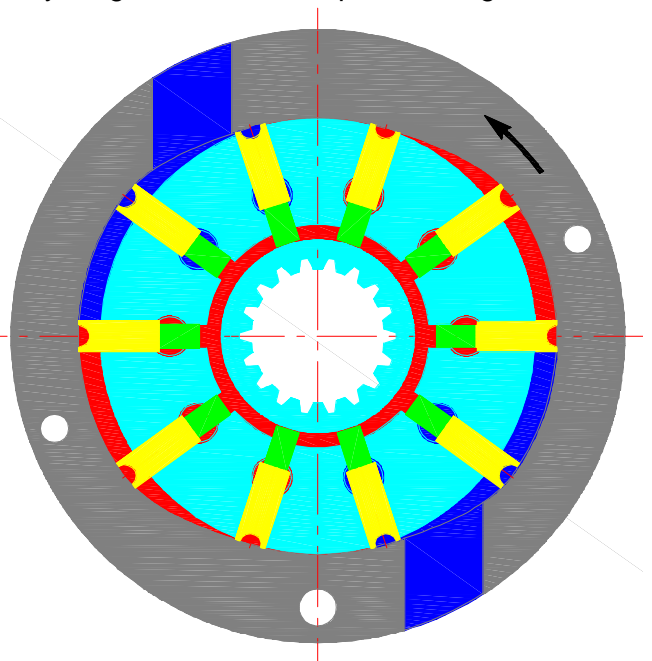


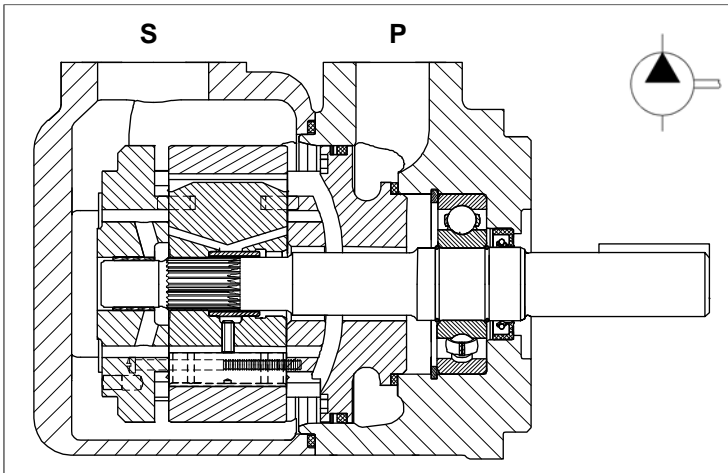


## HIGH PRESSURE HYDRAULIC VANE PUMPS BD SERIES

Versatility, power, compactness and low running costs are the main characteristics of BD vane pumps. All the components subject to wear are contained in a cartridge unit that can be easily removed for inspection and/or replacement without disconnecting the pump from the circuit, drastically reducing expensive machine down time. The cartridge contains a rotor, vanes and pins, a cam ring and two supports. During operation the rotor is driven by a splined shaft coupled to the drive unit. As the rotation speed increases, centrifugal forces, in combination with the pressure generated behind the vanes, push the vanes outwards, where they follow the profile of the cam with a sufficient contact pressure to ensure adequate hydraulic sealing. The two opposed pumping chambers formed by the elliptical profile of the cam cancel out radial loads on the shaft bearings, thereby giving them extremely long lifetimes. The special design of the double-lip vanes renders the BD series pumps particularly suitable for applications requiring high pressure levels and very low noise emissions.

The BD series is available in three versions of single pump (from 10 to 227 l/min at 1000 rpm) and four versions of double pump (from 20 to 385 l/min total, at 1000 rpm), with input powers of over 328 KW at max pressure and speed. The BD series pumps are extremely compact and are supplied with SAE norm hydraulic flanges and shafts. This makes them very easy to install and guarantees their interchangeability with other similar pumps.





## General description

Fixed displacement vane pump, hydraulically balanced, with capacity determined by the type of cartridge used and the speed of rotation. The pump is available in 15 different displacements from 16 to 150 l/min (from 4 to 40 gpm) at 1500 rpm and pressure 0 bar.

