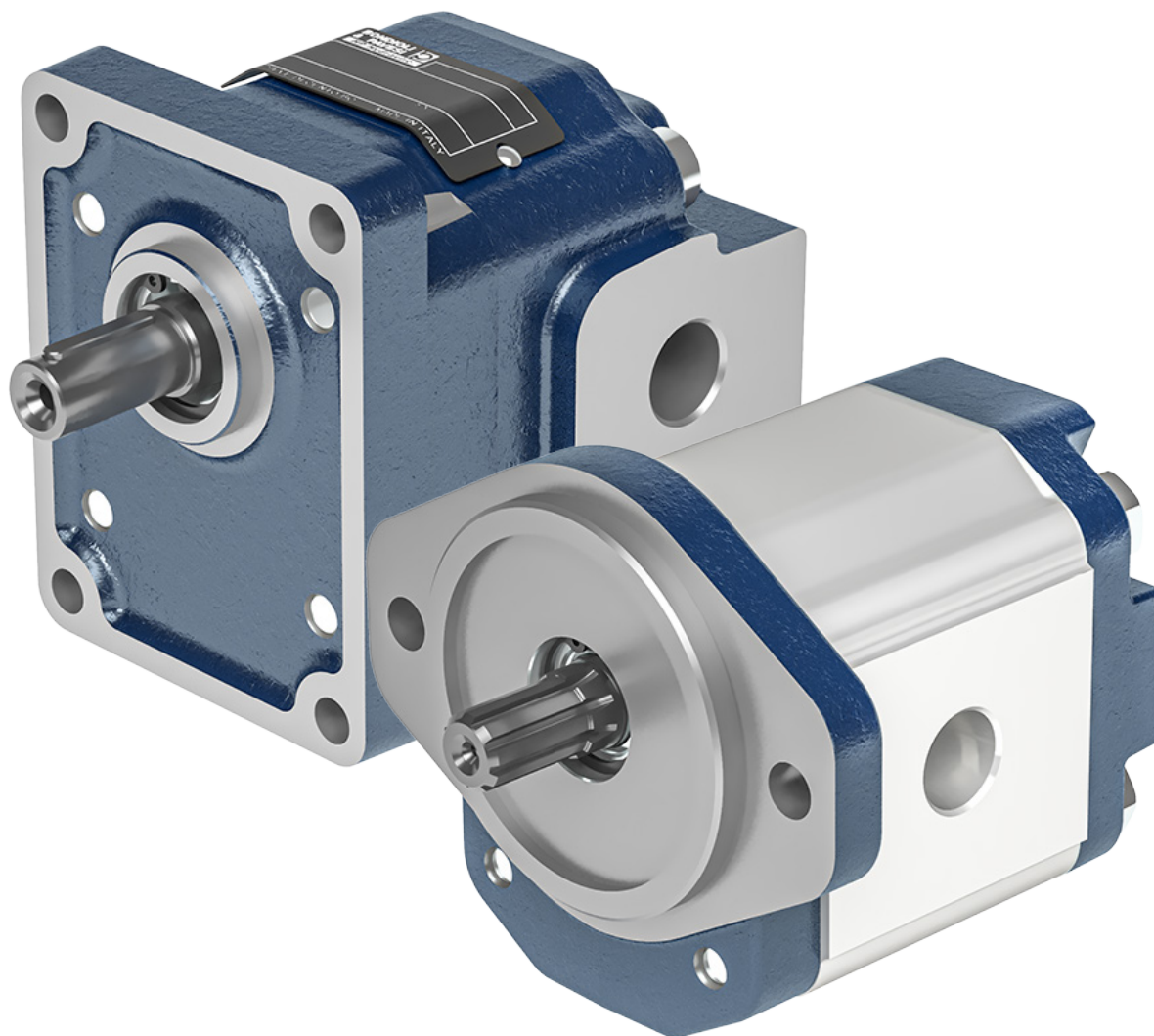


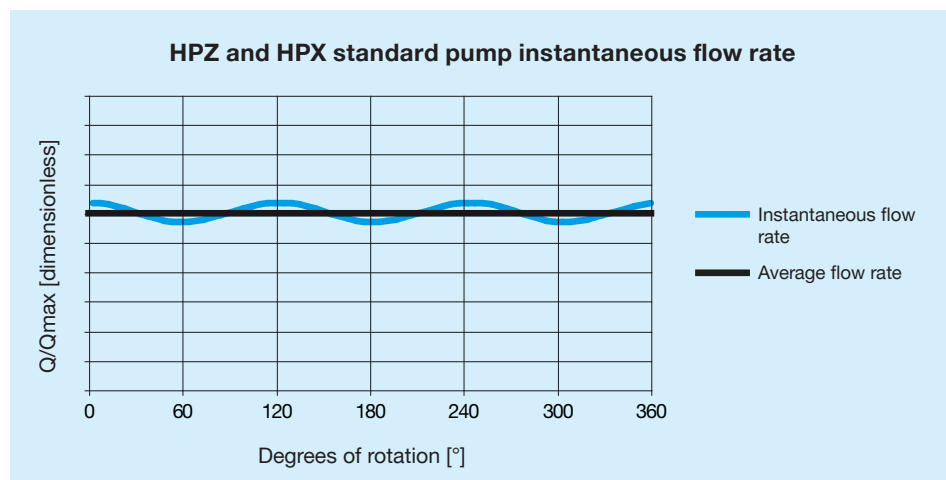
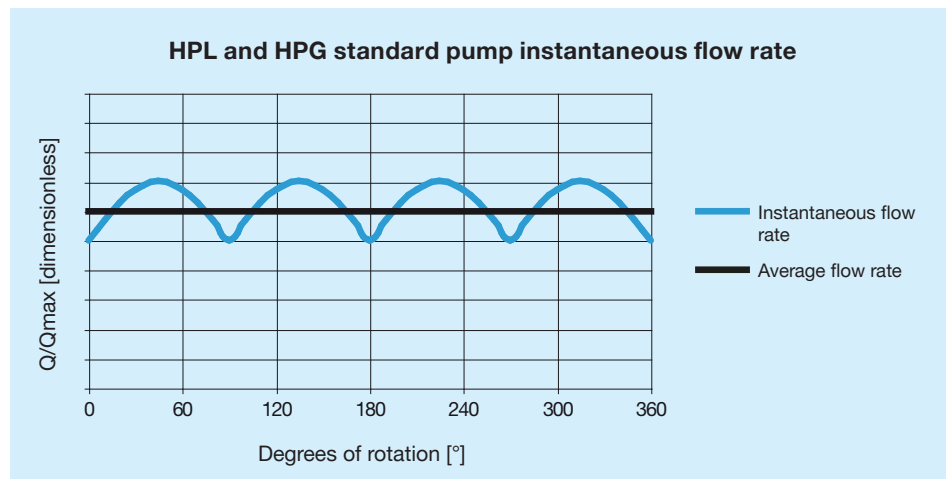
Silent gear pumps



