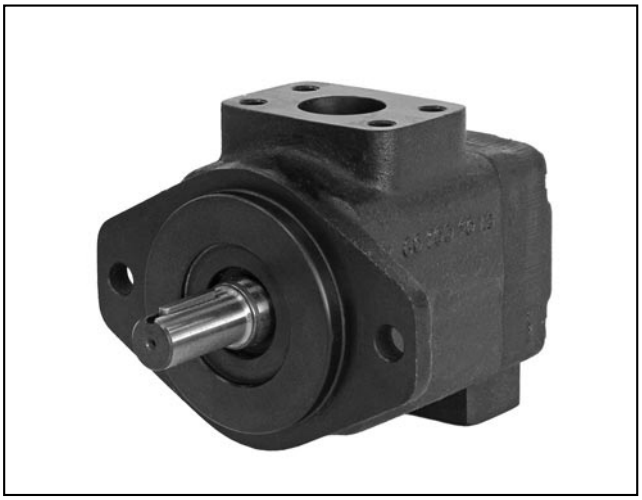
Зміст

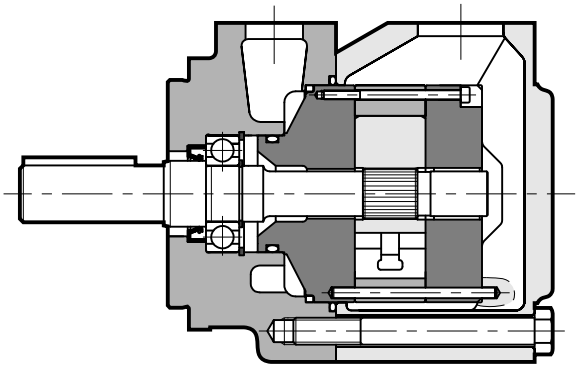


DFP

FIXED DISPLACEMENT VANE PUMPS

SERIES 20

OPERATING PRINCIPLE



— The DFP pumps are fixed displacement vane pumps available in four sizes, each size having five nominal displacement. They are available with one pumping element (single pump) or with two pumping element (double pump).

— The pumping group consists of a compact cartridge that contains the rotor, the vanes, the cam ring and the head discs. The cartridge is easily removable without the need to disconnect the pump from the hydraulic circuit, thus simplifying the maintenance operations.

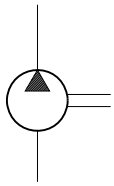
— The special elliptical profile of the cam ring with double opposing suction and delivery chambers eliminates the radial thrusts on the rotor, significantly reducing pump wear. The use of a 12-vane rotor reduces the pulsations in the delivery, limiting the vibrations and noise level of the pump.

TECHNICAL SPECIFICATIONS

PUMP SIZE		1	2	3	4
Displacement range	cm^3/rev	18 ÷ 45,9	40,1 ÷ 67,5	69 ÷ 121,6	138,6 ÷ 193,4
Flow rate range (at 1500 rpm)	l/min	26,1 ÷ 69,6	101,4 ÷ 177,3	49,6 ÷ 97,3	203,4 ÷ 285
Operating pressures	bar	140 ÷ 210	175	175	175
Rotation speed	rpm	600 ÷ 1800			
Rotation direction		clockwise or counterclockwise			
Loads on the shaft		axial loads are not allowed			
Hydraulic connections		SAE J518 c fittings, flanged (see par. 9)			
Mounting flange type		SAE J744			
Mass (single pump)	kg	12	15	23	34

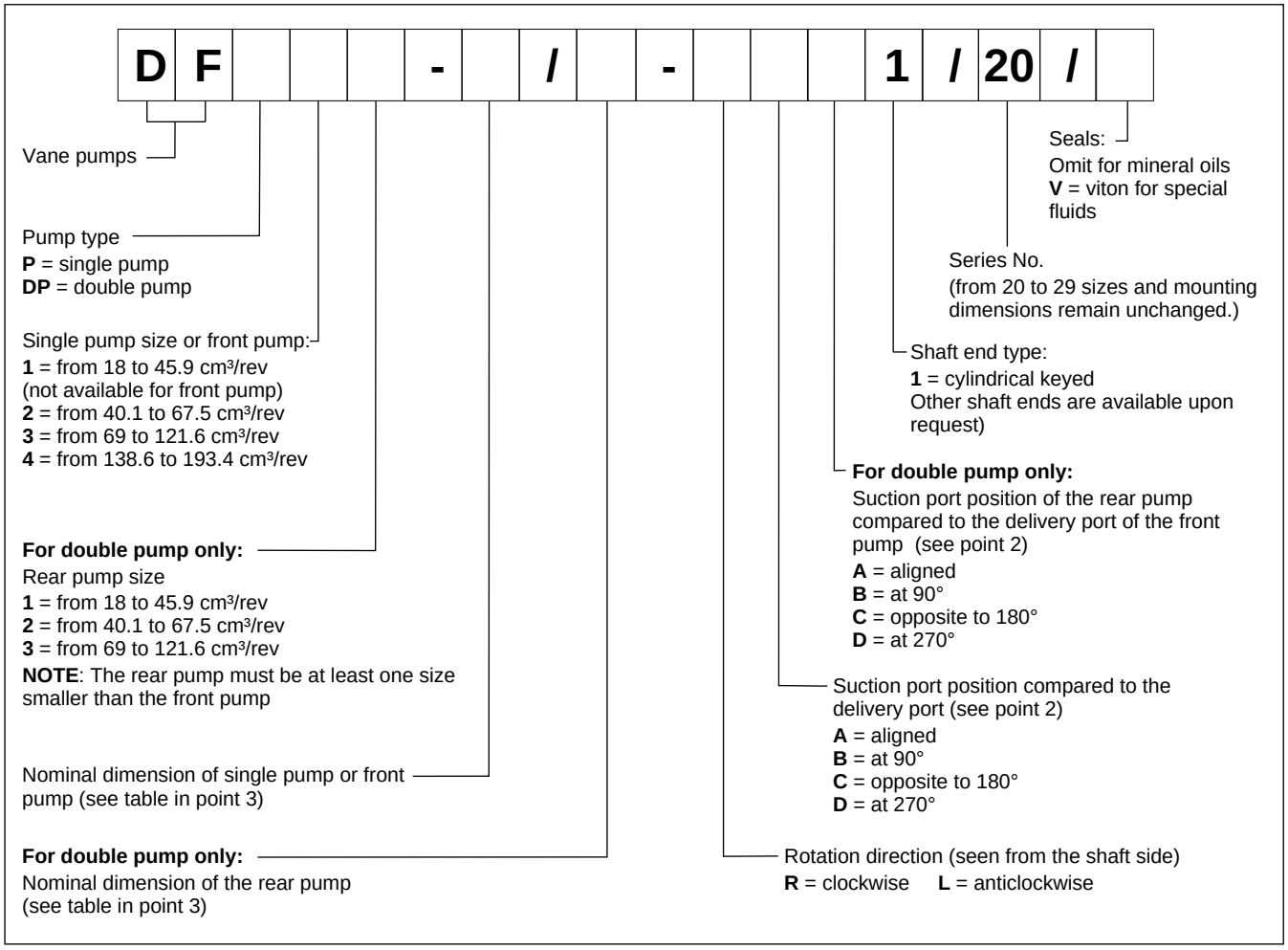
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-10 / +70
Fluid viscosity range	see point 4.2	
Degree of fluid contamination	see point 4.3	
Recommended viscosity	cSt	13 ÷ 54

HYDRAULIC SYMBOL

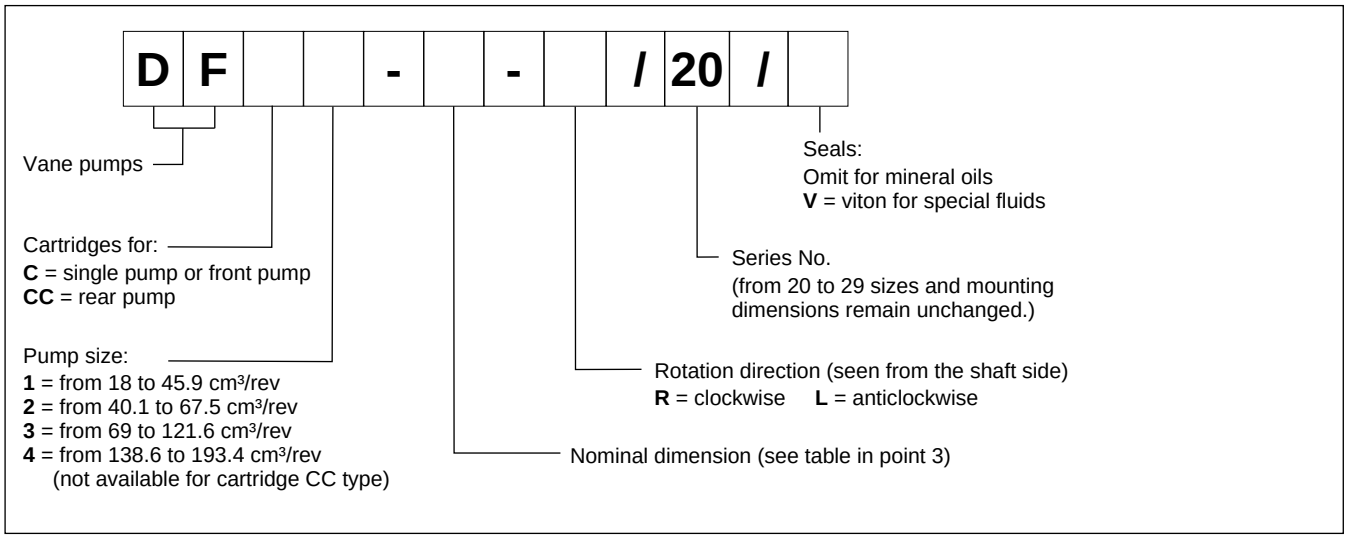


1 - IDENTIFICATION CODE

1.1 - Single pump and double pump



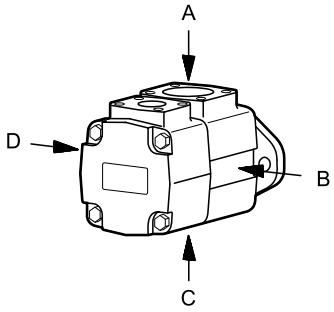
1.2 - Cartridges



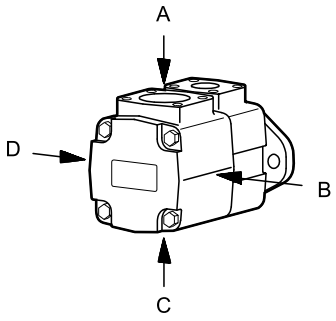
2 - PORTS POSITIONS

SINGLE PUMPS

DFP1

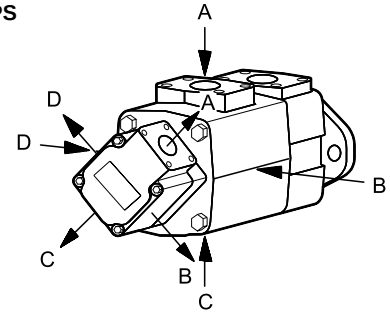


DFP2
DFP3
DFP4

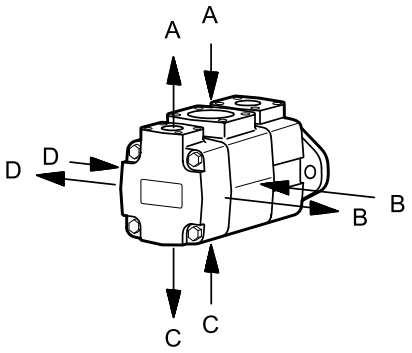


DOUBLE PUMPS

DFDP21
DFDP31
DFDP32
DFDP41
DFDP42



DFDP43



3 - PERFORMANCES

(obtained with mineral oil with viscosity 25 cSt at 45 °C)

PUMP SIZE	NOMINAL DIMENSION	GEOMETRIC DISPLACEMENT [cm³/giro]	NOMINAL FLOW RATE. (at 1500 rpm) [l/min]	MAX PRESSURE (NOTE) [bar]	ROTATION SPEED (see also point 5) [rpm] max	[rpm] min
DPF1	**05**	18	26.1	210	1800	600
	08	27.4	39.4			
	11	36.4	52.6			
	12	39.5	58.7	160		
	14	45.9	69.6	140		
DFP2	**12**	40.1	58.8	175	1800	600
	14	45.4	65.7			
	17	55.2	80.2			
	19	60.1	88.7			
	21	67.5	99.8			
DFP3	**21**	69	101.4	175	1800	600
	25	81.6	120.1			
	30	97.7	121.4			
	35	112.7	167.2			
	38	121.6	177.3			
DFP4	**42**	138.6	203.4	175	1800	600
	47	153.5	222.7			
	50	162.2	234			
	57	183.4	267			
	60	193.4	185			

NOTE: A pressure peak of + 10% is allowed for a time not exceeding 0.5 seconds, if temperature and filtration conditions are optimal)

4 - HYDRAULIC FLUID

4.1 - Fluid type

The maximum suction pressure allowed, with all fluid types, is 1,4 bar. The minimum suction pressure varies from -0,17 bar with mineral oil to -0,1 bar with other fluid types (the pressure values are to be considered relative)..

Pressures, maximum allowed speeds and recommended temperatures are shown in the table according to the hydraulic fluids types.

FLUID TYPES	**p max** [bar]	**max speed** [rpm]	**working temperature** [°C]
HFC (**NOTE 1**) (water-glycol solutions)	160 (**NOTE 2**)	1500	+15 / +50

NOTE 1: Water-glycol solutions are not compatible with Viton seals. The pumps are tested with mineral oil. Provide an adequate cleaning cycle.

NOTE 2: The max allowed pressure is 140 bar for DFP1-14.

4.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	13 cSt	referred to the maximum temperature of 70 °C of the fluid
optimum viscosity	13 ÷ 54 cSt	referred to the operating temperature of the fluid in the tank +30 / +60 °C
maximum viscosity	860 cSt	limited to only the pump start-up phase

When choosing the fluid type, verify that the true viscosity at the operating temperature is within the above range.

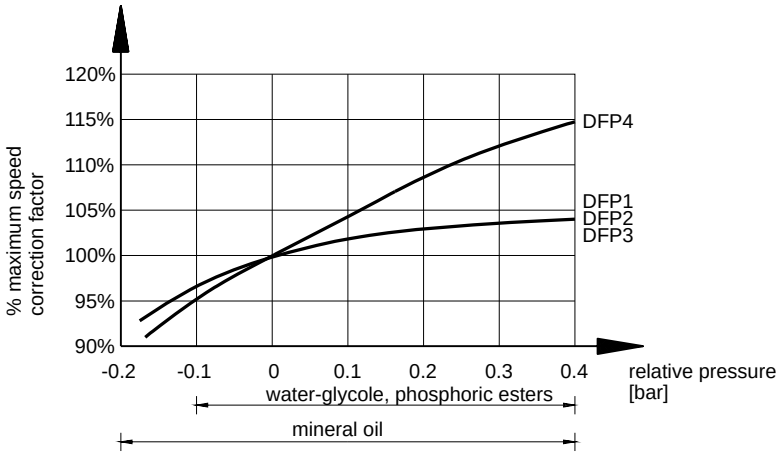
4.3 - Degree of fluid contamination

The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

If there is a filter installed on the suction line, be sure that the pressure at the pump inlet is not lower than the values specified at point 4.1. The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

5 - MAXIMUM SPEED CORRECTION FACTOR

If the pressure in the suction line is different than zero, the maximum rotation speed shown in table 3 must be multiplied by the correction factor obtained from the diagram here below.

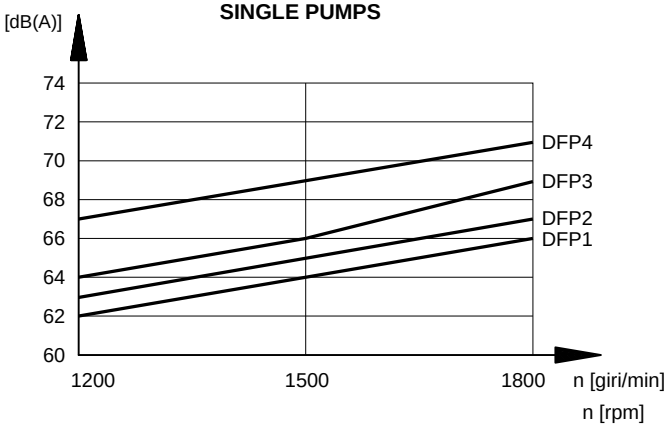


6 - NOISE LEVEL

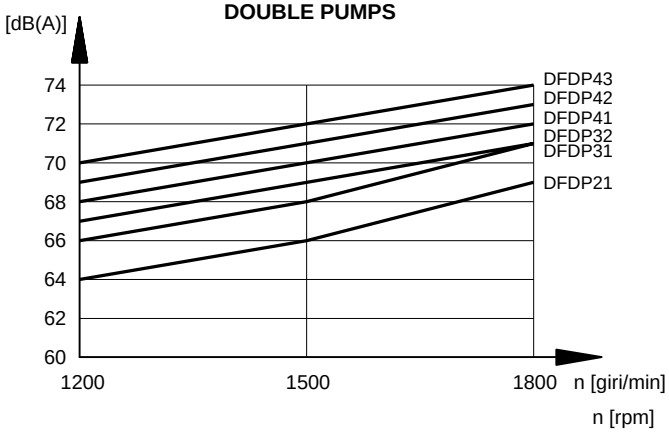
(values obtained with mineral oil with viscosity of 25 cSt at 40°C, delivery pressure 140 bar and suction pressure 0 bar)

The diagram curves were measured in a semi-anechoic room, at a distance of 1 m from the pump. The shown values must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

SINGLE PUMPS



DOUBLE PUMPS

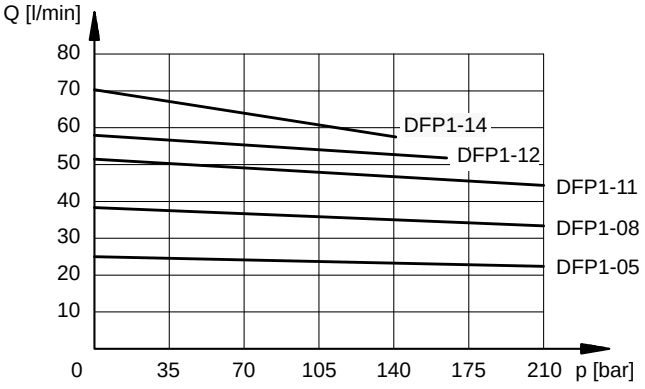


7 - CHARACTERISTIC CURVES

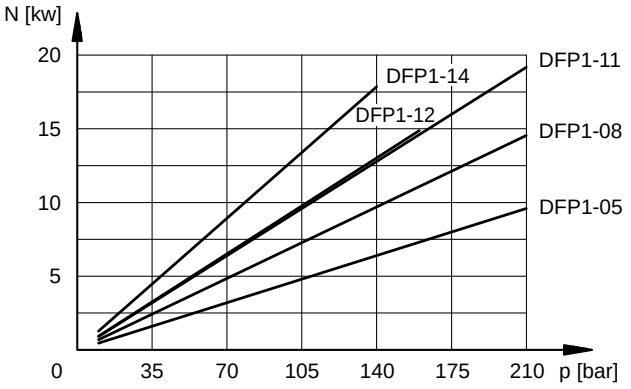
(obtained with mineral oil with viscosity of 25 cSt at 45 °C and 1500 rpm speed)

7.1 - DFP1 pumps

FLOW RATE/PRESSURE CURVES

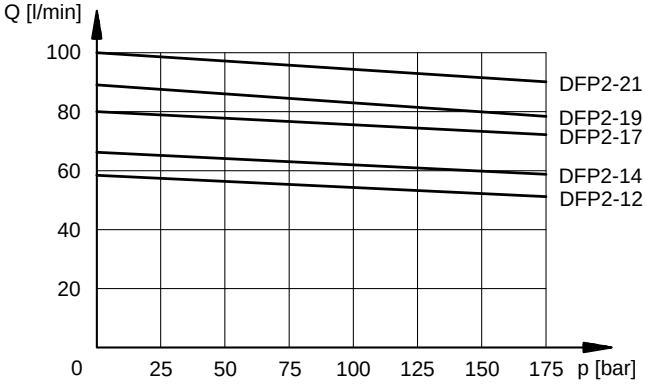


ABSORBED POWER/PRESSURE CURVES

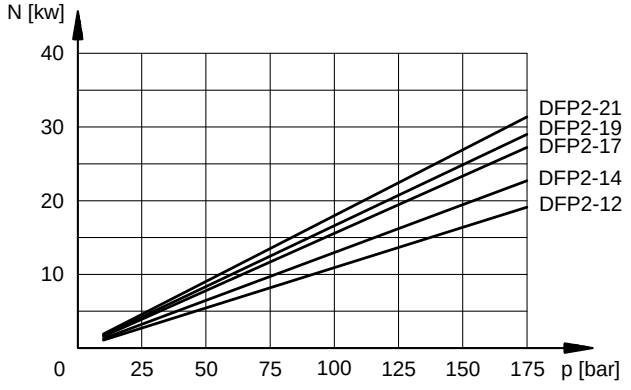


7.2 - DFP2 pumps

FLOW RATE/PRESSURE CURVES

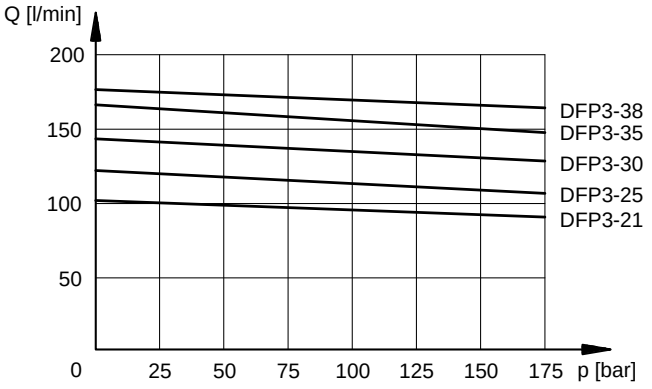


ABSORBED POWER/PRESSURE CURVES

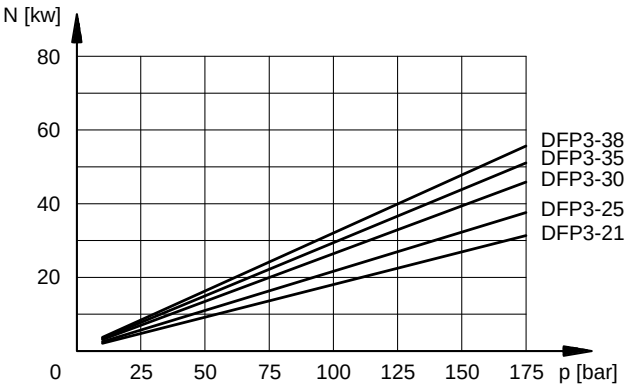


7.3 - DFP3 pumps

FLOW RATE/PRESSURE CURVES

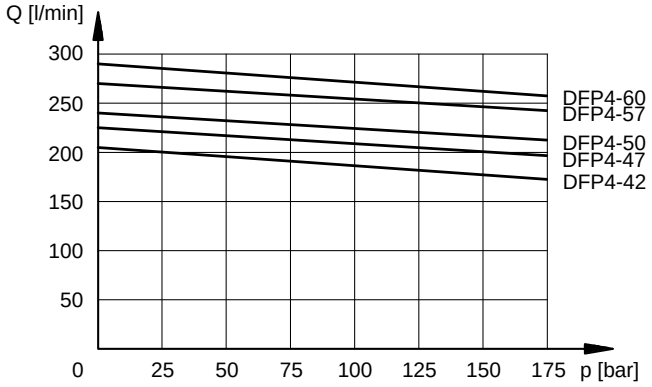


ABSORBED POWER/PRESSURE CURVES

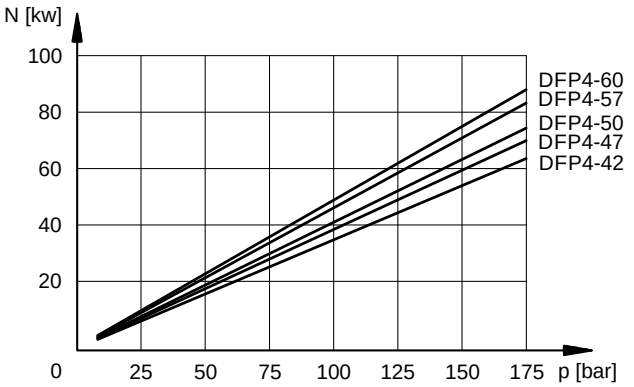


7.4 - DFP4 pumps

FLOW RATE/PRESSURE CURVES

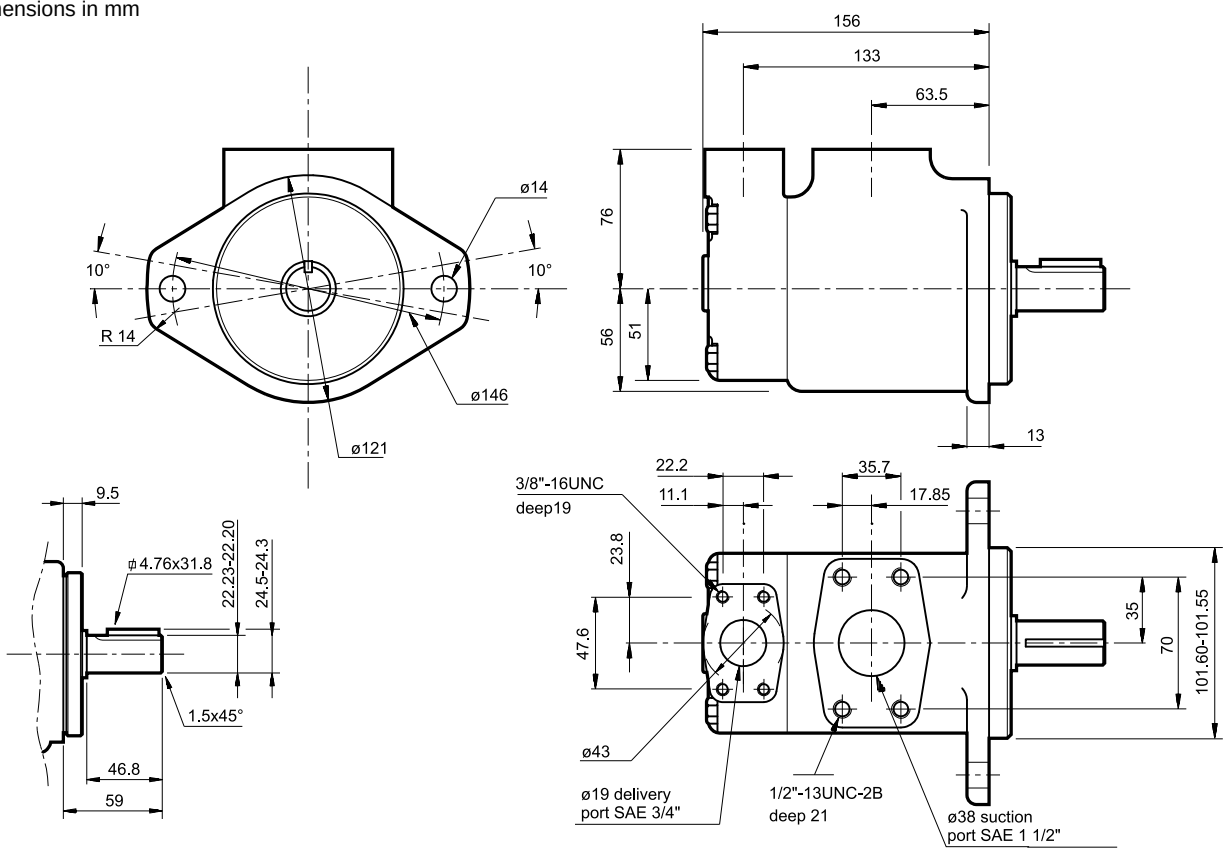


ABSORBED POWER/PRESSURE CURVES



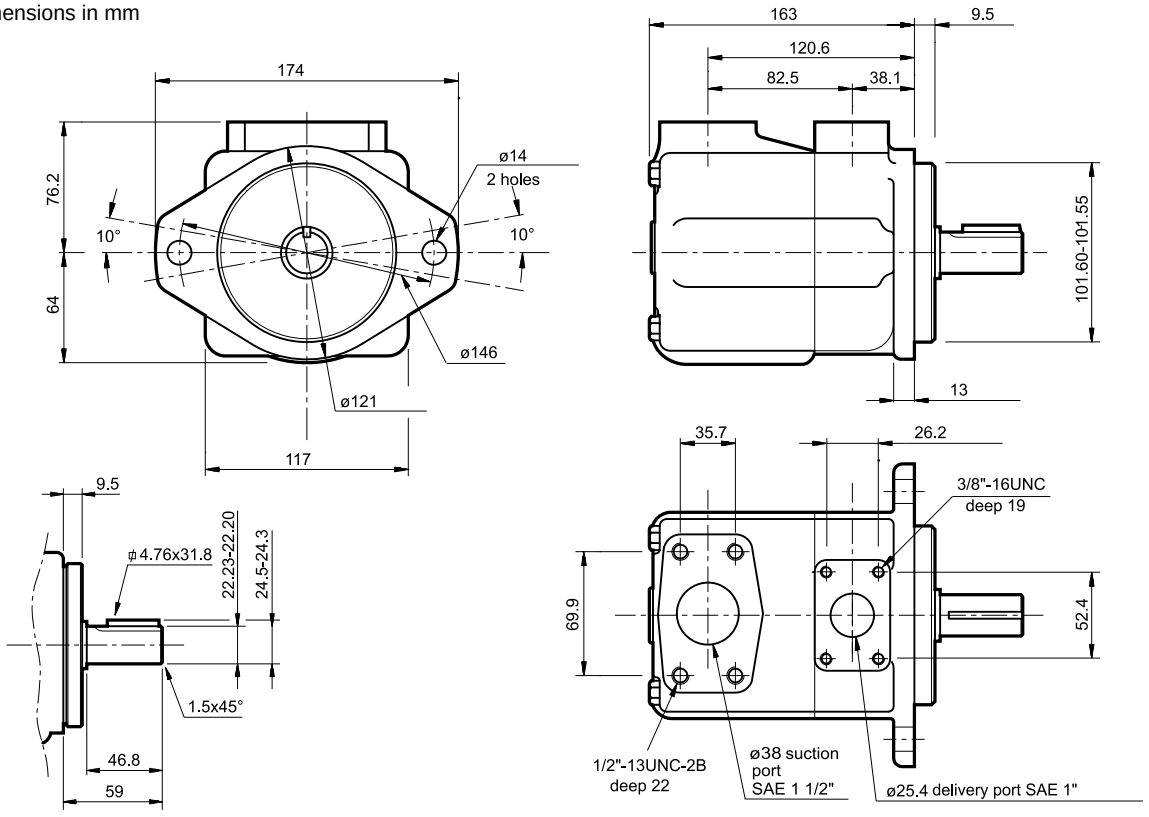
8 - DFP1 PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



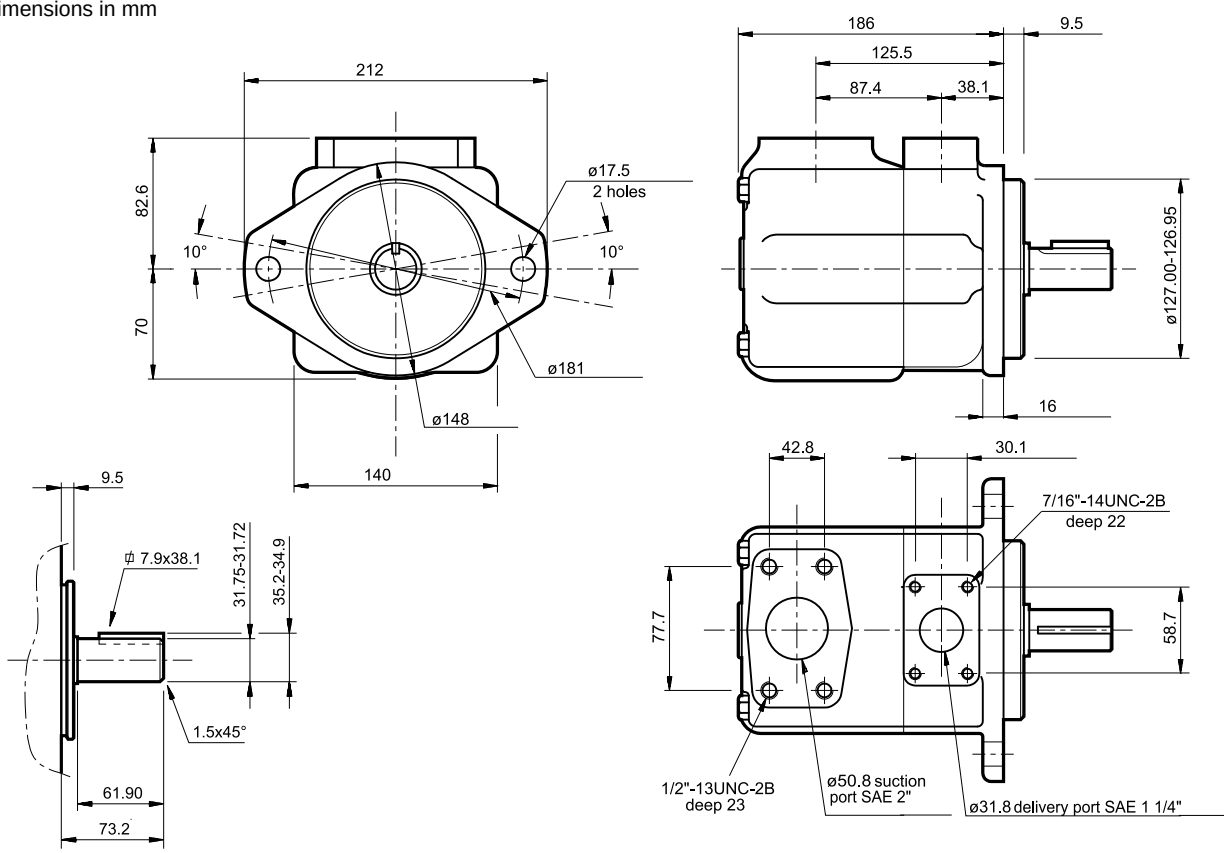
9 - DFP2 PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



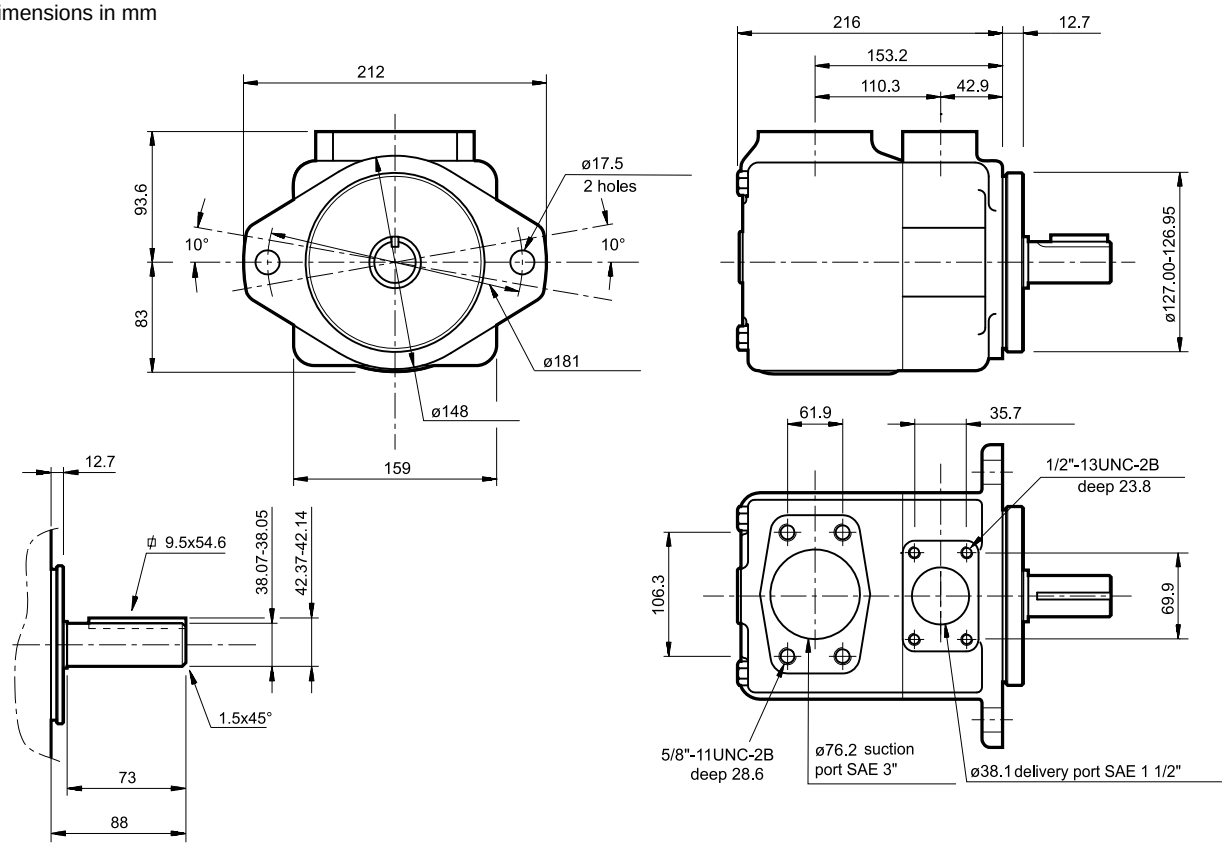
10 - DFP3 PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



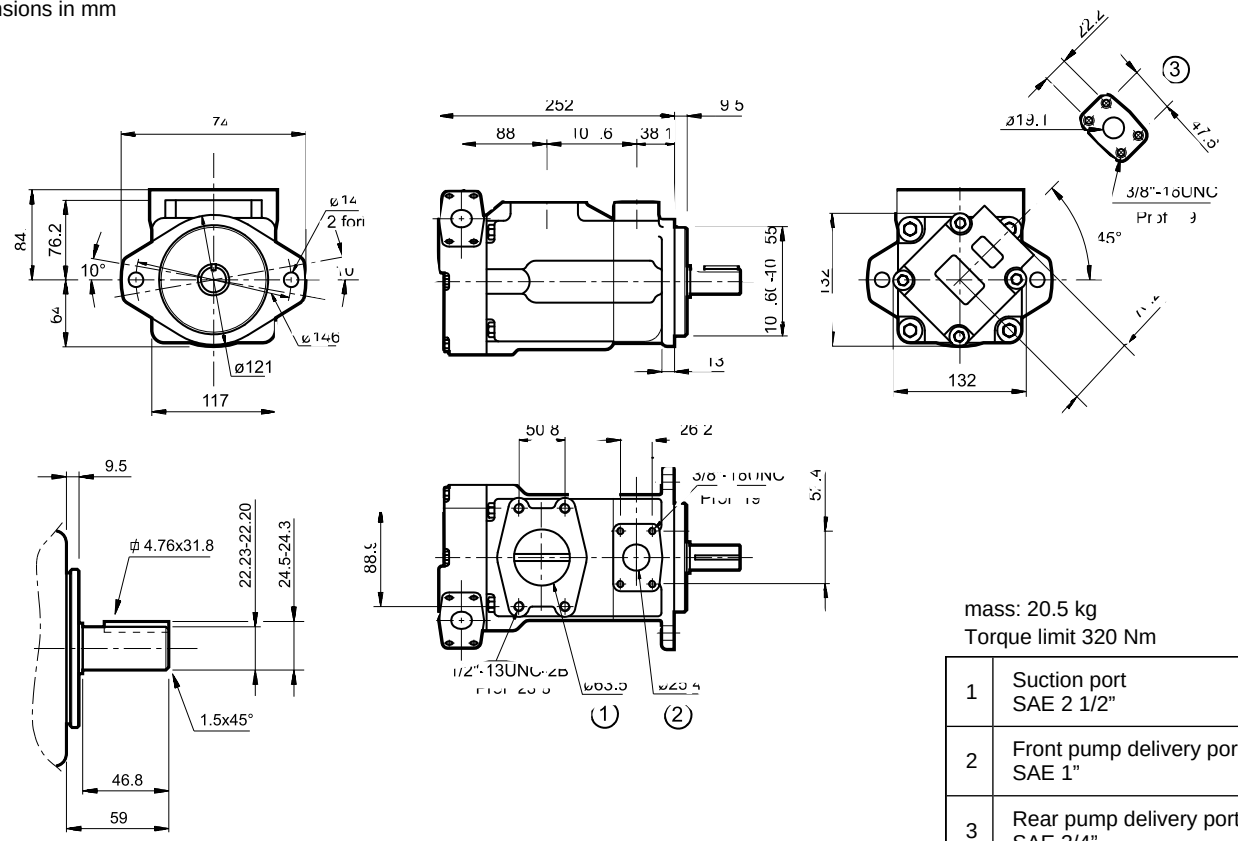
11 - DFP4 PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