## Technical characteristics

Cartridge model	Geometric displacement		Rated capacity at 0 bar				Maximum pressure				Speed range rpm
			1200 rpm		1500 rpm		intermittent		continuous		
	ml/rev.	(in <sup>3</sup> /r)	l/min	(gpm)	l/min	(gpm)	bar	(psi)	bar	(psi)	
03	10,8	(0.66)	12,93	(3.42)	16,2	(4.29)	275	(4000)	240	(3500)	400 - 2800
05	17,2	(1.05)	20,60	(5.45)	25,8	(6.83)	275	(4000)	240	(3500)	400 - 2800
06	21,3	(1.30)	25,52	(6.75)	31,9	(8.44)	275	(4000)	240	(3500)	400 - 2800
08	26,4	(1.61)	31,64	(8.37)	39,6	(10.48)	275	(4000)	240	(3500)	400 - 2800
10	34,1	(2.08)	40,86	(10.81)	51,1	(13.52)	275	(4000)	240	(3500)	400 - 2800
12	37,1	(2.26)	44,45	(11.76)	55,6	(14.71)	275	(4000)	240	(3500)	400 - 2800
14	46,0	(2.81)	55,11	(14.58)	69,0	(18.25)	275	(4000)	240	(3500)	400 - 2800
17	58,3	(3.56)	69,85	(18.48)	87,4	(23.12)	275	(4000)	240	(3500)	400 - 2800
20	63,8	(3.89)	76,47	(20.23)	95,7	(25.32)	275	(4000)	240	(3500)	400 - 2800
22	70,3	(4.29)	84,26	(22.29)	105,4	(27.88)	275	(4000)	240	(3500)	400 - 2800
25	79,3	(4.84)	95,03	(25.14)	118,9	(31.46)	275	(4000)	240	(3500)	400 - 2500
28	88,8	(5.42)	106,41	(28.15)	133,2	(35.24)	210	(3000)	160	(2300)	400 - 2500
31	100,0	(6.10)	119,83	(31.70)	150,0	(39.68)	210	(3000)	160	(2300)	400 - 2500

**Hydraulic fluids:** antiwear petroleum base, synthetic fluid, water glycols and invert emulsions.

**Viscosity range / Viscosity index:** with antiwear petroleum base, from 10 to 2000 cSt. (10 to 108 cSt. recommended). Other fluids from 18 to 2000 c.St. (18 to 108 c.St. recomm.). Choose 30 c.St. for max life-time. *Viscosity index:* 90° min.

**Filtration:** to maintain contamination level to ISO 18/14 or NAS 1638 class 8.

Filters: for the inlet, use strainer with mesh not less than 149 micron abs. (omit strainer with application requiring cold start or when using fire resistant fluids); for the return line - 25 micron abs. or better.

**Water contamination level:** max 0.10% for mineral oil. With other fluids, max 0.05%

**Intermittent pressure:** typically the working time permitted at such pressure is < 30% of the duty cycle. With duty cycles longer than 15 minutes, please contact the technical office of B&C.

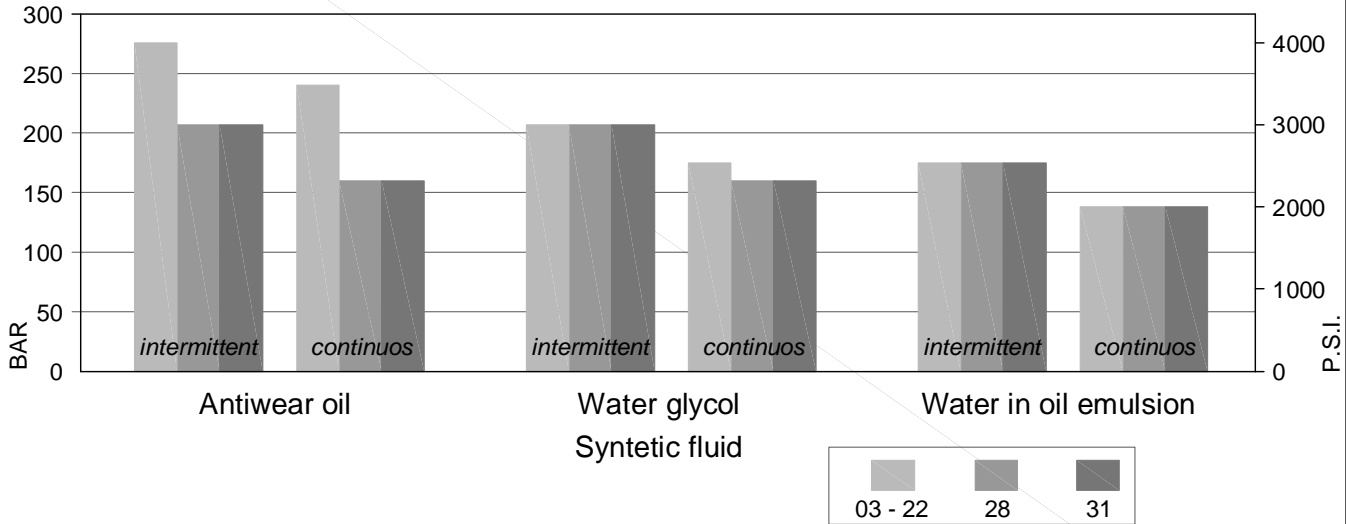
**Minimum inlet pressure:** (with mineral oil 10-65 c.St.): 0,8 bar abs. (3 psi abs.). In the biggest displacements of each series and with the highest speeds, is required an higher inlet pressure. Please consult the specific section for details. In case of tandem pump, supply the inlet port with the highest pressure requested among the pump stages.

**Operating temperature:** with "antiwear petroleum base" the permitted temperature is: from -18 to +100° C; with water glycol and "water in oil emulsion": from +10 to +50°C; with syntetic fluid: from -18 to +70°C; with rapeseed and esters: from -20 to + 70°C. During cold start the pumps should be operated at low speed and pressure until fluid warms up to an acceptable viscosity for full power operation.