Introduction	4
HPZ aluminium series	7
HPX cast iron series	29

Introduction

At high pressures, external gear pumps generate noise and vibration levels that are often too high for certain applications. Pump-induced noise can be divided into two types identified as the 'mechanical noise' generated by the pump itself, and the 'hydraulic noise' caused by fluid pulsation, is often the primary source of noise. There follows an example of instantaneous flow rate pulsation attributable to 'hydraulic noise', i.e. the cyclic variation and displacement of the volume of fluid from low to high pressure. The cyclical nature of these variations induces pulsations that are the source of the noise effectively perceived outside.



Based on Bondioli & Pavesi's technology and experience in gear manufacturing, the two HPZ and HPX helical gear pump ranges are designed for all mobile and stationary, agricultural and industrial applications where noise abatement is required, or where noise restrictions are imposed by legislation.

HPZ is the Group 2 range of silent aluminium pumps for mobile and agricultural applications where a significant reduction in the sound pressure level (dB(A)) is required.

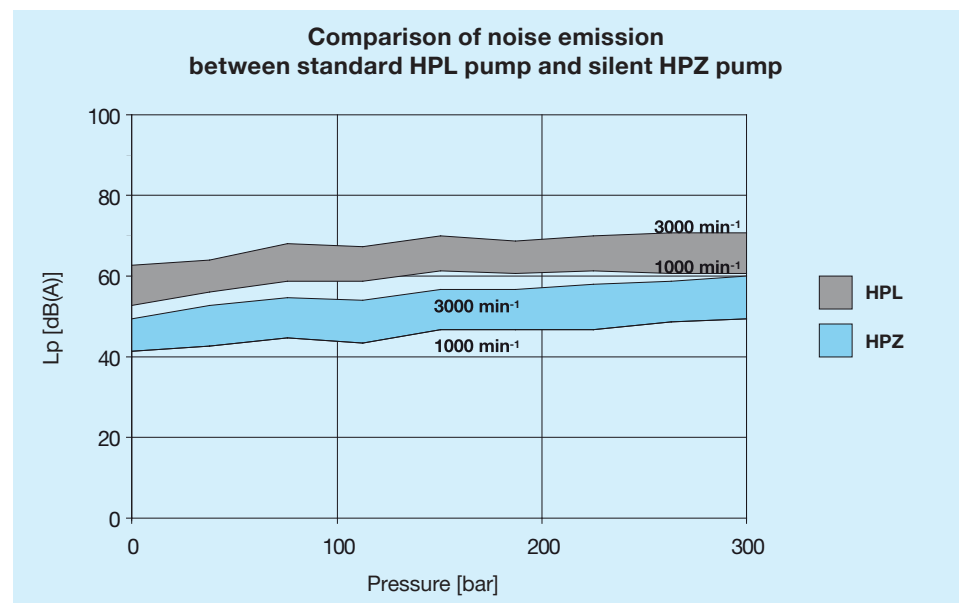
HPX is the Group 2 range of silent cast iron pumps for heavy duty applications. HPZ and HPX series gear pumps maintain the performance, efficiency and

reliability of the conventional HPL and HPG series, with the added benefit of reduced noise: the HPZ series reduces the sound pressure level by 2 to 10 dB(A) compared to the corresponding standard HPL series in aluminium, while the HPX series significantly improves the already excellent results obtained with the standard HPG series in cast iron.

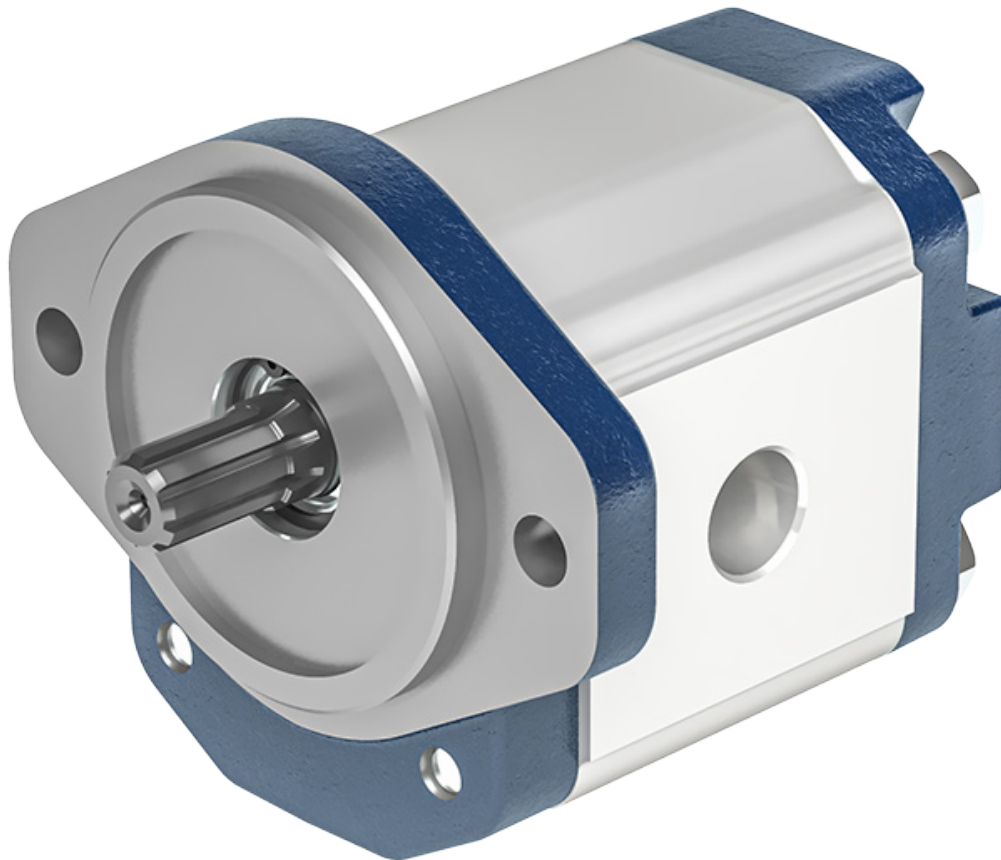
The HPZ and HPX series are designed in line with the Bondioli & Pavesi construction philosophy, which ensures interchangeable components, versatile composition of multiple pumps and a broad choice of valves.