12 - DFDP21 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

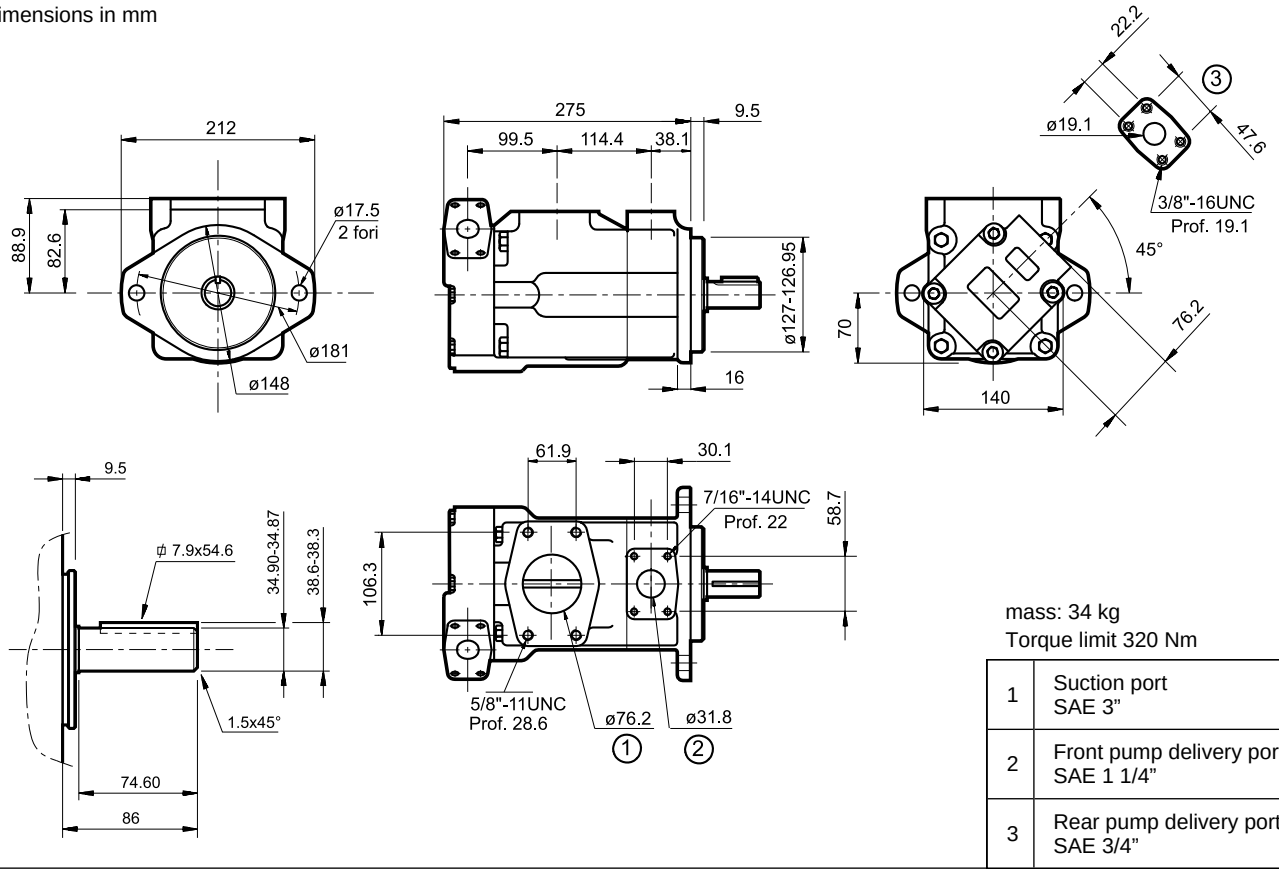


mass: 20.5 kg
Torque limit 320 Nm

1	Suction port SAE 2 1/2”
2	Front pump delivery port SAE 1”
3	Rear pump delivery port SAE 3/4”

13 - DFDP31 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

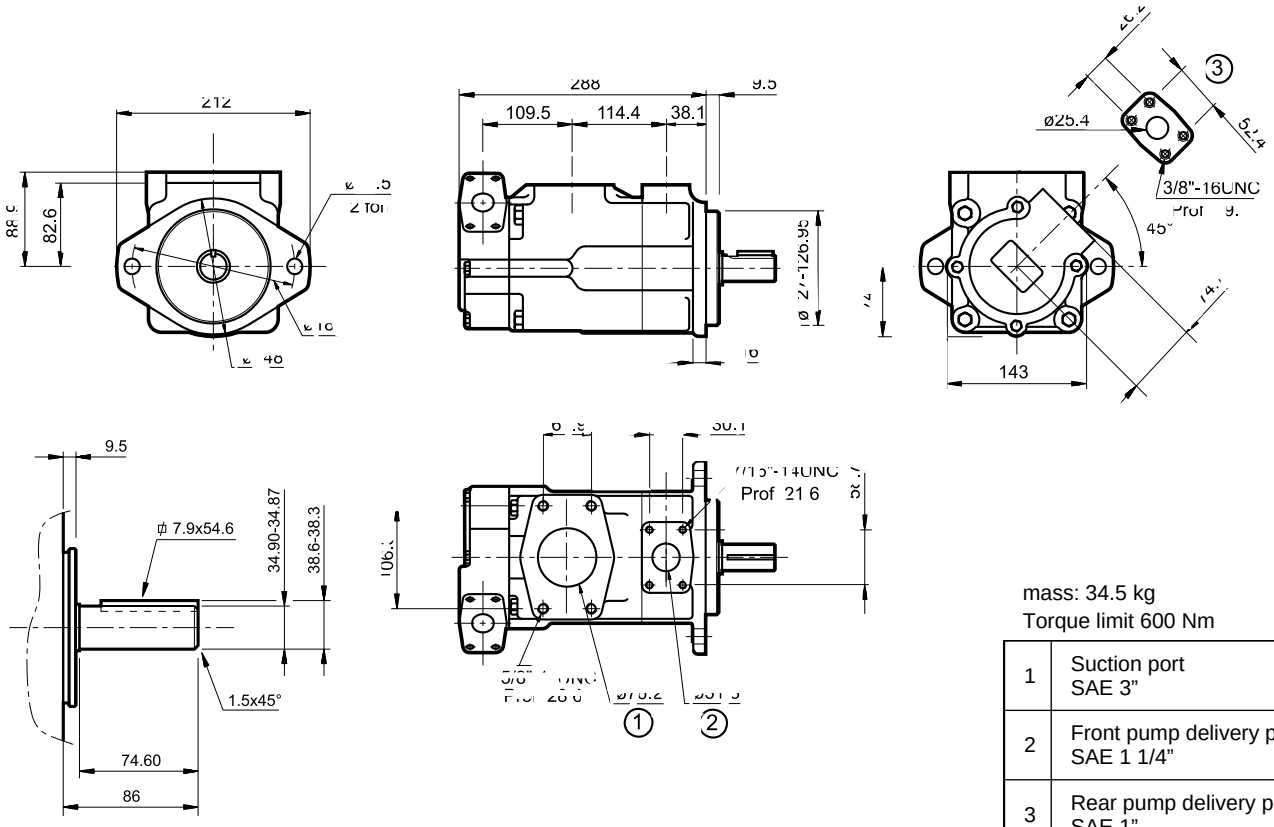


mass: 34 kg
Torque limit 320 Nm

1	Suction port SAE 3”
2	Front pump delivery port SAE 1 1/4”
3	Rear pump delivery port SAE 3/4”

14 - DFDP32 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

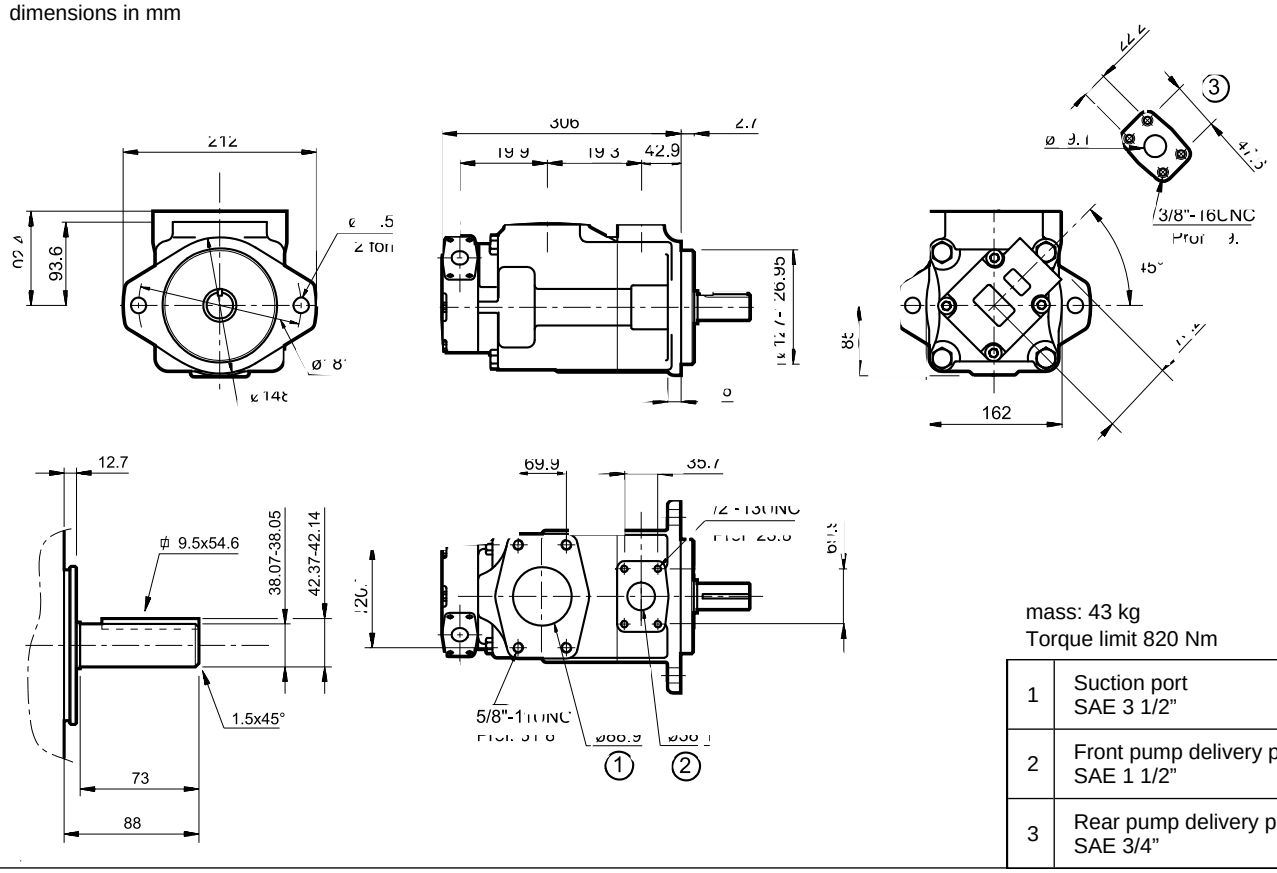


mass: 34.5 kg
Torque limit 600 Nm

1	Suction port SAE 3”
2	Front pump delivery port SAE 1 1/4”
3	Rear pump delivery port SAE 1”

15 - DFDP41 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

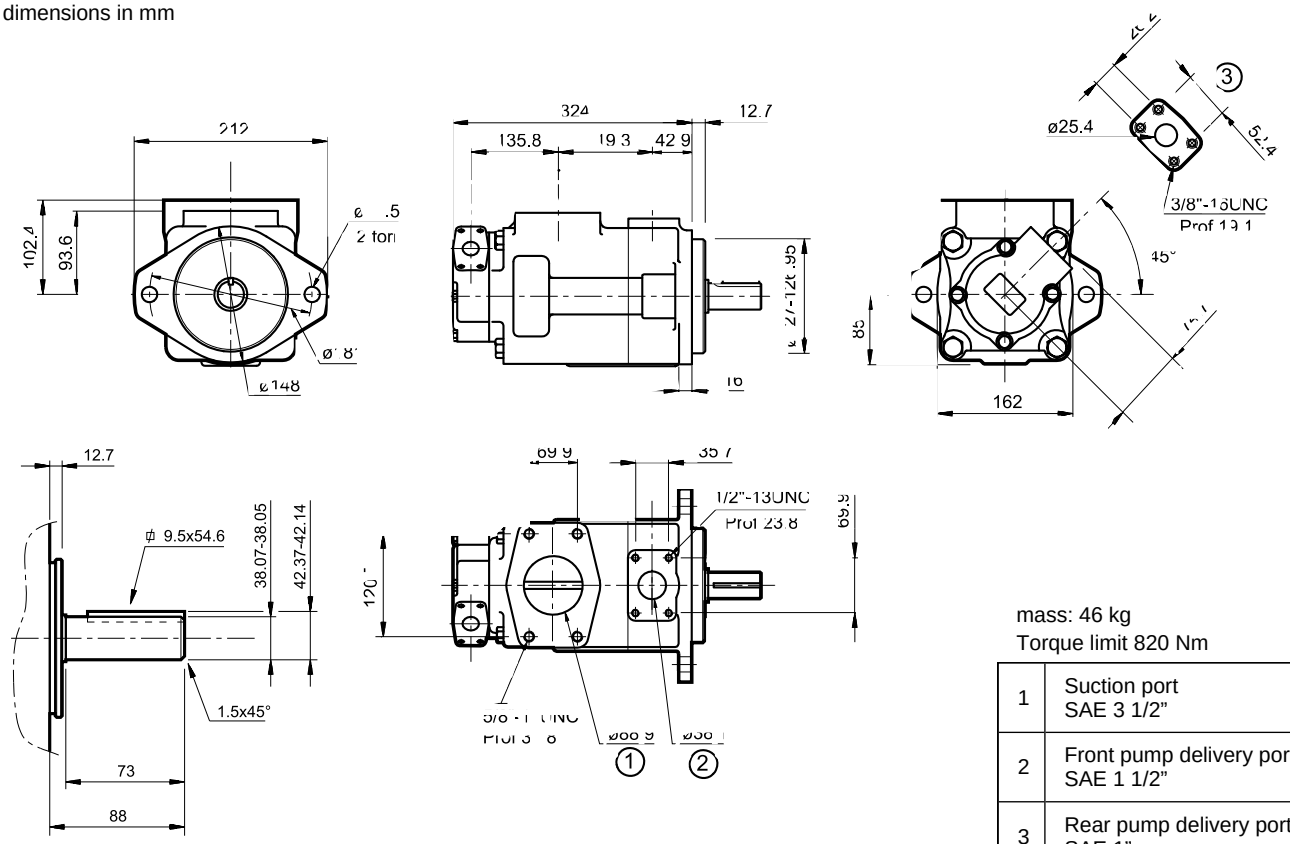


mass: 43 kg
Torque limit 820 Nm

1	Suction port SAE 3 1/2”
2	Front pump delivery port SAE 1 1/2”
3	Rear pump delivery port SAE 3/4”

16 - DFDP42 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

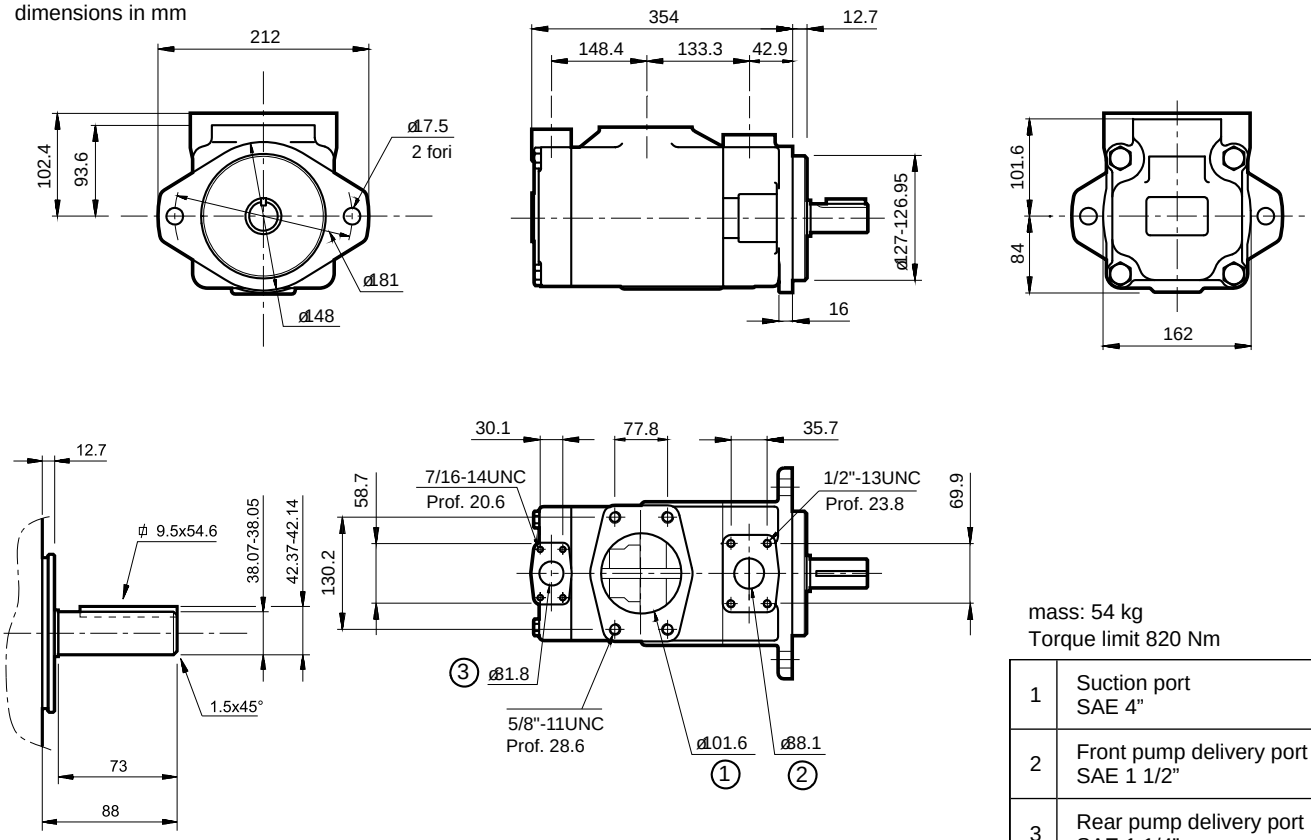


mass: 46 kg
Torque limit 820 Nm

1	Suction port SAE 3 1/2”
2	Front pump delivery port SAE 1 1/2”
3	Rear pump delivery port SAE 1”

17 - DFDP43 DOUBLE PUMP OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



mass: 54 kg
Torque limit 820 Nm

1	Suction port SAE 4”
2	Front pump delivery port SAE 1 1/2”
3	Rear pump delivery port SAE 1 1/4”

18 - INSTALLATION

The DFP pumps can be installed in any position.

Before starting, check that the direction of rotation of the motor agrees with the direction of rotation of the pump .

The pump start up, especially at a cold temperature, should occur with the pump unloading.

The suction pipe must be suitably sized to facilitate the flow of oil. Any of bends and bottlenecks or an excessive length of the suction line can impair the correct operation of the pump.

It is good to place the pump under the tank. Otherwise, make sure that the minimum level of the fluid is higher than the level of the pump suction line to avoid drain from the suction line with the pump at standstill. In the case of circuits with high flow rate and pressure values, it is advisable to install the pump under the head.

The motor-pump coupling must be made directly with a flexible coupling. Couplings that generate axial or radial loads on the pump shaft are not allowed.

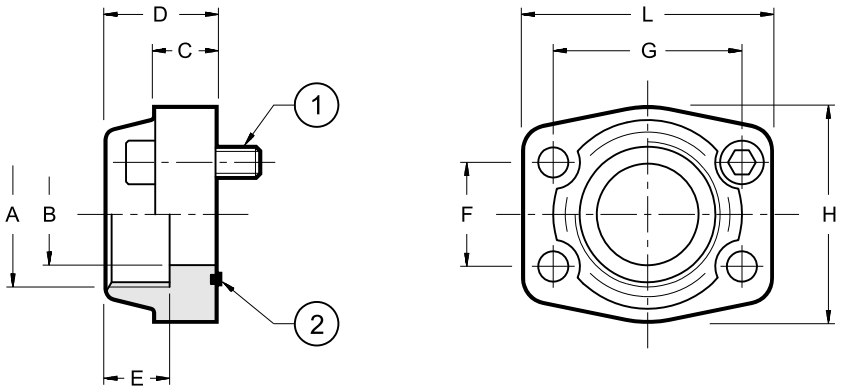
Refer to point 4.3 for the characteristics and installation of the filtering elements.

The pump body and the suction line must be filled with fluid before starting the engine. The pump start-up must take place with minimum pressure in the system especially at low temperatures.

Start the engine several times for about 1 second, at regular intervals of 2-3 seconds, until the pump has been primed. Check with a pressure gauge that the delivery pressure increases slightly. Operate all the system components several times until the air bubbles disappear in the fluid returning to the tank. Only after that, gradually increase the pressure.

19 - SAE J518 CONNECTION FLANGES

dimensions in mm



NOTE: The fastening bolts and the O-Rings must be ordered separately.

Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 N. 4 SHC bolts	Bolts code	2
0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22,2	47,6	50	65	3/8” UNC x 1 1/2”	0530612	OR 4100
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26,2	52,4	55	70			OR 4131
0610720	SAE - 1 1/4”	276	1 1/4” BSP	32	21	41	22	30,2	58,7	68	79	7/16” UNC x 1 1/2”	0530613	OR 4150
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	45	24	35,7	70	78	93	1/2” UNC x 1 3/4”	0530638	OR 4187
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77,8	90	102			OR 4225
0610722	SAE - 2 1/2”	172	2 1/2” BSP	63	25	50	30	50,8	89	105	116			OR 4175
0610723	SAE - 3”	138	3” BSP	73	27	50	34	62	106,4	116	134	5/8” UNC x 2”	0530658	OR 4337
0610724	SAE - 3 1/2”	34	3 1/2” BSP	89	27	48	34	69,8	120,7	136	152			OR 4387
0773528	SAE - 4”	34	4” BSP	99	27	48	34	77,77	130,18	146	162			OR 4437

DUPLOMATIC MOTION SOLUTIONS
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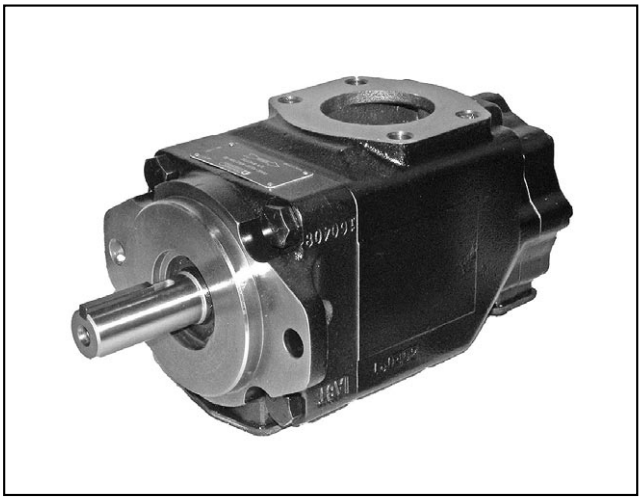
via M. Re Depaolini 24 ▪ 20015 PARABIAGO (MI) ▪ ITALY
tel. +39 0331.895.111 ▪ www.duplomatic.com ▪ e-mail: sales.exp@duplomatic.com

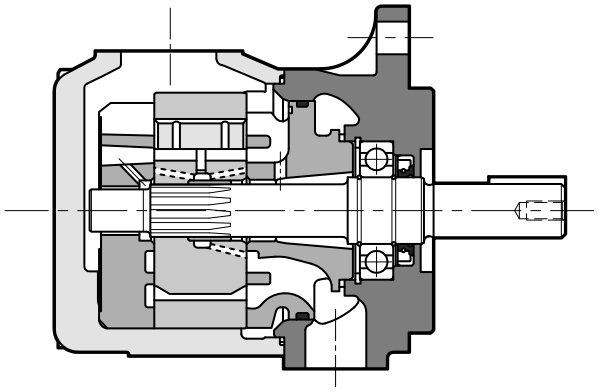


FV6

FIXED DISPLACEMENT VANE PUMPS

SERIES 10

OPERATING PRINCIPLE



— The FV6 pumps are fixed displacement vane pumps, with several nominal displacement each. Single, double and triple pumps are available.

— The pumping group is composed of a cartridge element that contains rotor, vanes, cam ring and support plates. Cartridges are easily removable without disconnecting the pump from the hydraulic circuit, thus simplify the maintenance operations.

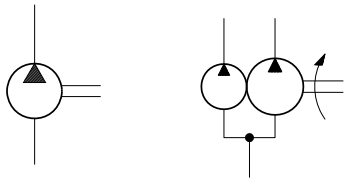
— The special elliptical profile of the cam ring, with double suction and delivery chambers one against the other, eliminates the radial thrusts on the rotor, reducing wear of the pump. The use of a 10 vane rotor reduces the delivery pressure pulsations, suppressing the vibrations and noise level of the pump.

TECHNICAL SPECIFICATIONS

PUMP SIZE (SINGLE)		FV6C	FV6D	FV6E
Displacement range	cm^3/rev	10.8 ÷ 100	47.6 ÷ 158	132.3 ÷ 269
Flow rate range (at 1500 rpm - 0 bar)	l/min	16.2 ÷ 150	71.4 ÷ 237	198 ÷ 403
Operating pressure	bar	240	210	210
Rotation speed (max)	rpm	2800	2500	2200
Rotation direction		clockwise or anticlockwise		
Loads on shaft		see diagrams		
Hydraulic connections		SAE J518c		
Mounting flange SAE J744		SAE B	SAE C	SAE C
Mass (empty single pump)	kg	15.4	24	43

Ambient temperature range	°C	-20 / +60
Fluid temperature range (see par. 4)	°C	-10 / +70
Fluid viscosity range	cSt	see paragraph 4
Fluid contamination degree	see paragraph 4.3	
Recommended viscosity	cSt	30

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE FOR SINGLE PUMPS

FV6		-		-				/	10	

Fixed displacement vane pump with SAE flange

Pump size:
C = from 10.8 to 100 cm³/rev
D = from 47.6 to 158 cm³/rev
E = from 132.3 to 269 cm³/rev

Cartridge size
see paragraph 2

Shaft end type:
FV6C
1 = cylindrical keyed SAE B J744
2 = cylindrical keyed no SAE
3 = splined SAE B J498b class 1
4 = splined SAE B-B J498b class 1
FV6D
1 = cylindrical keyed SAE C J744
2 = cylindrical keyed no SAE
3 = splined SAE C J498b class 1
4 = splined no SAE
FV6E
1 = cylindrical keyed SAE C-C J744
2 = cylindrical keyed no SAE
3 = splined SAE C J498b class 1
4 = splined SAE C-C J498b class 1

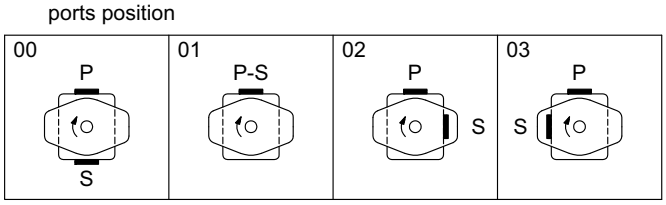
Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Ports position
(view from shaft side)
Pressure port always on top
00 = opposed (**standard**)
01 = in line
02 = 90° CW from P port
03 = 90° CCW 90° CW from P port

Rotation direction
(view from shaft side)
R = clockwise
L = counterclockwise

ports position

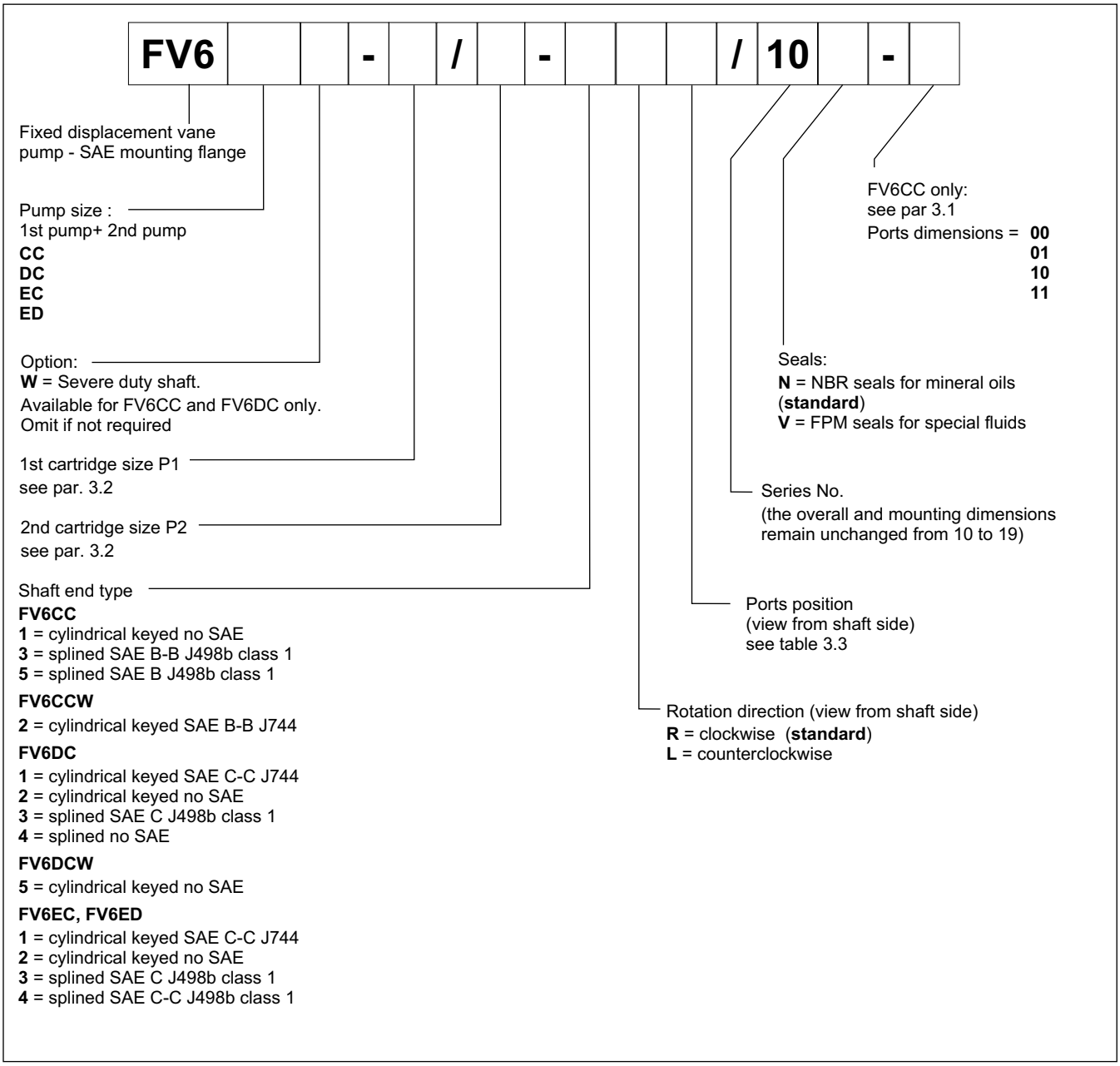


2 - PERFORMANCES

(obtained with antiwear mineral oil with viscosity of 24 cSt)

PUMP	CARTRIDGE SIZE	DISPLACEMENT [cm³/rev]	MAX FLOW RATE at 0 bar - 1500 rpm [l/min]	PRESSURE [bar] continuous	PRESSURE [bar] peak	ROTATION SPEED [rpm] max	ROTATION SPEED [rpm] min
FV6C	03	10.8	16.2	240	280	2800	600
	05	17.2	25.8				
	06	21.3	31.9				
	08	26.4	39.6				
	10	34.1	51.1				
	12	37.1	55.6				
	14	46.0	69.0				
	17	58.3	87.4				
	20	63.8	95.7				
	22	70.3	105.4				
	25	79.3	118.9			2500	
	28	88.8	133.2	160	210		
	31	100.0	150				
FV6D	14	47.6	71.4	210	250	2500	600
	17	58.2	87.3				
	20	66.0	99.0				
	24	79.5	119.3				
	28	89.7	134.6				
	31	98.3	147.5				
	35	111.0	166.5				
	38	120.3	180.5				
	42	136.0	204.0			2200	
	45	145.7	218.6				
	50	158.0	237	160	210		
FV6E	42	132.3	198.5	210	250	2200	600
	45	142.4	213.6				
	50	158.5	237.8				
	52	164.8	247.2				
	57	179.8	269.6				
	62	196.7	295.1				
	66	213.3	320.0				
	72	227.1	340.0				
	85	269	403	80	120	2000	

3 - IDENTIFICATION CODE FOR FV6 DOUBLE PUMPS



3.1 - Ports dimensions for FV6CC

The largest cartridge must always be installed on the front side.

P2 = 3/4” for 46 ml/rev max
S = 2” 1/2 for 126 ml/rev max

	P1	P2	S
00	1”	1”	3”
01	1”	3/4”	3”
10	1”	1”	2” 1/2
11	1”	3/4”	2” 1/2

3.2 - Available cartridges

Grey boxes indicates reduced performance. See paragraph 2 for limits.

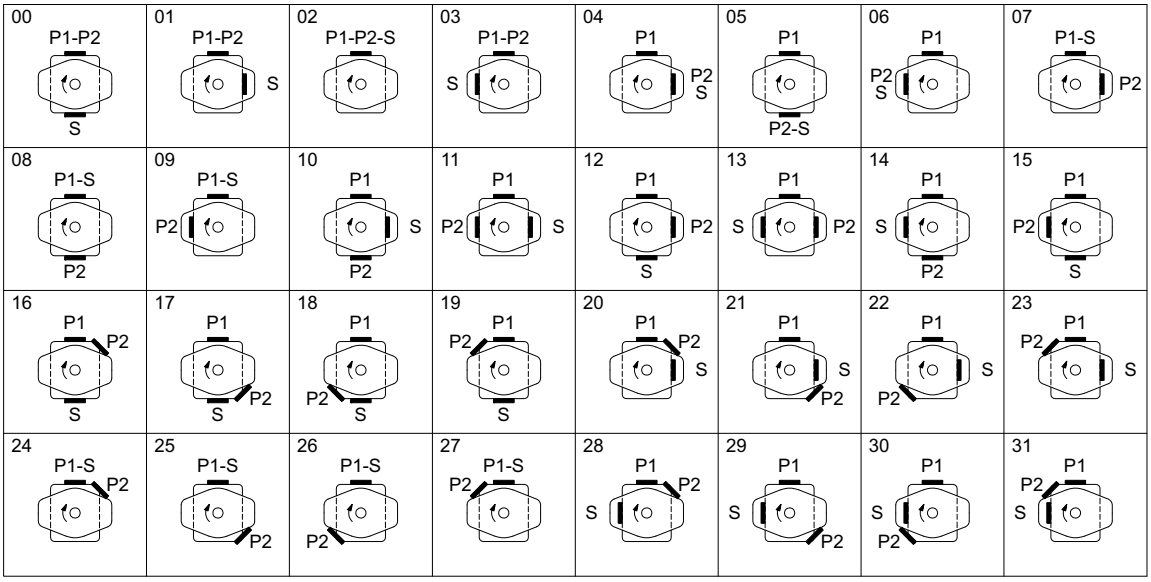
The second cartridge (for P2) should have equal or lower displacement than the first.

CC		DC		EC		ED	
1st cartridge	2nd cartridge	1st cartridge	2nd cartridge	1st cartridge	2nd cartridge	1st cartridge	2nd cartridge
03	03	14	03	42	03	42	14
05	05	17	05	45	05	45	17
06	06	20	06	50	06	50	20
08	08	24	08	52	08	52	24
10	10	28	10	57	10	57	28
12	12	31	12	62	12	62	31
14	14	35	14	66	14	66	35
17	17	38	17	72	17	72	38
20	20	42	20	85	20	85	42
22	22	45	22		22		45
25	25	50	25		25		50
28	28		28		28		
31	31		31		31		

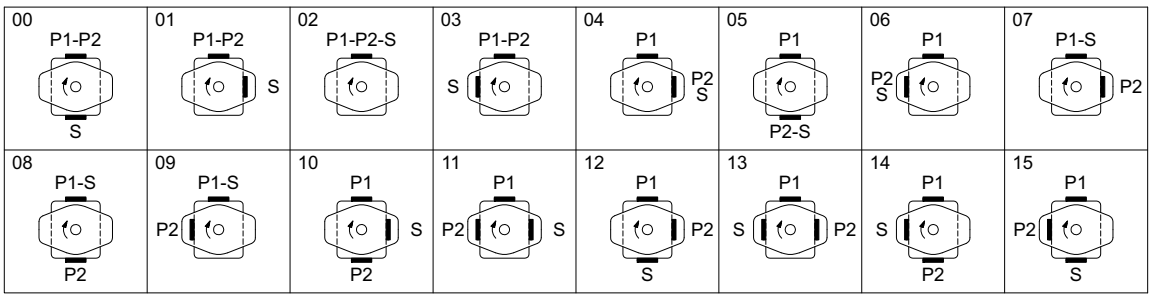
3.3 - Ports position codes

FV6CC
FV6DC
FV6EC

FV67CB
FV67DB
FV67EB



FV6ED



4 - HYDRAULIC FLUID

Data in this catalogue have been obtained with antiwear fluid petroleum base. Minimum allowable inlet pressure 0,8 absolute bar (-0,2 relative bars). Differential pressure between inlet and outlet pressure should be at least 1.5 bar.

Pressures, maximum allowed speeds and recommended temperatures are shown in the table below, according to the types of hydraulic fluid used.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	The performance ratings shown in the table 'PERFORMANCES' must be reduced as follows: max continuous pressure: 140 bar (FV6E-085 is 75 bar) max peak pressure: 175 bar (FV6E-085 is 75 bar) max rotation speed: 1800 rpm - Minimum allowable inlet pressure 1 absolute bar - The fluid maximum temperature must be between 10°C and 50°C. - Use NBR seals only. - Minimum viscosity 18 cSt
HFD (phosphate esters)	The performance ratings shown in the table 'PERFORMANCES' must be reduced as follows: max continuous pressure: 175 /160 bar (FV6E-085 is 80 bar) max peak pressure: 210 bar (FV6E-085 is 120 bar) max rotation speed: 1800 rpm - Minimum allowable inlet pressure 1,08 absolute bar - The fluid temperature must be between -18°C and 70°C. - Use VITON seals - Minimum viscosity 18 cSt

4.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to the maximum temperature of 90 °C of the fluid, with antiwear
optimum viscosity	30 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	840 cSt	limited to only the pump start-up phase at cold start.

When choosing the fluid type, verify that the true viscosity at the operating temperature is within the above range.

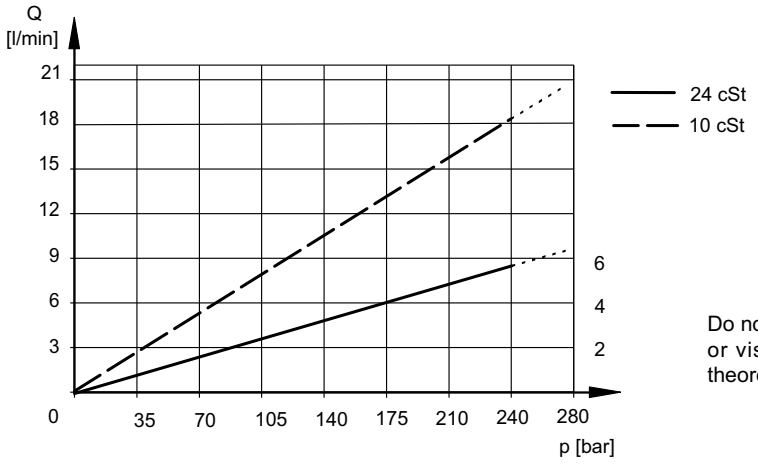
4.3 - Degree of fluid contamination

The degree of fluid contamination must be according to ISO 4406:1999 class 19/17/14 or better. Strainers on inlet port are not recommended. However, if requested, do not exceed 149 micron (100 mesh).