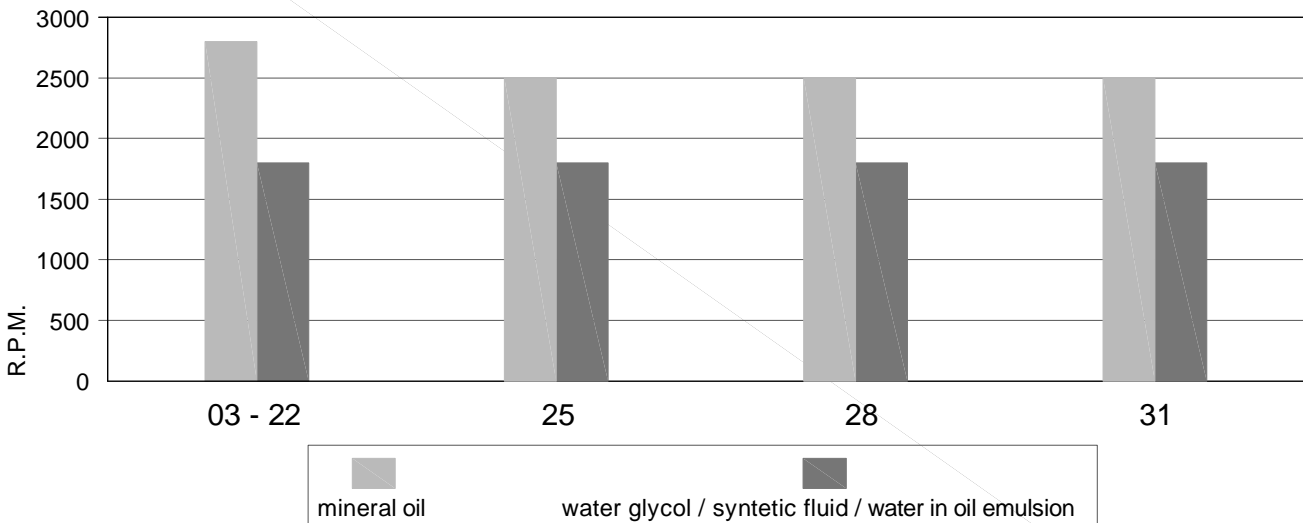
**Drive:** direct and coaxial by means of a flexible coupling. Low axial and radial loads allowed. Consult specific section for more detail.

