	145	382	98
PLP 05	MRE90	174	155	140	125	17.5	9.5	13	90	176	56	275	146	164	107	382	82
PHP 05														131	145	420	98
PLP 1														201	166	441	114
PHP 1														132	203	478	114
PLP 05	MRE100	192	175	160	140	21.2	11.2	15	100	194	62	304	157	164	107	411	82
PHP 05														131	145	449	98
PLP 1														201	166	470	114
PHP 1														132	203	507	114
PLP 05	MRE112	226	175	190	140	21.2	11.2	15	112	220	70	325	169	164	107	432	82
PHP 05														131	145	470	98
PLP 1														201	166	491	114
PHP 1														132	203	528	114
PLP 05	MRE132	260	218	216	178	21.2	11.2	17.5	132	256	88	410	195	164	107	517	82
PHP 05														131	145	555	98
PLP 1														201	166	576	114
PHP 1														132	203	613	114

INSTRUCTIONS FOR INSTALLATION AND USE

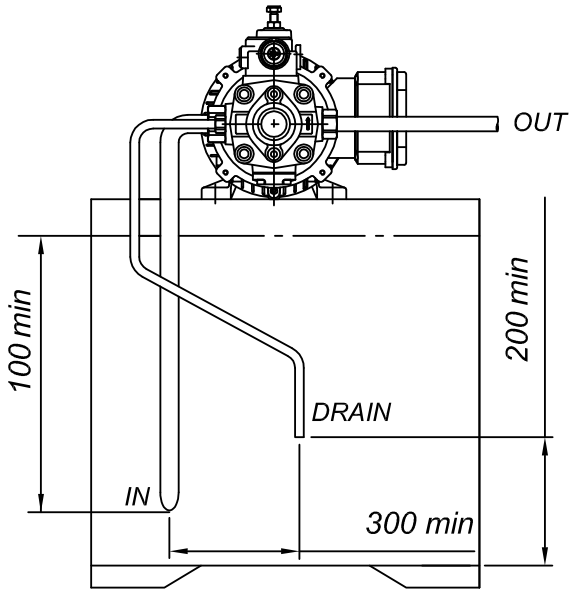
1) GMP integrated Motor-Pump Units must be mounted on a horizontal axis (see figure).
   When the pump is installed above the tank oil level, pay attention to the inlet pressure (page 4).
   The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port. The inlet pipes should be as short as possible, with a small number of bends and without internal section changes.

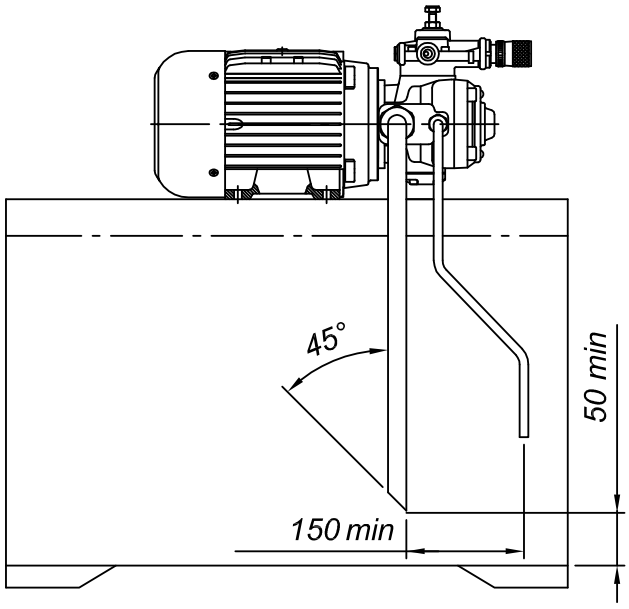
2) All return and drain pipes must be positioned so that the oil cannot be sucked back directly by the pump (see figure).
   The oil tank must be suitably sized in order to exchange the thermal power generated by the various system components and to provide a low recycle rate.
   To ensure the maximum pump working life, the inlet oil temperature must never be above 60°C. In systems where the pump runs for a long time under zero flow setting conditions, the installation of a heat exchanger in the drain line is recommended.
   The pressure on the drain port must never exceed the specified value (page 4).

   The drain pipe must always be independent from the other return lines, connected directly to the tank, and extended sufficiently inside the tank so as to be below the minimum oil level to avoid generating foam. Moreover, the drain pipe must be free of restrictions and as far as possible from the inlet pipe.