5 - CHARACTERISTIC CURVES OF SINGLE PUMPS

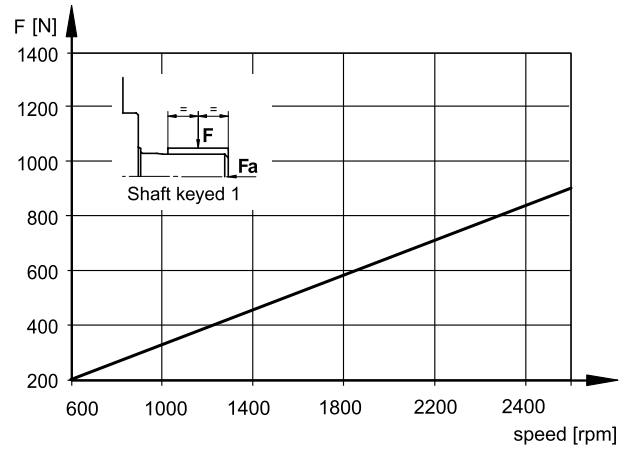
5.1 - FV6C

INTERNAL LEAKAGE (typical)



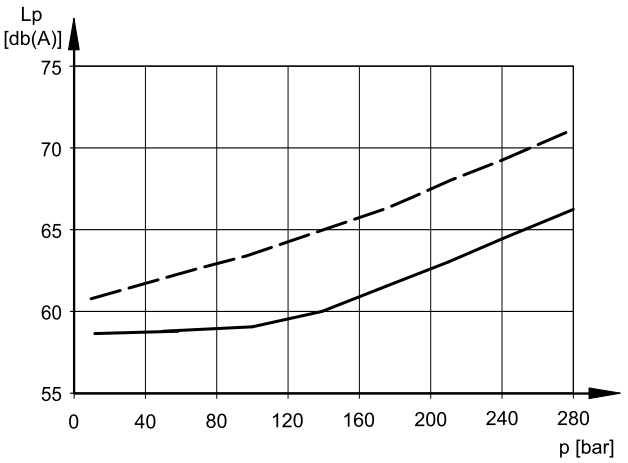
Do not operate the pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 800 N

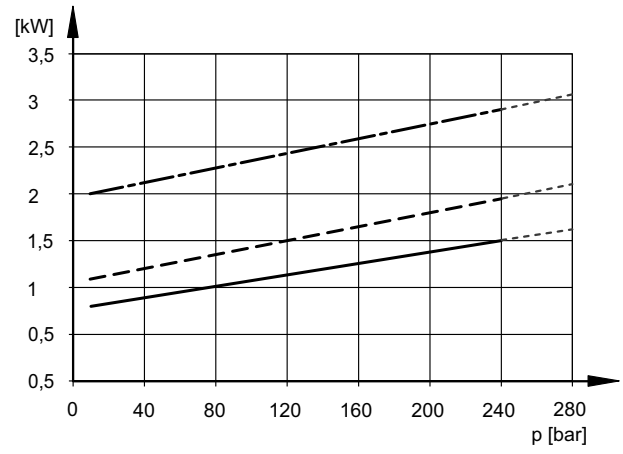
NOISE LEVEL (typical)



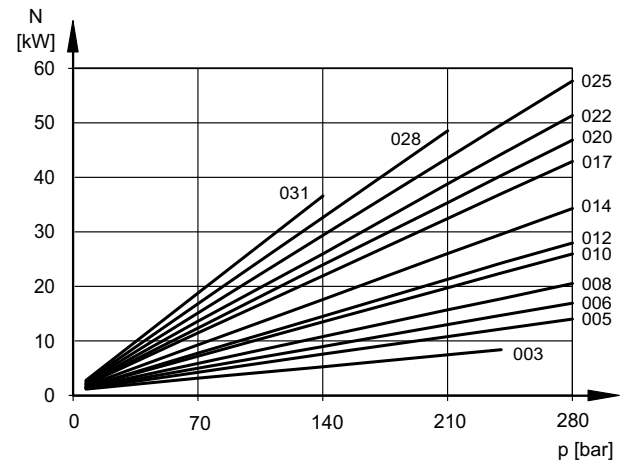
Value obtained with a FV6C-22 pump, according to ISO 4412
1 mt distance

1000 rpm
1500 rpm

POWER LOSS HYDROMECHANICAL (typical)

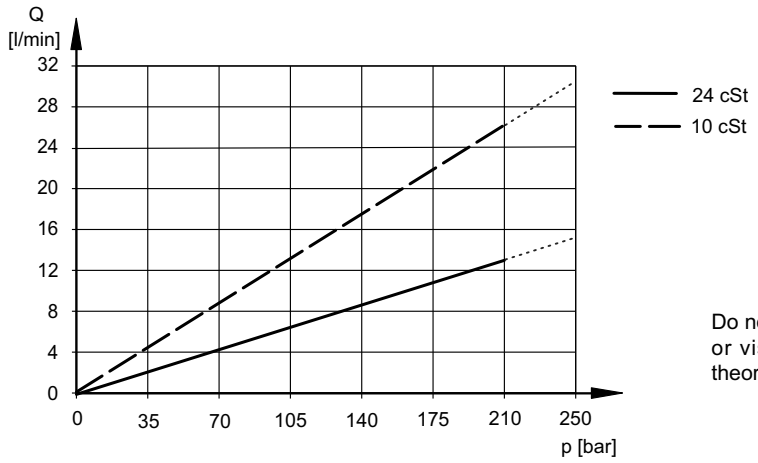


ABSORBED POWER at 1500 rpm



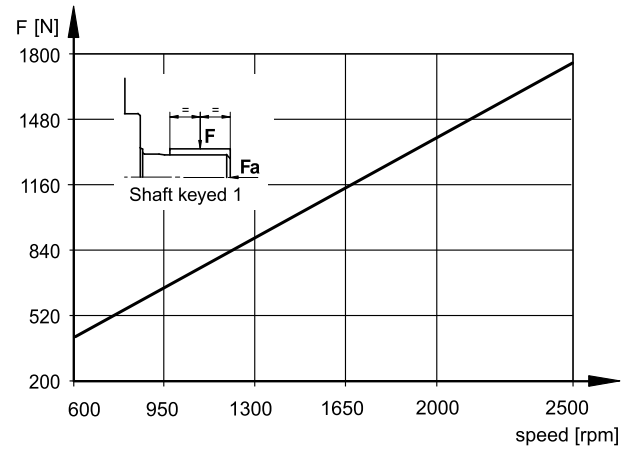
5.2 - FV6D

INTERNAL LEAKAGE (typical)



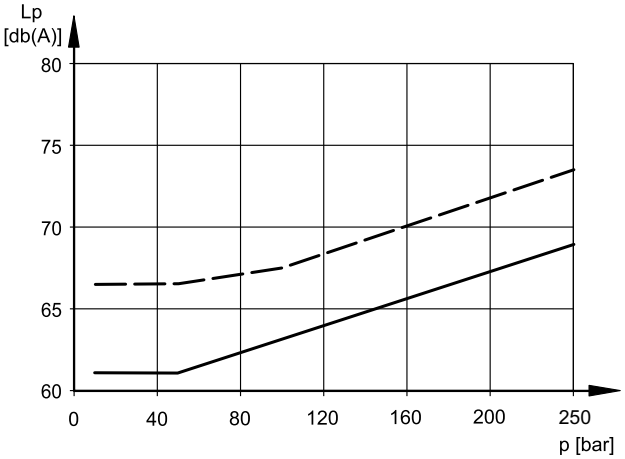
Do not operate the pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow.

PERMISSIBLE RADIAL LOAD



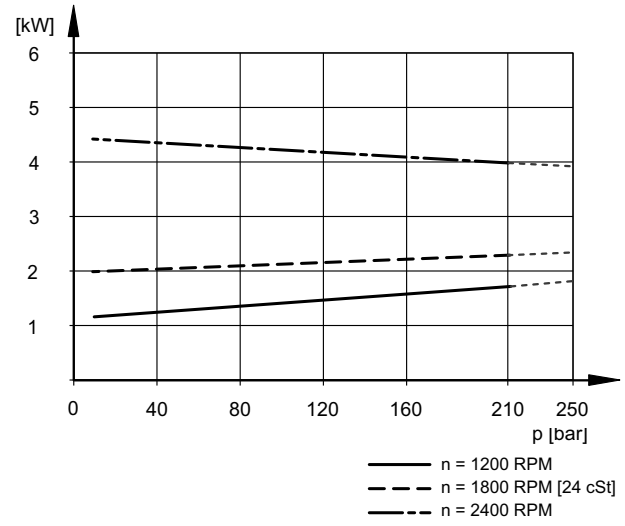
Maximum permitted axial load Fa = 1200 N

NOISE LEVEL (typical)

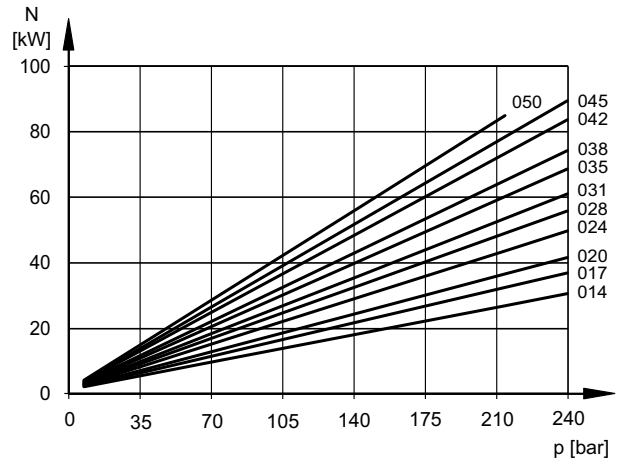


Value obtained with a FV6D-38 pump, according to ISO 4412
1 mt distance

POWER LOSS HYDROMECHANICAL (typical)

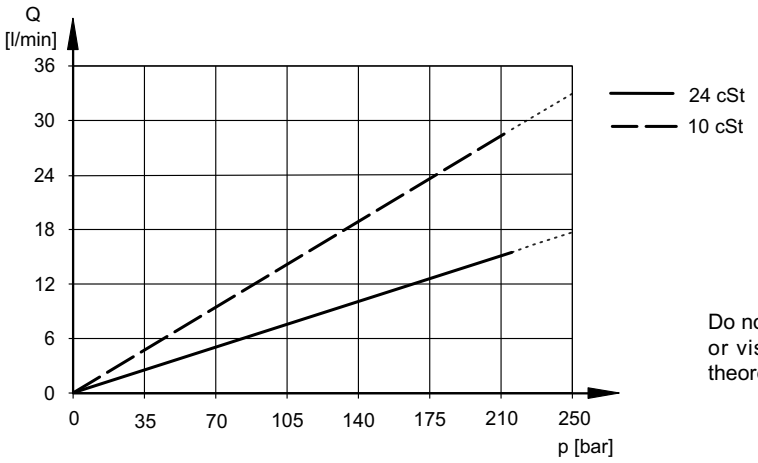


ABSORBED POWER at 1500 rpm



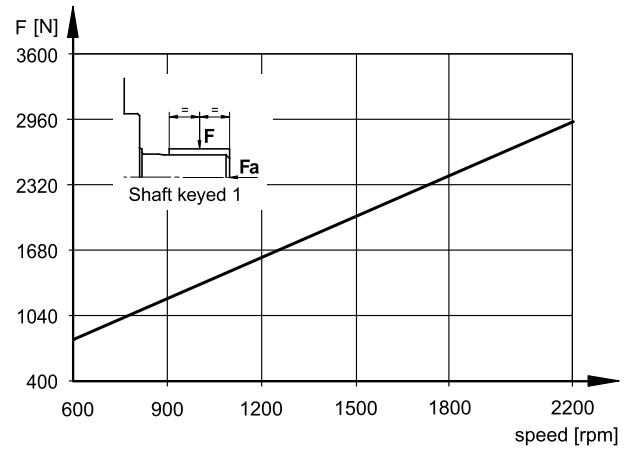
5.3 - FV6E

INTERNAL LEAKAGE (typical)



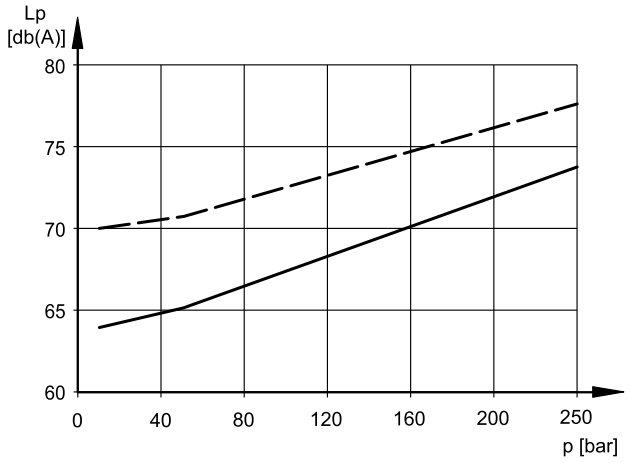
Do not operate the pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow.

PERMISSIBLE RADIAL LOAD



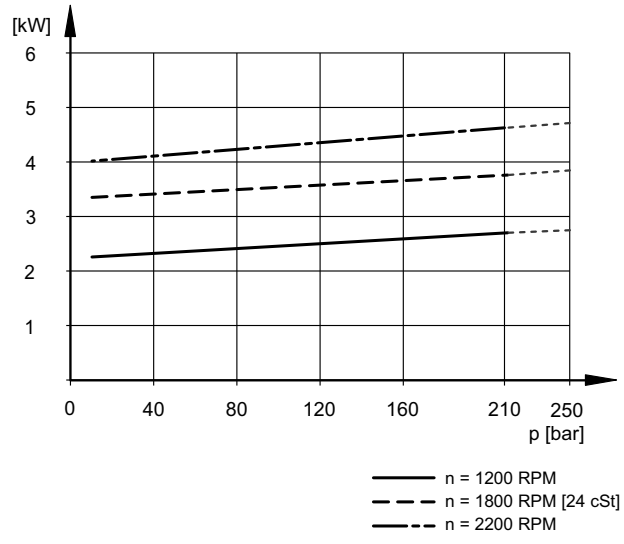
Maximum permitted axial load Fa = 2000 N

NOISE LEVEL (typical)

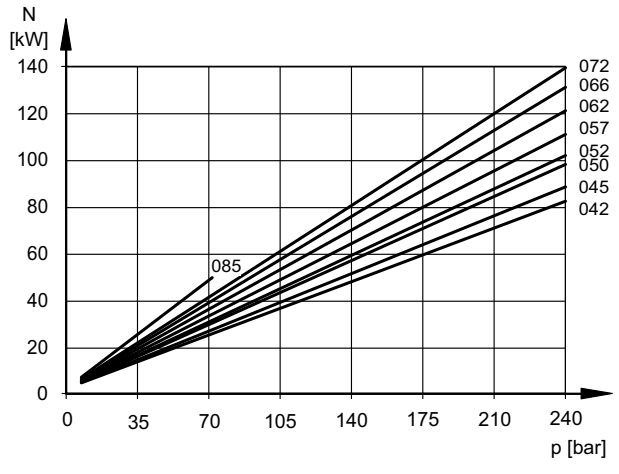


Value obtained with a FV6E-50 pump, according to ISO 4412
1 mt distance

POWER LOSS HYDROMECHANICAL (typical)



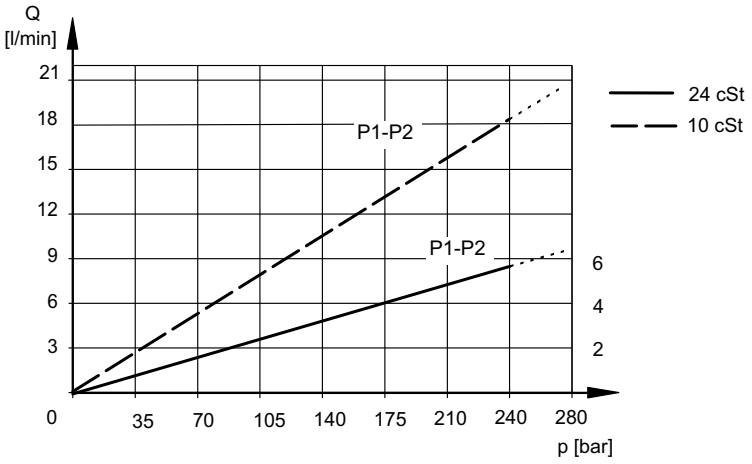
ABSORBED POWER at 1500 rpm



6 - CHARACTERISTIC CURVES OF DOUBLE PUMPS

6.1 - FV6CC

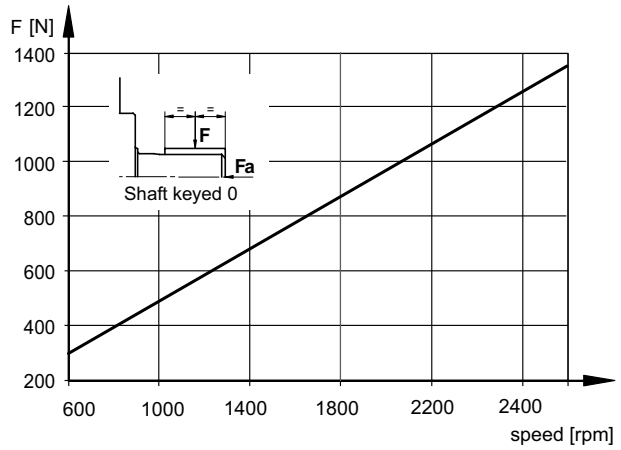
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

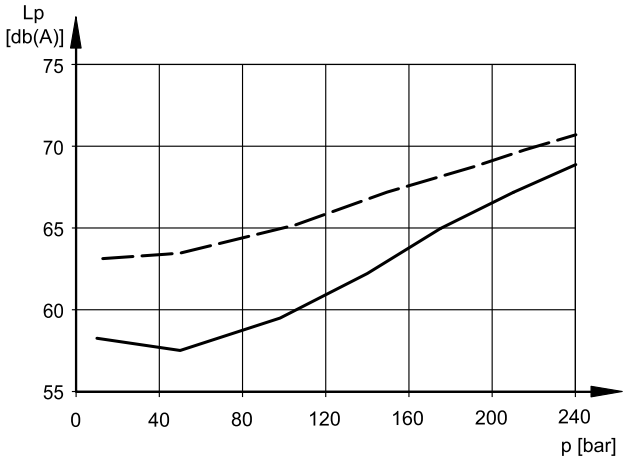
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 800 N

NOISE LEVEL (typical)



FV6CC-22/22 pump, according to ISO 4412, 1 mt distance.

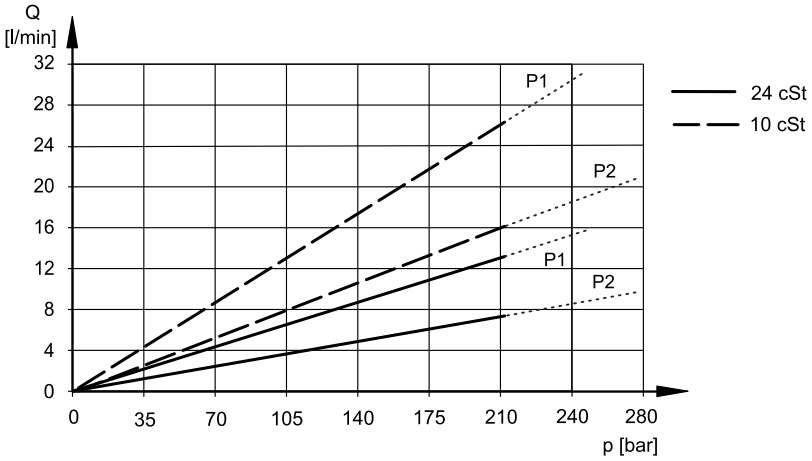
Values obtained with pe = 0.9 bar abs and both stages discharging at the same pressure.

POWER LOSS HYDROMECHANICAL

Refer to diagram of FV6C pump.
Total hydromechanics power loss is the sum of each section at its operating conditions.

6.2 - FV6DC

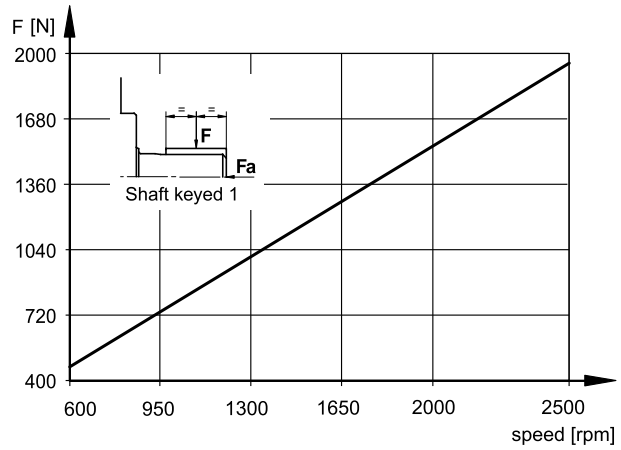
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

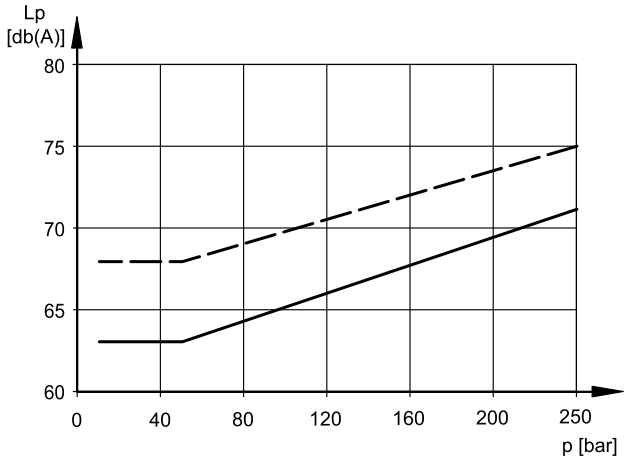
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 1200 N

NOISE LEVEL (typical)



FV6DC-38/22 pump, according to ISO 4412, 1 mt distance

1000 rpm
1500 rpm

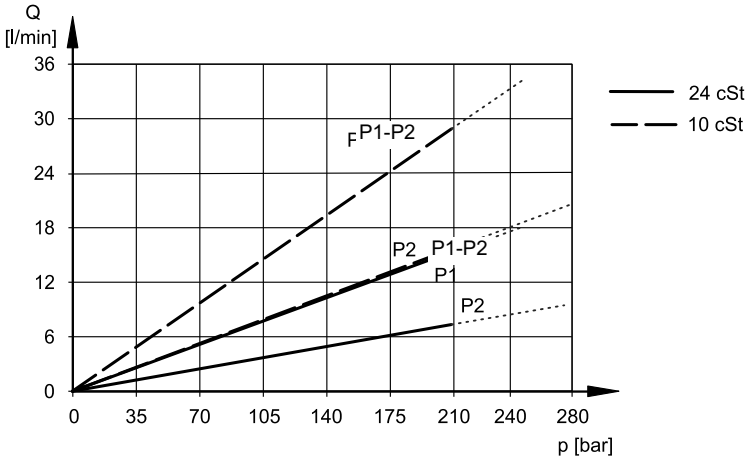
Values obtained with pe = 0.9 bar abs and both stages discharging at the same pressure.

POWER LOSS HYDROMECHANICAL

Refer to diagram of FV6D pump for P1 and to that of FV6C for P2. Total hydromechanics power loss is the sum of each section at its operating conditions.

6.3 - FV6EC

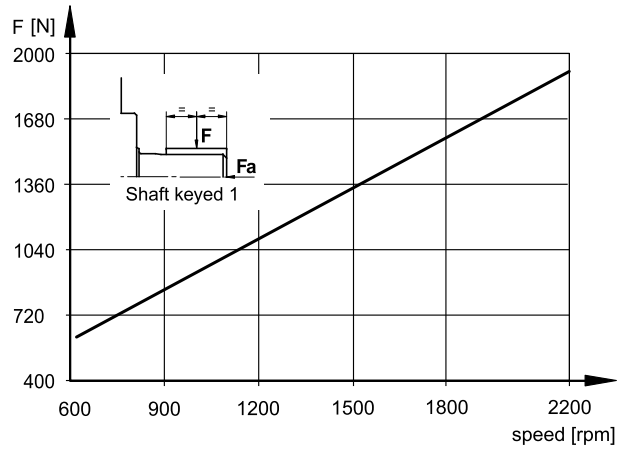
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

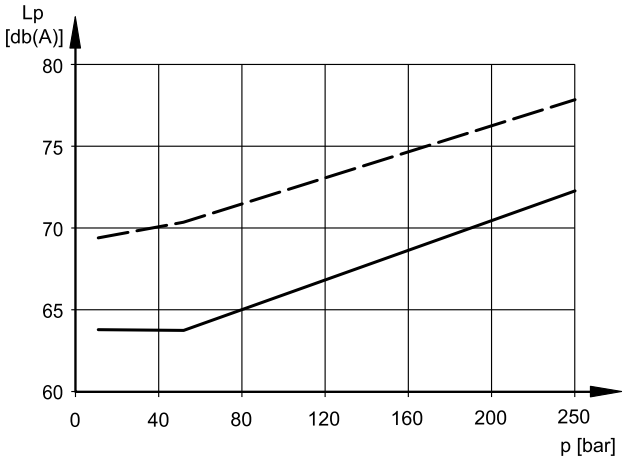
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 2000 N

NOISE LEVEL (typical)



FV6EC-50/22 pump, according to ISO 4412, 1 mt distance.

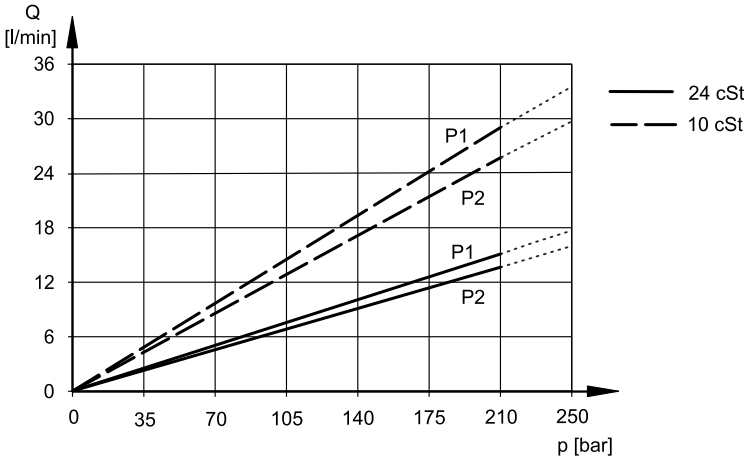
Values obtained with pe = 0.9 bar abs and both stages discharging at the same pressure.

POWER LOSS HYDROMECHANICAL

Refer to diagram of FV6E pump for P1 and to that of FV6C for P2. Total hydromechanics power loss is the sum of each section at its operating conditions.

6.4 - FV6ED

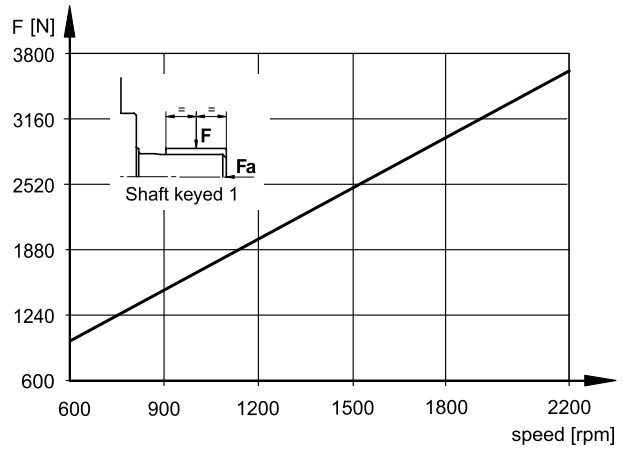
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

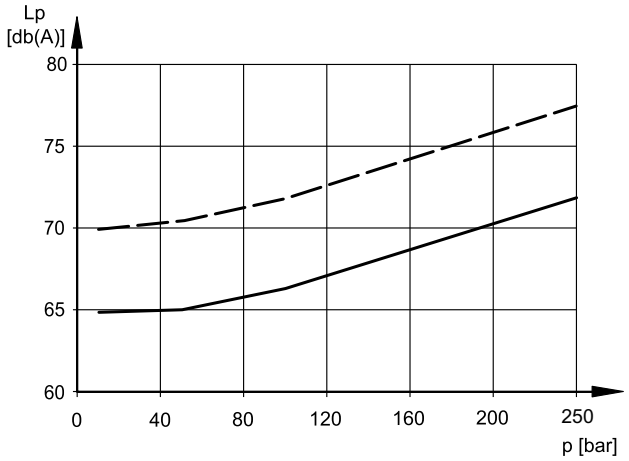
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 2000 N

NOISE LEVEL (typical)



FV6ED-50/38 pump, according to ISO 4412, 1 mt distance

Values obtained with pe = 0.9 bar abs and both stages discharging at the same pressure.

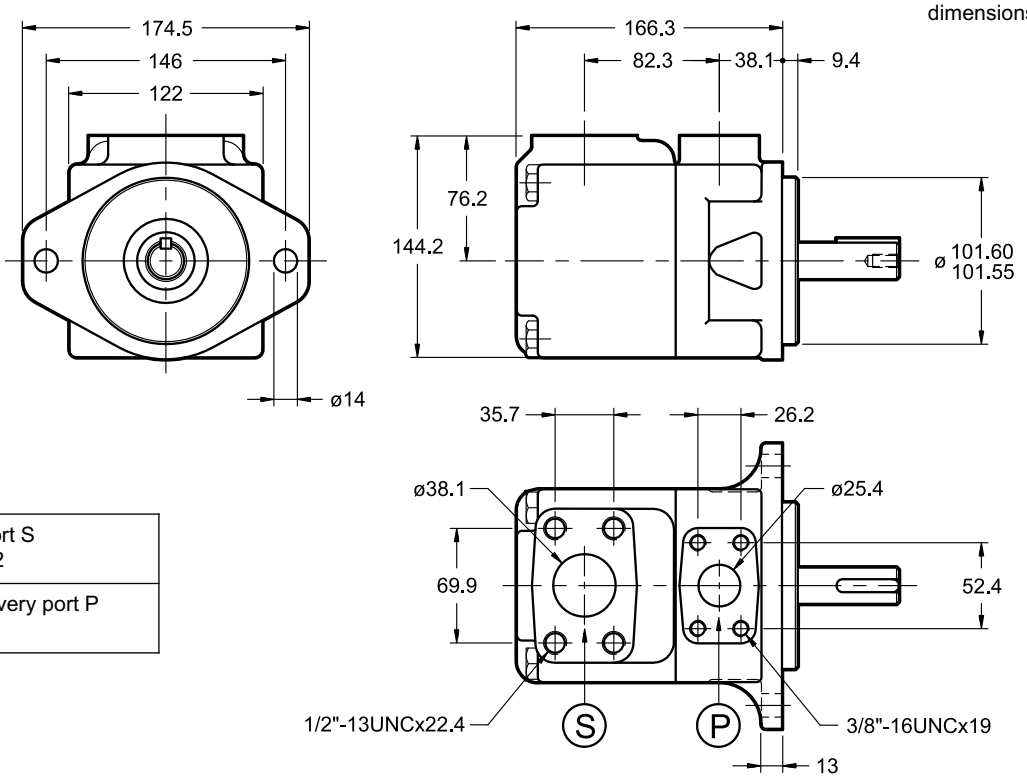
POWER LOSS HYDROMECHANICAL

Refer to diagram of FV6E pump for P1 and to that of FV6D for P2.
Total hydromechanics power loss is the sum of each section at its operating conditions.

7 - SINGLE PUMPS OVERALL AND MOUNTING DIMENSIONS

7.1 - FV6C

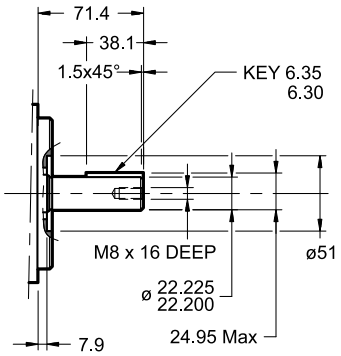
dimensions in mm



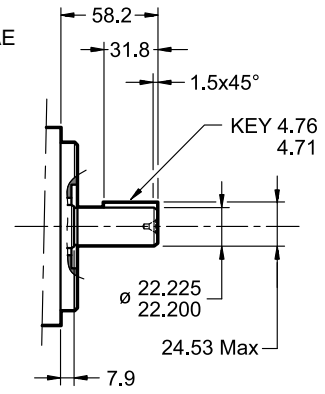
S	Suction port S SAE 1” 1/2
P	Pump delivery port P SAE 1”

SHAFTS:

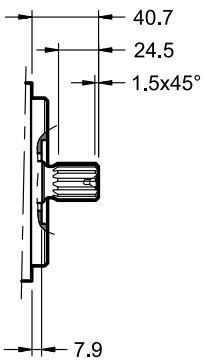
cylindrical keyed SAE B
(identification code: **1**)
Torque limit: 275 Nm



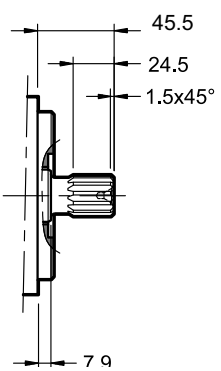
cylindrical keyed no SAE
(identification code: **2**)
Torque limit: 238 Nm



splined SAE B J498b
16/32 d.p. - 13T
(identification code: **3**)
Torque limit: 343 Nm

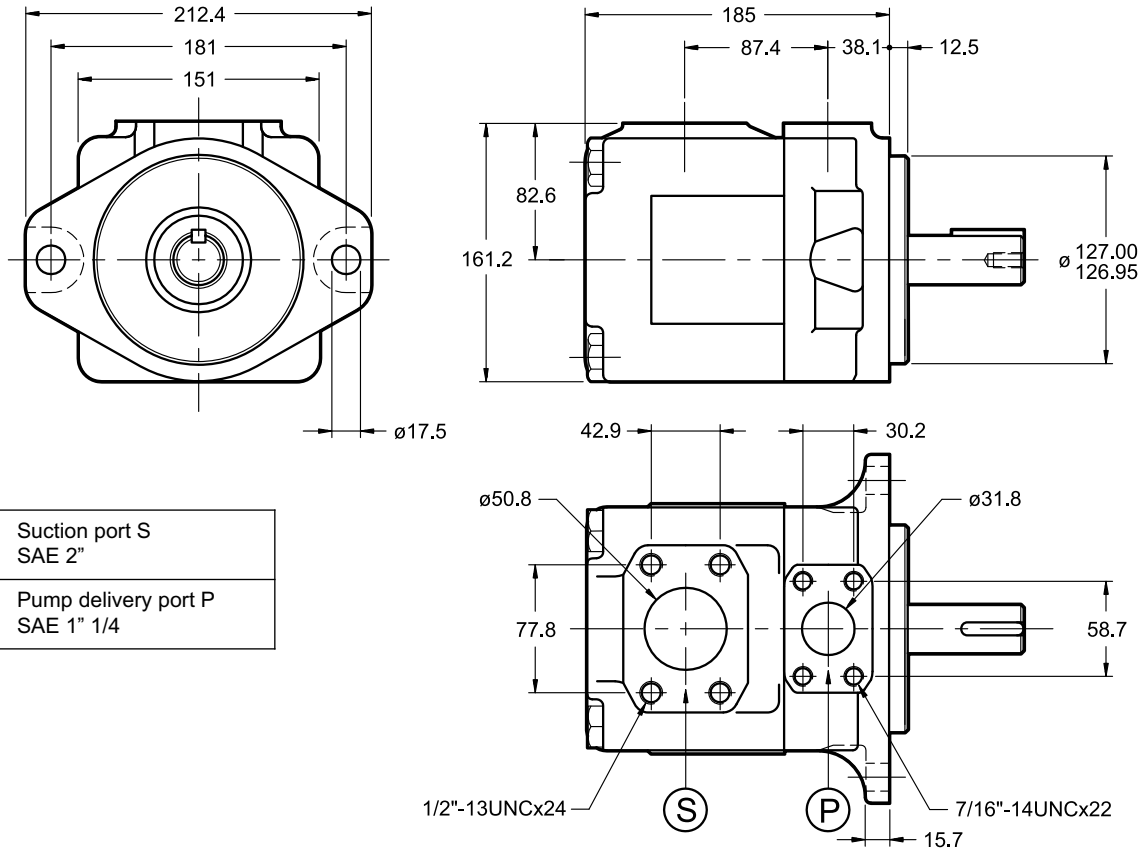


splined SAE B-B J498b
16/32 d.p. - 15T
(identification code: **4**)



7.2 - FV6D

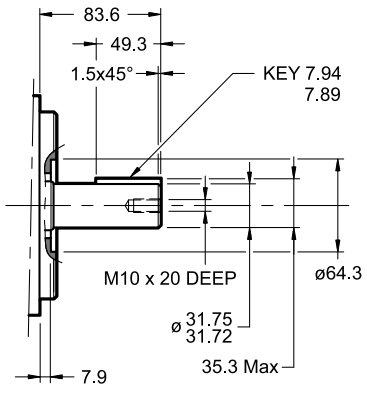
dimensions in mm



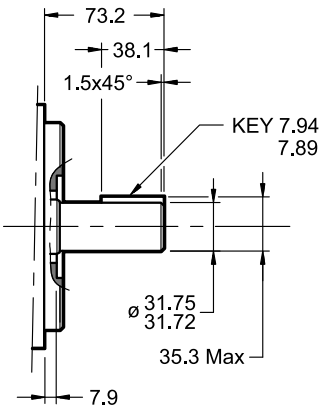
S	Suction port S SAE 2”
P	Pump delivery port P SAE 1” 1/4

SHAFTS:

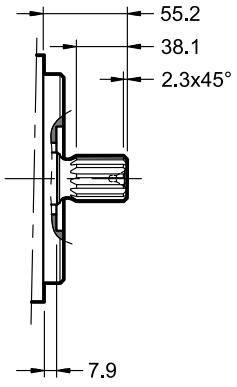
cylindrical keyed SAE C
(identification code: **1**)



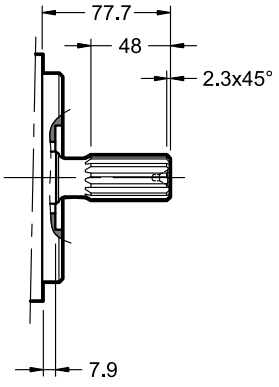
cylindrical keyed no SAE
(identification code: **2**)
Torque limit: 577 Nm



splined SAE C J498b
12/24 d.p. - 14T
(identification code: **3**)

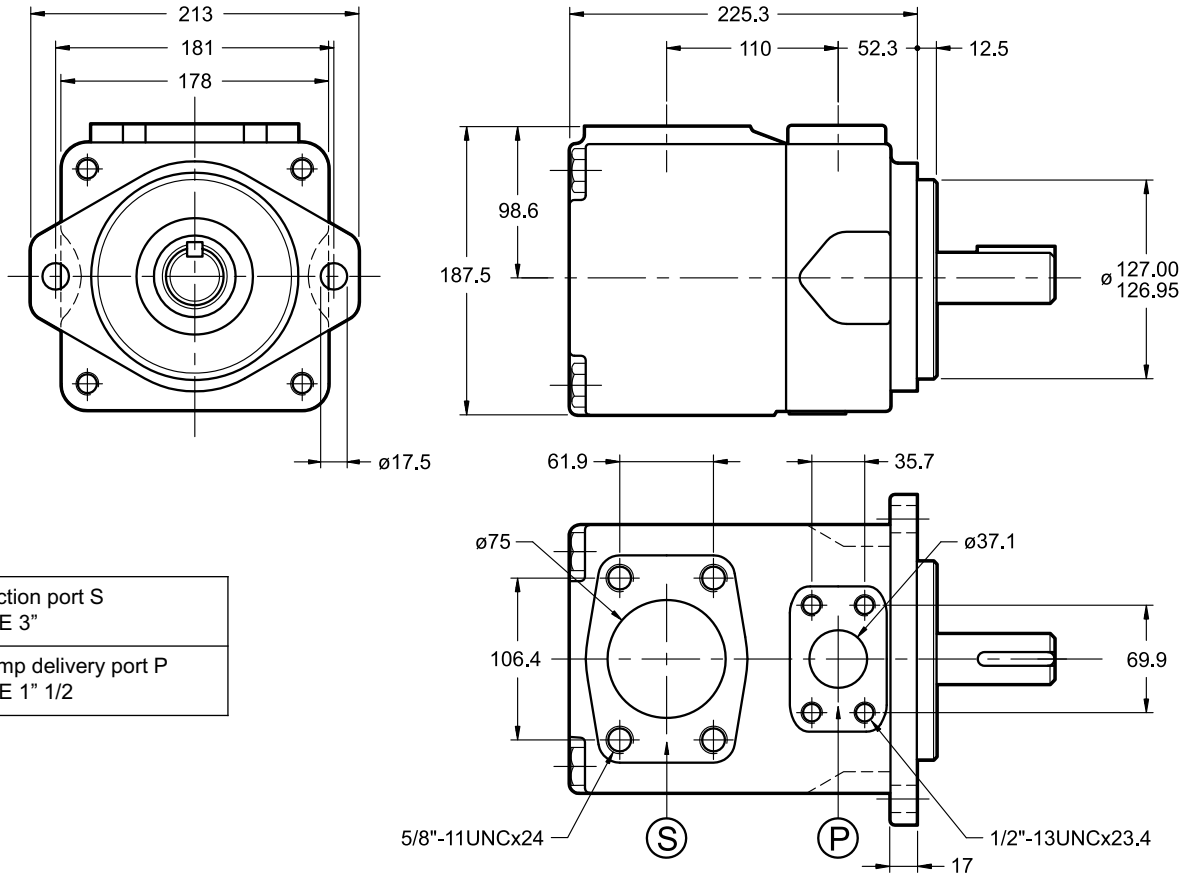


splined no SAE
12/24 d.p. - 14T
(identification code: **4**)