## Main operating data

### max pressure / fluid type



### max speed / fluid type

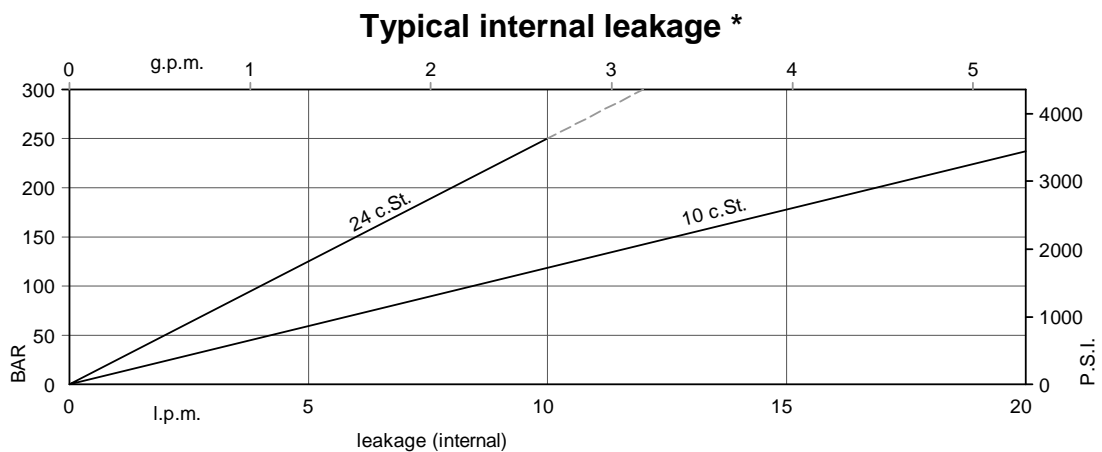
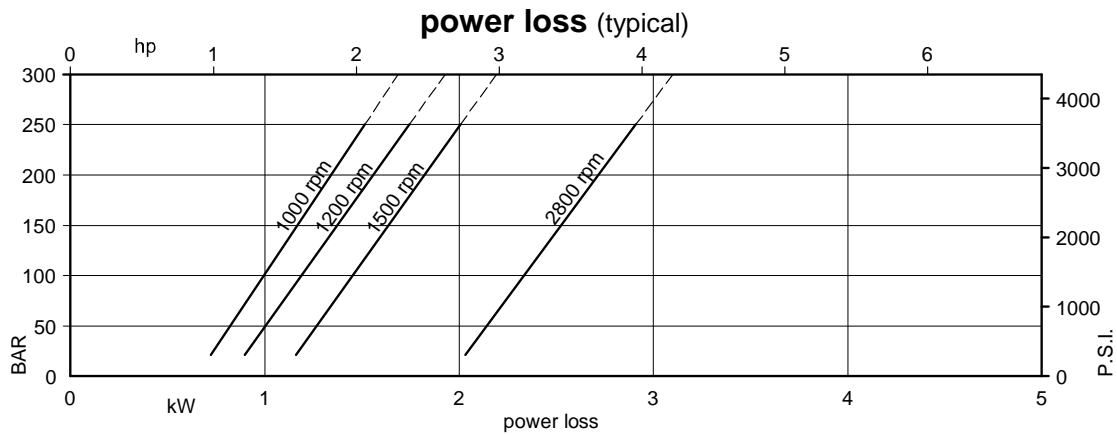
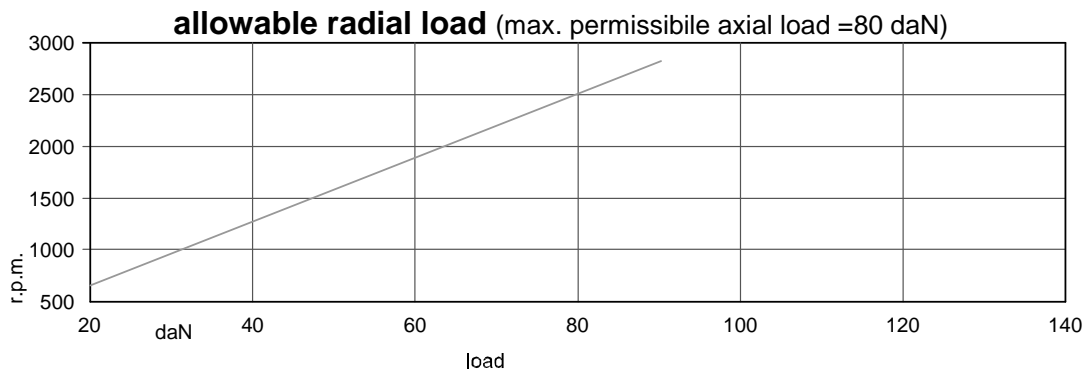
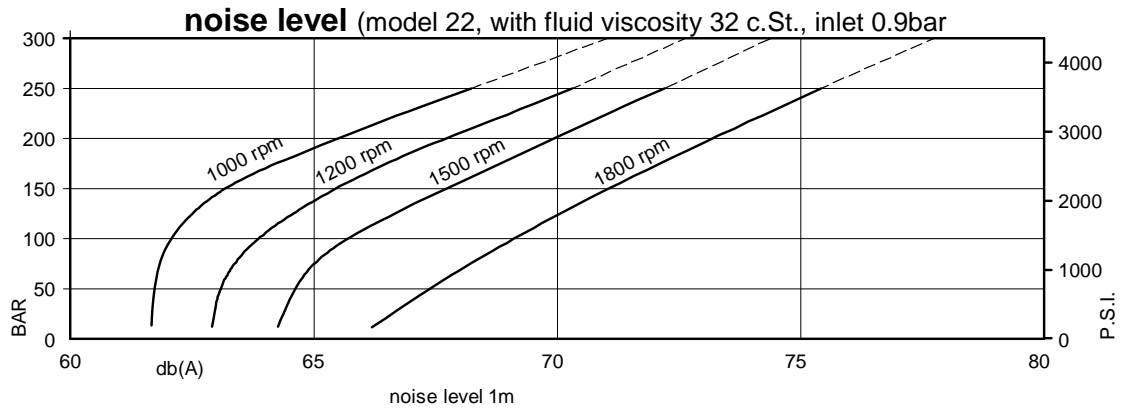


### min. allowable inlet pressure / rotation speed (abs. bar)\*

Speed r.p.m.	from 03 to 10	12	14	17	20	22	25	28	31
2800	1.00	1.00	1.00	1.03	1.03	1.05			
2500	0.90	0.92	0.95	0.95	0.95	0.98	1.05	1.08	1.11
2300	0.80	0.85	0.85	0.90	0.90	0.90	0.95	0.98	1.0
2200	0.80	0.80	0.80	0.85	0.85	0.90	0.95	0.98	0.90
2100	0.80	0.80	0.80	0.80	0.80	0.85	0.90	0.90	0.85
1800	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
1500	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
1200	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

\* measured inside the inlet flange; with petroleum base fluid (visc. 10 to 65 cSt.).  
 Multiply the abs. pressure by 1.25 when using water-glycol or "water in oil emulsion", by 1.35 with synthetic fluids, and by 1.1 with ester or rapeseed base.

## Main operating data



\* If the internal leakage is more than 50% of the theoretical flow, do not operate the pump

## Specific operating data

Typical: 24 c.St. (115 SUS)