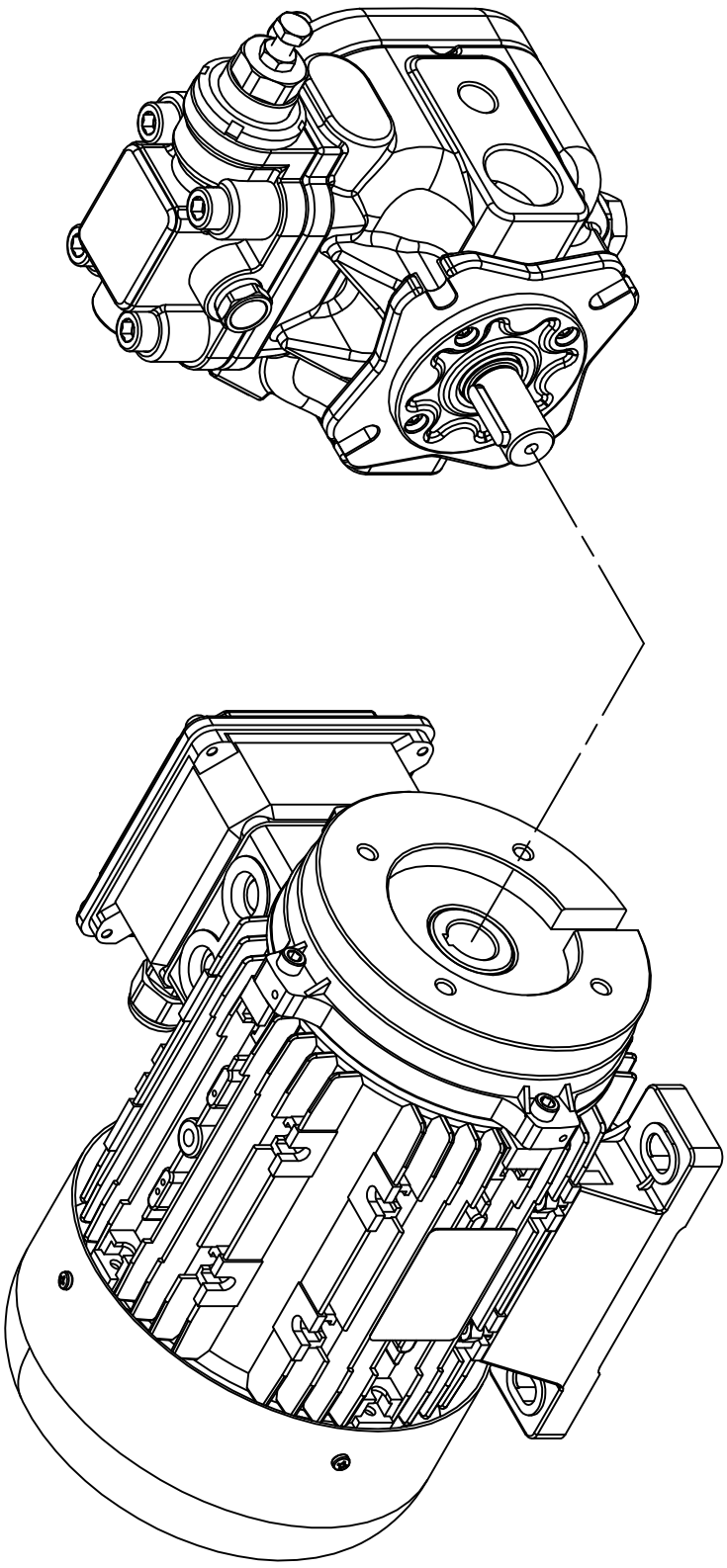
3) No induced RADIAL or AXIAL LOADS are allowed on the pump shaft.

4) During initial installation, the pump must be run under maximum flow conditions (P connected to T), with the oil flowing directly into the tank, in order to induce air bleeding. This phase must run for several minutes.
   Pump priming (delivery of oil to the outlet) must occur within a few seconds, otherwise the pump must be turned off and the operation repeated. Subsequent start-ups under zero flow setting conditions are admissible only with pressure not exceeding 30 bar, and with the system and pump completely filled with oil.
   During the initial and subsequent starting operations, the difference between the oil temperature and the ambient temperature (body pump temperature) must not exceed 20°C.