The range of multiple pumps is highly modular, allowing combinations of silent and standard aluminium and cast iron pump stages.

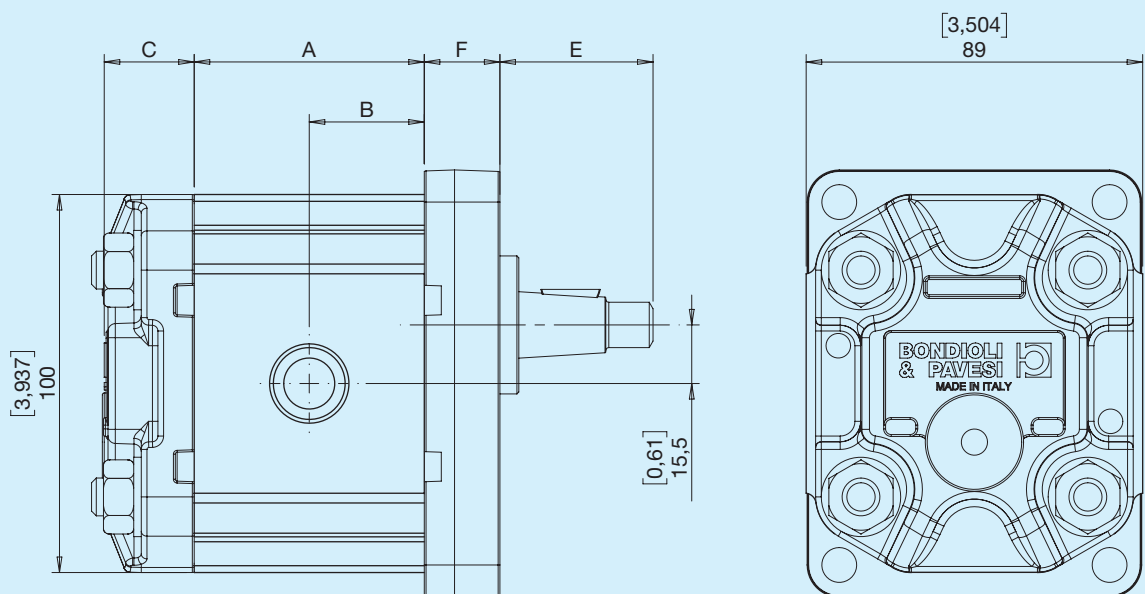
The silent HPZ aluminium and HPX cast iron pumps use the bases, shaft profiles, covers, combined valves and accessories used in the HPL aluminium and HPG cast iron standard pump range.



HPZ Series Group 2

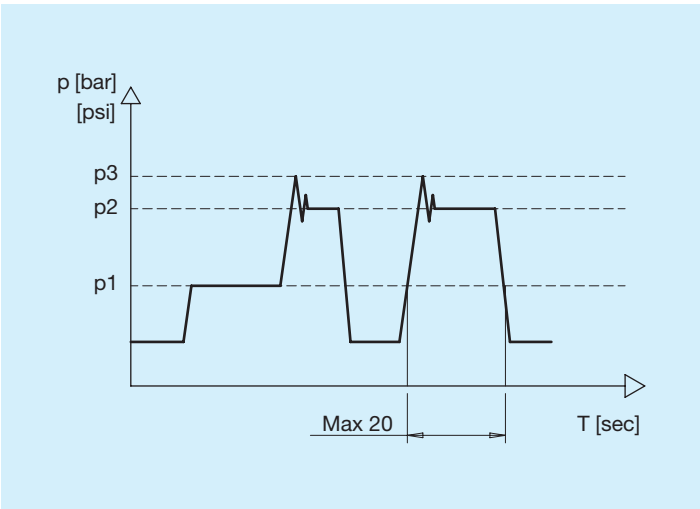


Before use, carefully read the GENERAL INSTRUCTIONS FOR USE OF GEAR PUMPS AND MOTORS.