7.3 - FV6E

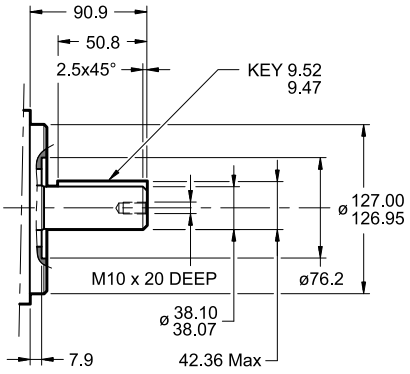
dimensions in mm



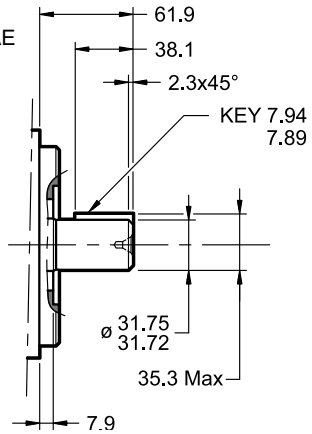
S	Suction port S SAE 3”
P	Pump delivery port P SAE 1” 1/2

SHAFTS:

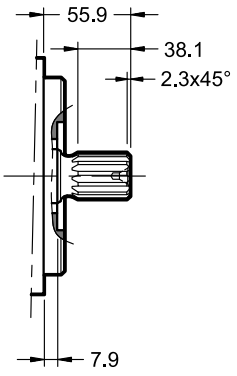
cylindrical keyed SAE C-C
(identification code: **1**)



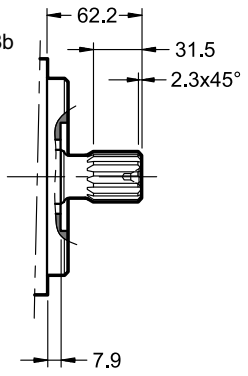
cylindrical keyed no SAE
(identification code: **2**)
Torque limit: 577 Nm



splined SAE C J498b
12/24 d.p. - 14T
(identification code: **3**)



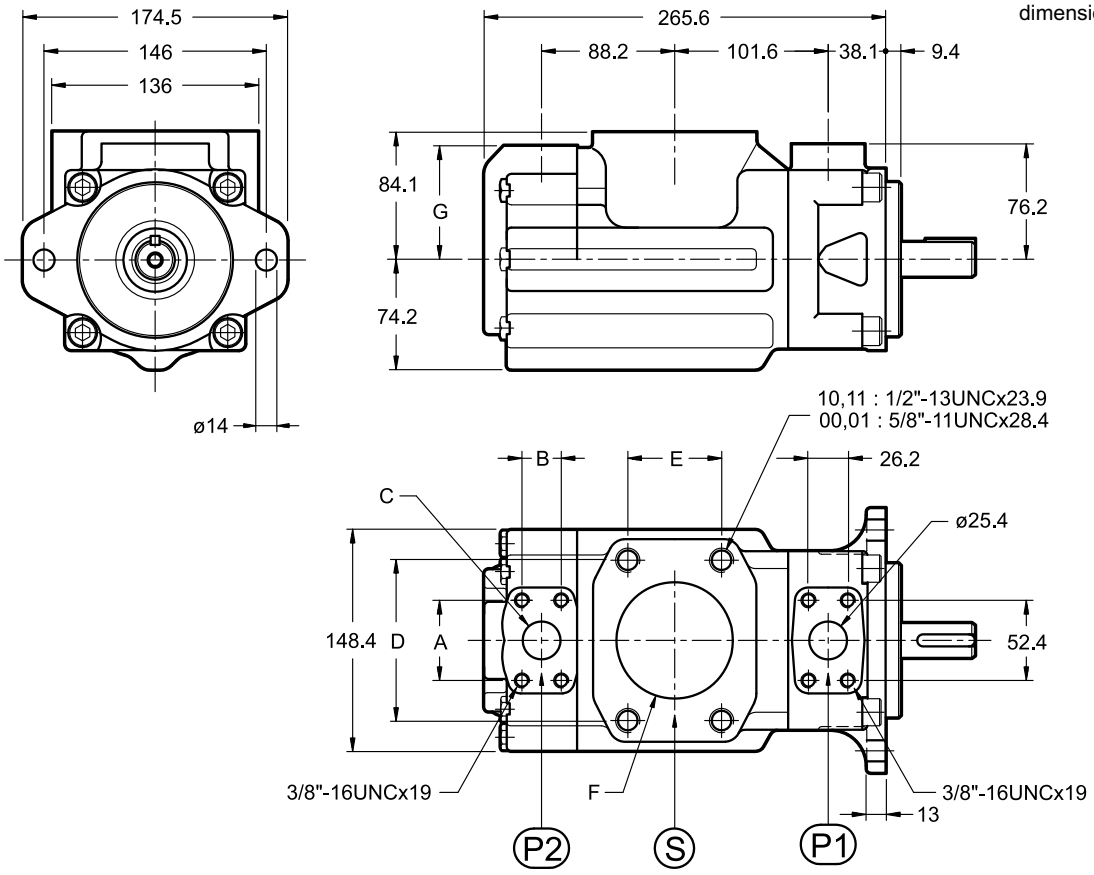
splined SAE C-C J498b
12/24 d.p. - 17T
(identification code: **4**)



8 - FV6 DOUBLE PUMPS OVERALL AND MOUNTING DIMENSIONS

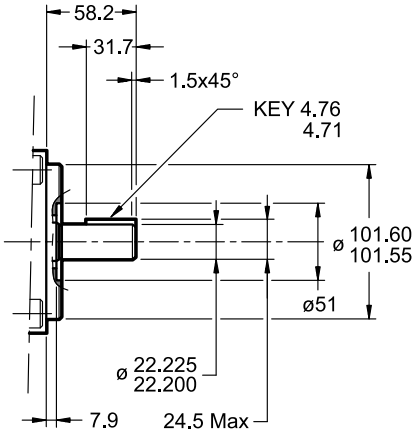
8.1 - FV6CC

dimensions in mm

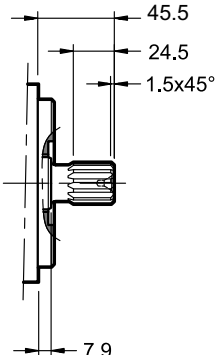


SHAFTS:

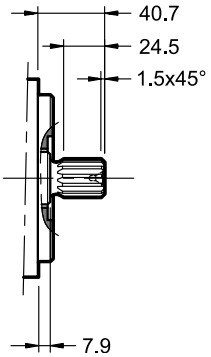
cylindrical keyed - no SAE
(identification code: **1**)
Torque limit: 238 Nm



splined SAE B-B J498b
16/32 d.p. - 15T
(identification code: **3**)
Torque limit: 545 Nm



splined SAE B J498b
16/32 d.p. - 13T
(identification code: **5**)
Torque limit: 343 Nm

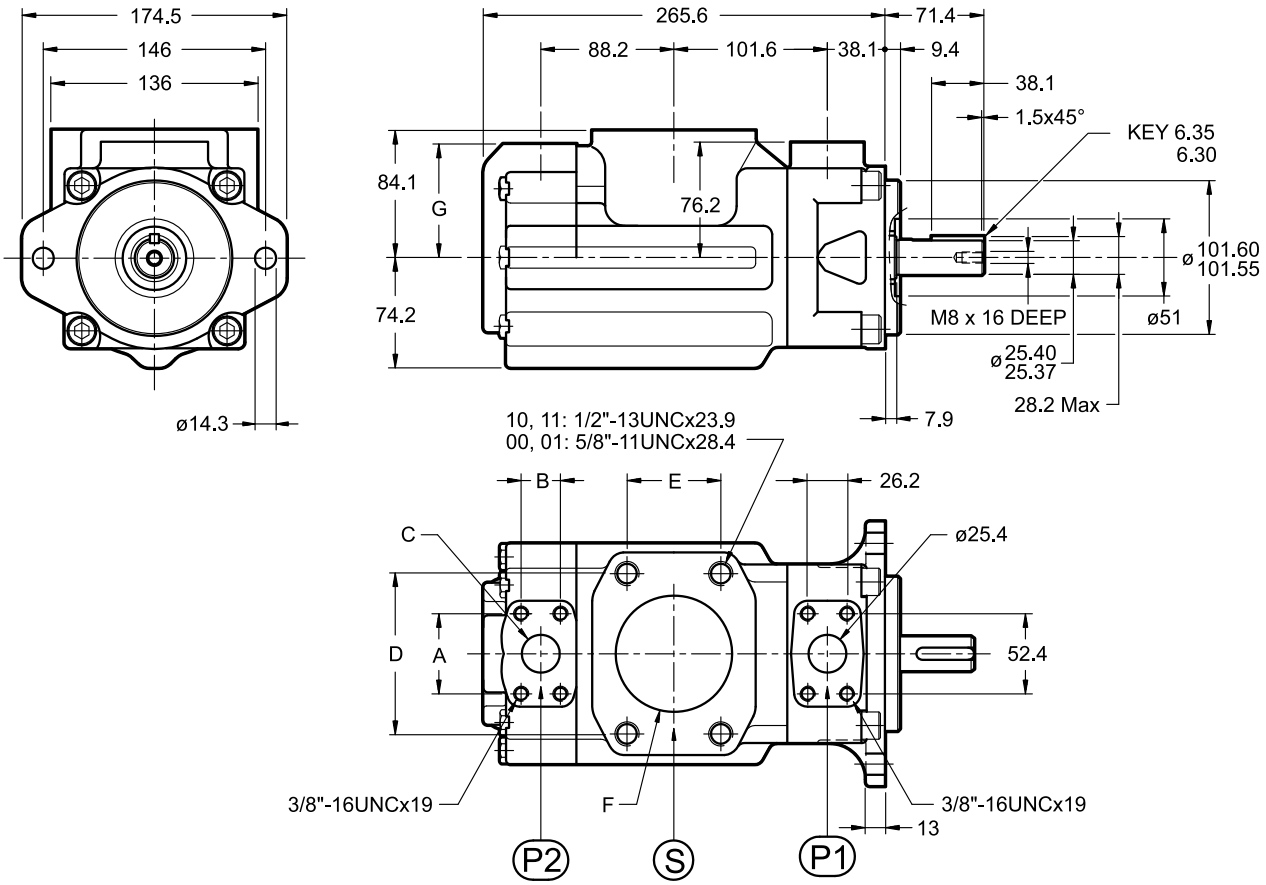


dimensions (mm)							
	P2			**S**			**height**
	A	B	ØC	D	E	ØF	G
00	52.4	26.2	25.4	106.4	61.9	76.2	74.7
01	47.6	22.2	19.0	106.4	61.9	76.2	76.2
10	52.4	26.2	25.4	88.9	50.8	63.5	74.7
11	47.6	22.2	19.0	88.9	50.8	63.5	76.2

S	Suction port S: **00, 01** : SAE 3” **10, 11** : SAE 2” 1/2
P1	Delivery port P1: SAE 1”
P2	Delivery port P2: **00, 10** : SAE 1” **01, 11** : SAE 3/4”

8.2 - FV6CCW

dimensions in mm



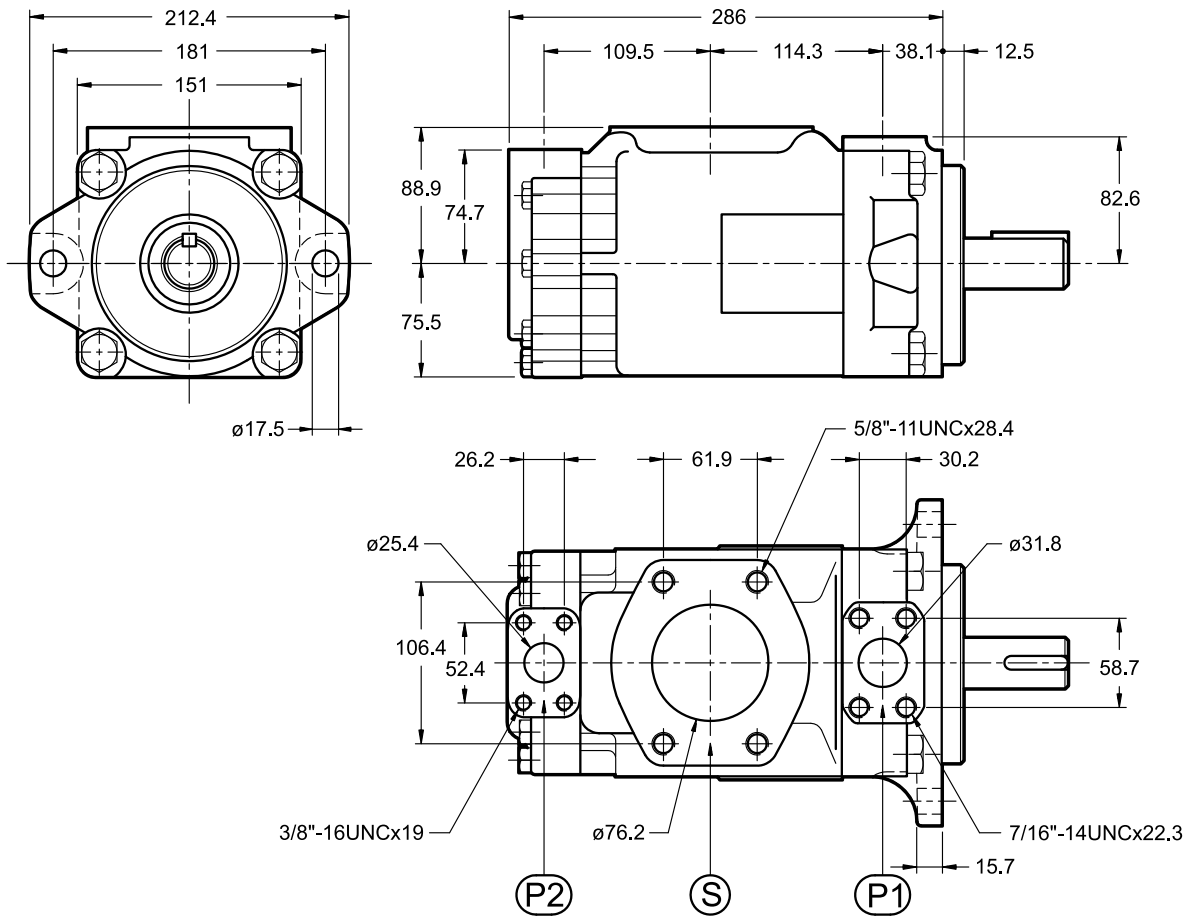
SHAFT:
cylindrical keyed SAE B-B
(identification code: **2**)
Torque limit 357 Nm

dimensions (mm)							
	P2			**S**			**height**
	A	B	ØC	D	E	ØF	G
00	52.4	26.2	25.4	106.4	61.9	76.2	74.7
01	47.6	22.2	19.0	106.4	61.9	76.2	76.2
10	52.4	26.2	25.4	88.9	50.8	63.5	74.7
11	47.6	22.2	19.0	88.9	50.8	63.5	76.2

S	Suction port S: **00, 01** : SAE 3” **10, 11** : SAE 2” 1/2
P1	Delivery port P1: SAE 1”
P2	Delivery port P2: **00, 10** : SAE 1” **01, 11** : SAE 3/4”

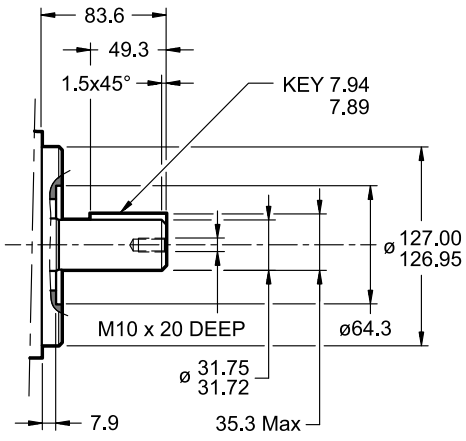
8.3 - FV6DC

dimensions in mm

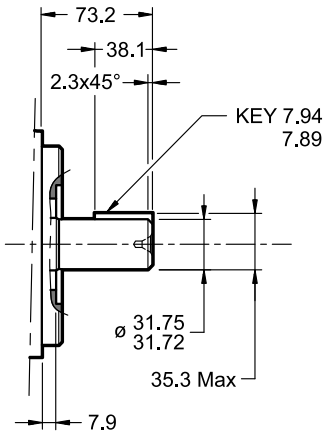


SHAFTS:

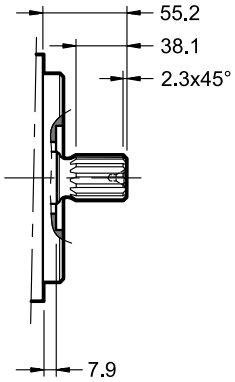
cylindrical keyed SAE C
(identification code: **1**)
Torque limit: 721 Nm



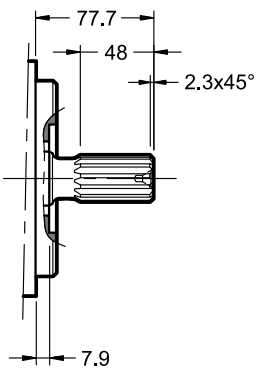
cylindrical keyed - no SAE
(identification code: **2**)
Torque limit: 577 Nm



splined SAE C J498b
12/24 d.p. - 14T
(identification code: **3**)



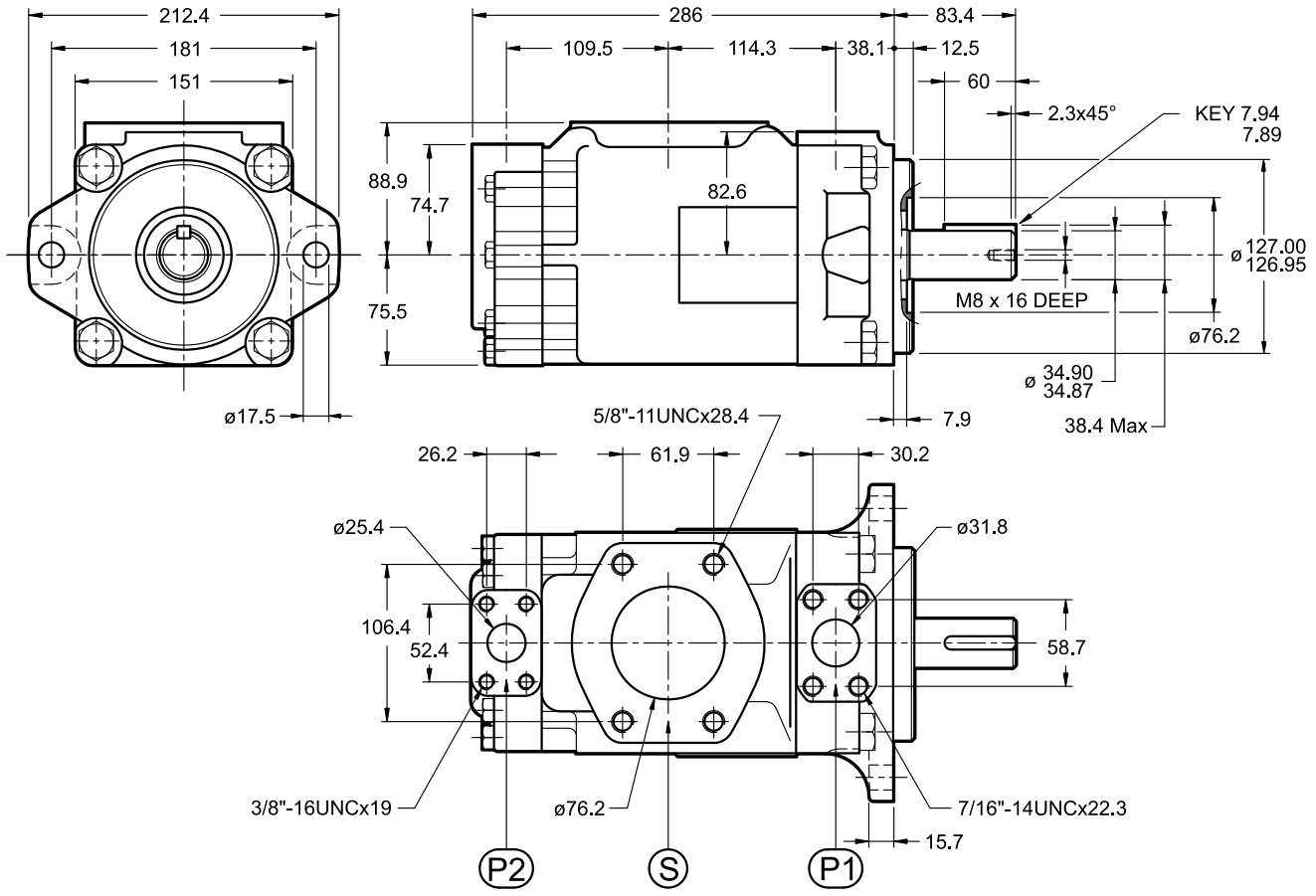
splined - no SAE
12/24 d.p. - 14T
(identification code: **4**)



S	Suction port S SAE 3”
P1	Delivery port P1: SAE 1” 1/4
P2	Delivery port P2: SAE 1”

8.4 - FV6DCW

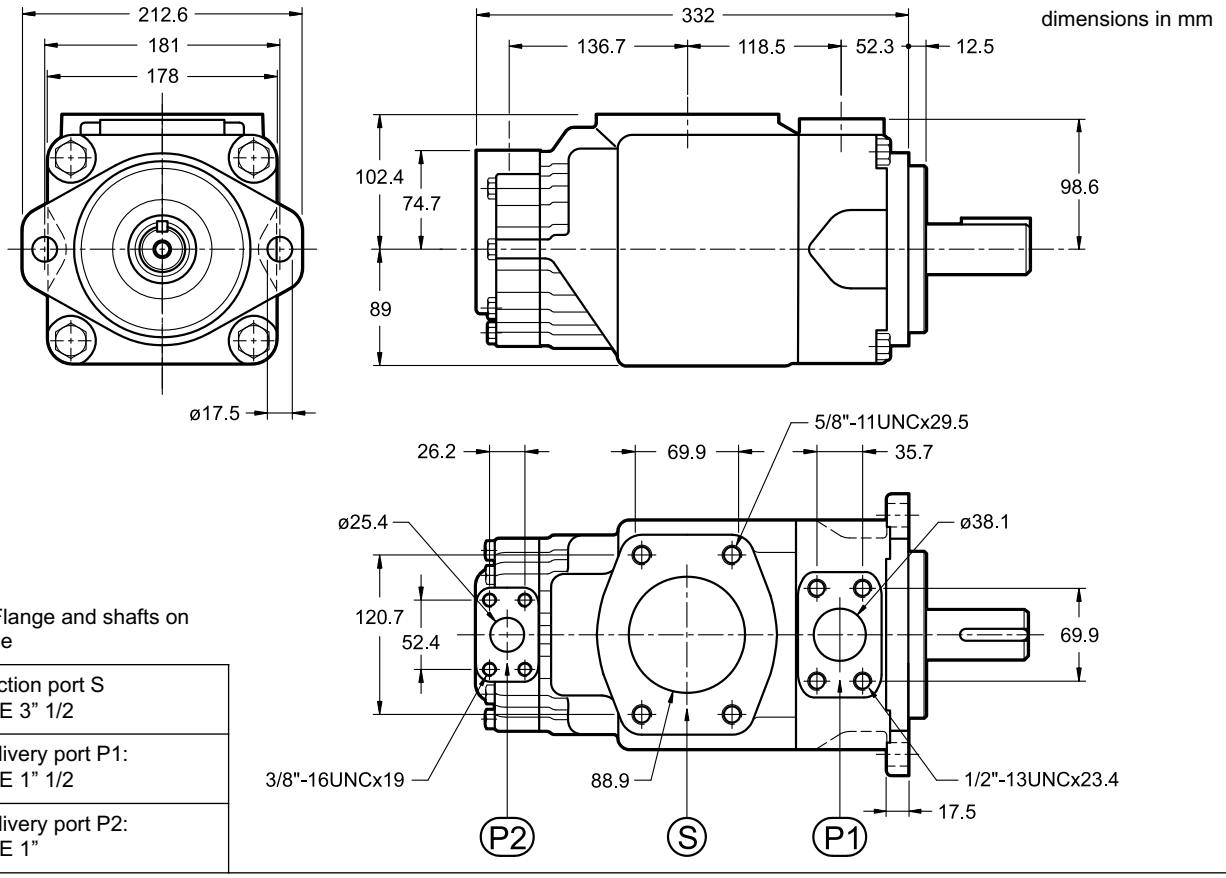
dimensions in mm



SHAFT:
cylindrical keyed - no SAE
(identification code: **5**)

S	Suction port S SAE 3”
P1	Delivery port P1: SAE 1” 1/4
P2	Delivery port P2: SAE 1”

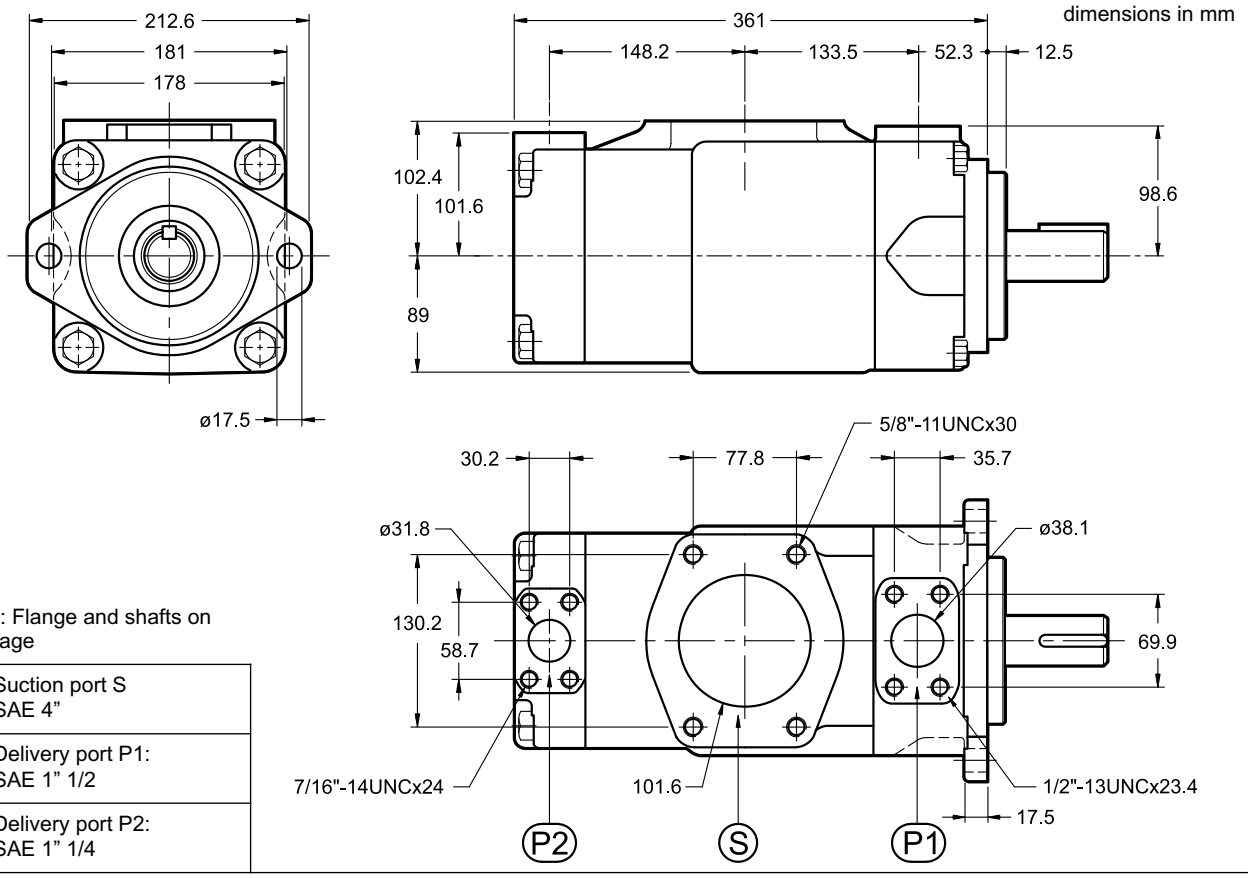
8.5 - FV6EC



NOTE: Flange and shafts on next page

S	Suction port S SAE 3” 1/2
P1	Delivery port P1: SAE 1” 1/2
P2	Delivery port P2: SAE 1”

8.6 - FV6ED

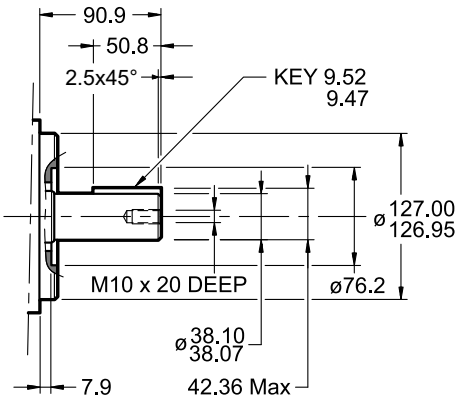


NOTE: Flange and shafts on next page

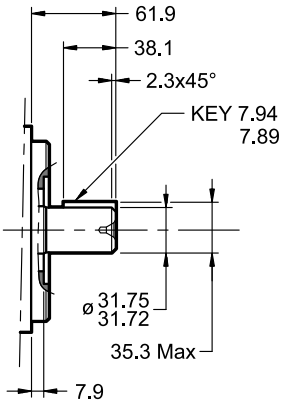
S	Suction port S SAE 4”
P1	Delivery port P1: SAE 1” 1/2
P2	Delivery port P2: SAE 1” 1/4

8.7 - Shafts for FV6EC and FV6ED

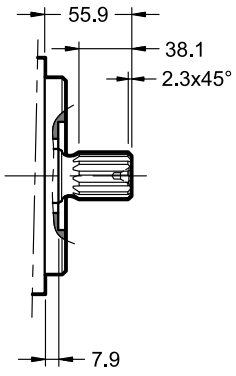
cylindrical keyed SAE C-C
(identification code: **1**)



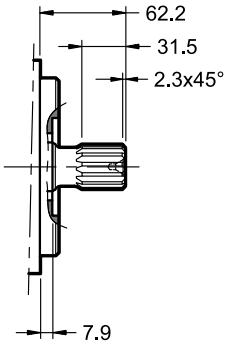
cylindrical keyed - no SAE
(identification code: **2**)
Torque limit: 577 Nm



splined SAE C J498b
12/24 d.p. - 14T
(identification code: **3**)



splined SAE C-C J498b
12/24 d.p. - 17T
(identification code: **4**)



9 - INSTALLATION AND START-UP

— FV6 pumps can be installed in any position. They are normally positioned directly above the oil tank. The installation below the oil level is suggested for circuits with high flow rates and pressures.

— The suction line must be sized to facilitate the oil flow. Bends and restrictions or an excessive line length could impair the operation of the pump. A bevel on both suction and return lines is recommended to increase the surface and so lower the velocity. We suggest a 45° minimum angle.

— Check the rotation direction of the motor is according to the rotation direction shown on the pump label before start up.

— The pump start-up should occur with the pump unloaded, especially at cold temperatures. Set the pressure relief valve of the circuit to its minimum setting value so the pump is unloaded when started. Circuit priming and air bleed off have to be performed before resetting the pressure relief valve.

— A minimum pump shaft speed of 600 rpm is recommended for priming. To prevent possible damage to the internal parts, the pump should never be started dry or without internal lubrication. The pump should prime quite instantly (few seconds). If not, shut down and check conditions.

Pump with positive head: allow the fluid to flow to the pump inlet, loosen the discharge port(s) fitting(s) until the fluid comes out and re-tighten the discharge line(s). Then start the pump which should prime quite instantly. Purge the air off the circuit,preferably using air bleed off valves or pressure test points. Let the pump discharge several minutes unloaded.

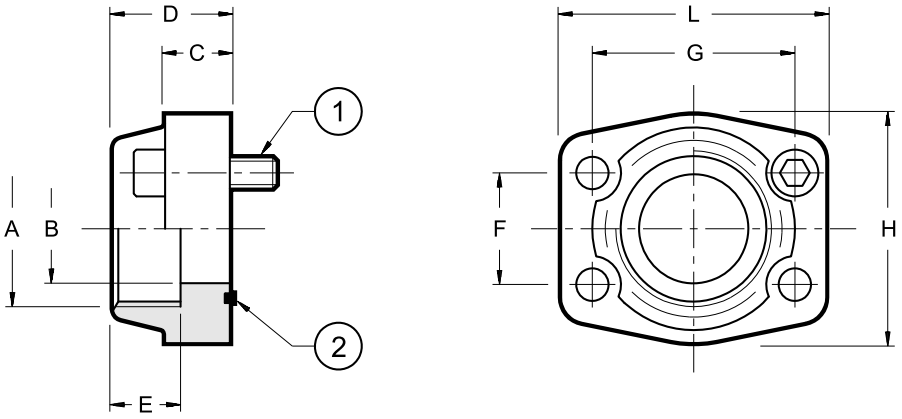
Pump mounted above fluid level: fill the pump through outlet port(s) with suitable and clean fluid and start rotation in jog mode. Purge the air off the circuit, preferably using air bleed off valves or pressure test points. Let the pump discharge several minutes unloaded.

— The motor-pump coupling must be made directly with a flexible coupling. Couplings that generate axial or radial loads on the pump shaft are not allowed.

— Refer to paragraph 4.3 for the characteristics and installation of the filtering elements.

10 - SAE J518 CONNECTION FLANGES

dimensions in mm



Fastening bolts are included with the pump.

Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1 N. 4 SHC bolts	2
0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22,2	47,6	50	65	3/8” UNC x 1 1/2”	OR 4100
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26,2	52,4	55	70		OR 4131
0610720	SAE - 1 1/4”	276	1 1/4” BSP	32	21	41	22	30,2	58,7	68	79	7/16” UNC x 1 1/2”	OR 4150
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	45	24	35,7	70	78	93	1/2” UNC x 1 3/4”	OR 4187
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77,8	90	102		OR 4225
0610722	SAE - 2 1/2”	172	2 1/2” BSP	63	25	50	30	50,8	89	105	116		OR 4175
0610723	SAE - 3”	138	3” BSP	73	27	50	34	62	106,4	116	134	5/8” UNC x 2”	OR 4337
0610724	SAE - 3 1/2”	34	3 1/2” BSP	89	27	48	34	69.9	120.7	136	152		OR 4387
0773528	SAE - 4”	34	4” BSP	99	27	48	34	77.7	130.2	146	162		OR 4437

DUPLOMATIC MOTION SOLUTIONS

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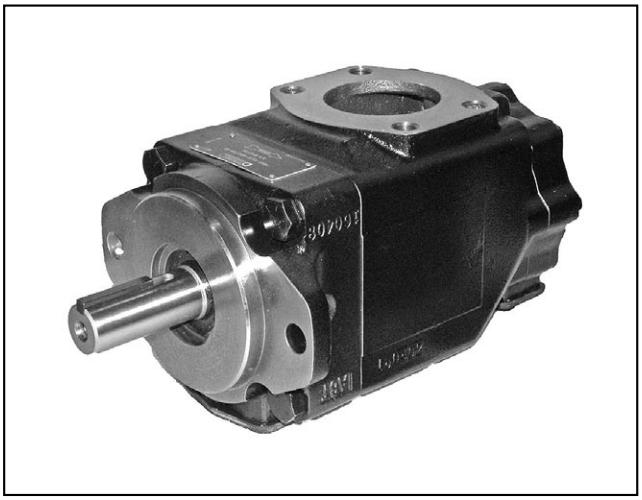
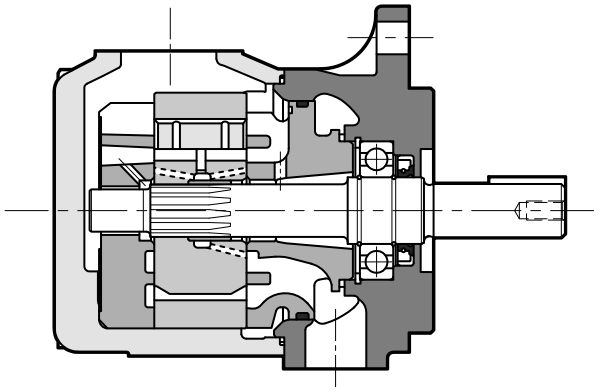
tel. +39 0331.895.111 ▪ www.duplomatic.com ▪ e-mail: sales.exp@duplomatic.com



FV7*S
FIXED DISPLACEMENT VANE PUMPS
SERIES 10

OPERATING PRINCIPLE



— The FV7*S pumps are fixed displacement vane pumps, with several nominal displacement each. Single, double and triple pumps are available.

— The pumping group is composed of a cartridge element that contains rotor, vanes, cam ring and support plates. Cartridges are easily removable without disconnecting the pump from the hydraulic circuit, thus simplify the maintenance operations.

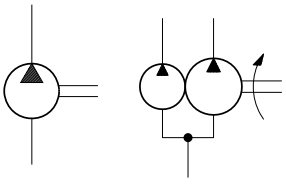
— The special elliptical profile of the cam ring, with double suction and delivery chambers one against the other, eliminates the radial thrusts on the rotor, reducing wear of the pump. The use of a 12 vane rotor reduces the delivery pressure pulsations, suppressing the vibrations and noise level of the pump.