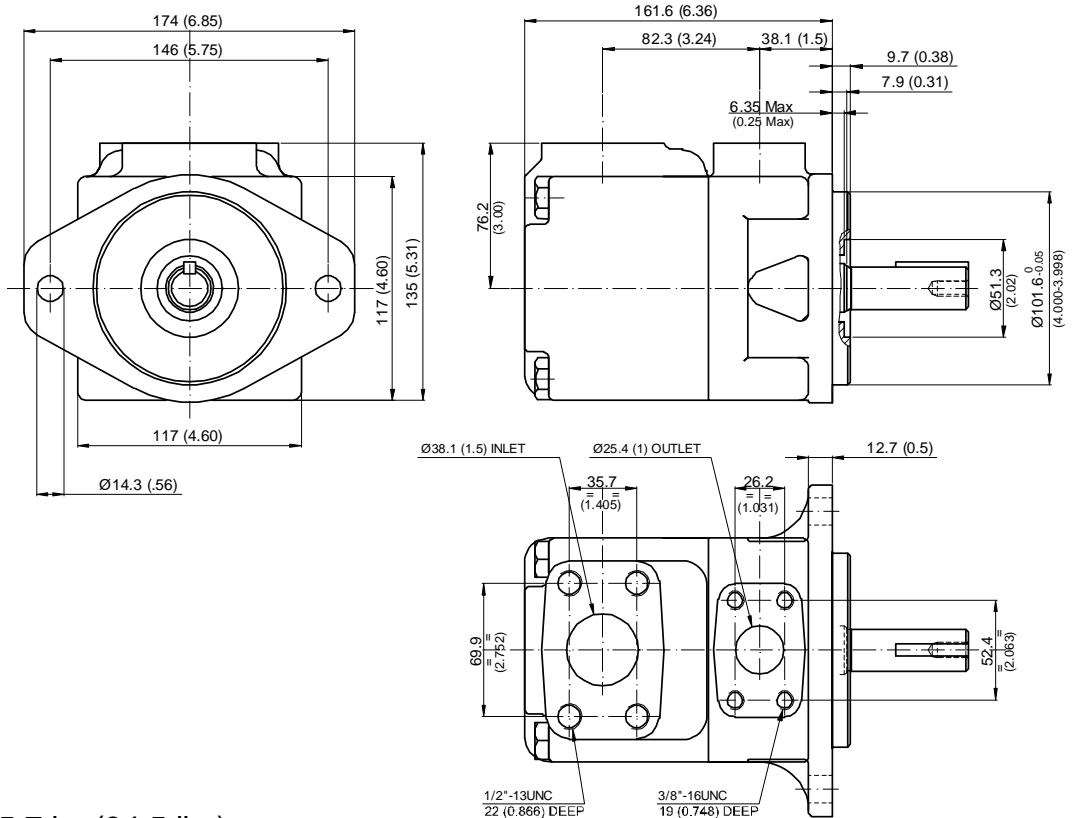
Cartridge model	Geometric displacement		Speed rpm	140 bar		240 bar		Input power (kW)		
	ml/rev.	(in <sup>3</sup> /r)		l/min	(gpm)	l/min	(gpm)	7 bar (100 psi)	140 bar (2000 psi)	240 bar (3500 psi)
03	10,8	(0.66)	1000	-	-	-	-	1.00	-	-
			1200	-	-	-	-	1.05	-	-
			1500	10,7	(2.84)	-	-	1.30	5.30	-
			1800	13,6	(3.61)	-	-	1.55	8.45	-
05	17,2	(1.05)	1000	11,7	(3.09)	-	-	1.10	5.10	-
			1200	15,1	(3.99)	-	-	1.14	8.17	-
			1500	20,3	(5.37)	15,8	(4.18)	1.40	7.50	12.2
			1800	25,1	(6.65)	21,0	(5.56)	1.68	12.0	14.4
06	21,3	(1.30)	1000	15,80	(4.18)	11,30	(2.99)	1.10	6.00	10.00
			1200	19,73	(5.22)	15,61	(4.13)	1.19	7.13	11.86
			1500	26,50	(7.01)	22,00	(5.82)	1.50	8.90	14.70
			1800	32,51	(8.60)	28,39	(7.51)	1.76	10.50	17.33
08	26,4	(1.61)	1000	20,90	(5.53)	16,40	(4.34)	1.20	7.20	12.10
			1200	25,86	(6.84)	21,74	(5.75)	1.26	8.51	14.29
			1500	34,10	(9.02)	29,60	(7.83)	1.60	10.70	17.70
			1800	41,66	(11.02)	37,54	(9.93)	1.87	12.58	20.98
10	34,1	(2.08)	1000	28,60	(7.57)	24,10	(6.38)	1.30	8.90	15.10
			1200	35,08	(9.28)	30,96	(8.19)	1.37	10.61	17.96
			1500	45,70	(12.09)	41,20	(10.90)	1.70	13.40	22.30
			1800	55,53	(14.69)	51,41	(13.60)	2.03	15.72	26.47
12	37,1	(2.26)	1000	31,60	(8.36)	27,10	(7.17)	1.30	9.60	16.30
			1200	38,67	(10.23)	34,55	(9.14)	1.41	11.42	19.38
			1500	50,20	(13.28)	45,70	(12.09)	1.70	14.40	24.10
			1800	60,90	(16.11)	56,78	(15.02)	2.09	16.95	28.62
14	46,0	(2.81)	1000	40,50	(10.71)	36,00	(9.52)	1.40	11.70	19.90
			1200	49,33	(13.05)	45,21	(11.96)	1.53	13.85	23.62
			1500	63,50	(16.80)	59,00	(15.61)	1.90	17.60	29.50
			1800	76,92	(20.35)	72,80	(19.26)	2.27	20.58	34.97
17	58,3	(3.56)	1000	52,80	(13.97)	48,30	(12.78)	1.60	14.50	24.80
			1200	64,07	(16.95)	59,95	(15.86)	1.70	17.19	29.47
			1500	82,00	(21.69)	77,50	(20.50)	2.10	21.90	36.90
			1800	99,04	(26.20)	94,92	(25.11)	2.52	25.60	43.76
20	63,8	(3.89)	1000	58,30	(15.42)	53,80	(14.23)	1.60	15.80	27.00
			1200	70,69	(18.70)	66,57	(17.61)	1.77	18.68	32.09
			1500	90,20	(23.86)	85,70	(22.67)	2.20	23.80	40.20
			1800	108,90	(28.81)	103,65	(27.42)	2.63	27.84	47.68
22	70,3	(4.29)	1000	64,80	(17.14)	60,30	(15.95)	1.70	17.30	29.60
			1200	78,47	(20.76)	74,35	(19.67)	1.86	20.46	35.18
			1500	100,00	(26.46)	95,50	(25.26)	2.30	26.10	44.10
			1800	120,58	(31.90)	116,46	(30.81)	2.76	30.49	52.32
25 <sup>1)</sup>	79,3	(4.84)	1000	73,80	(19.52)	69,30	(18.33)	1.80	19.30	33.20
			1200	89,25	(23.61)	85,13	(22.52)	1.99	22.90	39.47
			1500	113,50	(30.03)	109,00	(28.84)	2.50	29.20	49.50
			1800	136,76	(36.18)	132,64	(35.09)	2.95	34.16	58.75
28 <sup>1)</sup>	88,8	(5.42)	1000	83,30	(22.04)	80,10 <sup>2)</sup>	(21.19) <sup>2)</sup>	1.90	21.90	32.50 <sup>2)</sup>
			1200	100,62	(26.62)	97,75 <sup>2)</sup>	(25.86) <sup>2)</sup>	2.11	25.49	37.77 <sup>2)</sup>
			1500	127,70	(33.78)	124,50 <sup>2)</sup>	(32.94) <sup>2)</sup>	2.80	32.70	48.50 <sup>2)</sup>
			1800	153,85	(40.70)	150,97 <sup>2)</sup>	(39.94) <sup>2)</sup>	3.14	38.04	56.42 <sup>2)</sup>
31 <sup>1)</sup>	100,0	(6.10)	1000	94,50	(25.00)	91,30 <sup>2)</sup>	(24.15) <sup>2)</sup>	2.00	24.40	36.40 <sup>2)</sup>
			1200	114,04	(30.17)	111,17 <sup>2)</sup>	(29.41) <sup>2)</sup>	2.26	28.53	42.34 <sup>2)</sup>
			1500	144,50	(38.23)	141,30 <sup>2)</sup>	(37.38) <sup>2)</sup>	2.80	36.50	54.40 <sup>2)</sup>
			1800	173,99	(46.03)	171,12 <sup>2)</sup>	(45.27) <sup>2)</sup>	3.37	42.61	63.28 <sup>2)</sup>