C - See section on covers E - See section on shafts F - See section on flanges

Pressure definition

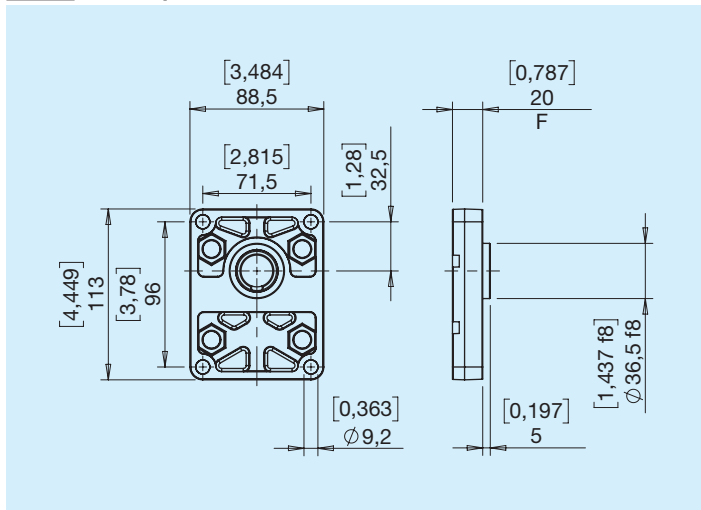


p1	Continuous pressure
A,B - Use	Intermittent pressure Maximum pressure permitted for short periods (max. 20 sec)
L1, L2 - Drain port	Peak pressure Maximum permitted pressure intended as peak pressure of Vmax

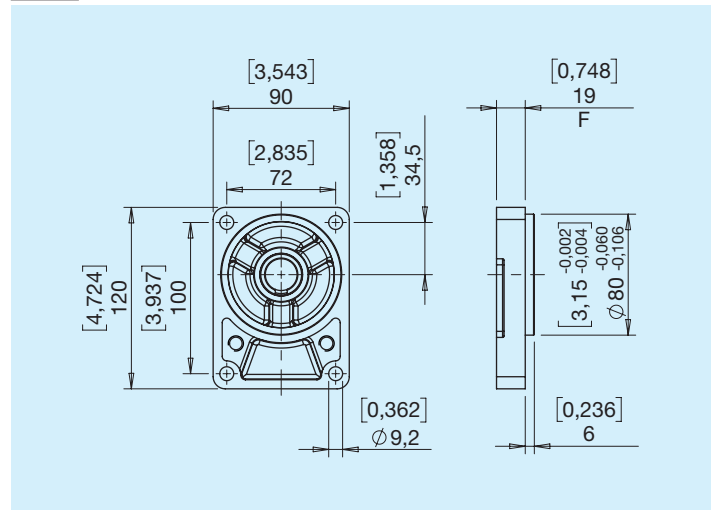
Pump dimensions and technical data

HPZPA2	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		Weight		A		B	
	cm ³	in ³	bar	psi	bar	psi	bar	psi	min ⁻¹	min ⁻¹	kg	lbs	mm	in	mm	in
06	6.3	0.38	240	3481	260	3771	300	4351	3500	700	2.50	5.51	54.65	2.152	27.3	1.075
09	9.2	0.56	230	3336	250	3626	280	4061	3500	700	2.60	5.73	60.85	2.396	30.4	1.197
11	11.7	0.71	230	3336	250	3626	280	4061	3000	700	2.80	6.17	66.45	2.616	33.2	1.307
14	14.4	0.88	230	3336	250	3626	280	4061	3000	700	3.00	6.61	72.25	2.844	36.1	1.421
17	17.4	1.06	230	3336	250	3626	280	4061	3000	700	3.10	6.83	78.55	3.093	39.3	1.547
21	21.8	1.33	200	2901	220	3191	250	3626	3000	700	3.40	7.49	88.05	3.467	44.0	1.732
26	26.1	1.59	180	2611	190	2756	210	3046	2500	700	3.60	7.93	97.45	3.837	48.7	1.917