TECHNICAL SPECIFICATIONS

PUMP SIZE (SINGLE)		FV7BS	FV7DS
Displacement range	cm^3/rev	5.8 ÷ 50	44 ÷ 137.5
Flow rate range (at 1500 rpm - 0 bar)	l/min	8.7 ÷ 75	66 ÷ 206
Operating pressure	bar	320	250
Rotation speed (max)	rpm	3600	3000
Rotation direction		clockwise or anticlockwise	
Loads on shaft		see diagrams	
Hydraulic connections		SAE J518	SAE J518
Mounting flange		SAE B J744	SAE C J744
Mass (empty single pump)	kg	23	26

Ambient temperature range	°C	-20 / +60
Fluid temperature range (see par. 4)	°C	-10 / +70
Fluid viscosity range	cSt	see paragraph 4
Fluid contamination degree	see paragraph 4.3	
Recommended viscosity	cSt	30

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

FV7		S	-		-				/	10		-	

Fixed displacement vane pump

Pump size:
B = from 5.8 to 50 cm³/rev
D = from 44 to 137.5 cm³/rev

Mounting flange:
SAE J744

Cartridge size:
see paragraph 2

Shaft end type
FV7BS:
1 = cylindrical keyed SAE B
3 = splined SAE B
4 = splined SAE B-B

FV7DS:
1 = cylindrical keyed SAE C
2 = cylindrical keyed - no SAE
3 = splined SAE C
4 = splined SAE C special

Rotation direction
(view from shaft side)
R = clockwise
L = counterclockwise

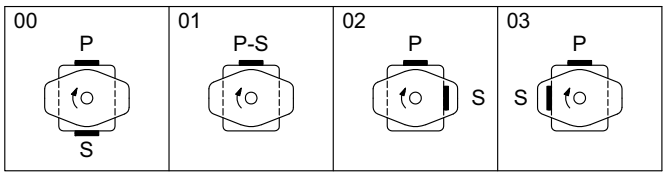
For FV7BS only:
Delivery port size
00 = 1”
01 = 3/4”

Seals:
N = NBR seals for mineral oils (**standard**)
V = FPM seals for special fluids

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Ports position
(view from shaft side)
Delivery port always on top
00 = opposed (**standard**)
01 = in line
02 = 90° CW from P port
03 = 90° CCW 90° CW from P port

Ports position

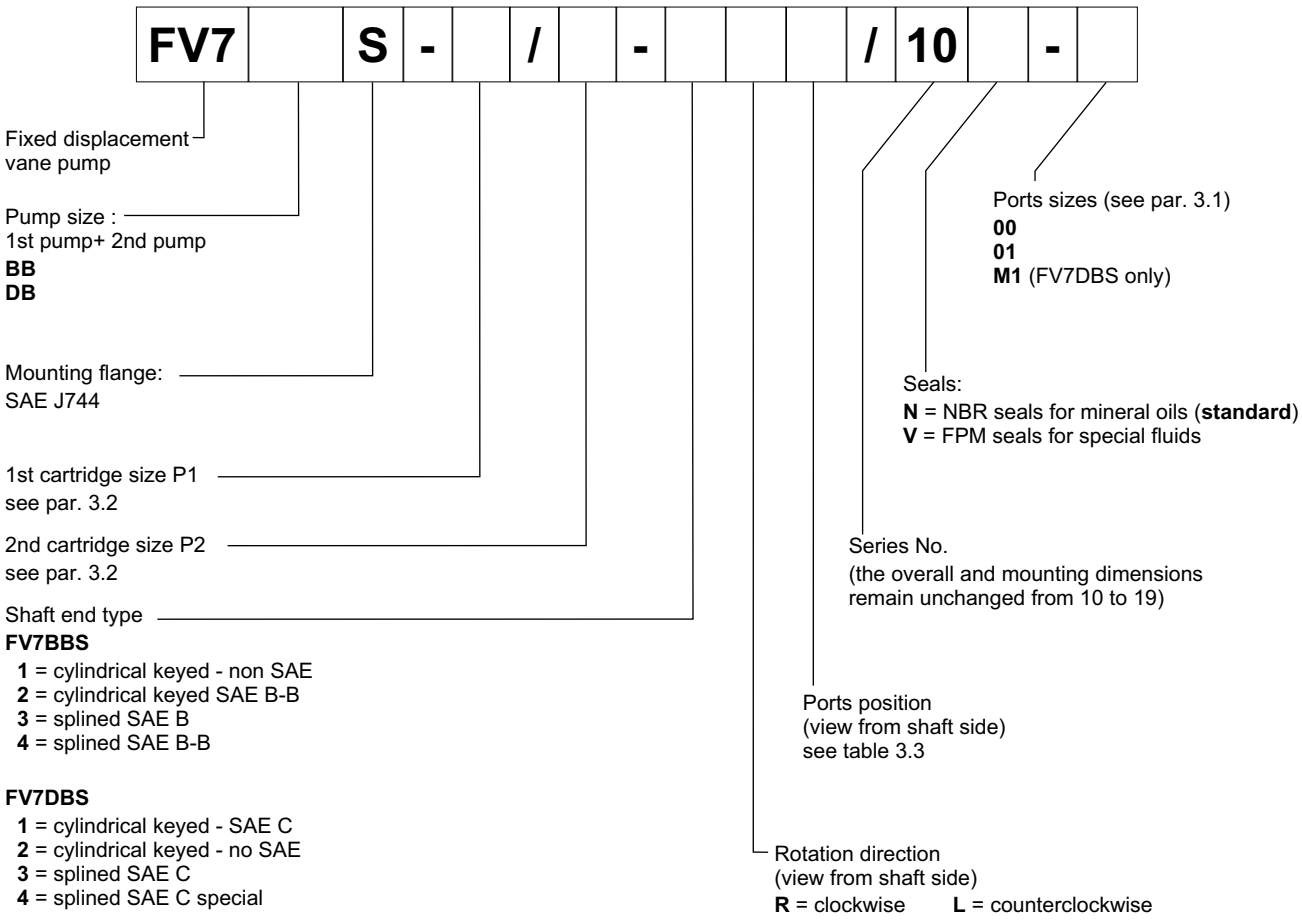


2 - PERFORMANCES

(obtained with antiwear mineral oil with viscosity of 24 cSt)

PUMP	CARTRIDGE SIZE	DISPLACEMENT [cm^3/rev]	MAX FLOW RATE at 0 bar - 1500 rpm [l/min]	PRESSURE [bar] continuous	PRESSURE [bar] peak	ROTATION SPEED [rpm] max	ROTATION SPEED [rpm] min
FV7BS	**02**	5.8	8.7	320	350	3600	600
	03	9.8	14.7				
	04	12.8	19.2				
	05	15.9	23.9				
	06	19.8	29.7				
	07	22.5	33.8				
	08	24.9	37.4				
	10	31.8	47.7				
	12	41	61.5	275	300	3000	
	15	50	75	240	280		
FV7DS	**14**	44	66	250	300	3000	600
	17	55	82.5				
	20	66	99				
	22	70.3	105.5				
	24	81.1	121.7				
	28	90	135				
	31	99.2	148.8				
	35	113.4	170.1		280	2800	
	38	120.6	180.9				
	42	137.5	206.3	230	260	2500	

3 - IDENTIFICATION CODE FOR DOUBLE PUMPS



NOTE: Triple pumps available. Please contact our technical office.

3.1 - Ports sizes

FV7BBS			
	P1	P2	S
00	1”	3/4”	2” 1/2
01	3/4”		

FV7DBS			
	P1	P2	S
00	1” 1/4	1”	3”
01	1” 1/4	3/4”	
M1			

NOTE : M1 version is metric threaded

3.2 - Available cartridges

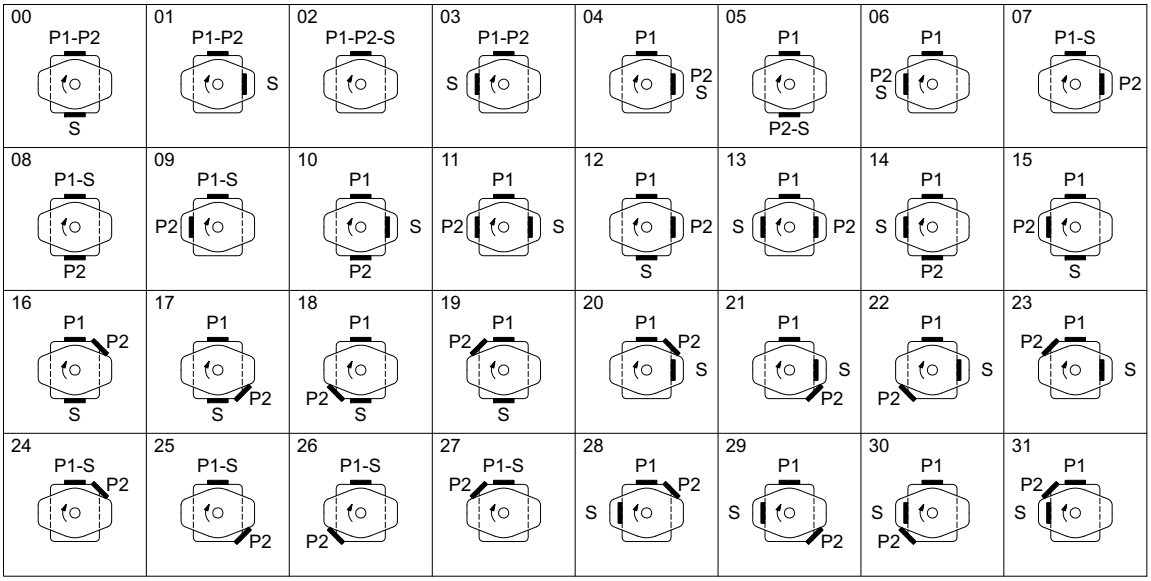
Grey boxes indicates reduced performance. See paragraph 2 for limits.

The second cartridge (for P2) should have equal or lower displacement than the first.

BB		DB	
1st cartridge	2nd cartridge	1st cartridge	2nd cartridge
02	02	14	02
03	03	17	03
04	04	20	04
05	05	22	05
06	06	24	06
07	07	28	07
08	08	31	08
10	10	35	10
12	12	38	12
15	15	42	15

3.3 - Ports position codes

FV7BBS
FV7DBS



4 - HYDRAULIC FLUID

Data in this catalogue are obtained with antiwear fluid petroleum base. Minimum allowable inlet pressure 0,8 absolute bar (-0,2 relative bars). Differential pressure between inlet and outlet pressure should be at least 1.5 bar.

Pressures, maximum allowed speeds and recommended temperatures are shown in the table below, according to the types of hydraulic fluid used.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	The performance ratings shown in the table 'PERFORMANCES' must be reduced as follows: max continuous pressure: 140 bar max peak pressure: 175 bar max rotation speed: 1800 rpm - Minimum allowable inlet pressure 1 absolute bar - The fluid maximum temperature must be between 10°C and 50°C. - Use NBR seals only. - Minimum viscosity 18 cSt
HFD (phosphate esters)	The performance ratings shown in the table 'PERFORMANCES' must be reduced as follows: max continuous pressure: 210 bar max peak pressure: 240 bar max rotation speed: 1800 rpm - Minimum allowable inlet pressure 1,08 absolute bar - The fluid temperature must be between -18°C and 70°C. - Use VITON seals - Minimum viscosity 18 cSt

4.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to the maximum temperature of 90 °C of the fluid, with antiwear
optimum viscosity	30 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	840 cSt	limited to only the pump start-up phase at cold start.

When choosing the fluid type, verify that the true viscosity at the operating temperature is within the above range.

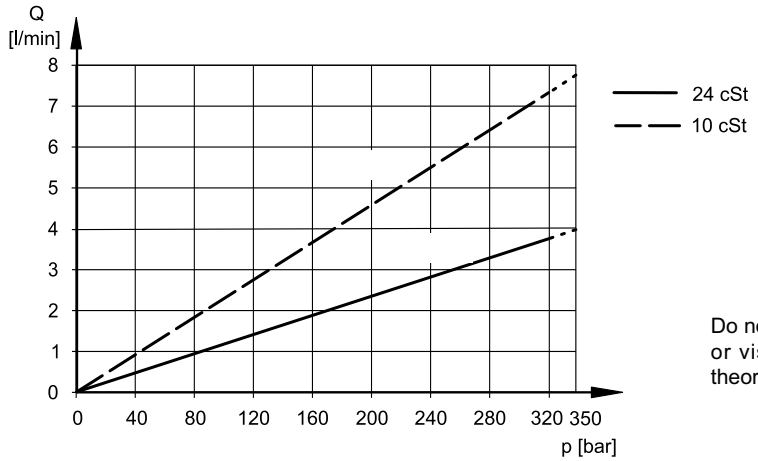
4.3 - Degree of fluid contamination

The degree of fluid contamination must be according to ISO 4406:1999 class 19/17/14 or better. Strainers on inlet port are not recommended. However, if requested, do not exceed 149 micron (100 mesh).

5 - CHARACTERISTIC CURVES OF SINGLE PUMPS

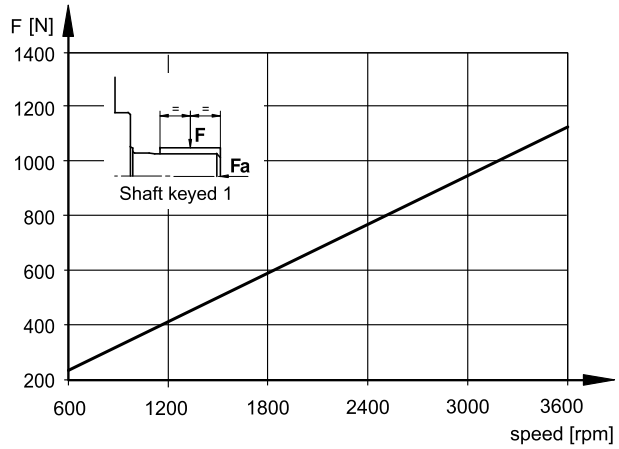
5.1 - FV7B

INTERNAL LEAKAGE (typical)



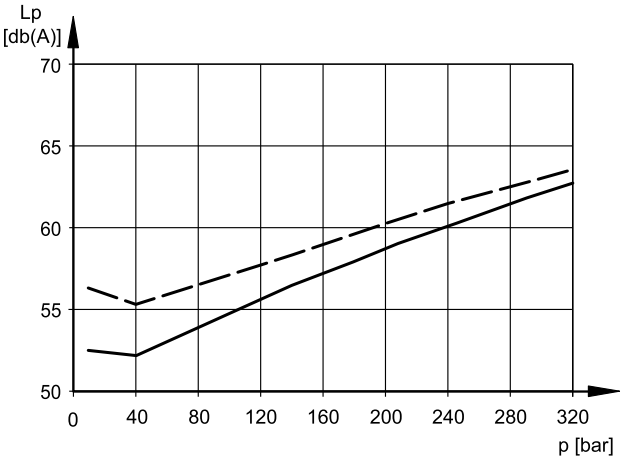
Do not operate the pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 800 N

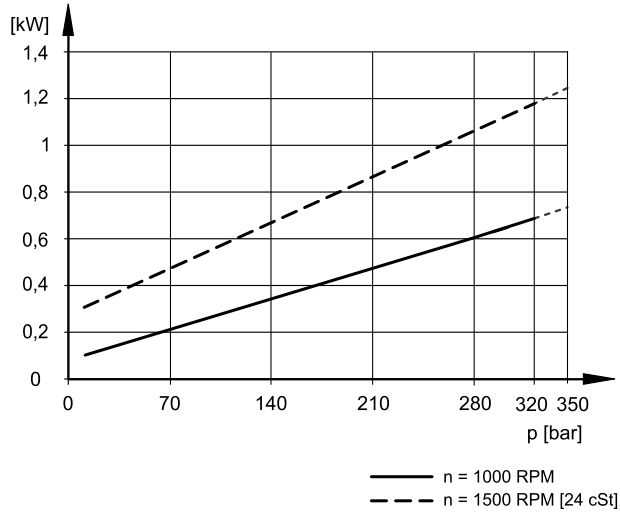
NOISE LEVEL (typical)



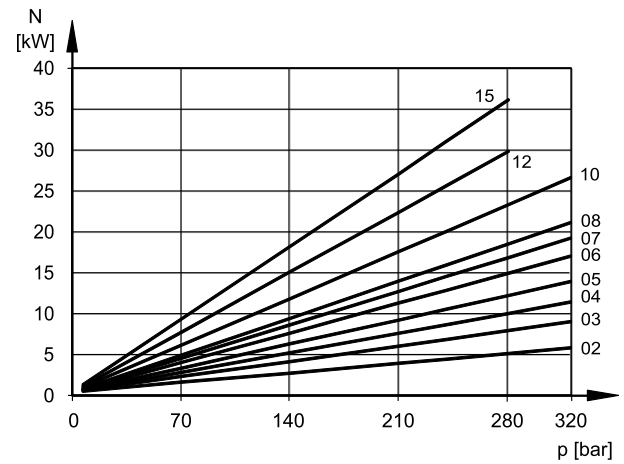
Value obtained with a FV7BS-10 pump, according to ISO 4412
1 mt distance

1000 rpm
1500 rpm

POWER LOSS HYDROMECHANICAL (typical)

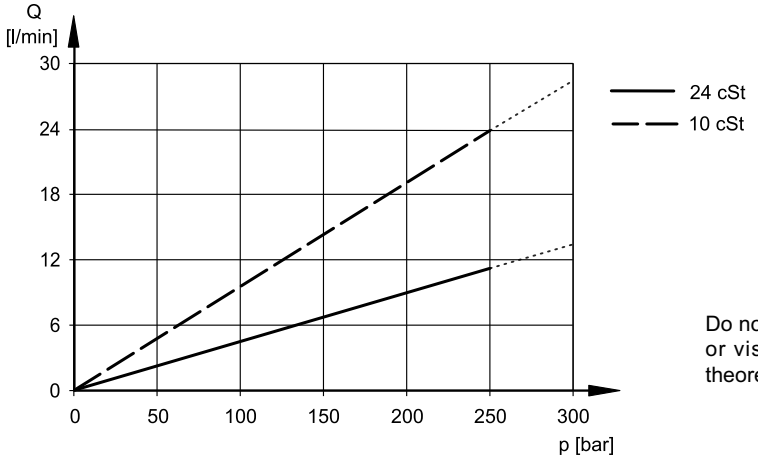


ABSORBED POWER at 1500 rpm



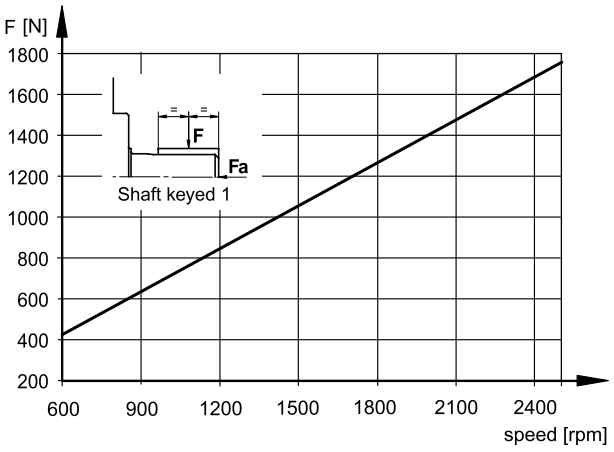
5.2 - FV7D

INTERNAL LEAKAGE (typical)



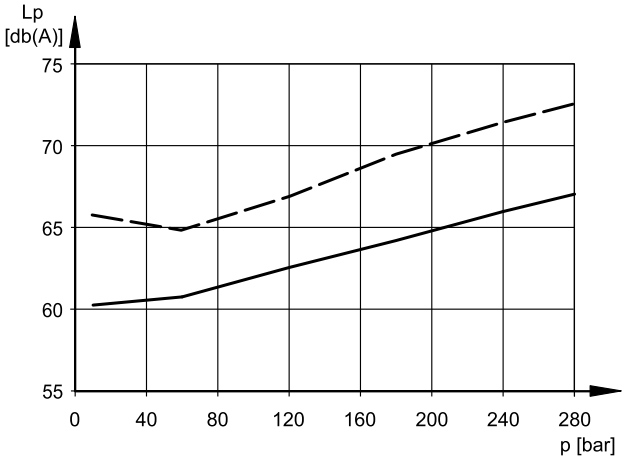
Do not operate the pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 1200 N

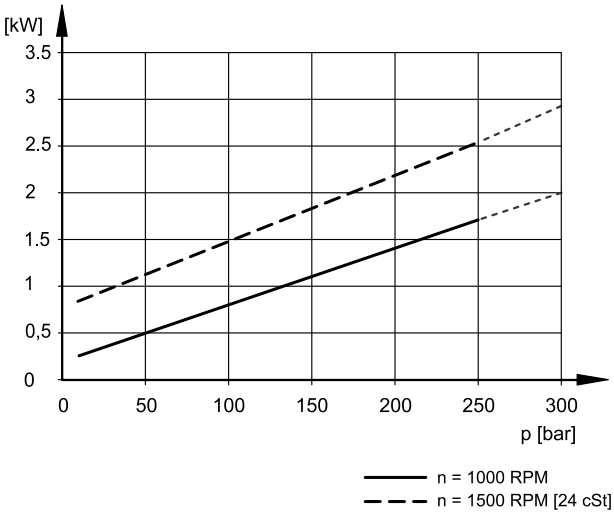
NOISE LEVEL (typical)



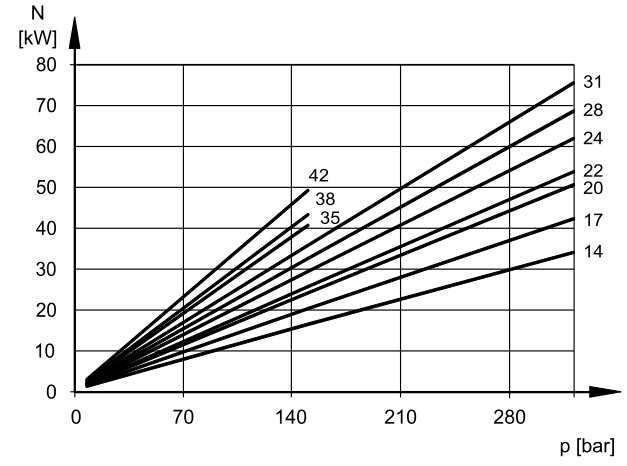
Value obtained with a FV7DS-31 pump, according to ISO 4412
1 mt distance

1000 rpm
1500 rpm

POWER LOSS HYDROMECHANICAL (typical)



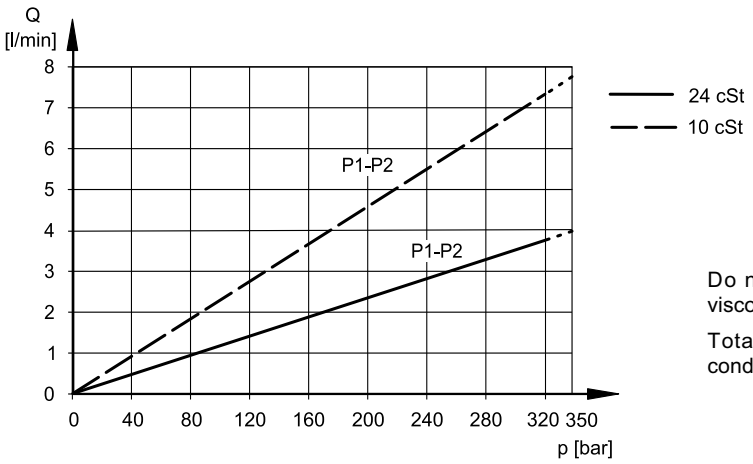
ABSORBED POWER at 1500 rpm



6 - CHARACTERISTIC CURVES OF DOUBLE PUMPS

6.1 - FV7BB

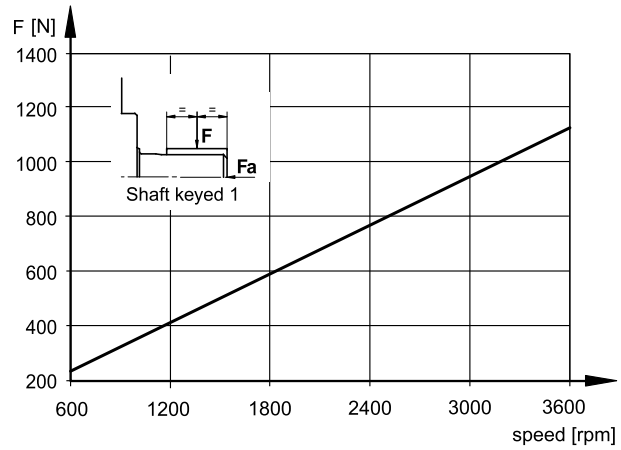
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

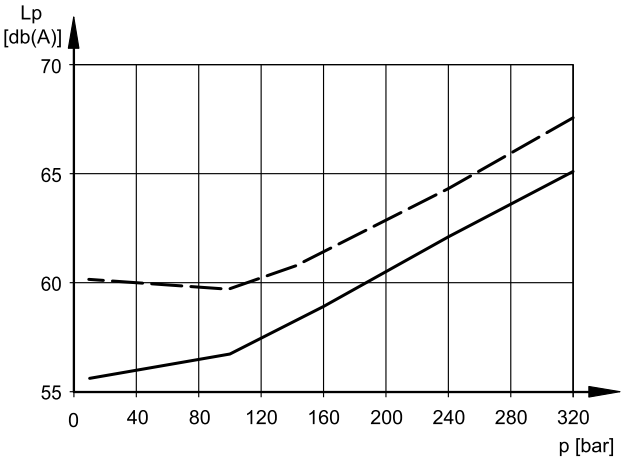
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 800 N

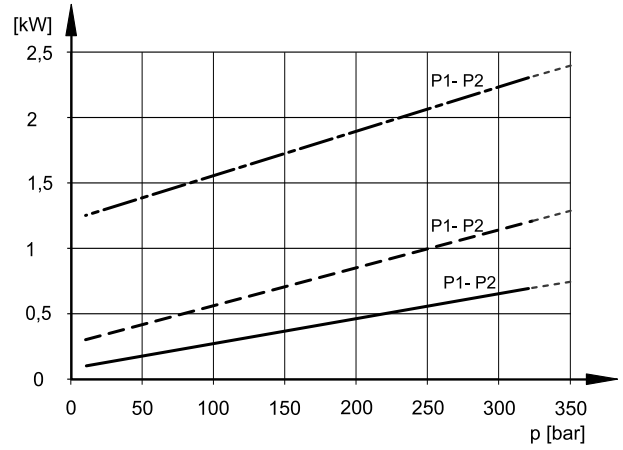
NOISE LEVEL (typical)



FV7BBS-10-04 pump, according to ISO 4412, 1 mt distance.

Values obtained with pe = 0.9 bar abs and both stages discharging at the same pressure.

POWER LOSS HYDROMECHANICAL (typical)

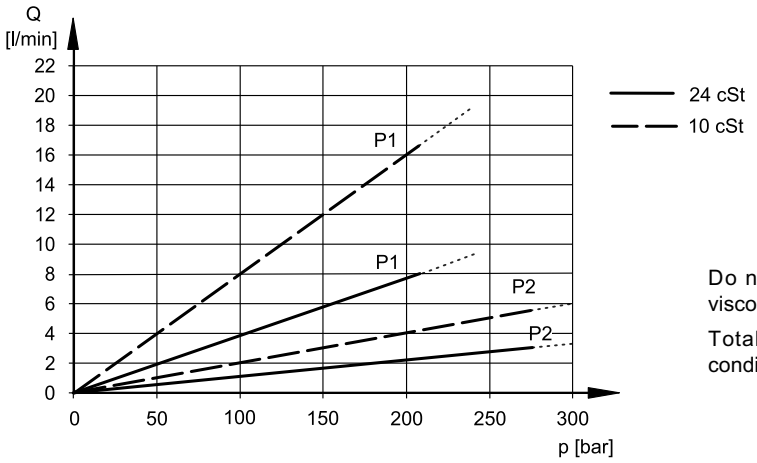


Total hydromechanics power loss is the sum of each section at its operating conditions.

n = 1000 RPM
n = 1500 RPM [24 cSt]
n = 2800 RPM

6.2 - FV7DB

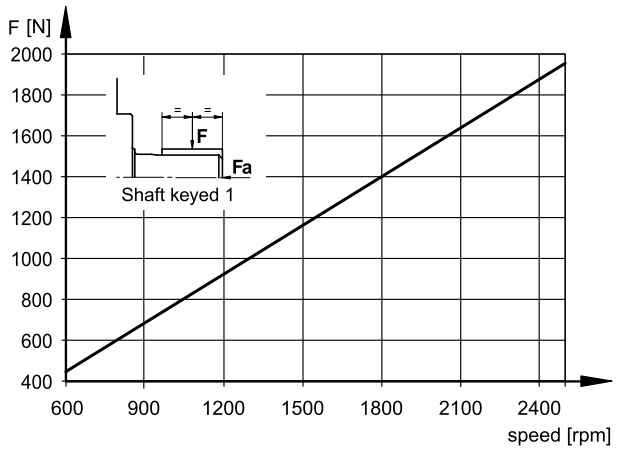
INTERNAL LEAKAGE (typical)



Do not operate pump more than 5 seconds at any speed or viscosity if the internal leakage is more than 50% of theoretical flow

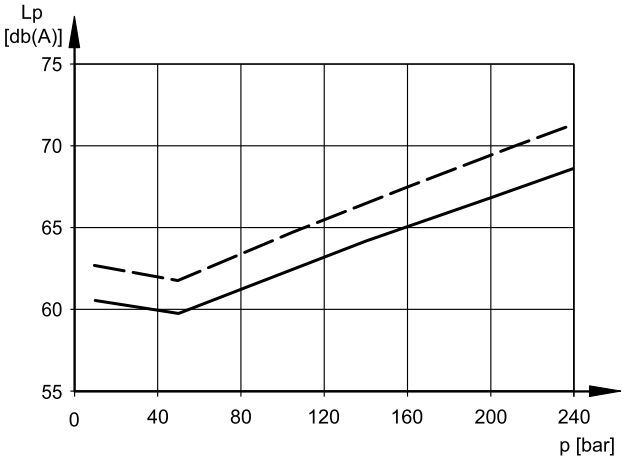
Total leakage is the sum of each section loss at its operating conditions.

PERMISSIBLE RADIAL LOAD



Maximum permitted axial load Fa = 1200 N

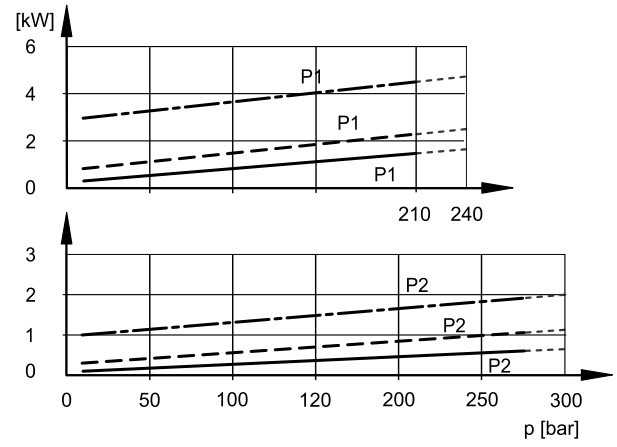
NOISE LEVEL (typical)



FV7DBS-31-10 pump, according to ISO 4412, 1 mt distance.

Values obtained with p_e = 0.9 bar abs and both stages discharging at the same pressure.

POWER LOSS HYDROMECHANICAL (typical)

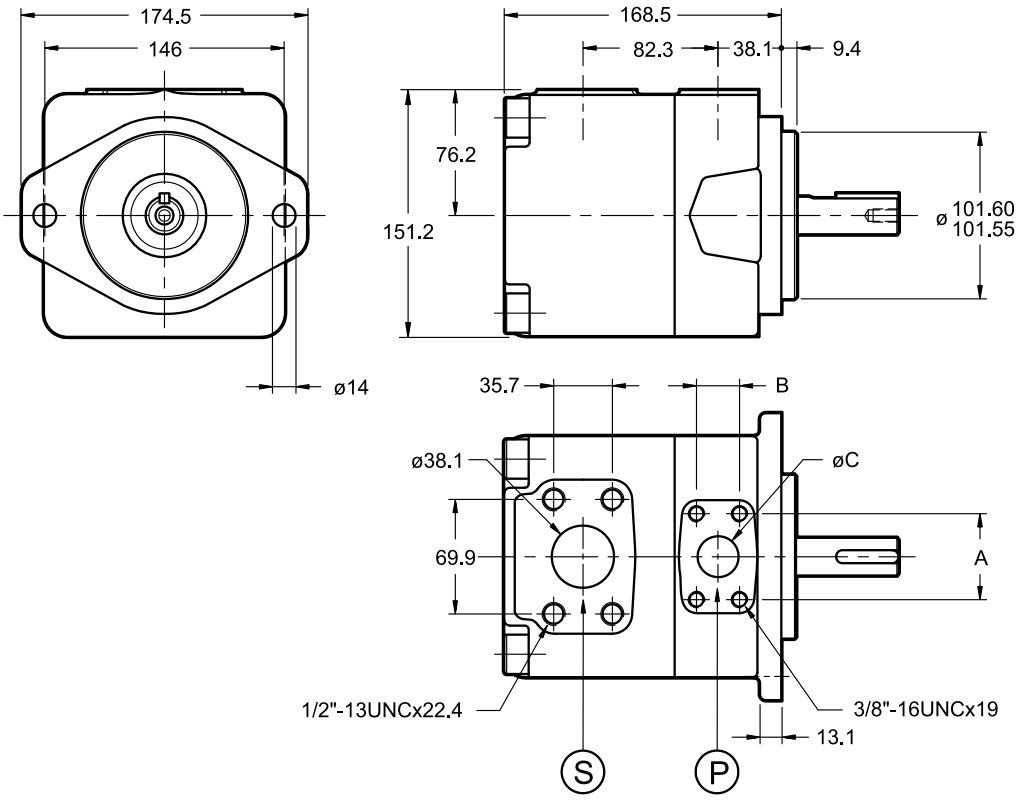


Total hydromechanics power loss is the sum of each section at its operating conditions.

7 - SINGLE PUMPS OVERALL AND MOUNTING DIMENSIONS

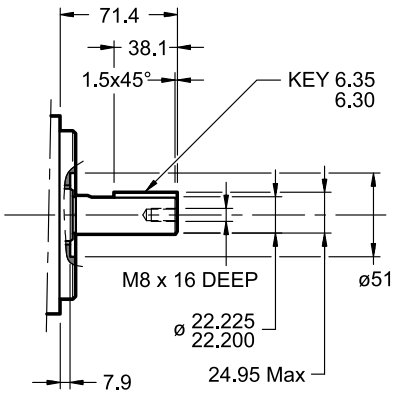
7.1 - FV7BS

dimensions in mm

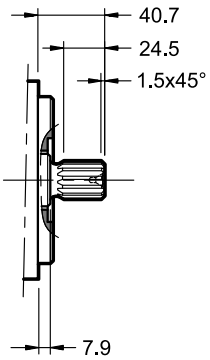


SHAFTS:

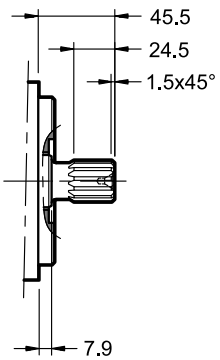
cylindrical keyed SAE B
(identification code: **1**)



splined SAE B
16/32 d.p. - 13T
(identification code: **3**)



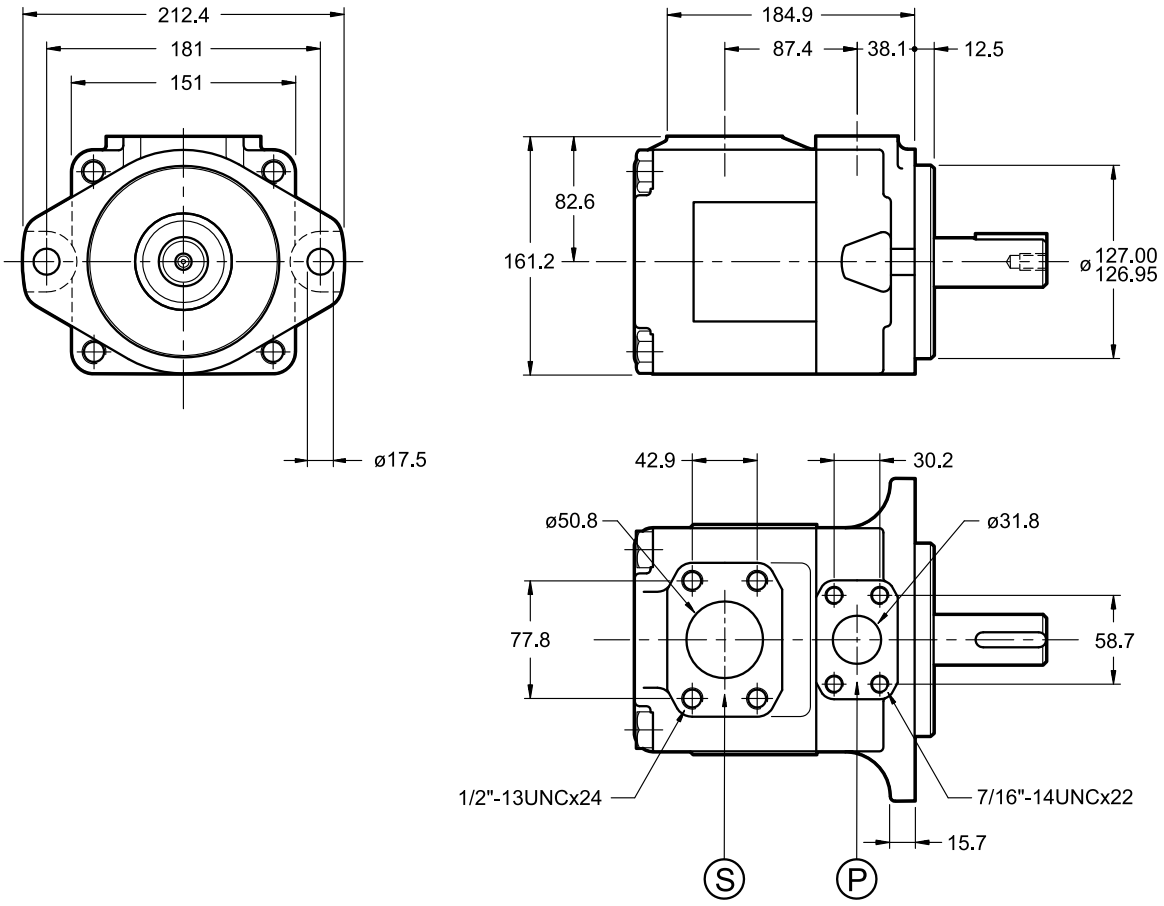
splined SAE B-B
16/32 d.p. - 15T
(identification code: **4**)



PORTS DIMENSIONS (mm)			
code	**A**	**B**	**ØC**
00	52.4	26.2	25.4
01	47.6	22.2	19.0

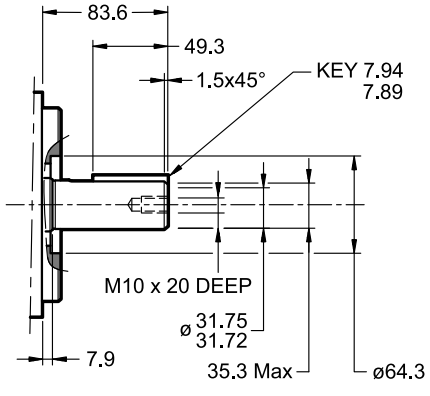
7.2 - FV7DS

dimensions in mm

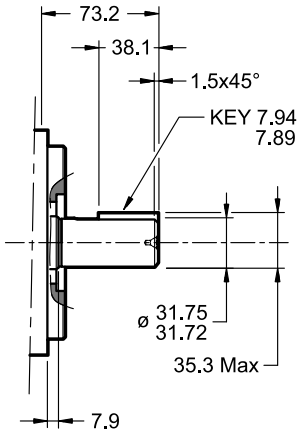


SHAFTS:

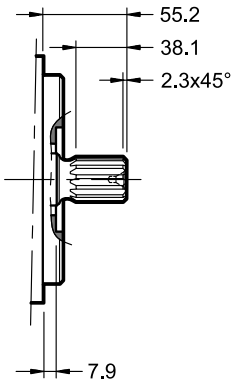
cylindrical keyed SAE C
(identification code: **1**)



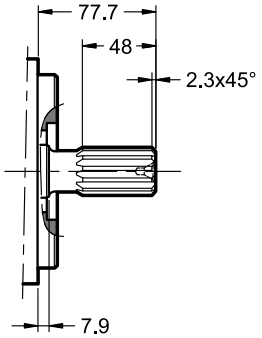
cylindrical keyed - no SAE
(identification code: **2**)



splined SAE C
12/24 d.p. - 14T
(identification code: **3**)



splined SAE special
12/24 d.p. - 14T
(identification code: **4**)

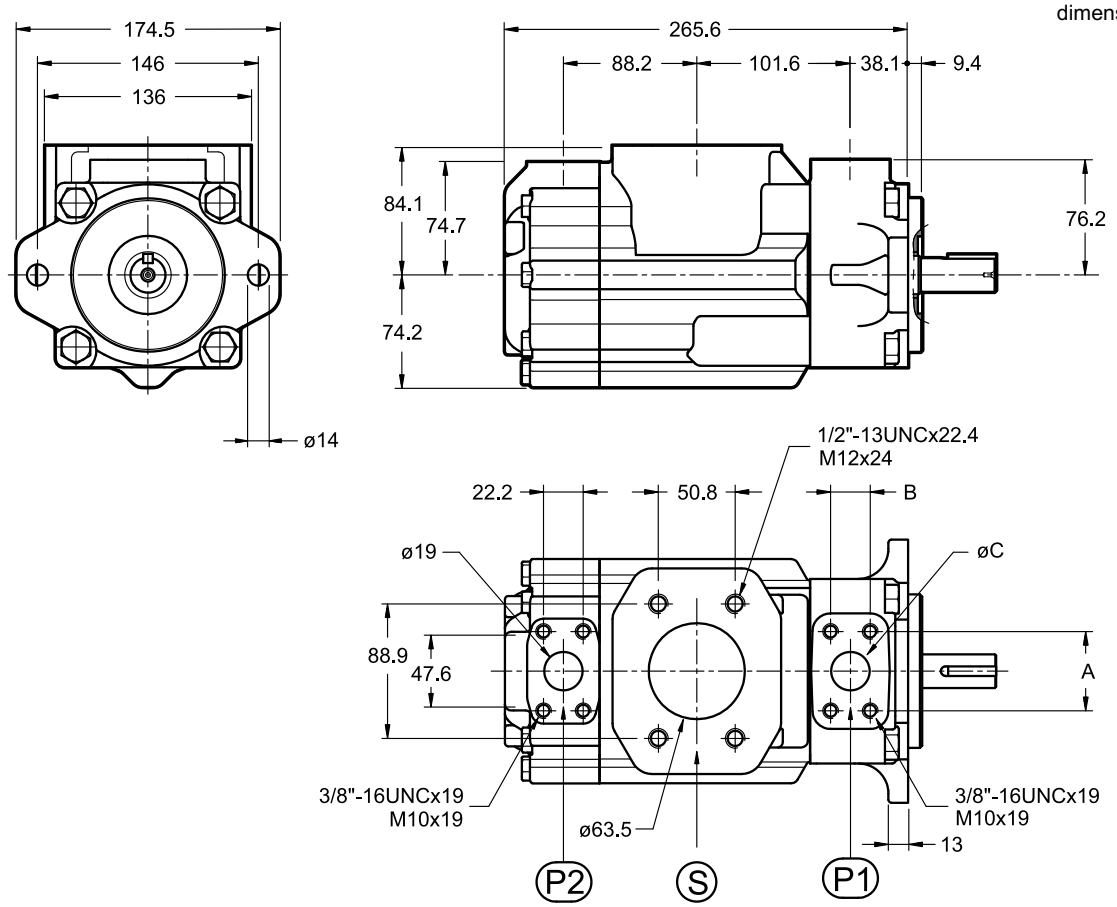


S	Suction port S SAE 2”
P	Pump delivery port P SAE 1” 1/4

8 - DOUBLE PUMPS OVERALL AND MOUNTING DIMENSIONS

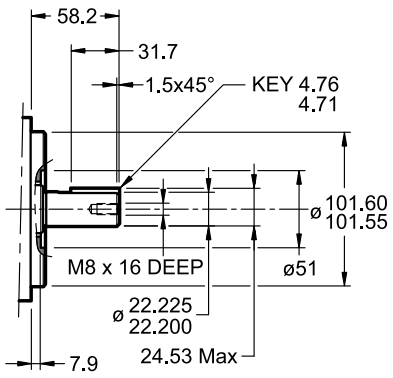
8.1 - FV7BBS

dimensions in mm

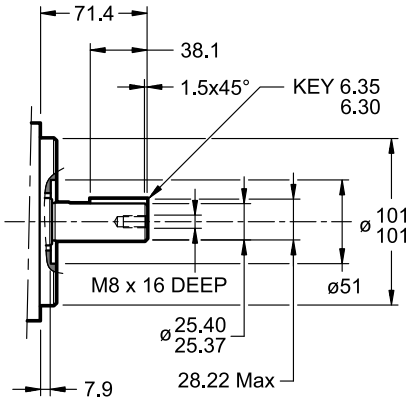


SHAFTS:

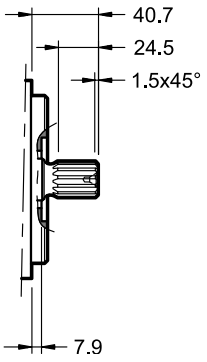
cylindrical keyed - no SAE
(identification code: **1**)
Torque limit 238 Nm



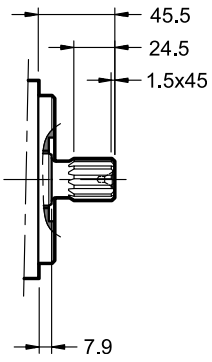
cylindrical keyed SAE B-B
(identification code: **2**)
Torque limit 357 Nm



splined SAE B
16/32 d.p. - 13T
(identification code: **3**)



splined SAE B-B
16/32 d.p. - 15T
(identification code: **4**)

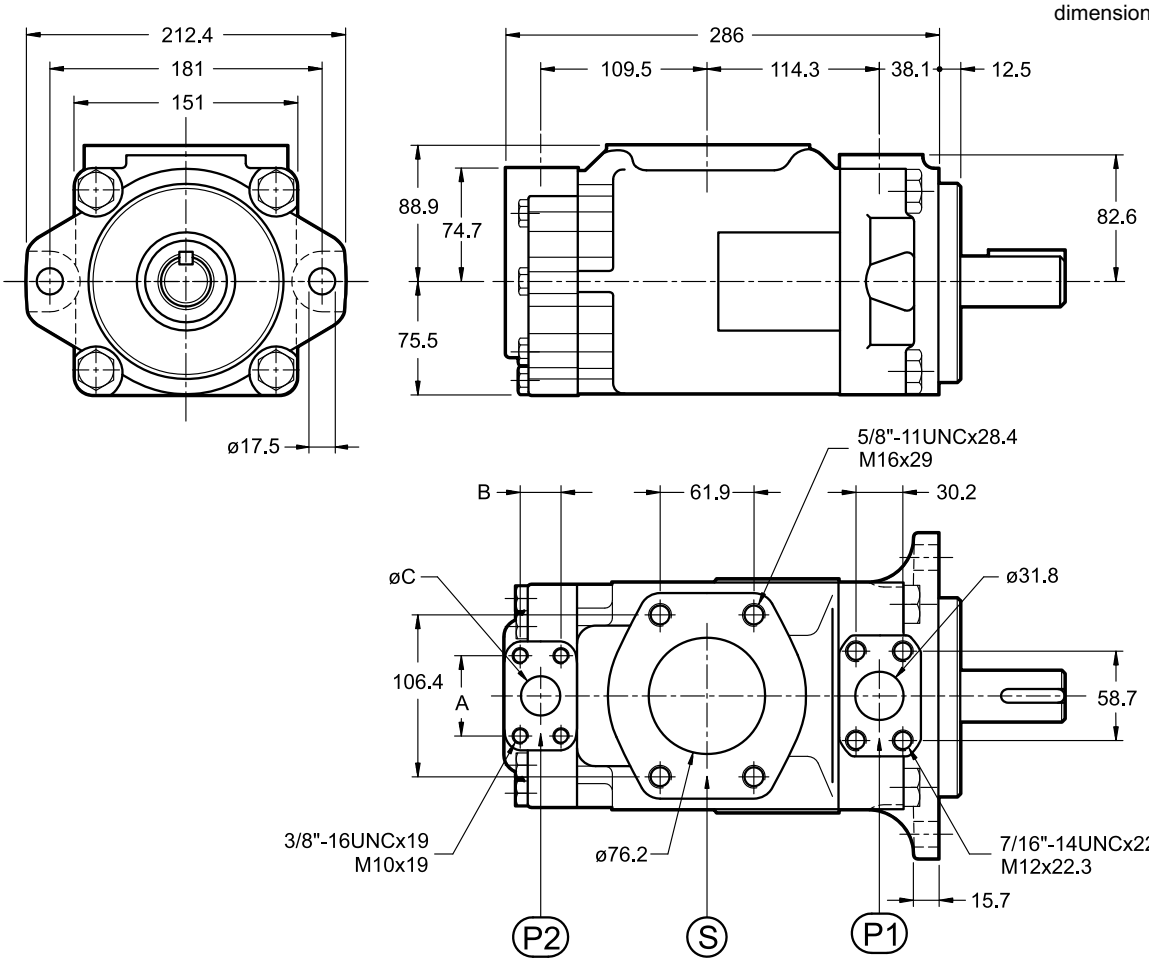


PORTS DIMENSIONS (mm)			
code	**A**	**B**	**ØC**
00	52.4	26.2	25.4
01	47.6	22.2	19.0

S	Suction port S: SAE 2” 1/2
P1	Delivery port P1: **00**: SAE 1” **01**: SAE 3/4”
P2	Delivery port P2: SAE 3/4”

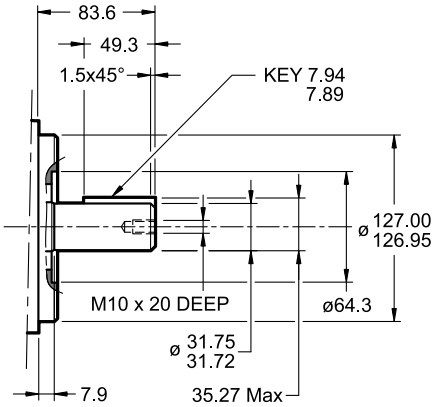
8.2 - FV7DBS

dimensions in mm

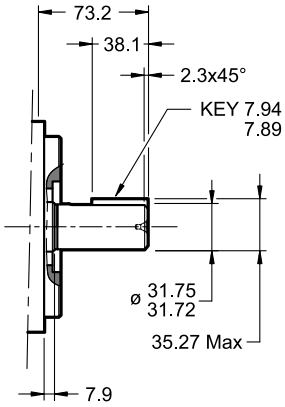


SHAFTS:

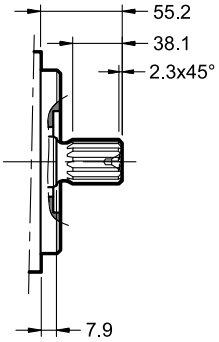
cylindrical keyed SAE C
(identification code: **1**)
Torque limit 721 Nm



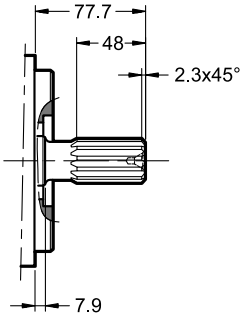
cylindrical keyed - no SAE
(identification code: **2**)
Torque limit 577 Nm



splined SAE C
12/24 d.p. - 14T
(identification code: **3**)



splined SAE C special
12/24 d.p. - 14T
(identification code: **4**)



NOTE: M1 version has ports for metric-threaded screws

PORTS DIMENSIONS (mm)			
code	**A**	**B**	**ØC**
00	52.4	26.2	25.4
01, M1	47.6	22.2	19.0

S	Suction port S: SAE 3”
P1	Delivery port P1: SAE 1” 1/4
P2	Delivery port P2: **00**: SAE 1” **01, M1**: SAE 3/4”

9 - INSTALLATION AND START-UP

— FV7S pumps can be installed in any position. They are normally positioned directly above the oil tank. The installation below the oil level is suggested for circuits with high flow rates and pressures.

— The suction line must be sized to facilitate the oil flow. Bends and restrictions or an excessive line length could impair the operation of the pump. A bevel on both suction and return lines is recommended to increase the surface and so lower the velocity. We suggest a 45° minimum angle.

— Check the rotation direction of the motor is according to the rotation direction shown on the pump label before start up.

— The pump start-up should occur with the pump unloaded, especially at cold temperatures. Set the pressure relief valve of the circuit to its minimum setting value so the pump is unloaded when started. Circuit priming and air bleed off have to be performed before resetting the pressure relief valve.

— A minimum pump shaft speed of 600 rpm is recommended for priming. To prevent possible damage to the internal parts, the pump should never be started dry or without internal lubrication. The pump should prime quite instantly (few seconds). If not, shut down and check conditions.

Pump with positive head: allow the fluid to flow to the pump inlet, loosen the discharge port(s) fitting(s) until the fluid comes out and re-tighten the discharge line(s). Then start the pump which should prime quite instantly. Purge the air off the circuit,preferably using air bleed off valves or pressure test points. Let the pump discharge several minutes unloaded.

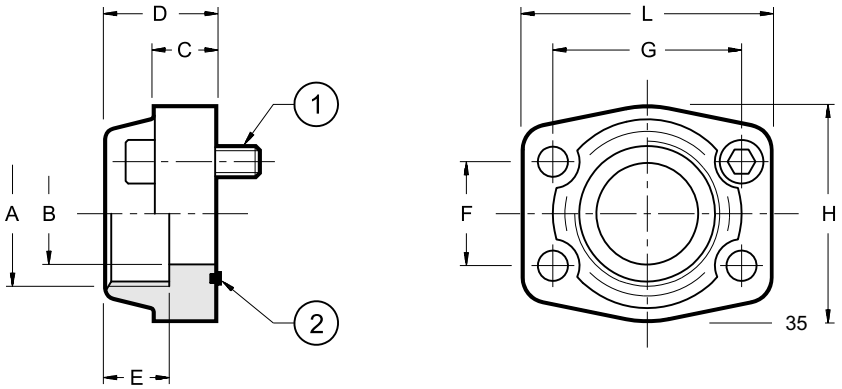
Pump mounted above fluid level: fill the pump through outlet port(s) with suitable and clean fluid and start rotation in jog mode. Purge the air off the circuit, preferably using air bleed off valves or pressure test points. Let the pump discharge several minutes unloaded.

— The motor-pump coupling must be made directly with a flexible coupling. Couplings that generate axial or radial loads on the pump shaft are not allowed.

— Refer to paragraph 4.3 for the characteristics and installation of the filtering elements.

10 - SAE J518 CONNECTION FLANGES

dimensions in mm



Fastening bolts are included with the pump.

Flange code	Flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	1	2
0610719	SAE - 3/4”	345	3/4” BSP	19	18	36	19	22,2	47,6	50	65	3/8” UNC x 1 1/2”	OR 4100
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26,2	52,4	55	70		OR 4131
0610720	SAE - 1 1/4”	276	1 1/4” BSP	32	21	41	22	30,2	58,7	68	79	7/16” UNC x 1 1/2”	OR 4150
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	45	24	35,7	70	78	93	1/2” UNC x 1 3/4”	OR 4187
0610722	SAE - 2 1/2”	172	2 1/2” BSP	63	25	50	30	50,8	89	105	116		OR 4175
0610723	SAE - 3”	138	3” BSP	73	27	50	34	62	106,4	116	134	5/8” UNC x 2”	OR 4337

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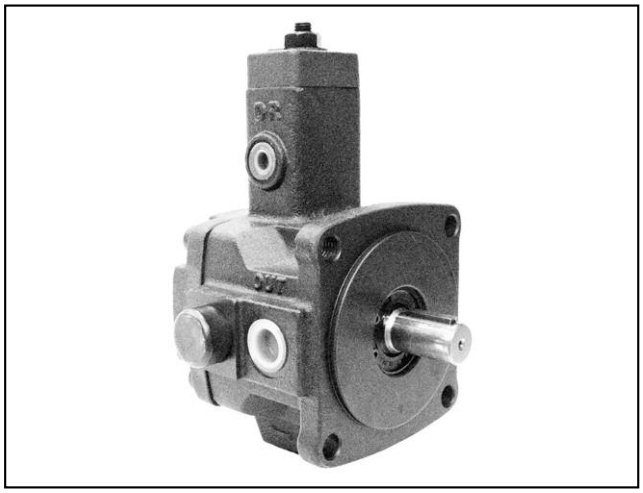
tel. +39 0331.895.111 ▪ www.duplomatic.com ▪ e-mail: sales.exp@duplomatic.com

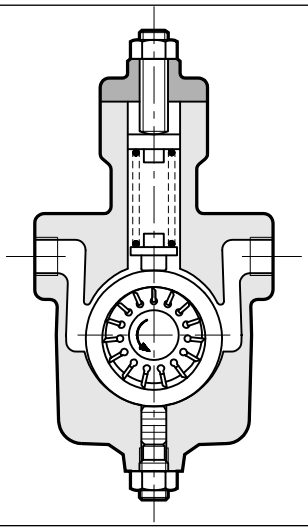


PVE

VARIABLE DISPLACEMENT VANE PUMPS WITH DIRECT PRESSURE ADJUSTMENT

SERIES 30

OPERATING PRINCIPLE



— The PVE pumps are variable displacement vane pumps with direct pressure regulator.

— The pump group is complete with hydrostatic axial compensation distribution plates that improve the volumetric efficiency and reduce wear of the components.

— The pressure regulator adjustable load spring keeps the pump group cam ring in eccentric position.

When the delivery pressure equals the pressure corresponding to the spring setting, the cam ring is moved so to reduce the displacement, adjusting the flow rate to the values required by the plant.

In zero flow demand conditions, the pump delivers oil only to compensate any possible bleedings, keeping the circuit pressure constant.

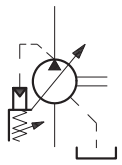
— The PVE pumps are available in four dimensions with maximum displacement from 6,6 to 22,2 cm^3/rev and with pressure regulator max setting values up to 35 bar and 70 bar (standard).

TECHNICAL SPECIFICATIONS

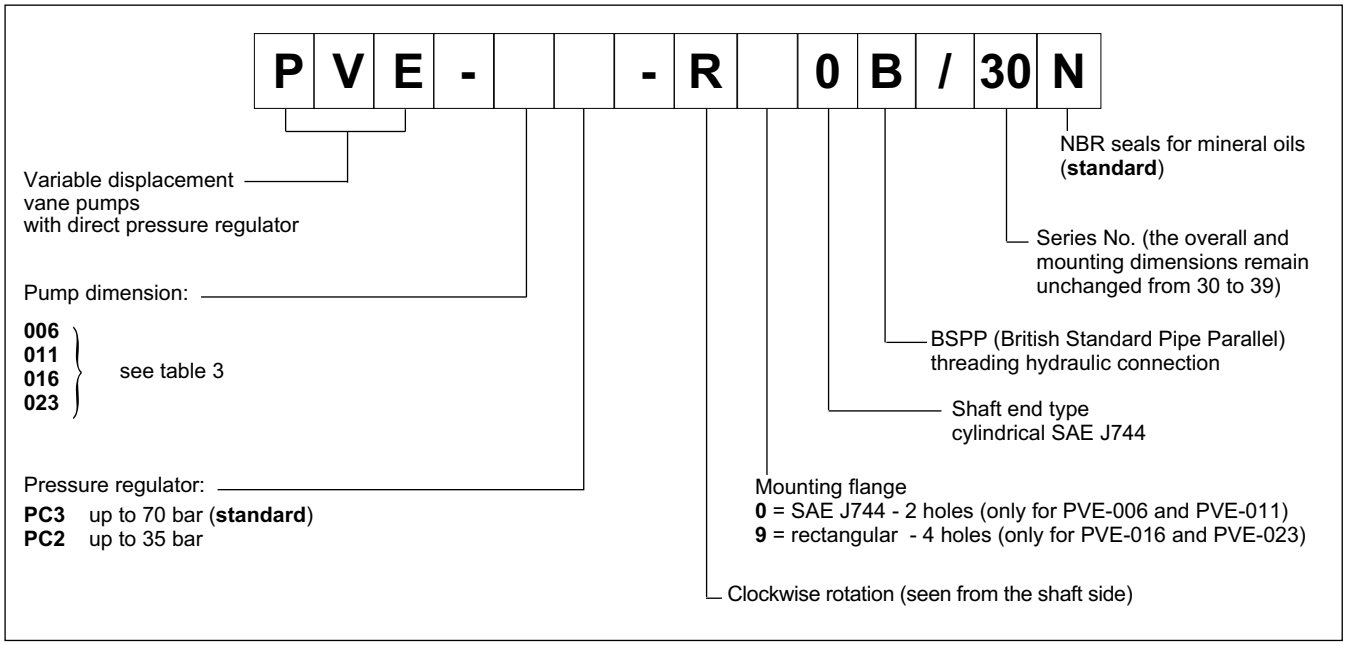
PUMP SIZE		006	011	016	023
Displacement	cm^3/rev	6,6	11,1	16,6	22,2
Flow rate (at 1.500 rpm and with 3.5 bar delivery pressure)	l/min	10,0	16,7	25,0	33,3
Operating pressure	bar	70			
Rotation speed	rpm	min 800 - max 1800			
Rotation direction		clockwise (seen from the shaft side)			
Shaft loads	N	radial and axial loads are not allowed			
Hydraulic connection		BSPP (parallel) threading fittings			
Type of mounting		SAE flange J744 - 2 holes		rectangular flange - 4 holes	
Mass	kg	5	6	9	9

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-10 / +70
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	
Recommended viscosity	cSt	25 ÷ 50

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type
Use only HL and HLP mineral oil based hydraulic fluids according to ISO 6743/4.

2.2 - Fluid viscosity
The operating fluid viscosity must be within the following range:

minimum viscosity	16 cSt	referred to the maximum drainage fluid temperature of 70 °C.
optimum viscosity	25 ÷ 50 cSt	referred to the fluid working temperature in the tank.
maximum viscosity	800 cSt	limited to only the start-up phase of the pump.

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination
The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The filter must be equipped with a by-pass valve and, if possible, with a clogging indicator.

3 - PERFORMANCES (obtained with viscosity of 46 cSt at 40°C)

PUMP	REGULATOR	DISPLACEMENT [cm³/rev]	MAX FLOW RATE [l/min]		PRESSURE ADJUSTMENT RANGE [bar]		ROTATION SPEED [rpm]	
			1500 rev	1800 rev	min	max	min	max
PVE-006	PC2	6,6	10	12	15	35	800	1800
	PC3				50	70		
PVE-011	PC2	11,1	16,7	20	15	35		
	PC3				50	70		
PVE-016	PC2	16,6	25	30	15	35		
	PC3				50	70		
PVE-023	PC2	22,2	33,3	40	15	35		
	PC3				50	70		

NOTE: Flow rate values are obtained with delivery pressure = 3.5 bar

4 - NOISE LEVEL

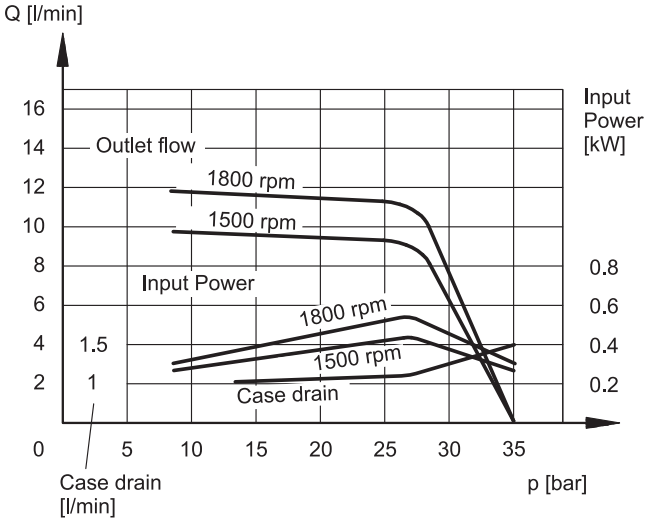
PUMP	NOISE LEVEL [dB (A)] null displacement	full displacement
PVE-006	61	63
PVE-011	62	65
PVE-016	64	68
PVE-023	64	70

The noise pressure levels were measured in a semi-anechoic room, at an axial distance of 1 m from the pump.
The values shown must be reduced by 5 dB(A) if they are to be considered in a completely anechoic room.

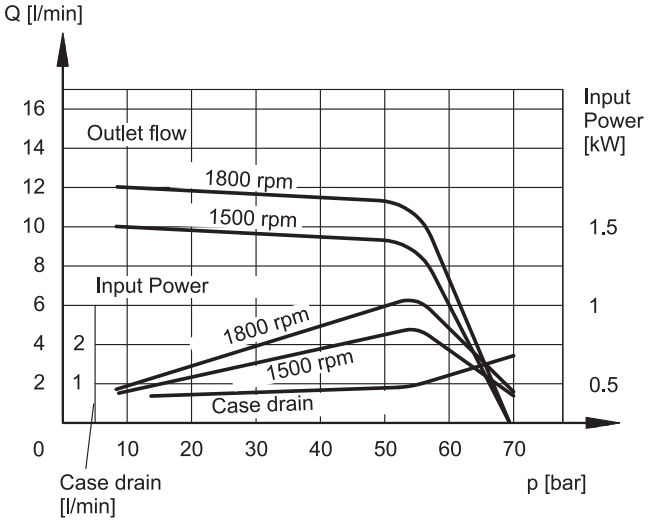
5 - CHARACTERISTIC CURVES (values obtained with mineral oil with viscosity of 46 cSt at 40°C)

The diagram curves were measured with a pump rotation speed of 1500 and 1800 rev/min.

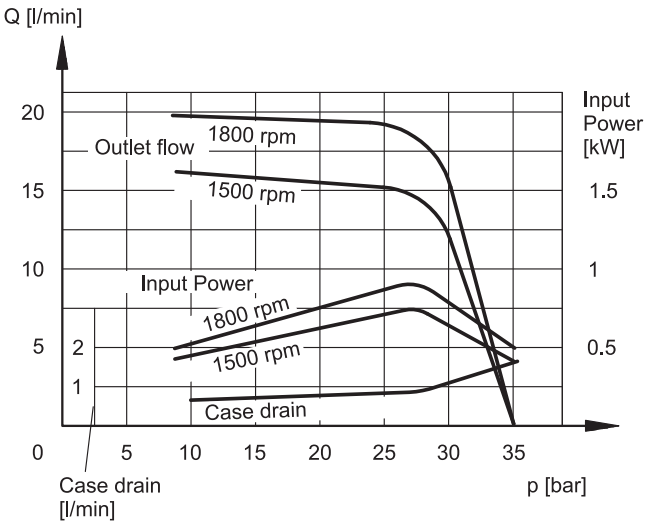
PVE-006PC2



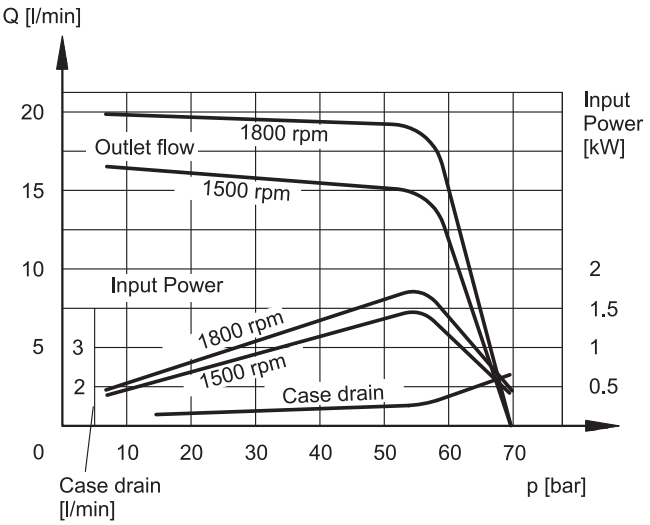
PVE-006PC3



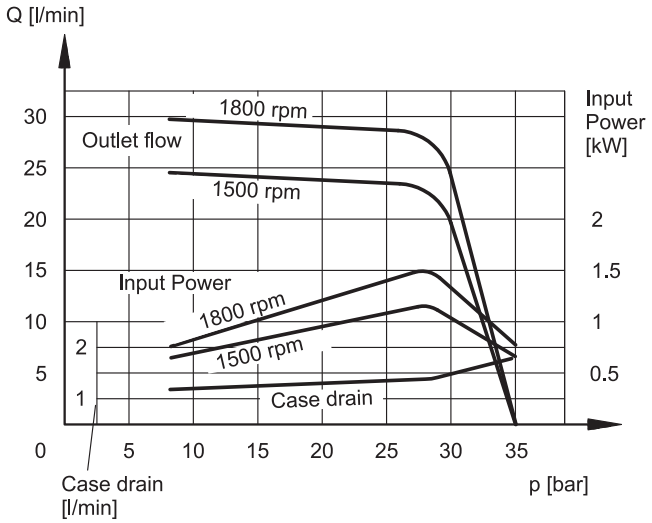
PVE-011PC2



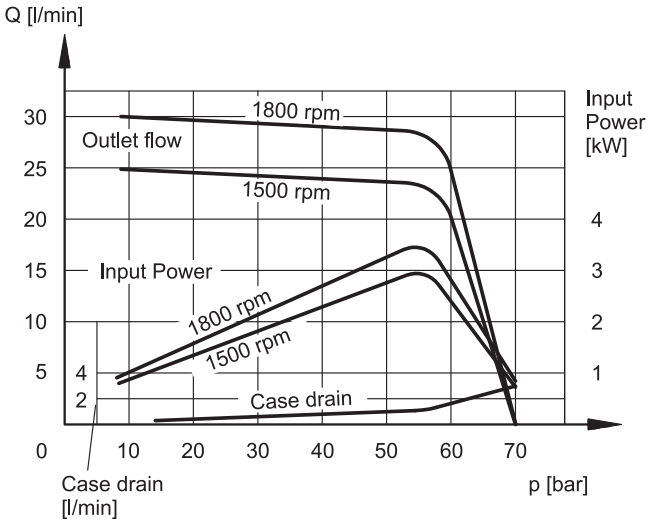
PVE-011PC3



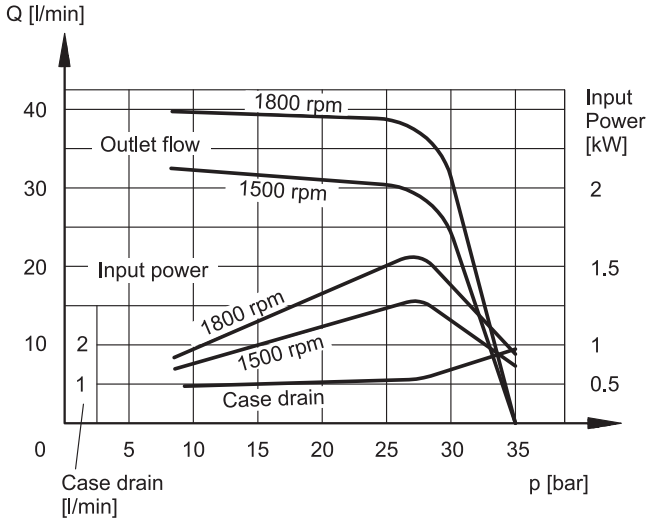
PVE-016PC2



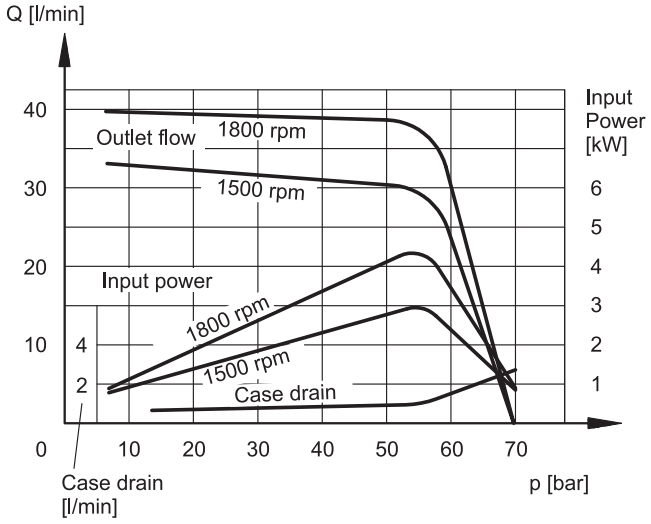
PVE-016PC3



PVE-023PC2

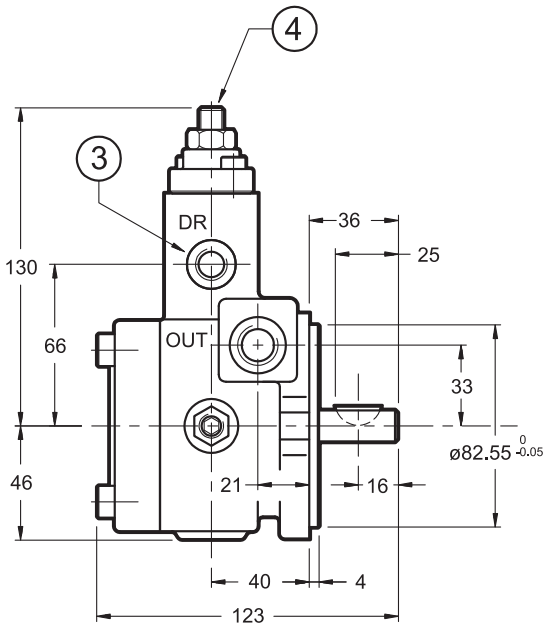


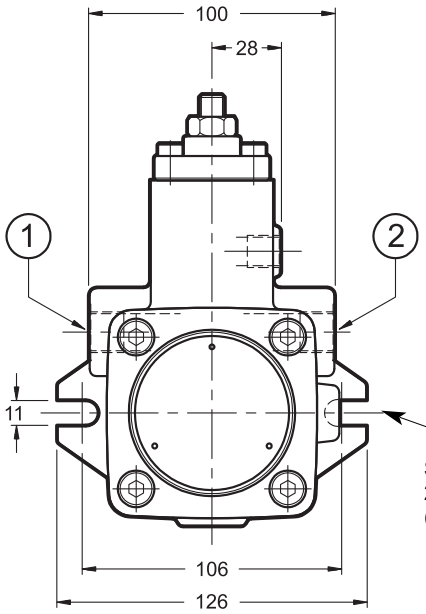
PVE-023PC3



6 - OVERALL AND MOUNTING DIMENSIONS PVE-006

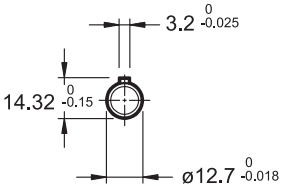
dimensions in mm





SAE J744 fitting flange
2 holes
(identification code: **0**)

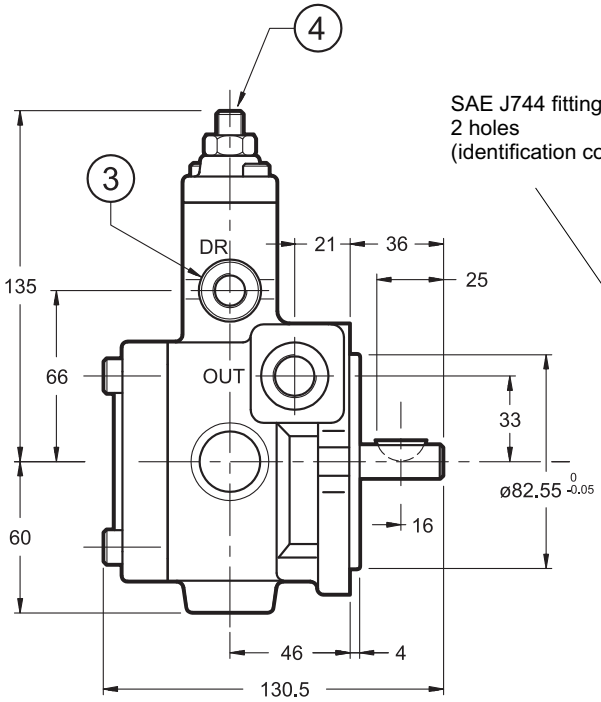
Cylindrical with
key shaft end SAE J744
(identification code: **0**)



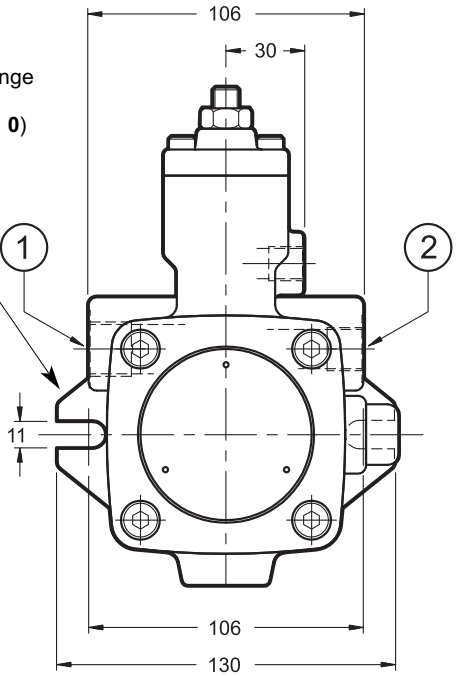
1	Suction port: 3/8” BSPP (parallel)
2	Delivery port: 3/8” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.

7 - OVERALL AND MOUNTING DIMENSIONS PVE-011

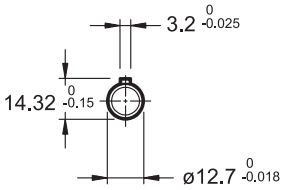
dimensions in mm



SAE J744 fitting flange
2 holes
(identification code: **0**)

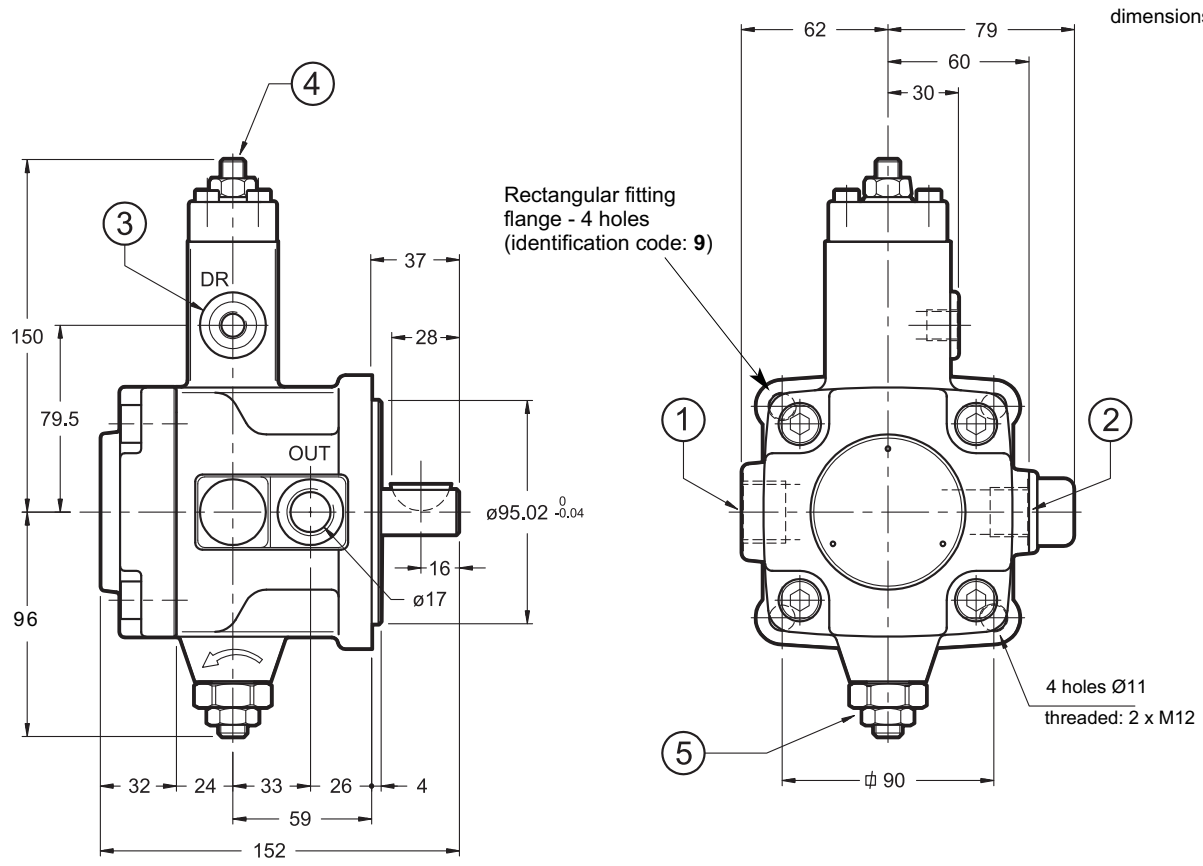


Cylindrical with key shaft end
SAE J744
(identification code: **0**)



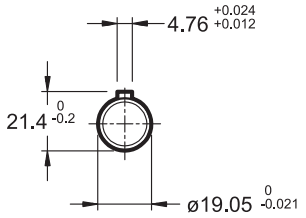
1	Suction port: 1/2” BSPP (parallel)
2	Delivery port: 3/8” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.

8 - OVERALL AND MOUNTING DIMENSIONS PVE-016 AND PVE-023



Cylindrical with key shaft end
SAE J744

(identification code: **0**)



1	Suction port: 3/4” BSPP (parallel)
2	Delivery port: 1/2” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.
5	Volume adjustment. Clockwise rotation to reduce flow.

9 - INSTALLATION

— The PVE pumps can be installed with the axis oriented in any position.

— The suction tube has to be suitably sized so that the suction pressure is never lower than -0.3 bar (relative). Bends or restrictions or an excessive tube length could further decrease the value of the suction pressure with a following increase in the noise emissions and a decrease in the pump lifetime.

— The drainage port must be connected directly to the tank by a line separate from other discharges, located far from the suction line and lengthened to below the minimum oil level so as to avoid formation of foam.

— **Before starting, the pump body has to be filled with the fluid.** The pump start up, especially at a cold temperature, should occur with the pump unloading. Start and stop motor several time in order to purge the air from pump and pipelines.

— The pumps are normally positioned directly above the oil tank. Flooded suction port installation of the pumps is advisable in the case of circuits with high flow rates and pressures.

— The drainage tube has to be sized so that the pressure inside the pump body is always lower than 0.3 bars (relative), even during the dynamic change and flow rate phases. The drainage tube has to unload inside the tank far from the suction area. We suggest to interpose a screen between the two lines.

— The motor-pump connection must be carried out directly with a flexible coupling. Couplings that generate axial or radial loads on the pump shaft are not allowed.

10 - MULTIPLE PUMPS

PVE-016 and PVE-023 pumps can be connected to external gear pumps (see available displacements in the table at par. 10.3). The possibility to couple two pumps makes possible to create multi-flow groups with independent hydraulic circuits.

10.1 - Maximum applicable torque

While sizing coupled pumps, consider that the shaft of the front pump must bear the torque generated by both pumps when they are loaded simoultaneusly.

NOTE: The maximum applicable torque at the shaft of the front pump is 62 Nm.