- Internal leakage exceeding 50% of the theoretical flow

1) 2500 r.p.m. max.

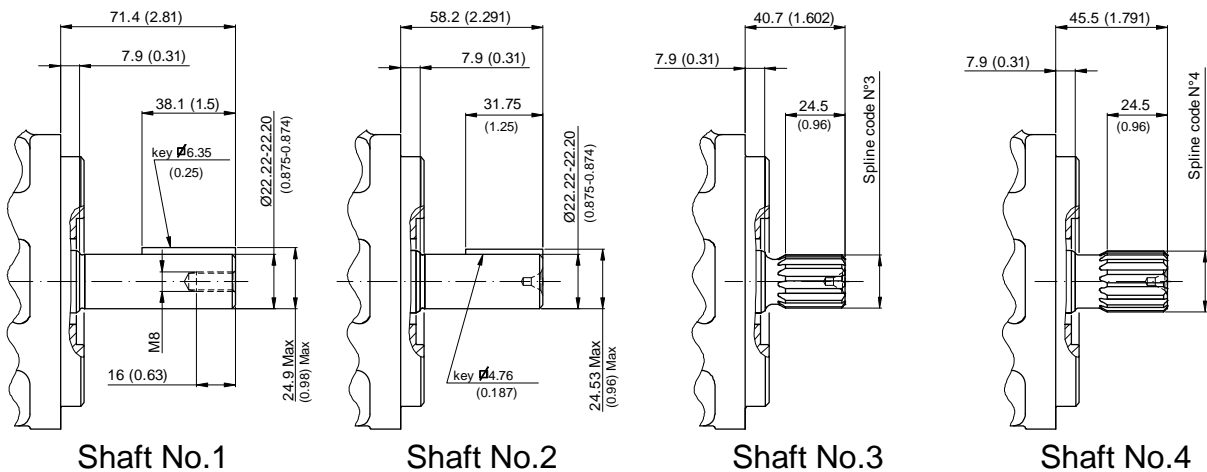
2) 210 bar (3000 p.s.i.) max. int.