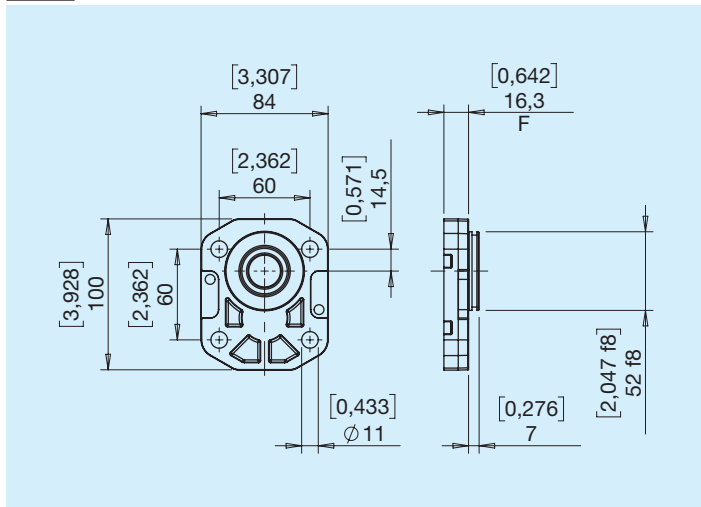
M European



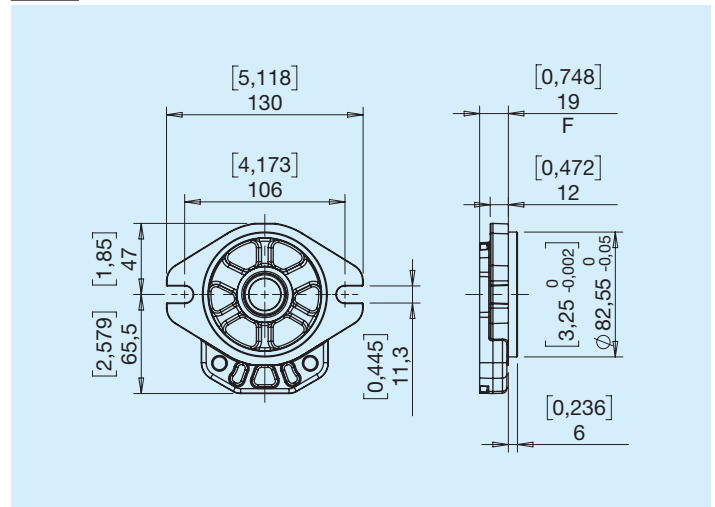
N German



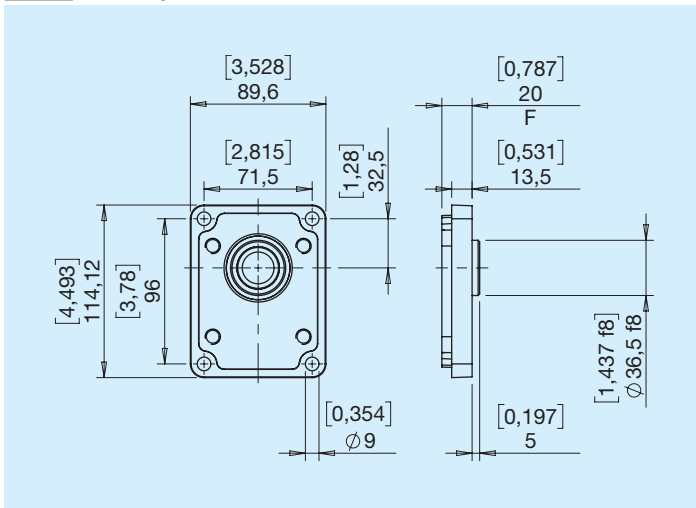
R German D52



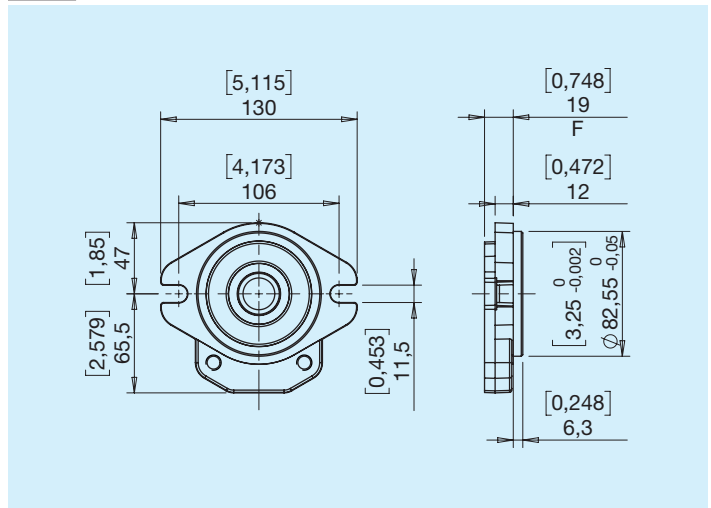
S SAE A 2 holes



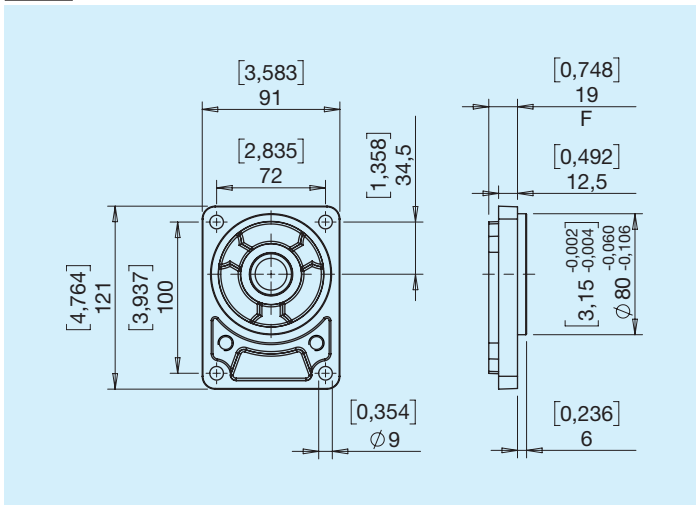
L European



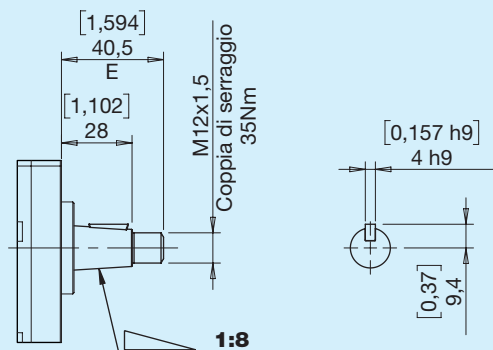
Q SAE A 2 holes



V German

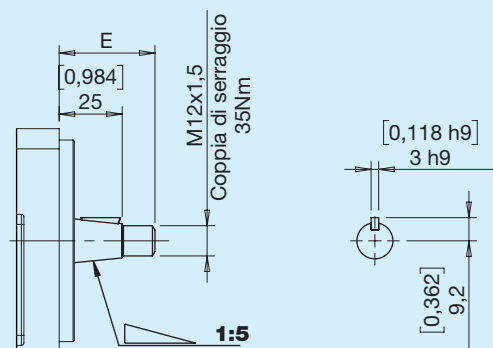


L Tapered (1:8)



Max. torque 140 Nm

M Tapered (1:5)

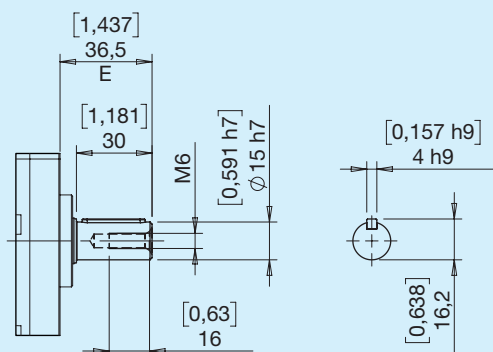


Max. torque 120 Nm

M shaft extension table

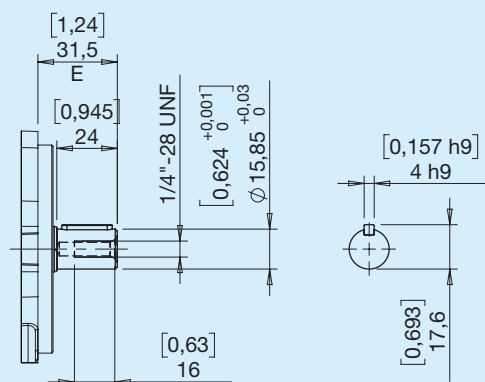
	Flanges			
	mm	in	mm	in
N6	19	0.75	50.8	2