ASSEMBLY



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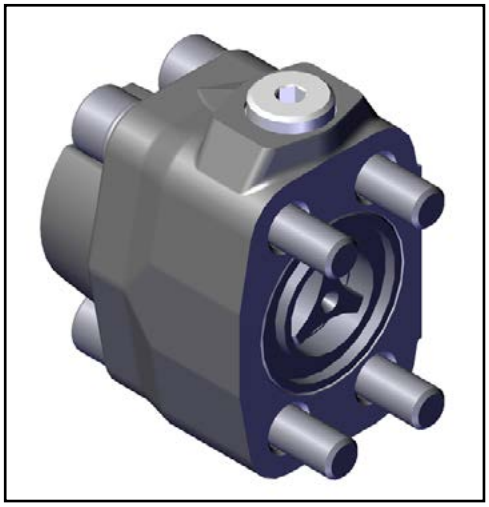
NRV-Type



Key Features:

Flange and valve integrated in the same body
Connection for circuit pressure reading
Easy to use
Can be used with Berarma Size 2 and 3 pumps, but thanks to their modular design they can be installed in any system

Series Name	Dimensions	Nominal Flow Rate (L/min)	Maximum Operating Pressure (bar)	Opening pressure (bar)
01-NRV-2	1" SAE J518 3000 series	250	300	1
01-NRV-3	1"1/4 SAE J518 3000 series	350	300	1

CONTENTS

CONTENTS

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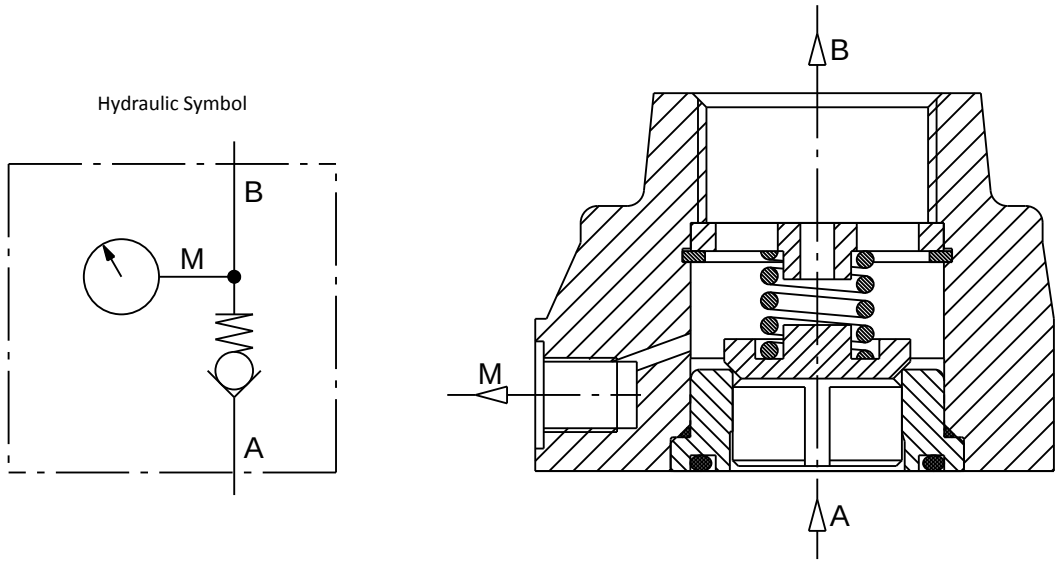
GENERAL DESCRIPTION

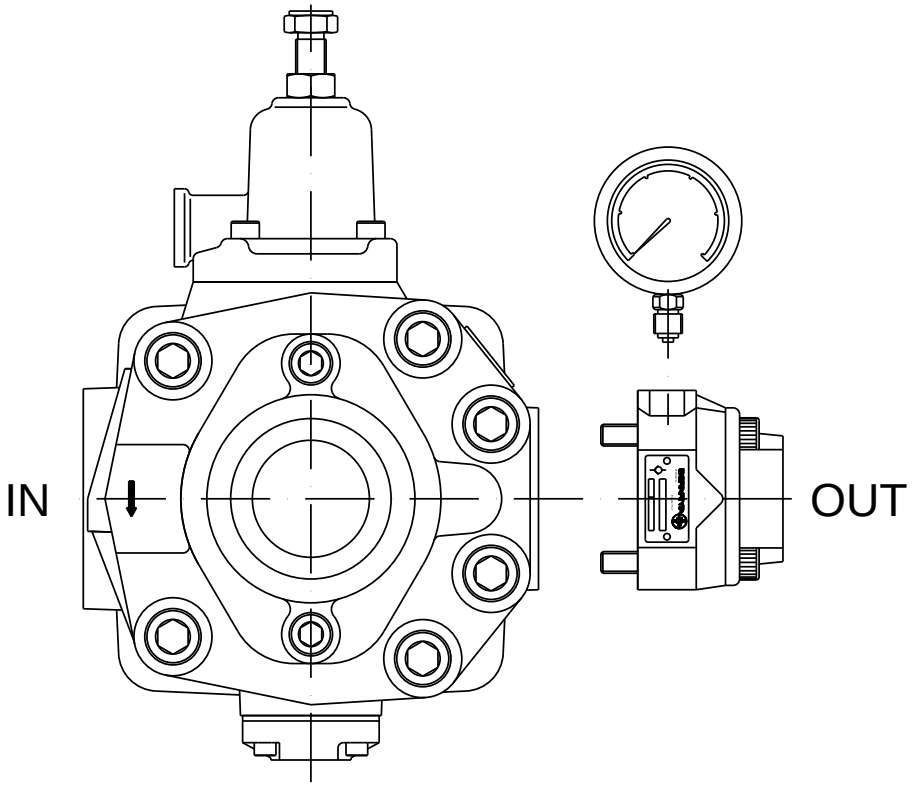
Berarma NRV non-return valves (check valves) are produced with an SAE J518 (3000 series) configuration with BSP thread ports.