## Installation dimensions mm (inches)



Approx weight: 15.7 kg (34.5 lbs)

## Shaft options mm (inches)



### Calculation of the max permitted torque (avoid to exceed)

Shaft No.	(ml/rev) x bar	(in3/rev) x psi
1	16500	14473
2	14300	12666
3	20600	18246
4	21821	19309

### Spline code

	3	4
Designation	Sae B	Sae B-B
Pressure angle	30°	30°
No. of teeth	13	15
Pitch	16/32 d.p.	16/32 d.p.
Spline type	flat root side fit	flat root side fit
Class	1- J498 b	1- J498 b

## Model code breakdown

**BD 02 G \*\* \* \* \*\* \***

Pump series

Pump type

Design

Cartridge model

03 05 06 08 10 12 14 17 20 22 25 28 31

Shaft end options

- 1 = keyed (Sae B)
- 2 = Keyed (No Sae)
- 3 = Splined (Sae B)
- 4 = Splined (Sae B-B)

Seals

1 = NBR

Port orientations

(compared to the outlet)

00 = Inlet opposite

01 = Inlet inline

02 = Inlet 90°CW (viewed from shaft-end)

03 = Inlet 90°CCW (viewed from shaft-end)

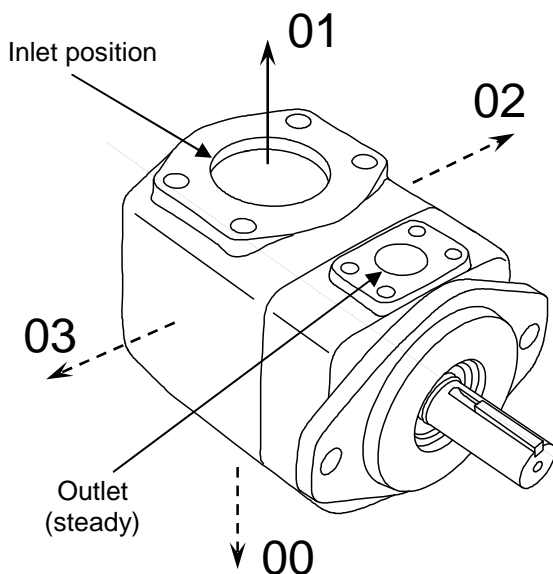
Pump rotation

(viewed from shaft-end)

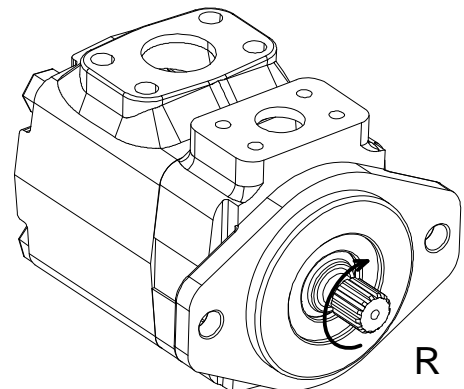
R = Right hand rotation CW

L = Left hand rotation CCW

Port orientations



Pump rotation



## Id. codes of pump components

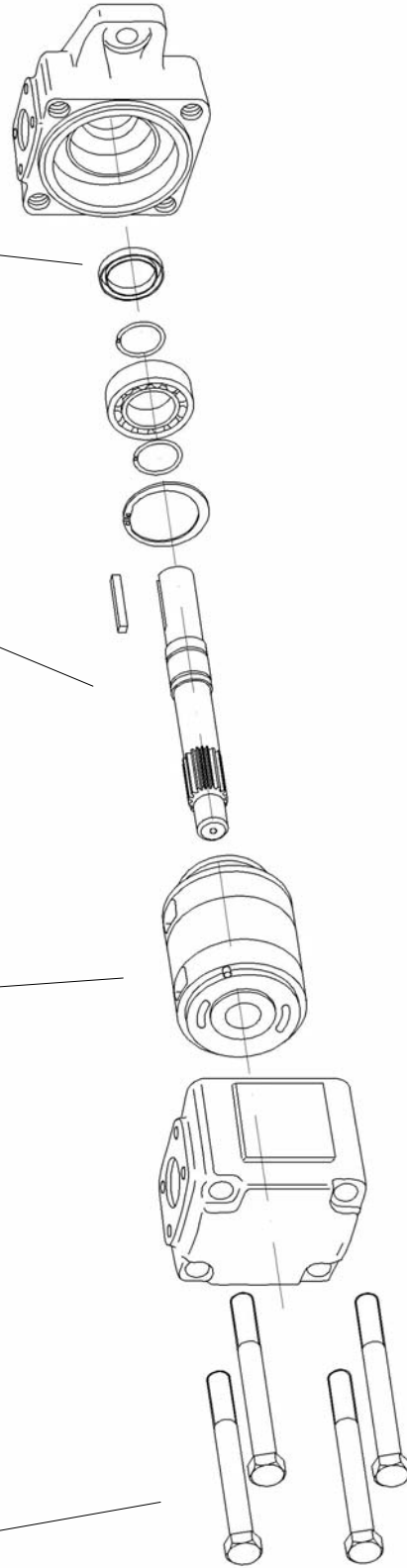
Screw	
Part No.	M3002070
Torque at 159 Nm (1418 lb.in.)	