N European round D15



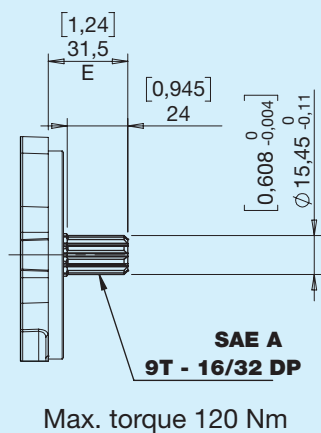
Max. torque 65 Nm

P Round SAE A

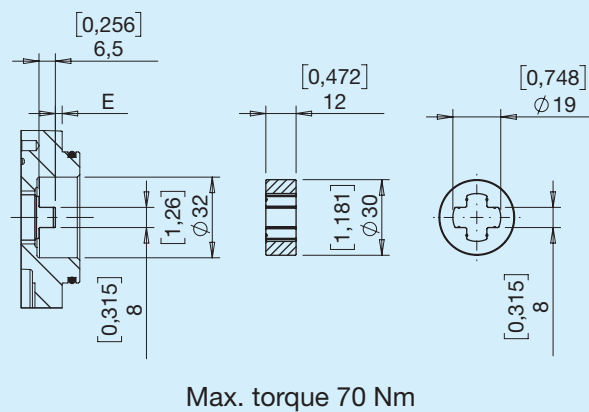


Max. torque 70 Nm

V Splined SAE A 9T

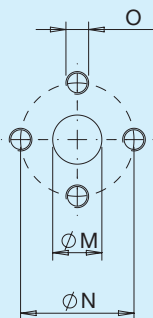


Z Splined SAE A 11T



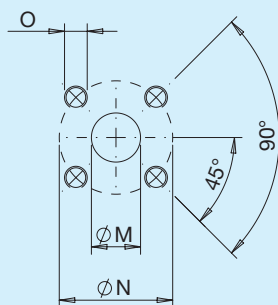
Shafts	Flanges						
	M	L	N	V	R	S	Q
L	•	•					
M			•	•			
N	•	•					
P						•	•
V						•	•
Z					•		

E Lateral



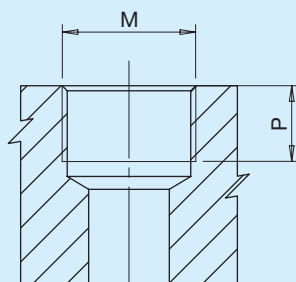
Type	M		N		O	
	mm	in	mm	mm		Nm
E3	13	0.51	30	1.18	M6	10
E5	20	0.79	40	1.57	M8	15

X Lateral



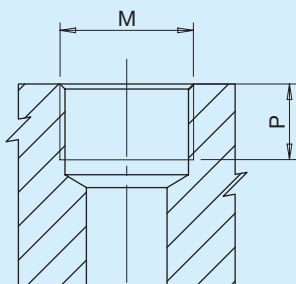
Type	M		N		O	
	mm	in	mm	mm		Nm
X4	15	0.59	35	1.38	M6	10
X5	15	0.59	40	1.57	M6	10
X6	20	0.79	40	1.57	M6	10
X8	27	1.06	55	2.17	M8	15

G Lateral



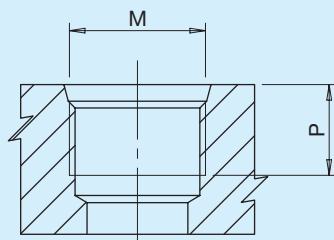
Type	M	Nm	P	
			mm	in
G4	PORT ISO 1179-1-G 1/2	50	16	0.63
G6	PORT ISO 1179-1-G3/4	90	19	0.75
G7	PORT ISO 1179-1-G 1	130	19	0.75

T Rear



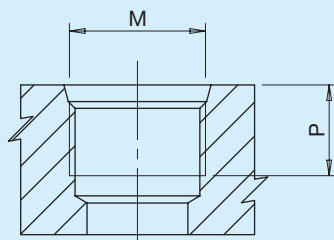
Type	M	Nm	P	
			mm	in
T4	PORT ISO 1179-1-G 1/2	50	16	0.63
T6	PORT ISO 1179-1-G3/4	90	19	0.75

U Lateral



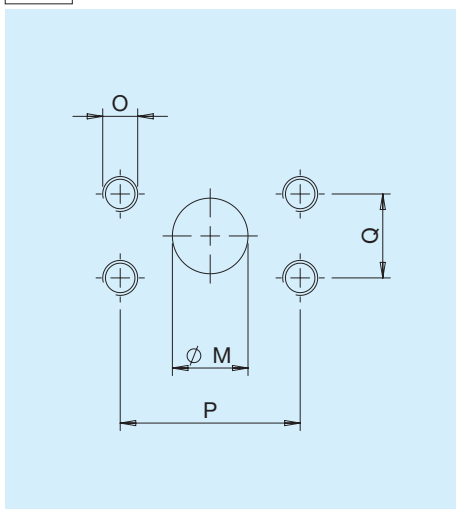
Type	Dim.	M	Nm	P	
				mm	in
U5	5/8'	PORT ISO 11926-1 - 7/8-14	70	17	0.67
U6	3/4'	PORT ISO 11926-1 - 1 1/16-12	90	19	0.75
U7	1'	PORT ISO 11926-1 - 1 5/16-12	130	20	0.79

C Rear



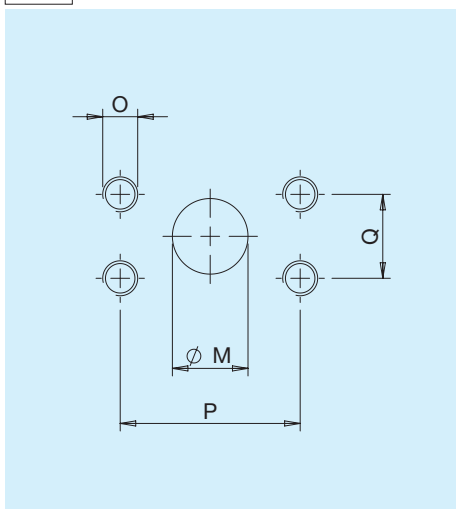
Type	Dim.	M	Nm	P	
				mm	in
C5	5/8'	PORT ISO 11926-1 - 7/8-14	70	17	0.67
C6	3/4'	PORT ISO 11926-1 - 1 1/16-12	90	19	0.75