The integration of valve and flange in the same body (where a port connection for circuit pressure reading is housed) makes them easy and cheap to use.

These valves are designed to be used on Berarma Size 2 and Size 3 pumps, but thanks to their modular design can be installed in any other system with an SAE J518 (3000 series) configuration with 1" (NRV 2) or 1"1/4 (NRV 3) BSP thread.



A - Inlet
B - Outlet
M - Pressure gauge port connection



ORDERING CODE

ORDERING CODE

Series/ Name	Size	Pressure setting	Supplies	Pressure Port
01 NRV		**L**	**M**	**PL**

Code	Size	
2	2	DN 25
3	3	DN 32

Code	Opening pressure
L	1 bar

Code	Supplies
M	Supplied with O-Ring and screws

Code	Pressure Port
PL	Circuit pressure

Ordering code example:

- 01 NRV 2 L M PL
- 01 NRV 3 L M PL

TECHNICAL DATA

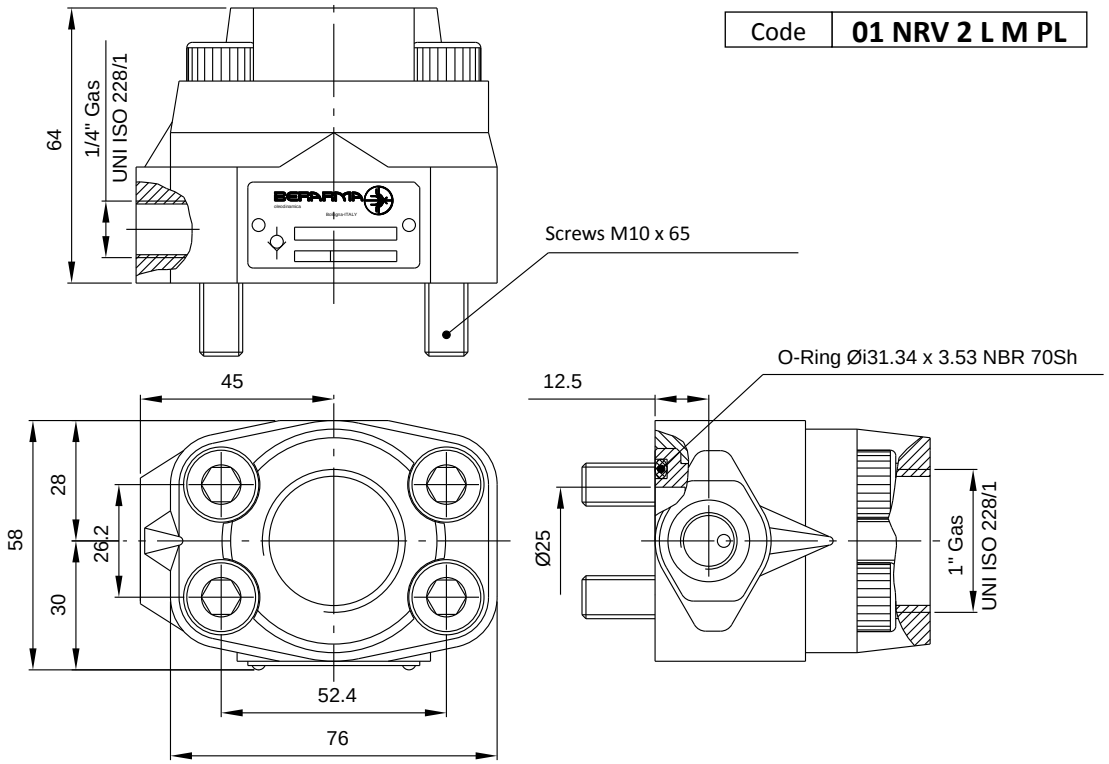
TECHNICAL DATA

ORDERING CODE	**01 NRV 2 L-M-PL**	**01 NRV 3 L-M-PL**
Nominal size (DN)	25	32
Nominal flow (L/min)	250	350
Maximum working pressure (bar)	300	
Opening pressure (bar)	1	
Hydraulic fluid	HM hydraulic oil according to ISO 6743/4; HLP hydraulic oil according to DIN 51524/2; HFD-U organic esters according to ISO 6743/4 (Quintolubric 888); for other fluids contact Berarma Technical-Sales Service	
Viscosity range (cSt, mm²/s)	10 - 380	
Fluid temperature range (∞C)	-10 / +80	
Weight (kg)	1.4	1.8
For different operating conditions, please contact Berarma Technical Service		

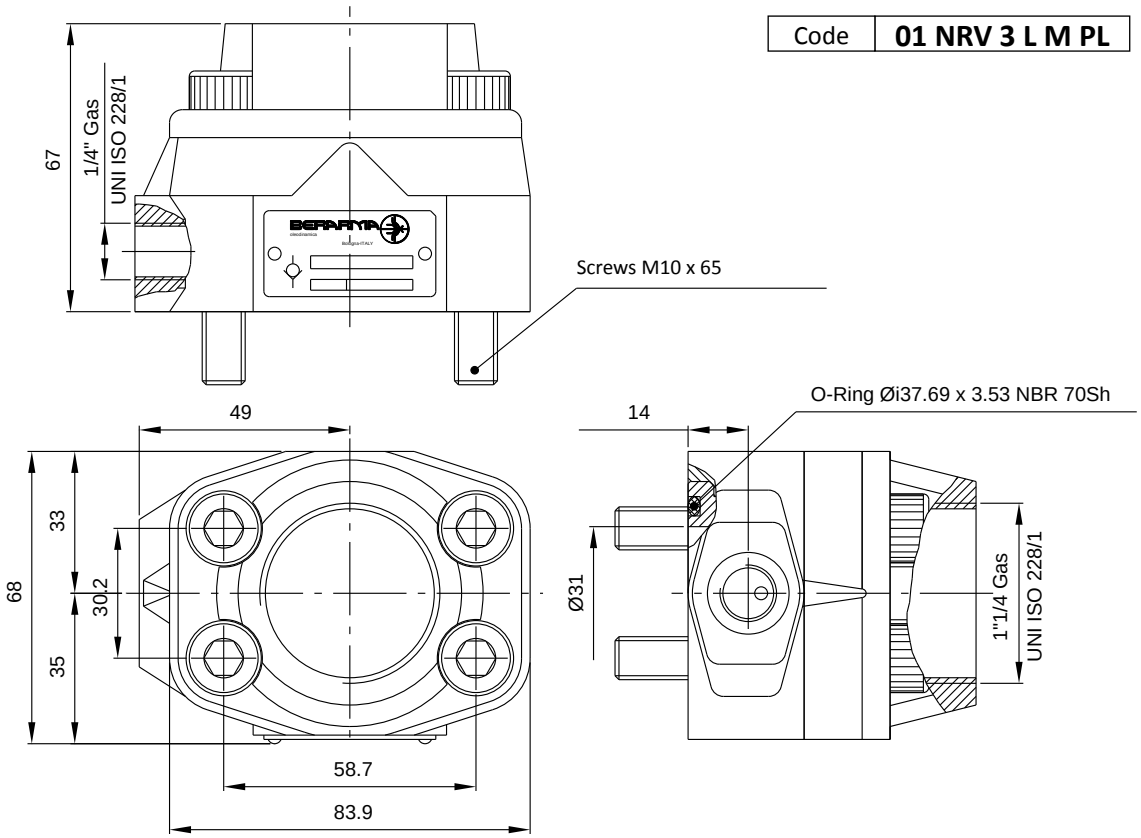
BERARMA oleodinamica

OVERALL DIMENSIONS

Code	01 NRV 2 L M PL



Code	01 NRV 3 L M PL



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