Type	Cartridge	
	Model	Pump rotation
	Right hand	Left hand
	03	N0100010
	05	N0100030
	06	N0100050
	08	N0100070
	10	N0100090
	12	N0100110
	14	N0100130
	17	N0100150
	20	N0100170
	22	N0100190
	25	N0100210
	28	N0100230
	31	N0100250
BD02		

Shaft	
Model	Part No.
01	K6021000
02	K6022000
03	K6023000
04	K6024000

Shaft seal	
Part No.	type
M3020060	NBR

Pump seal kit	
Part No.	Type
M3020500	NBR



## Operating instructions

**Maximum speed:** the maximum speeds given in this catalogue are valid for an atmospheric pressure of 1 bar (14.7psi), fluid viscosity between 10 to 65 cSt., and ambient temperature in the range of +30°C to +50°C. Sustained excess speed causes a rapid deterioration of the internal components reducing the lifetime of the cartridge.

**Minimum speed:** In general, the min. speed for all pumps is 400 rpm. However, it is possible to operate at lower speeds with certain pump configurations and with appropriate operating temperatures.

**Inlet pressure:** the inlet pressure, measured at the inlet port, should remain within the prescribed limits. Note that pressures lower than minimum limit cause cavitation and pressures above the maximum limit cause abnormal loads on the shaft and the bearings. In both cases this causes a significant reduction in the lifetime of the cartridge.

**Maximum outlet pressure:** the maximum continuous outlet pressure is different for each type of fluid used as can be seen from the corresponding diagrams. If fluid viscosity, pump speed and contamination level are respected, an intermittent pressure of +15% is permissible for a maximum time of 80% of the duty cycle lasting 15 minutes. For longer duty cycles, please consult our technical office.

**Mounting and drive connections:** consider the following indications when preparing the installation drawings:

*Pump with keyed shaft:* the pump with keyed shaft has to be coupled axially and by means of a flexible coupling to the drive; the clearance between the keyed shaft and the corresponding sleeve coupling has to be between 0.004 and 0.030 mm; avoid axial and radial loads on the shaft; the mounting flange has to be perpendicular to the drive shaft, with a maximum error of 0.18 mm every 100 mm.

*Pump with splined shaft:* the female spline must be hardened (30 to 45 R.C.) and should be free to float to find its own center; the clearance between splines has to be between 0.013 and 0.051 mm on the pitch diameter; the max angular misalignment between the two spline axes must be less than  $\pm 0.05$  per 25 mm radius. The coupling spline must be lubricated with grease or similar lubricant.

**Hydraulic circuit:** always install a pressure relief valve on the supply line to prevent the pressure from exceeding the allowed maximum. Normally, it is set in accordance with the weakest component in the system. (In the case where it is the pump, set the valve to a pressure 15% higher than the maximum pressure rating of the pump.) Inlet line tubing must have the sections that permits a fluid velocity between 0.5 and 1.9 m/sec. It is advisable to keep the tube connecting the pump to the reservoir as short possible. Particular care has to be taken with the inlet line which must be hermetically sealed to avoid entraining air into the circuit; this varies the characteristics of the hydraulic fluid causing the operating parts to become damaged.

**Filtration:** the inlet line filter must have a flow rate capacity that is higher than that of the pump at its maximum operating speed. The use of a filter by-pass is recommended for cold starts and should avoid the filter become clogged. Proper maintenance of the filter elements are essential for the correct operation of the entire system. In normal conditions replace the filter element after the first 50 hours of operation. Subsequently, replace it at least every 500 hours. Regarding the filter on the return line, apply the same general conditions as for the inlet line and it should be positioned in an accessible location for ease of maintenance.

**Tank:** if possible, the reservoir should be positioned above the pump. Otherwise, ensure that the minimum level of the fluid contained in it is higher than the pump inlet line opening. It is important to avoid draining the inlet line with the pump at standstill. The opening of the return line into the reservoir must remain below the minimum level of the fluid in the reservoir. It must not be positioned too close to the opening of the inlet line to avoid the possibility of any air bubbles passing into the inlet line. Baffles inside the reservoir may be useful in avoiding the problem. Rapid temperature changes can cause condensation on the underside of the lid of the reservoir with the formation of droplets of water that can fall into the oil. To avoid this problem it is recommended that the lid should have small vents so that the air space in the reservoir is ventilated. The vents have to be screened, though, to prevent the entry of dust or the sudden expulsion of fluid.

**Start-up:** use the following procedure when the pump is started-up for the first time: completely fill the pump and the inlet line with fluid; start the motor at lower speed for approximately one second a number of times at regular intervals of approximately 2 or 3 seconds until the noise level reduces, thereby confirming that it has been primed; with a manometer check to ensure that the outlet pressure increases slightly; once the pump has been primed, maintain low pressure levels activating all parts of the circuit a number of times until air bubbles disappear completely from the return line to the reservoir. This procedure should be carefully applied because any residual air inside the pump can quickly cause the rotor to seize. After long stops (>1 week) the start up procedure must be repeated.

**Cold starting:** when starting the pump, especially with low ambient temperatures, operate with moderate speed and pressure until the average temperature in the entire circuit is within the given limits. Make sure the fluid viscosity is within the limits, by consulting the specific pump model in this catalogue.

**Vertical installation:** The pump cannot work in vertical position (vertical shaft), unless the hydraulic circuit is equipped by devices to fill the pump completely before each starting.

The information provided in this catalogue is subject to change without notice