N Lateral



Type	Dim.	M		P		Q		O	Nm
		mm	in	mm	in	mm	in		
N4	1/2'	13	0.51	38.1	1.49	17.5	0.68	5/16-18 UNC-2B	17
N6	3/4'	20	0.79	47.6	1.87	22.2	0.87	3/8-16 UNC-2B	38
N7	1'	27	1.06	52.4	2.60	26.2	1.03	3/8-16 UNC-2B	38

F Lateral



Type	Dim.	M		P		Q		O	Nm
		mm	in	mm	in	mm	in		
F4	1/2'	13	0.51	38.1	1.49	17.5	0.68	M8	17
F6	3/4'	20	0.79	47.6	1.87	22.2	0.87	M10	38
F7	1'	25.4	1	52.4	2.60	26.2	1.03	M10	38

Combination of ports/flanges

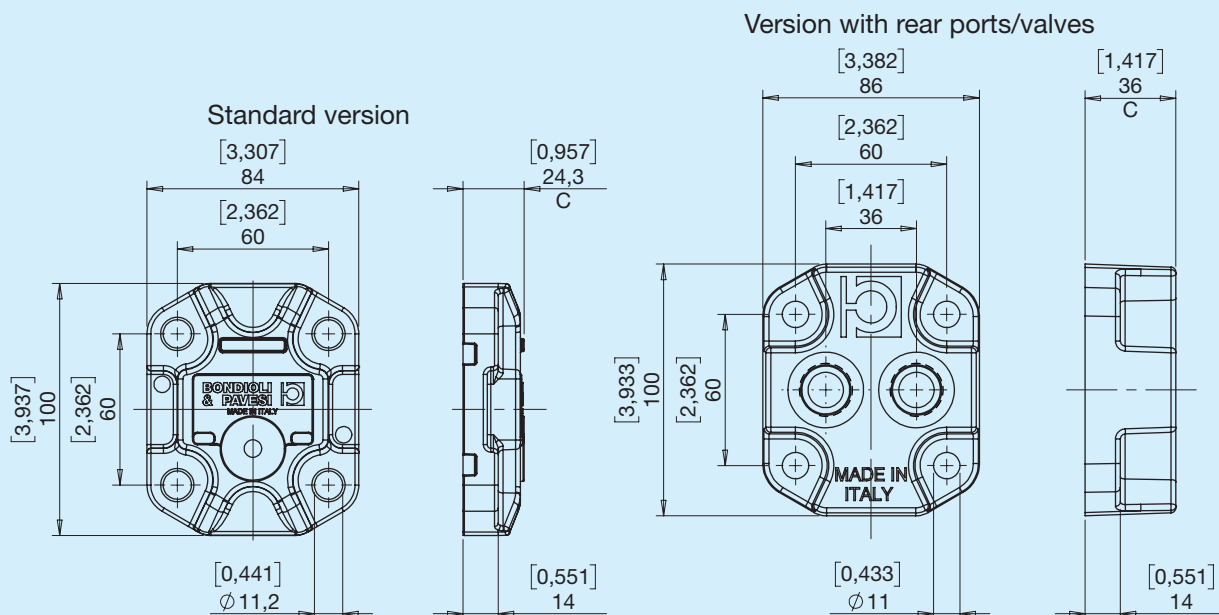
Ports	Flanges									
	M	L	N	V	O	P	R	S	Q	T
E	•	•								
G	•	•						•	•	•
X			•	•	•	•	•			
U								•	•	•
F								•	•	•
N								•	•	•
C								•	•	•
T	•	•	•	•	•	•	•	•	•	•

Combination of round ports for one-way pumps

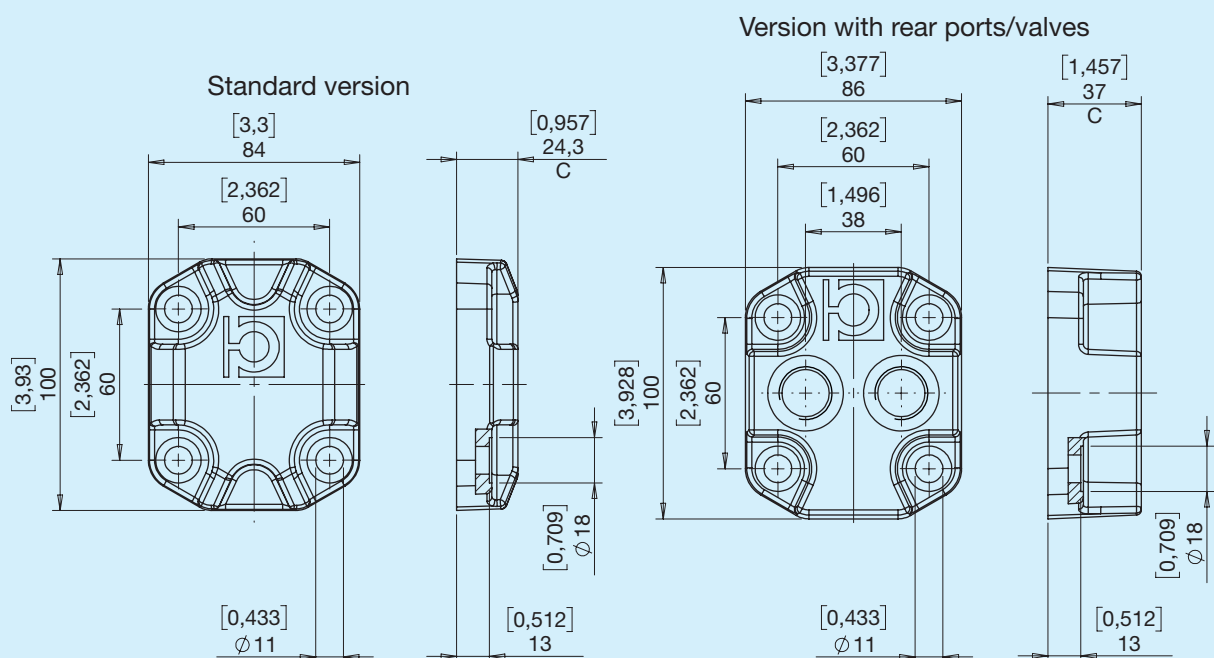
Ports	Round		
	6 9	11 14 17 21	26
	IN/OUT ports	IN/OUT ports	IN/OUT ports
E	E3 E3	E5 E3	E5 E5
G	G4 G4	G6 G4	G7 G6
X	X5 X4	X6 X4	X8 X4
U	U6 U5	U6 U5	U7 U6
F	F4 F4	F6 F4	F7 F6
N	N4 N4	N6 N4	N7 N6
C	C6 C5	C6 C5	-
T	T6 T4	T6 T4	-