The input torque (M) for each pump is given by the following ratio:

$$M = \frac{9550 \cdot N}{n} = [Nm]$$

n = rotation speed [rpm]

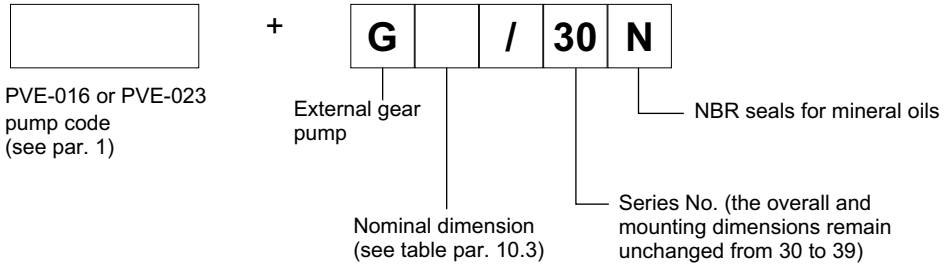
where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta_{tot}} = [kW]$$

Q = flow rate [l/min]
Δp = differential pressure between the pump suction and delivery [bar]
η_{tot} = total efficiency (coefficient = 0.8)

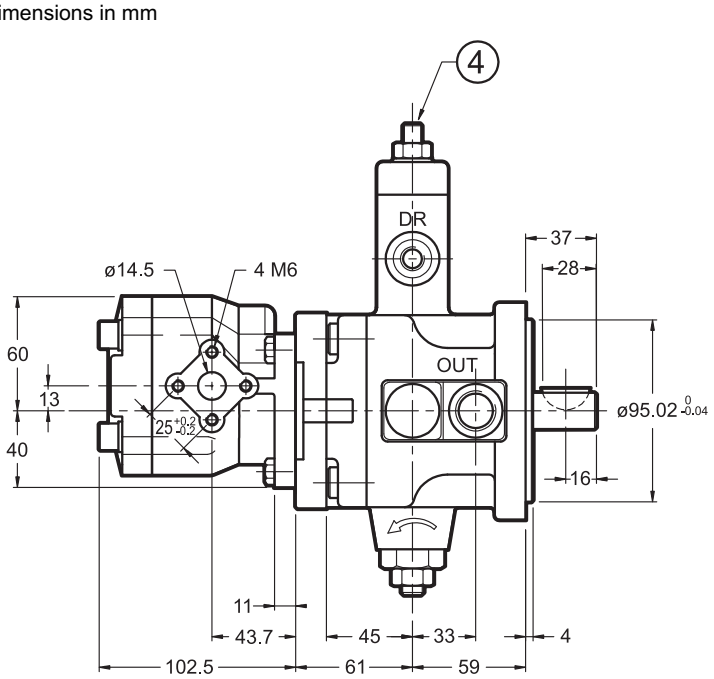
If the total of the obtained torques is higher than 62 Nm, it is necessary to reduce the working pressure / flow value of one or both the pumps until the total torque becomes lower than the maximum value indicated.

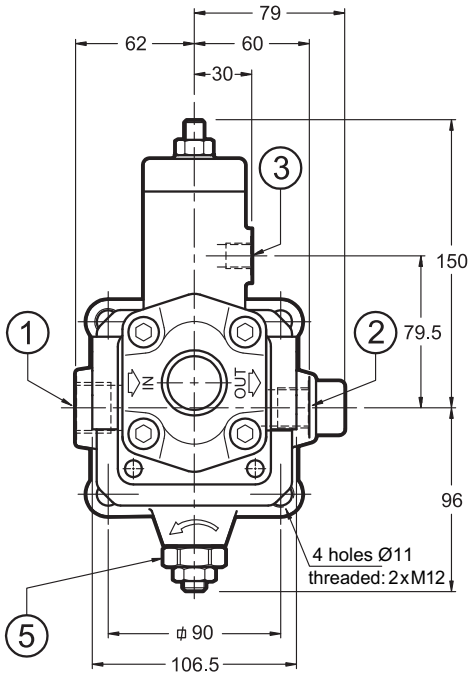
10.2 - Multiple pumps identification code



10.3 - Multiple pumps overall and mounting dimensions

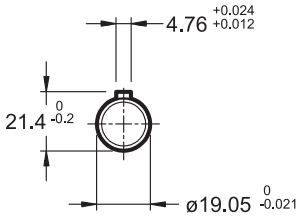
dimensions in mm





Cylindrical with key shaft end
SAE J744

(identification code: **0**)



AVAILABLE GEAR PUMPS

Nominal dimensions	Displacement [cm³/rev]	Max working pressure [bar]	Peak pressure [bar]	Min speed [rev/min]
0020	2	210	250	900
0025	2.5			850
0030	3			
0040	4			800
0050	5			
0060	6			
0075	7.5			
0090	9			
0105	10.5			
0120	12	175	210	

Gear pump weight: 1.7 kg

1	Suction port: 3/4” BSPP (parallel)
2	Delivery port: 1/2” BSPP (parallel)
3	Case drainage port: 1/4” BSPP (parallel)
4	Pressure compensator. Clockwise rotation to higher pressure.
5	Volume adjustment. Clockwise rotation to reduce flow.

DUPLOMATIC MOTION SOLUTIONS

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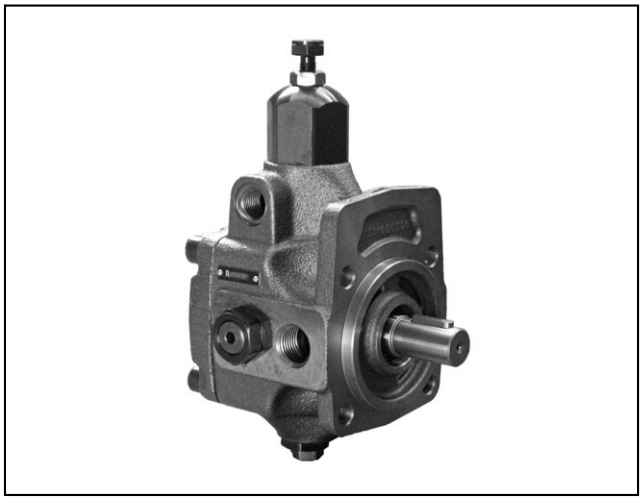
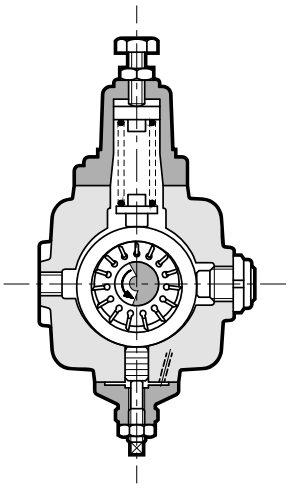


RV1D

VARIABLE DISPLACEMENT VANE PUMPS WITH DIRECT PRESSURE ADJUSTER

SERIES 10

OPERATING PRINCIPLE



— The RV1D pumps are variable displacement vane pumps with mechanical pressure compensator.

— The pressure compensator keeps the cam ring of the pumping group in the eccentric position with use of an adjustable load spring. When the delivery pressure equals the pressure corresponding to the spring setting, the cam ring is moved toward the center instantaneously, adjusting the flow rate to the values required by the plant.

— Energy consumption is reduced and adequate in every phase of the cycle.

— The pump group has hydrostatic axial compensation distribution plates, that improve the volumetric efficiency and reduce wear of the components.

— In zero flow demand conditions, the pump delivers fluid only to compensate any possible leaks and pilot lines, keeping constant the circuit pressure .

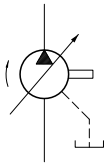
— The compensator response times are very low such as to make unnecessary the pressure relief valve.

PERFORMANCE RATINGS (measured with mineral oil with viscosity of 46 cSt at 40°C)

		016	020	025	032	040	050	063	080	100	120
Geometric displacement	cm^3/rev	16	20	25	32	40	50	63	80	100	120
Actual displacement (±3%)	cm^3/rev	17	21	26	33	42	51	63	80	100	123
Maximum flow at 1500 rpm	l/min	25,5	31,5	39	49,5	63	76,5	94,5	120	150	184,5
Max working pressure	bar	120	100			100			90		
Pressure adjustment range	bar	20 ÷ 120	30 ÷ 100			30 ÷ 100			50 ÷ 90		
Maximum drain port pressure allowed	bar	1									
Rotation speed range	rpm	800 ÷ 1800				800 ÷ 1500					
Rotation direction		clockwise (seen from the shaft side)									
Shaft loads		radial and axial loads are not allowed									
Max applicable torque on shaft: type R55 type R97	Nm	110 70	250 -			586 -			900 -		
Mass	kg	7,4	18,3			43,8			56		

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	+15 / +60
Recommended viscosity	cSt	22 ÷ 68
Fluid viscosity range	see paragraph 2.2	
Degree of fluid contamination	see paragraph 2.3	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

Variable displacement vane pump

Pump size:
group 05
016 = 17 cm³/rev
gruppo 1
020 = 21 cm³/rev
025 = 26 cm³/rev
032 = 33 cm³/rev
group 2
040 = 42 cm³/rev
050 = 51 cm³/rev
063 = 63 cm³/rev
group 3
080 = 80 cm³/rev
100 = 100 cm³/rev
120 = 123 cm³/rev

With mechanical pressure control
NOTE: pumps gr.3 **PC2** range 30 ÷ 50 bar available upon request

Rotation direction (seen from the shaft end)

Option: combined pumps.
Omit for single pumps
See at par. 13.
NOTE

Seals:
N = NBR seals for mineral oil (**standard**)
V = Viton for special fluids

Series No.
(from 10 to 19 sizes and mounting dimensions remain unchanged)

Hydraulic connection:
RV1D-016, 020, 025 and 032:
B = BSP threaded ports
RV1D-040, 050, 063, 080, 100 and 120:
S = suction / delivery SAE flanges with metric bolts; drain port BSP threaded

Shaft end:
5 = cylindrical keyed (not available with flange type 9)
7 = conical keyed (not available for RV1D-016)

Mounting flange:
5 = four-bolt mounting flange ISO 3019/2
9 = four-holes - rectangular - type GR2 (available for RV1D-016 only)

NOTE: No through-drive shaft inside standard single pumps.

2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. For use of other types of fluid, keep in mind the limitations shown in the following table or consult our technical department for approval.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	-The values shown in the performance ratings table must be reduced by at least 50% - The pump rotation speed must be limited to 1000 rpm. - Use NBR seals only
HFD (phosphate esters)	There are no particular limitations with this kinds of fluids. Operation with a fluid viscosity as close as possible to the optimum viscosity range specified in par. 2.2 is recommended. - Use FPM (Viton) seals only

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

optimum viscosity	22 ÷ 68 cSt	referred to the fluid working temperature in the tank
maximum viscosity	400 cSt	limited to only the start-up phase of the pump

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

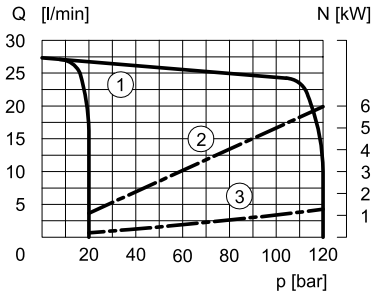
The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator. See installation section for details.

3 - CHARACTERISTIC CURVES RV1D-016 (GR. 05)

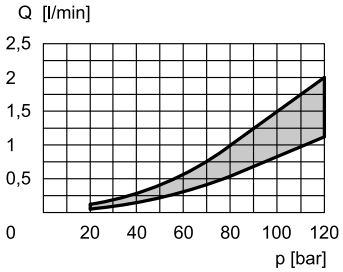
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

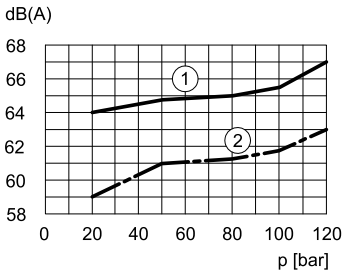


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



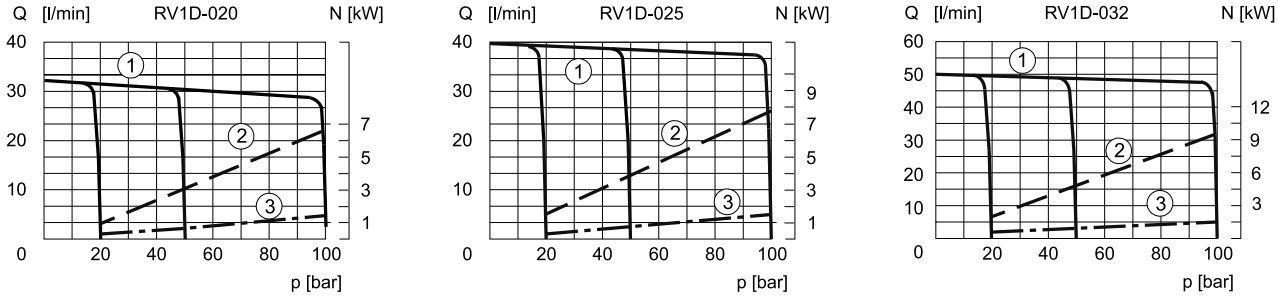
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

4 - CHARACTERISTIC CURVES OF RV1D-020, RV1D-025 AND RV1D-032 (GR. 1)

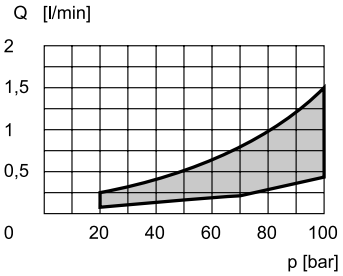
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

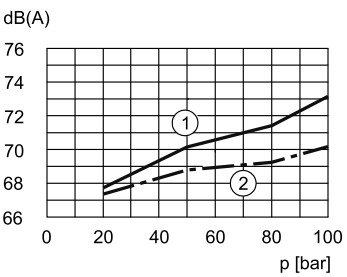


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



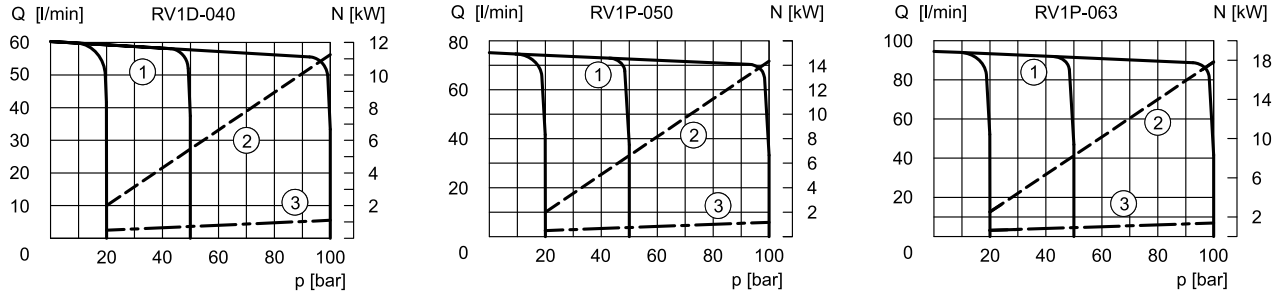
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

5 - CHARACTERISTIC CURVES FOR RV1D-040, RV1D-050 AND RV1D-063 (GR. 2)

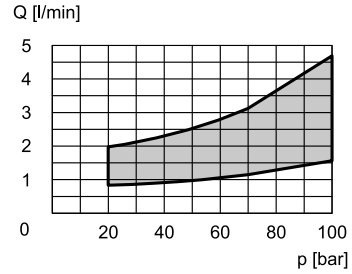
(values obtained with mineral oil with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

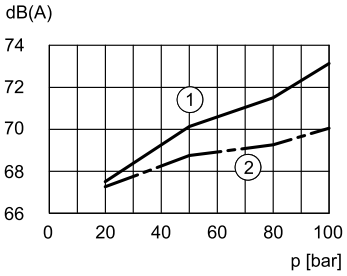


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



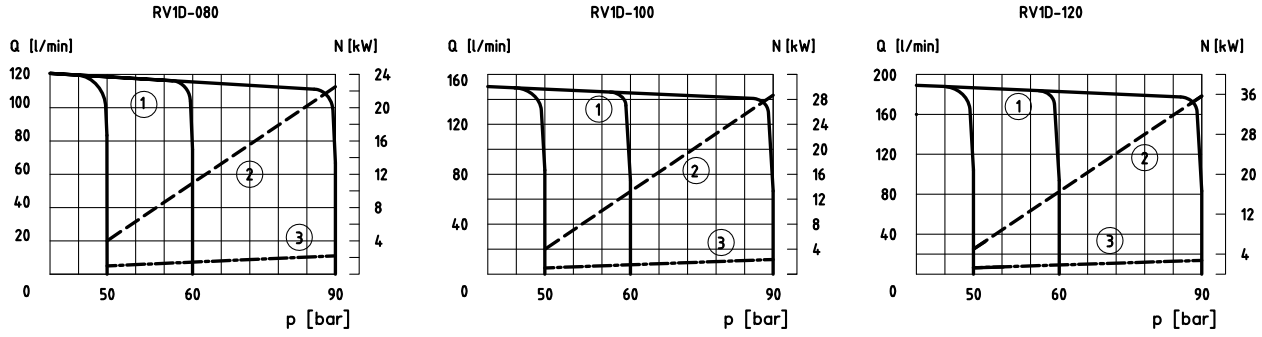
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

6 - CHARACTERISTIC CURVES FOR RV1D-080, RV1D-100 E RV1D-120 (GR. 3)

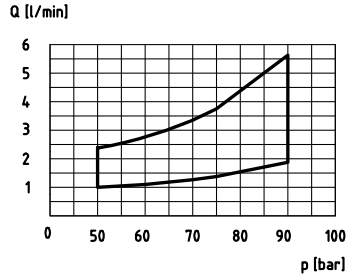
(values obtained with mineral oil viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

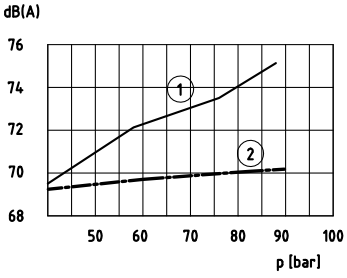


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



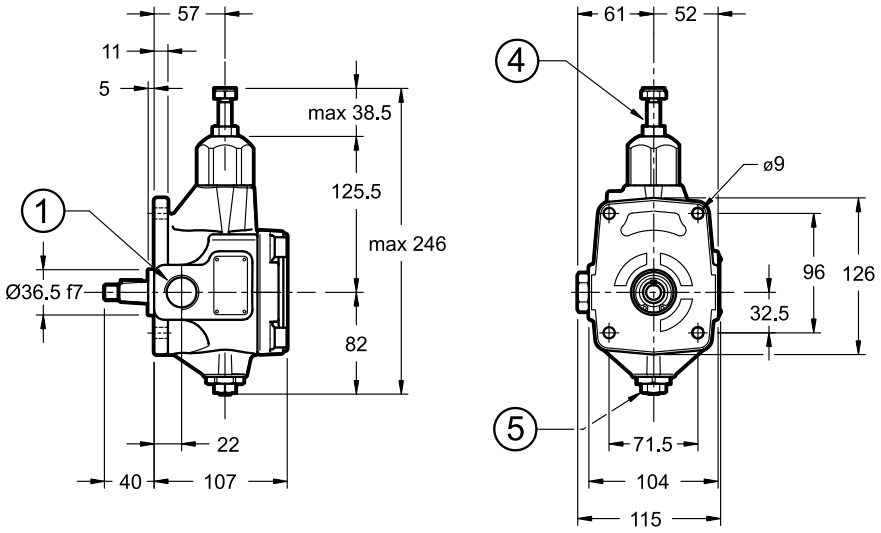
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

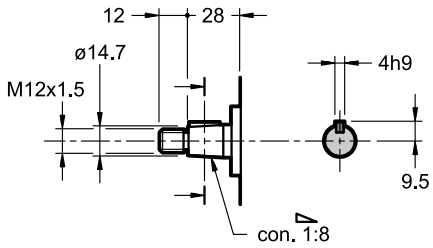
1) noise at max flow
2) noise with zero flow

7 - OVERALL AND MOUNTING DIMENSIONS RV1D-016 (GR. 05)

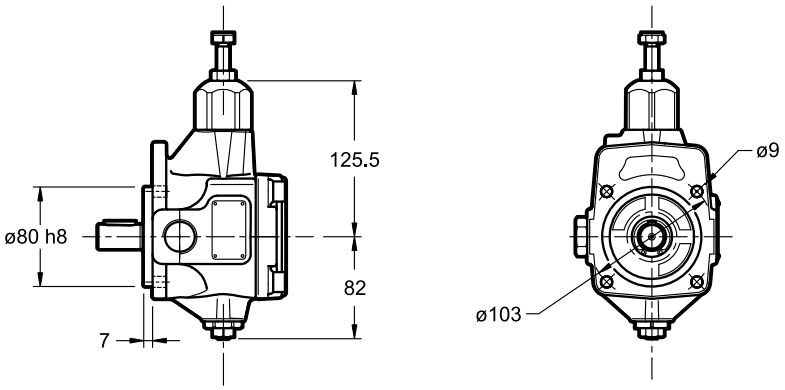
dimensions in mm

RV1D-016PC-R97B

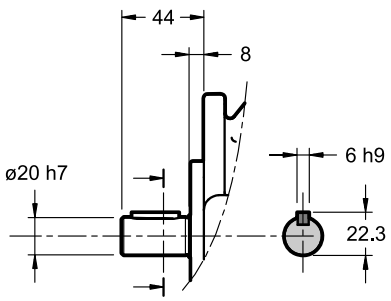




RV1D-016PC-R55B



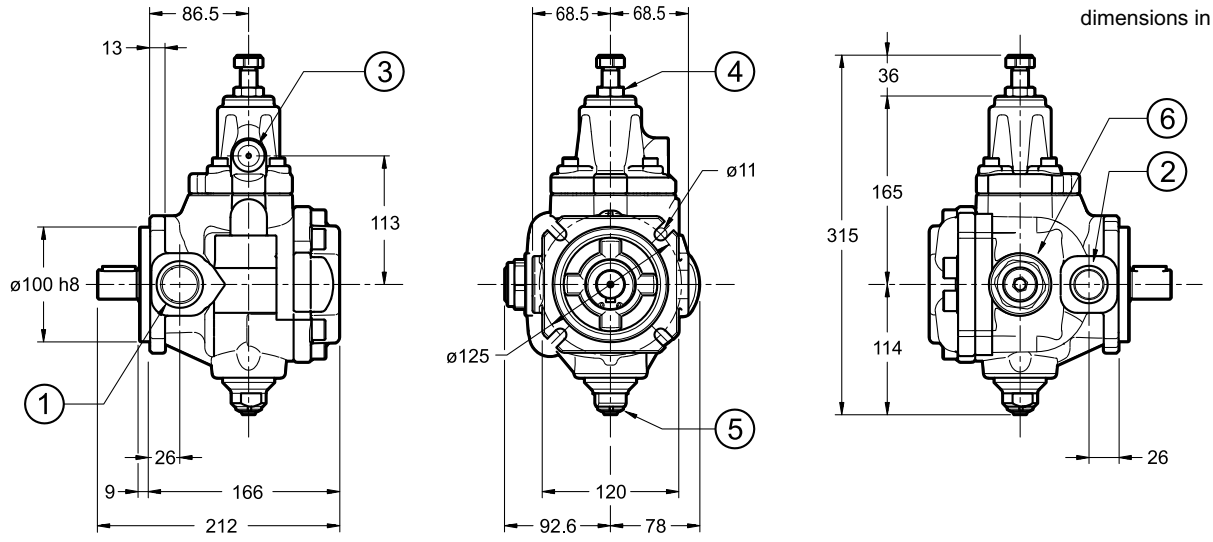
for non quoted dimensions
refer to the drawing
RV1D-016PC-R97B

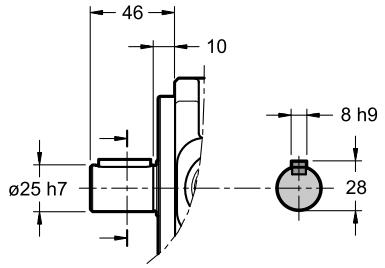


1	Suction port: 3/4” BSP
2	Delivery port: 1/2” BSP
3	Drainage port: 3/8” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 17. Locking nut : spanner 17.
5	Flow adjustment screw. Rotate clockwise to decrease flow. socket hex screw, hex key 5.Locking nut: spanner 17.
6	Guide block balancing adjustment screw. **Do not tamper.**

8 - OVERALL AND MOUNTING DIMENSIONS RV1D-020, RV1D-025 AND RV1D-032 (GR.1)

dimensions in mm

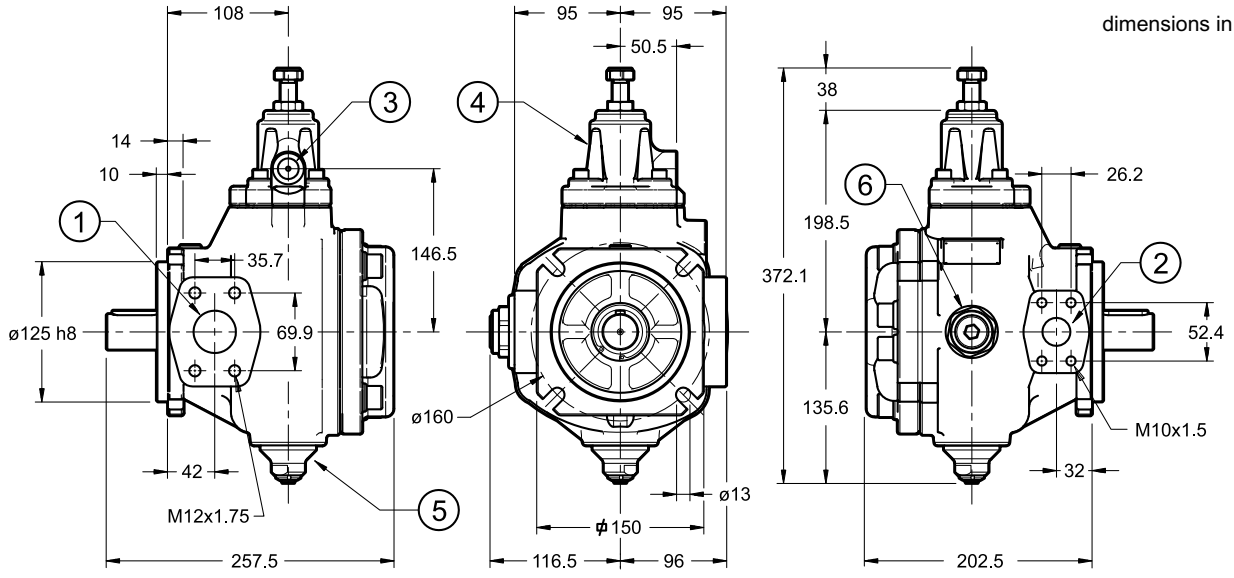


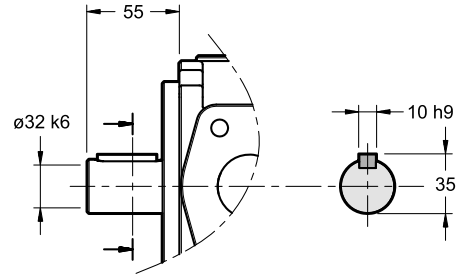


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

10 - OVERALL AND MOUNTING DIMENSIONS RV1D-040, RV1D-050 AND RV1D-063 (GR.2)

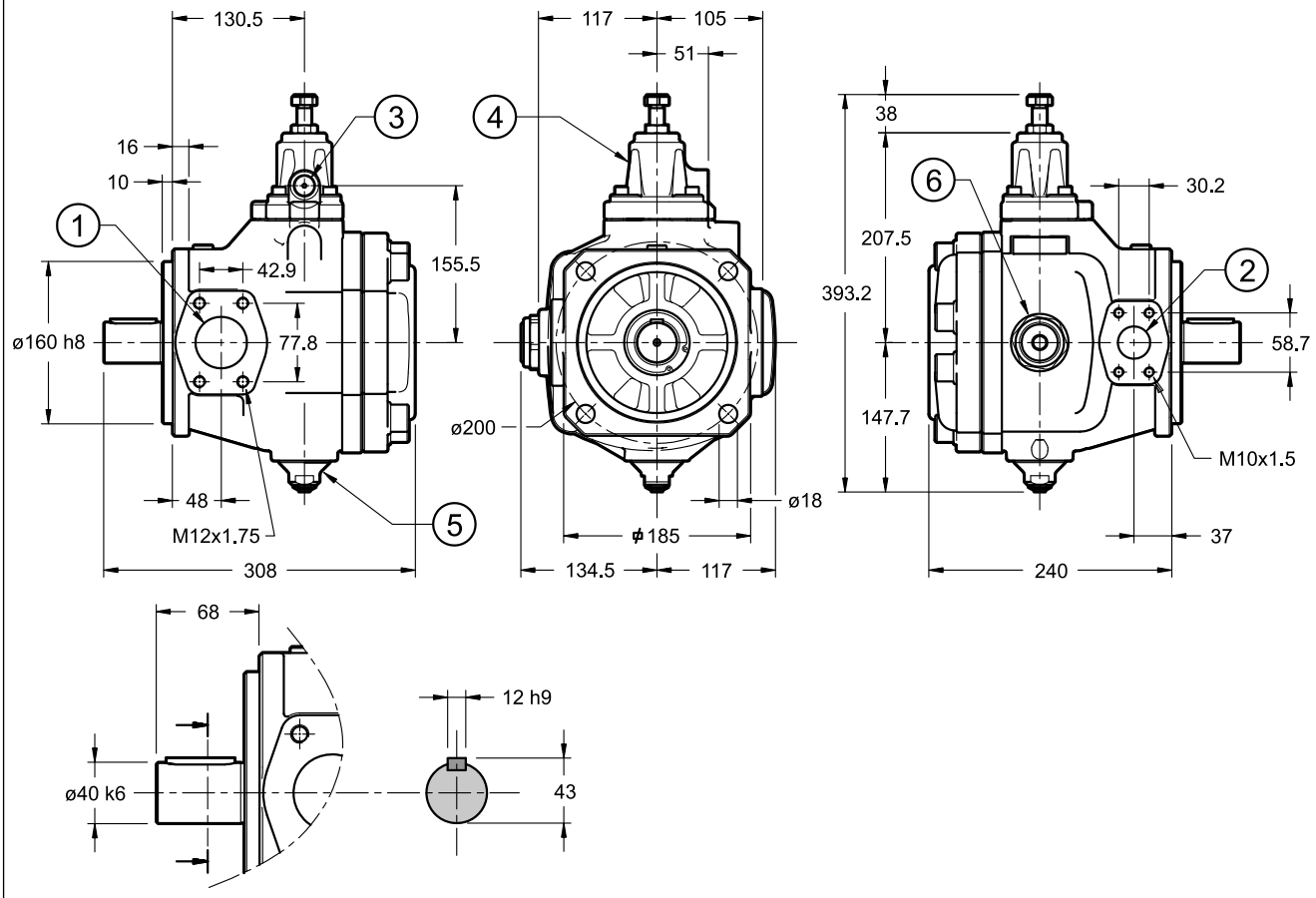
dimensions in mm





1	Suction port: SAE 3000 1 1/2”
2	Delivery port: SAE 3000 1”
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

9 - OVERALL AND MOUNTING DIMENSIONS RV1D-080, RV1D-100, RV1D-120 (GR. 3)



1	Suction port: SAE 3000 2”
2	Delivery port: SAE 3000 1 1/4”
3	Drainage port: 1/2” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 22. Locking nut : spanner 22.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Hex key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**

11 - INSTALLATION

The instruction manual for pumps installation and commissioning is always included in the packaging with the pump. Observe restrictions in this document and follow the instructions.

— RV1D-016, RV1D-020, RV1D-025 and RV1D-032 pumps can be installed in any position.

All the other pumps need to be installed with the axis in horizontal position and with pressure compensator upward.

— Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. Couplings that generate axial or radial loads on the pump shaft are not allowed.

— The suction line must be short, with a small number of bends and without internal section changes. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port.

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 suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump.**

Suction pressure should be between 0.8 and 1.5 bar absolute

— The drainage pipe must be connected directly to the tank by a line separate from other discharges, located as far as possible from the suction line and lengthened to below the minimum oil level in order to avoid foaming.

— 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 (approximately: tank capacity = 4 times the pump flow rate per minute).
In systems where the pump runs for a long time under zero-flow setting conditions, it is advisable to provide a fluid cooling system.

The pressure in the drain line must not exceed 1 bar.

To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C. **The fluid temperature must never exceed 60 °C**

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

— The pump must be started-up in full displacement (P→T) with flow to the tank without pressure for several minutes, to purge the air.
The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

— If the volume adjuster has been set for values less than 50% of the nominal flow-rate, start-up is allowed only if provided the system and the pump are completely filled with fluid.

— **It's essential that the difference between the fluid temperature and the ambient (pump body) temperature doesn't exceed 20 °C.**
If this is the case, the pump should be switched-on only for intervals of about 1-2 seconds (start/stop mode) without pressure, until the temperatures came balanced.

— The pumps are usually placed directly upon the fluid tank. Flooded suction port installation of the pump is recommended in the event of circuits with high flow rates and pressures.

12 - VOLUME ADJUSTMENT SCREW

The volume adjuster is fitted as standard on all the pumps.

It consists of an adjustment screw and a small balanced piston that limit the maximum eccentricity of the pumping group cam ring, changing the displacement. The maximum flow is reduced by turning the adjustment screw clockwise. Indicative data, sensitive to performance tolerances.

Nominal size		**016**	**020**	**025**	**032**	**040**	**050**	**063**	**080**	**100**	**120**
Reduction of displacement per turn	cm^3	9,7	10			16			16		
Minimum possible displacement	cm^3/rev	3,1	9,5	15	19	27,5	35,5	43,5	63	80	100

Tools required for adjustment:

RV1D-016: adjustment screw hexagon socket key 5. Locking nut spanner 17.
Other sizes: adjustment screw hexagon socket key 6. Tooth retainer KM1 type.

13 - MULTIPLE PUMPS

RV1D with through drive shaft are available. These pumps are designed to be connected one to the other in decreasing order of displacement. The RV1D-016 pump suitable for multiple pumps is the R55B version only (ISO 3019-2 four-bolt flange with cylindrical keyed shaft end)

RV1D pumps can be coupled also with RV1P type pumps (see catalogue 14 201) and with GP gear pumps (see catalogue 11 100). The torque on the shaft must be further reduced after the second pump.

Consult our Sales Support department for this kind of applications.

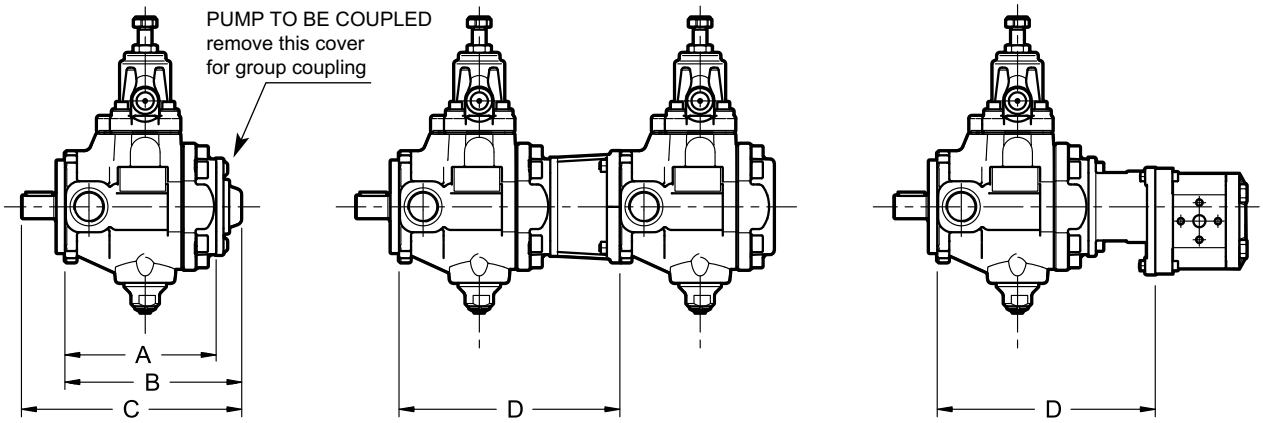
IDENTIFICATION CODE FOR MULTIPLE PUMPS

Both single pumps with through drive shaft (without mating joint) and multiple groups are available.
Fill the ordering code, by following the coupling sequence of the pumps. Insert the /F suffix after each pump with through drive shaft:

/ **F** — Version for multiple pumps:
/F = with through drive shaft

identification code front pump **/F** + identification code intermediate pump **/F** + identification code rear pump

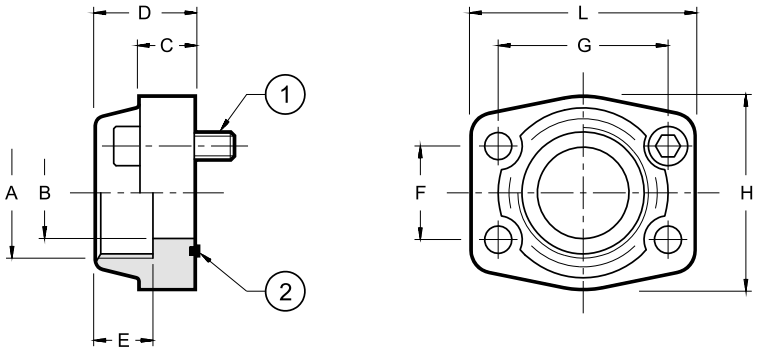
Examples:
Single pump with through drive shaft: RV1D-016PC-R55B/10V **/F**
Double pump identification: RV1D-016PC-R55B/10V **/F +** RV1D-016PC-R55B/10V
Triple pump identification: RV1D-025PC-R55B/10N **/F +** RV1D-025PC-R55B/10N **/F +** RV1D-025PC-R55B/10N
RV1D pump + gear pump identification: RV1D-050PC-R55B/10N **/F +** GP2-00208R97F/20N



Dimensions (mm)					
Group size	A	B	C	D with RV1D pump of same size group.	D with gear pump type GP1 / GP2 / GP3
05	104	131	175	177	168 / 176 / -
1	163	190	236	238	227 / 235 / -
2	199,5	246,5	301,5	301,5	289,5 / 289,5 / 290,5
3	237	284	352	354	327 / 327 / 328

Max torque applied to the shaft of the second pump (Nm)		
Group size Front pump	Second pump (same size group)	Second pump (smaller size group)
05	55	-
1	55	55
2	110	110
3	180	110

14 - CONNECTION FLANGES



the fastening bolts and the O-Rings must be ordered separately

flange code	flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	(1) n° 4 bolts	(2)
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26.2	52.4	22	70	SHC M10x35	OR 4131 (32.93x3.53)
0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30.2	58.7	68	79	SHC M10x35	OR 4150 (37.69x3.53)
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	44	24	35.7	70	78	93	SHC M12x45	OR 4187 (47.22x3.53)
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77.8	90	102	SHC M12x40	OR 4225 (56.74x3.53)

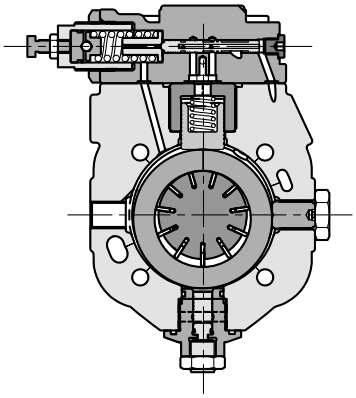
DUPLOMATIC MOTION SOLUTIONS

DUPLOMATIC MS S.p.A.
via M. Re Depaolini 24 ▪ 20015 PARABIAGO (MI) ▪ ITALY
tel. +39 0331.895.111 ▪ www.duplomatic.com ▪ e-mail: sales.exp@duplomatic.com

RV1P
VARIABLE DISPLACEMENT VANE PUMPS

SERIES 10

OPERATING PRINCIPLE



— RV1P are variable displacement vane pumps with hydraulic operated pressure compensator, that permit instantaneous adjustment of the flow rate according to the circuit requirements. Energy consumption is reduced and adequate in every cycle phase.

— The pumping group is provided with double hydrostatic axial compensation, that improves the volumetric efficiency and reduces wear of the components. Both internal paths for inlet and outlet are double.

— The pressure compensator operates keeping the cam ring of the pumping group in the eccentric position by a piston hydraulically controlled by a pressure pilot stage. When the delivery pressure equals the pressure corresponding to the pilot stage setting, the cam ring is moved toward the center, adjusting the flow rate to the plant requirements. In zero flow demand conditions, the pump delivers oil only to compensate any possible bleedings and pilotings, keeping the circuit pressure constant.

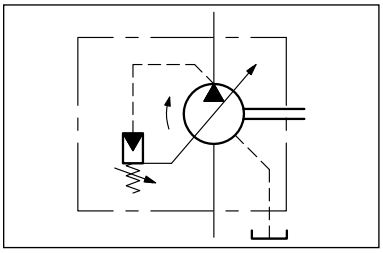
— The compensator response times are very restrained such as to allow the removal of the pressure relief valve.

TECHNICAL SPECIFICATIONS
(measured with mineral oil with viscosity of 46 cSt at 40°C)

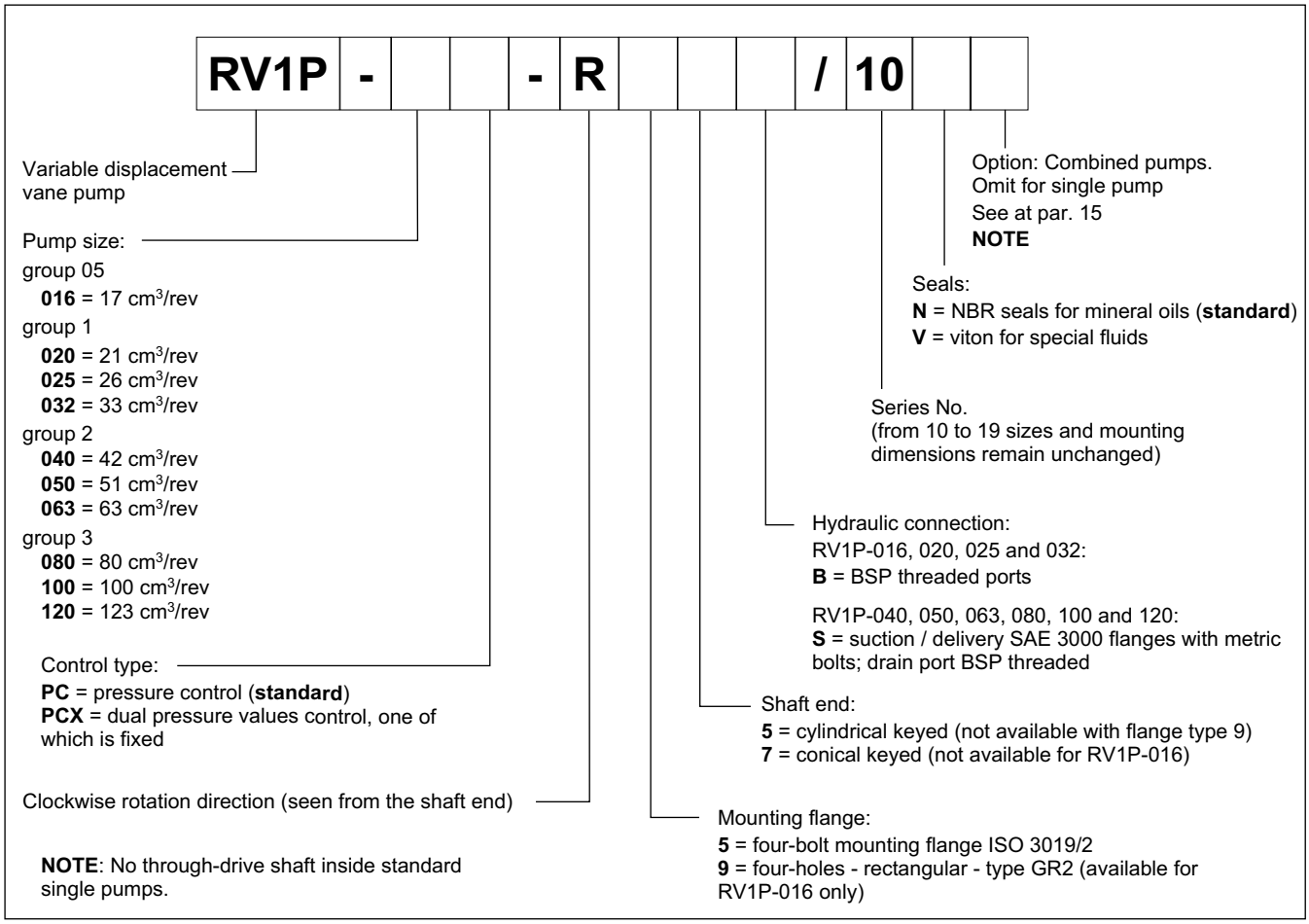
PUMP SIZE		016	020	025	032	040	050	063	080	100	120
Geometrical displacement (UNI ISO 3662)	cm^3/rev	16	20	25	32	40	50	63	80	100	120
Actual displacement (±3%)	cm^3/rev	17	21	26	33	42	51	63	80	100	123
Nominal flow rate (at 1500 rpm)	l/min	25,5	31,5	39	49,5	63	76,5	94,5	120	150	184,5
Maximum operating range	bar	250									210
Pressure adjustment range	bar	20 ÷ 250							40 ÷ 250		40 ÷ 210
Maximum pressure on drain port	bar	1									
Rotation speed range	rpm	800 ÷ 1800				800 ÷ 1500					
Rotation direction		clockwise (seen from the outlet shaft side)									
Loads on the shaft		loads radial and axial not allowed									
Maximum applicable shaft torque	Nm	130	250			586			900		
Mass (RV1P-*PC)	kg	16,5	18,5			43,7			57,2		

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	+15 / +60
Recommended viscosity	cSt	22 ÷ 68
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives. For use of other types of fluid, keep in mind the limitations shown in the following table or consult our technical department for approval.

FLUID TYPE	NOTES
HFC (water glycol solutions with proportion of water ≤ 40%)	- The values shown in the performance ratings table must be reduced by at least 50% - The pump rotation speed must be limited to 1000 rpm. - The max fluid temperature must be lower than 50°C - Use NBR seals only
HFD (phosphate esters)	There are no particular limitations with this kinds of fluids. Operation with a fluid viscosity as close as possible to the optimum viscosity range specified in par. 2.2 is recommended. - Use FPM (Viton) seals only

2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

optimum viscosity	22 ÷ 68 cSt	referred to the fluid working temperature in the tank
maximum viscosity	400 cSt	limited to only the start-up phase of the pump

When selecting the fluid type, be sure that the true viscosity is within the range specified above at the operating temperature.

2.3 - Degree of fluid contamination

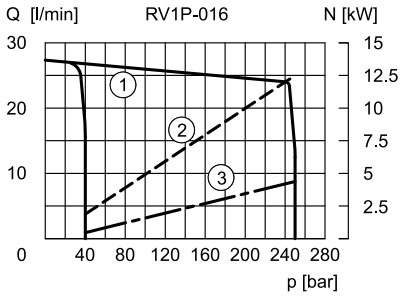
The maximum degree of fluid contamination must be according to ISO 4406:1999 class 20/18/15; therefore, use of a filter with $\beta_{20} \geq 75$ is recommended. A degree of maximum fluid contamination according to ISO 4406:1999 class 18/16/13 is recommended for optimum endurance of the pump. Hence, use of a filter with $\beta_{10} \geq 100$ is recommended.

The suction filter must be equipped with a by-pass valve and, if possible, with a clogging indicator. See installation section for details.

3 - CHARACTERISTIC CURVES RV1P-016 (GR. 05)

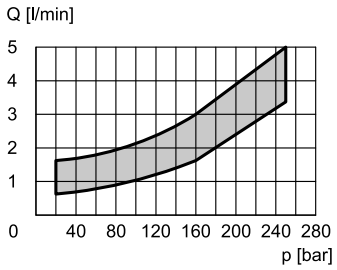
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

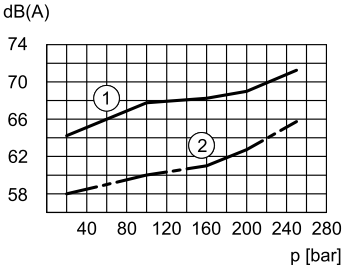


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



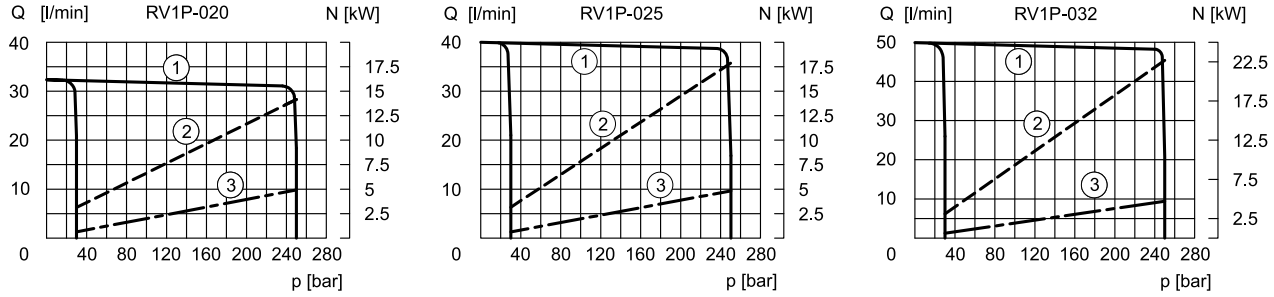
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

4 - CHARACTERISTIC CURVES OF RV1P-020, RV1P-025 AND RV1P-032 (GR. 1)

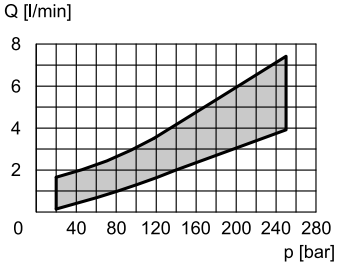
(obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

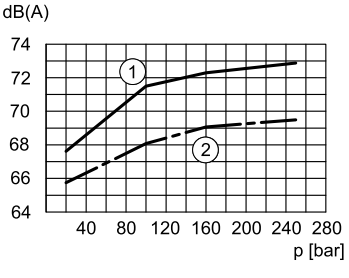


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



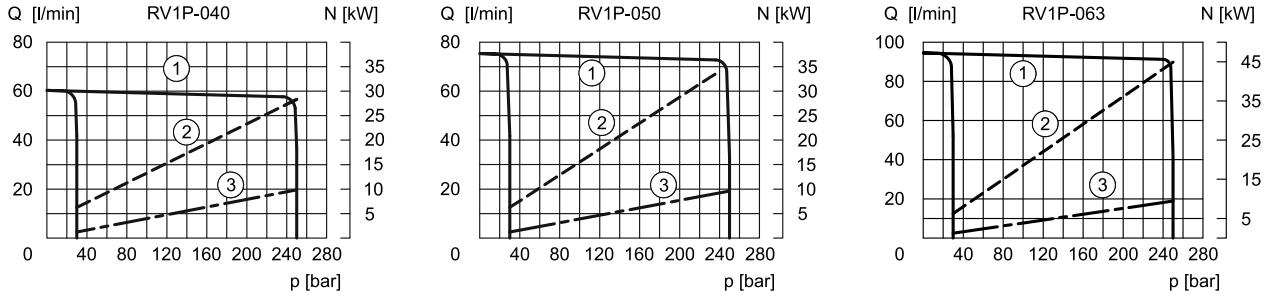
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

5 - CHARACTERISTIC CURVES FOR RV1P-040, RV1P-050 AND RV1P-063 (GR. 2)

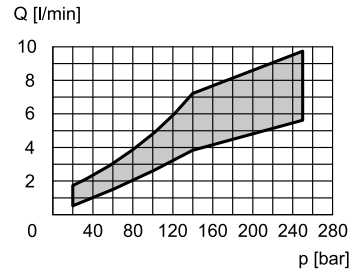
(values obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

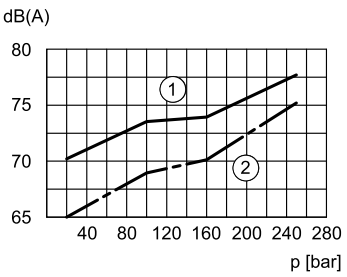


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



NOISE LEVEL



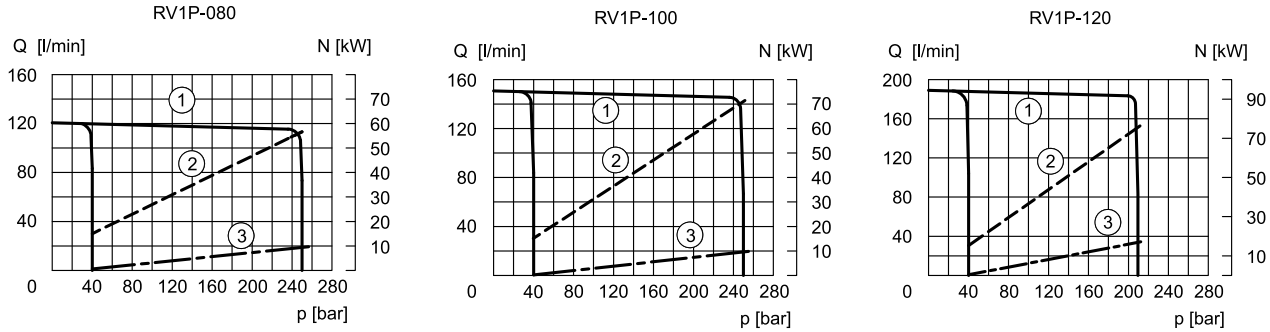
Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

6 - CHARACTERISTIC CURVES FOR RV1P-080, RV1P-100, RV1P-120 (GR. 3)

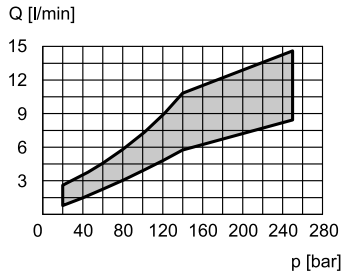
(values obtained with viscosity of 46 cSt at 40°C)

FLOW RATE - PRESSURE - ABSORBED POWER

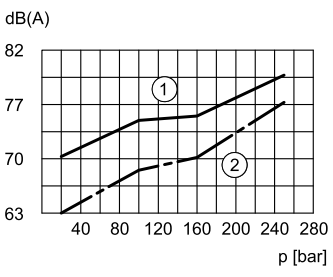


1) Flow rate - pressure curves, measured at 1500 rpm
2) Absorbed power at the maximum flow rate
3) Absorbed power at zero flow rate

DRAINAGE FLOW RATE



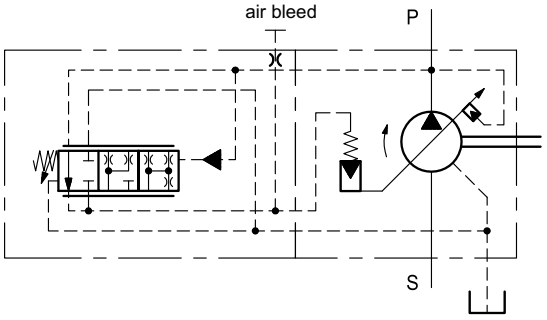
NOISE LEVEL



Approximate maximum values of noise level to minimum and maximum flow rate measured with the sound-level meter placed at one meter from pump coupling with flexible coupling.

1) noise at max flow
2) noise with zero flow

7 - PC PRESSURE CONTROL



The PC pressure regulator keeps the pressure at a constant set level in the circuit, thus adjusting automatically the pump flow rate according to the real need of the system.

The desired pressure can be set by manually adjusting the screw.

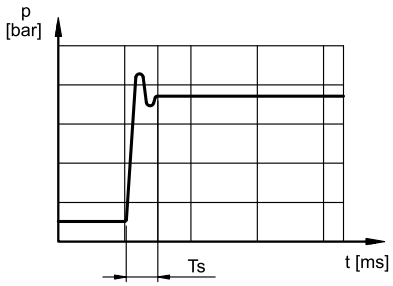
Overall dimensions at sections 9, 10, 11 and 12.

FEATURES OF THE PC CONTROL:

- adjustable pressure range:
  RV1P-016, 020, 025, 032, 040, 050 and 063 = 20 ÷ 250 bar
  RV1P-080 and 100 = 40 ÷ 250 bar
  RV1P-120 = 40 ÷ 210 bar

- default setting = 50 bar

7.1 - Response times and pressure peaks



Dynamic response curves obtained by switching the solenoid operated directional valve for closing the pump outlet.

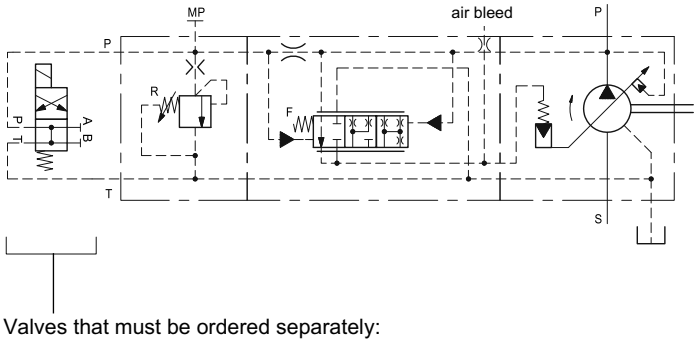
Pressure peaks exceeding 30% of the maximum operating pressure (10% for pumps gr.3) must be eliminated.

displacement	stabilization time Ts (ms)	
	15 → 210 bar	15 → 250 bar
016	50	40
020, 025, 032	80	60
040, 050, 063	100	80
080, 100, 120	120	100 (**NOTE**)

NOTE: for RV1P-120 range 15 → 210 bar

8 - PCX - DUAL PRESSURE CONTROL

Dual pressure value pump operating diagram



Valves that must be ordered separately:
solenoid switching valve DS3-SA2 (datasheet 41 150)

The PCX control, mated to a suitable two-position solenoid valve allows to electrically select the pump at null displacement and at a minimum delivery pressure value.

This function is useful for the start-up of a pump without load and allows to operate at minimum pressure in the system during the machine cycle pause, with considerable energy saving.

Pressure adjustment is obtained by a solenoid switching valve to be mounted on the control.

NOTE: The switching valve must be ordered separately.

FEATURES OF THE PCX CONTROL:

solenoid valve OFF = pump at null displacement and delivery pressure by fixed stage (F)

solenoid valve ON = pump at maximum displacement and delivery pressure set on control (R)

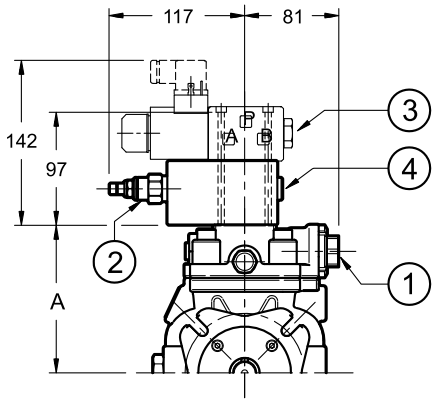
- fixed stage value (F):
  RV1P-016, 020, 025, 032, 040, 050 e 063 = 20 bar
  RV1P-080, 100 e 120 = 40 bar

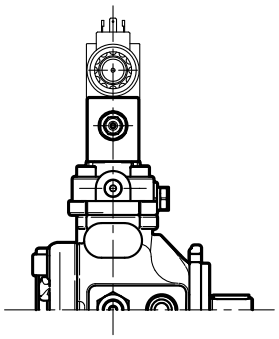
- adjustable pressure range (R):
  RV1P-016, 020, 025, 032, 040, 050 and 063 = 20 ÷ 250 bar
  RV1P-080 e 100 = 40 ÷ 250 bar
  RV1P-120 = 40 ÷ 210 bar

- default setting (R) = 50 bar

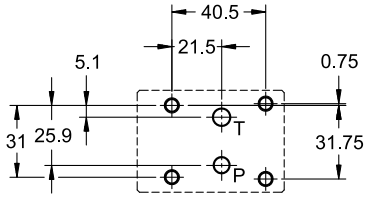
8.1 - Overall dimensions RV1P-*PCX

RV1P-016

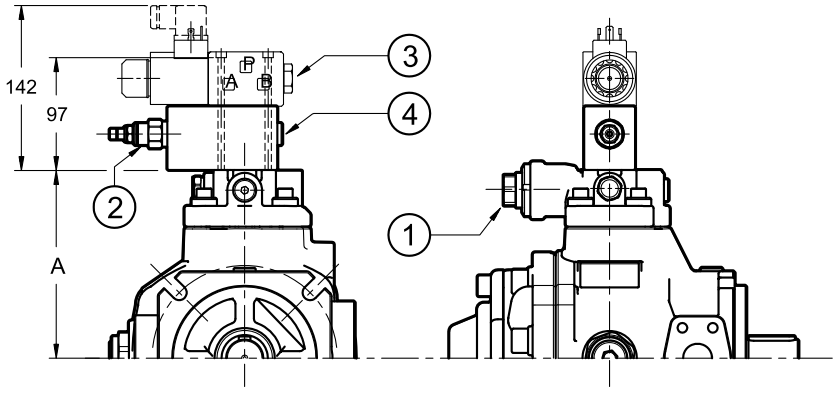




MOUNTING INTERFACE
ISO 4401-03



from RV1P-020 to RV1P-120



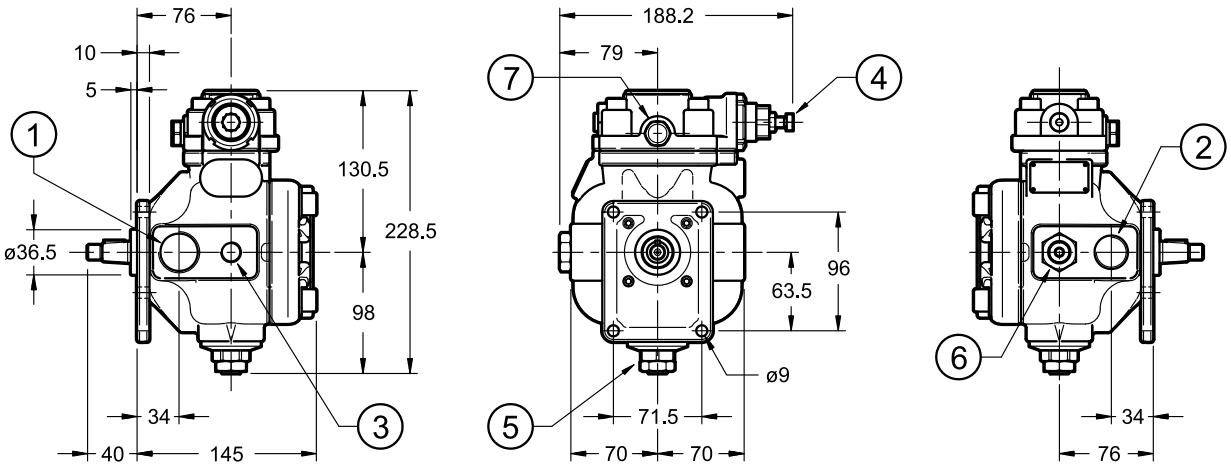
displacement	A (mm)
016	128
020, 025, 032	129
040, 050, 063	162,5
080, 100, 120	171,5

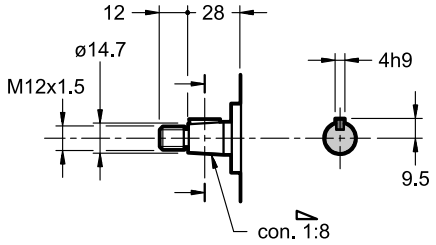
1	Main pressure stage. Fixed stage. **Do not tamper**
2	Pressure relief valve Clockwise rotation to increase pressure Socket hex screw 5/32” Locknut: hex screw 9/16”
3	Solenoid switching valve (to be ordered separately)
4	Gauge 1/4” BSP

9 - OVERALL AND MOUNTING DIMENSIONS RV1P-016 (GR. 05)

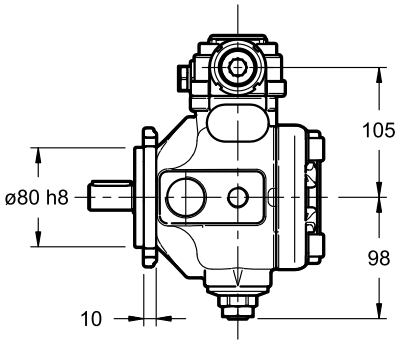
dimensions in mm

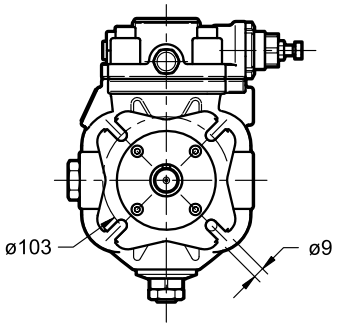
RV1P-016PC-R97B



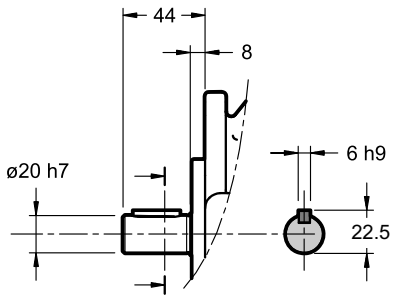


RV1P-016PC-R55B





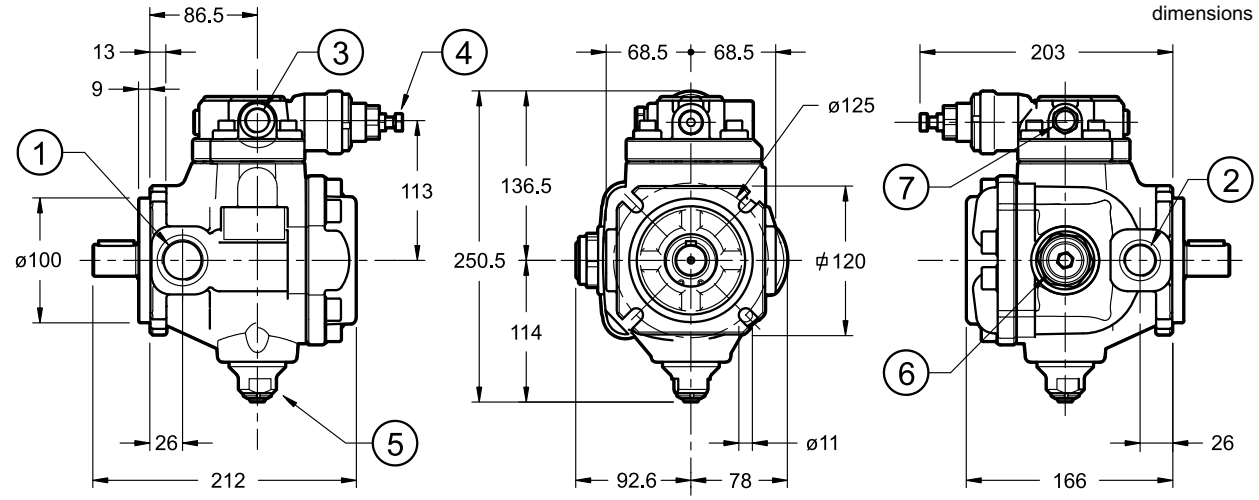
please refer to the drawing RV1P-016PC-R97B for non-quoted dimensions

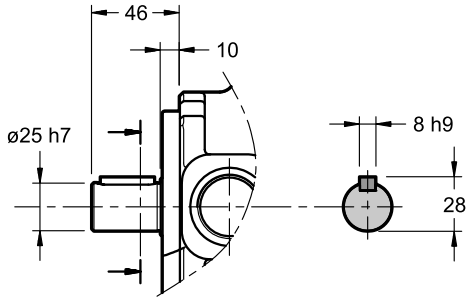


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drain port: 3/8” BSP
4	Pressure adjustment screw. Rotate clockwise to increase pressure. Spanner 13 Locking nut : spanner 13
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw, Allen key 8. Locknut spanner 24
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4 BSP

10 - OVERALL AND MOUNTING DIMENSIONS RV1P-020, RV1P-025 AND RV1P-032 (GR. 1)

dimensions in mm

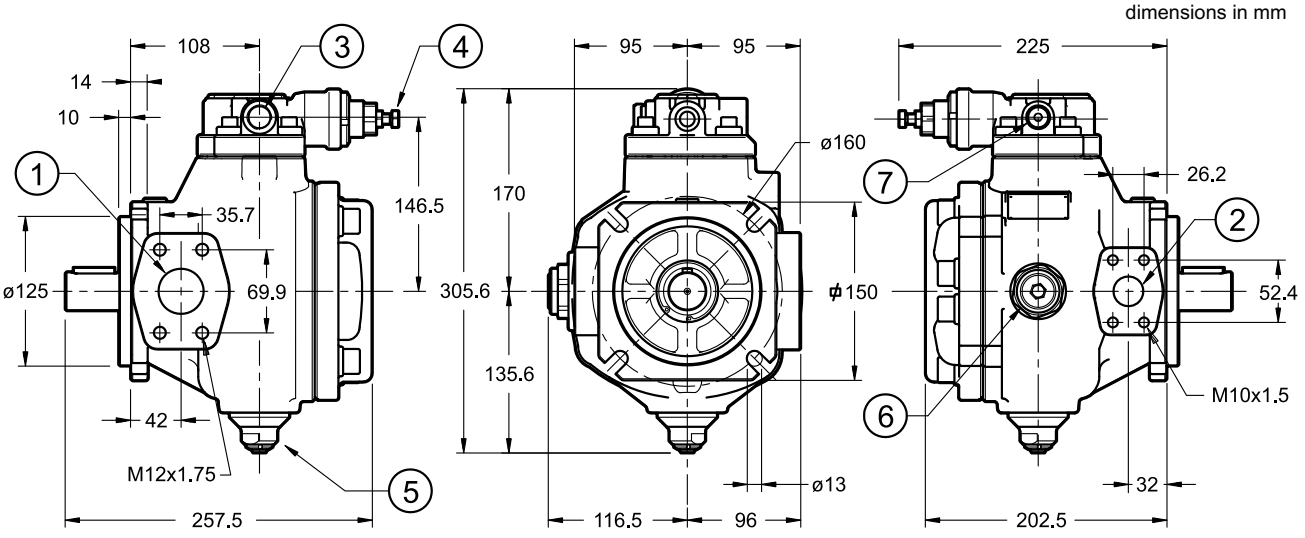


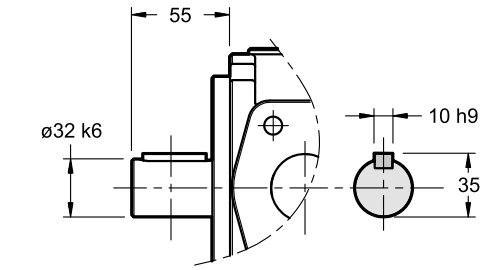


1	Suction port: 1” BSP
2	Delivery port: 3/4” BSP
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4 BSP

11 - OVERALL AND MOUNTING DIMENSIONS RV1P-040, RV1P-050 AND RV1P-063 (GR. 2)

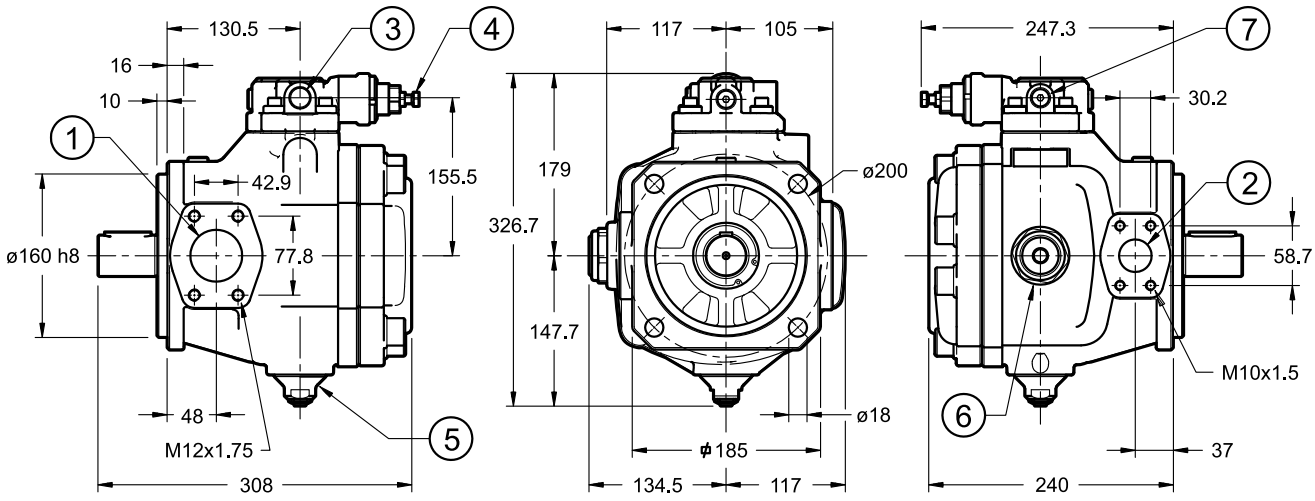
dimensions in mm





1	Suction port: SAE 3000 1 1/2” flange
2	Delivery port: SAE 3000 1” flange
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4” BSP

12 - OVERALL AND MOUNTING DIMENSIONS RV1P-080, RV1P-100, RV1P-120 (GR. 3)



1	Suction port: SAE 3000 2” flange
2	Delivery port: SAE 3000 1 1/4” flange
3	Drain port: 1/2” BSP
4	Pressure compensator. Rotate clockwise to increase pressure. Spanner 13. Locking nut: spanner 13.
5	Flow adjustment screw. Rotate clockwise to decrease flow. Socket hex screw Allen key 6. Retainer KM1 type.
6	Guide block balancing adjuster. **Do not tamper.**
7	Air breather 1/4” BSP

12 - INSTALLATION

The instruction manual for pumps installation and commissioning is always included in the packaging with the pump. Observe restrictions in this document and follow the instructions.

— RV1P-016, RV1P-020, RV1P-025 and RV1P-032 pumps can be installed in any position. The other pumps need to be installed with the axis in horizontal position and with pressure compensator upward.

— Motor-pump coupling must be made with a self-aligning flexible coupling with convex teeth and a polyamide cam. **Couplings that generate axial or radial loads on the pump shaft are not allowed**.

— The suction line must be short, with a small number of bends and without internal section changes. The minimum section of the inlet pipe must be equal to the section of the thread of the pump inlet port.

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 suction pipe should be completely airtight in order to avoid air intake which could be extremely damaging to the pump**.

Suction pressure should be between 0.8 and 1.5 bar absolute.

— The drainage pipe must be connected directly to the tank by a line separate from other discharges, located as far as possible from the suction line and lengthened to below the minimum oil level in order to avoid foaming.

— 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 (approximately: tank capacity = 4 times the pump flow rate per minute).
In systems where the pump runs for a long time under zero-flow setting conditions, it is advisable to provide a fluid cooling system.

The pressure in the drain line must not exceed 1 bar.

To ensure the maximum pump working life, the inlet fluid temperature must never be above 50°C. **The fluid temperature must never exceed 60 °C**

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

— Fill the pump with the fluid through the drain port. The pump must be started-up in full displacement (P→T) with flow to the tank without pressure. During this step bleed the air, unscrewing the cap of the air bleed port on the pressure compensator device, (see drawings) and then close the cap.

The pump should prime within 5 seconds. If it does not, switch it off and investigate the cause. The pump should not run empty.

Subsequents start-up 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 volume adjuster has been set for values less than 50% of the nominal flow-rate, start-up is allowed only if provided the system and pump are fully filled of fluid.

— **It's essential that the difference between the fluid temperature and the ambient temperature (pump body) doesn't exceed 20 °C.**
If this is the case, the pump should be switched-on only for intervals of about 1-2 seconds (start/stop mode) without pressure, until the temperatures came balanced.

— The pumps are usually placed directly upon the oil tank. Flooded suction port installation of the pump is recommended in the event of circuits with high flow rates and pressures.

14- VOLUME ADJUSTMENT SCREW

The volume adjuster is fitted as standard on all the pumps.

It consists of an adjustment screw and a small balanced piston that limit the maximum eccentricity of the pumping group cam ring, changing the displacement. The maximum flow is reduced by turning the adjustment screw clockwise. Indicative data, sensitive to performance tolerances.

Nominal size		**016**	**020**	**025**	**032**	**040**	**050**	**063**	**080**	**100**	**120**
Reduction of displacement per turn	cm^3	11	10			16			16		
Minimum possible displacement	cm^3/rev	3,3	9,5	15	19	27,5	35,5	43,5	63	80	100

Tools required for adjustment:

RV1P-016: adjustment screw hexagon socket key 8. Locking nut spanner 24.
Other sizes: adjustment screw hexagon socket key 6. Tooth retainer KM1 type.

15 - MULTIPLE PUMPS

RV1P with through drive shaft are available. These pump are sdesigned to be connected one to the other in decreasing order of displacement. The RV1P-016 pump suitable for multiple pumps is the R55B version only (ISO 3019-2 four-bolt flange with cylindrical keyed shaft end)

RV1P pumps can be coupled also with RV1D type pumps (see catalogue 14 101) and with gear pumps (see catalogue 11 100).
The torque on the shaft must be further reduced after the second pump.

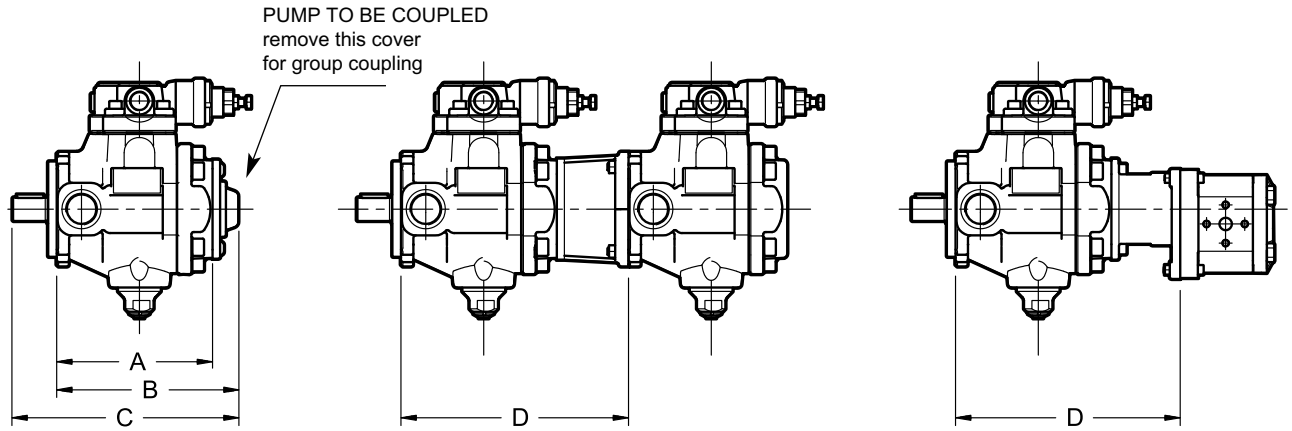
Consult our Sales Support department for this kind of applications.

IDENTIFICATION CODE FOR MULTIPLE PUMPS
Both single pumps with through drive shaft (without mating joint) and multiple groups are available.
Fill the ordering code, by following the coupling sequence of the pumps. Insert the /F suffix after each pump with through drive shaft:

/ **F** — Version for multiple pumps:
/F = with through drive shaft

identification code front pump **/F** + identification code intermediate pump **/F** + identification code rear pump

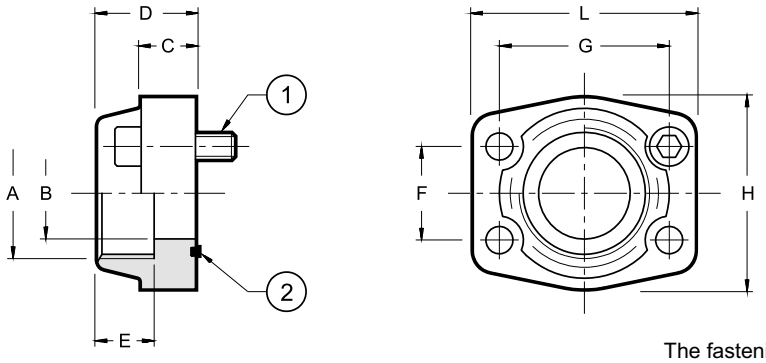
Examples:
Single pump with through drive shaft: RV1P-025PC-R55B/10V
Double pump identification: RV1P-025PC-R55B/10V **/F +** RV1P-025PC-R55B/10V
Triple pump identification: RV1P-040PC-R55S/10N **/F +** RV1P-040PC-R55S/10N **/F +** RV1P-040PC-R55S/10N
RV1P pump + gear pump identification: RV1P-050PCX-R55S/10N **/F +** GP2- 00208R97F/20N



Dimensions (mm)					
Group size	A	B	C	D with RV1P pump of same size group	D with gear pump type GP1 / GP2 / GP3
05	139	166	210	212	203 / 211 / -
1	163	190	236	238	227 / 235 / -
2	199,5	246,5	301,5	301,5	289,5 / 289,5 / 290,5
3	237	284	352	354	327 / 327 / 328

Max. torque applied to the shaft of the second pump (Nm)		
Group size front pump	Second pump (same size group)	Second pump (smaller size group)
05	55	-
1	55	55
2	110	110
3	180	110

16 - CONNECTION FLANGES



The fastening bolts and the O-Rings must be ordered separately

flange code	flange description	p_{max} [bar]	ØA	ØB	C	D	E	F	G	H	L	(1) n° 4 bolts	(2)
0610713	SAE - 1”	345	1” BSP	25	18	38	22	26.2	52.4	22	70	SHC M10x35	OR 4131 (32.93x3.53)
0610720	SAE - 1 ¼”	276	1 ¼” BSP	32	21	41	22	30.2	58.7	68	79	SHC M10x35	OR 4150 (37.69x3.53)
0610714	SAE - 1 1/2”	207	1 1/2” BSP	38	25	44	24	35.7	70	78	93	SHC M12x45	OR 4187 (47.22x3.53)
0610721	SAE - 2”	207	2” BSP	51	25	45	30	43	77.8	90	102	SHC M12x40	OR 4225 (56.74x3.53)

DUPLOMATIC MOTION SOLUTIONS

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