Other combinations of ports are available. For more information, please contact our technical sales department.

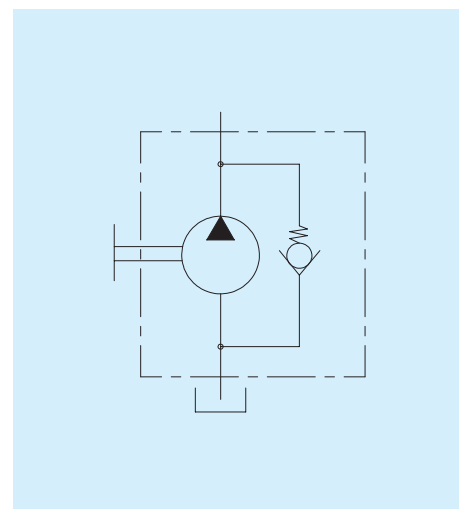
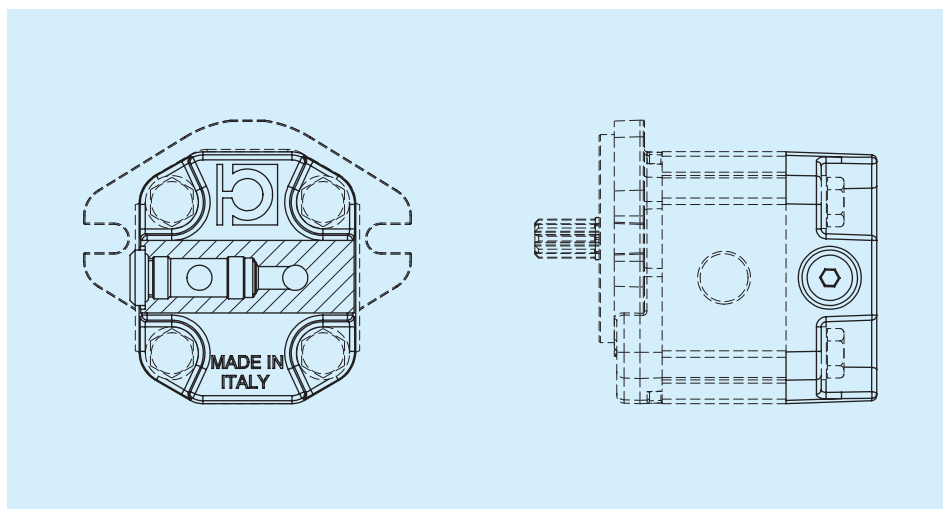
ST Aluminium



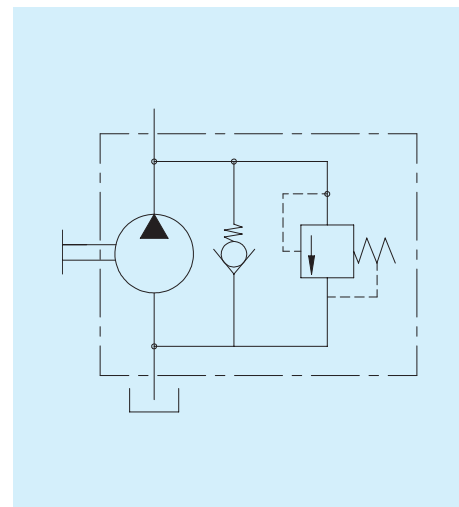
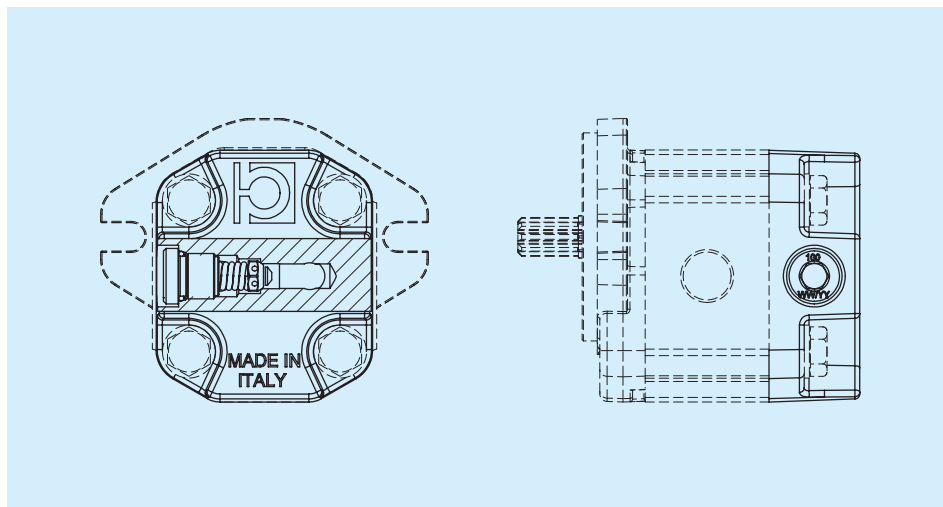
SG Cast iron



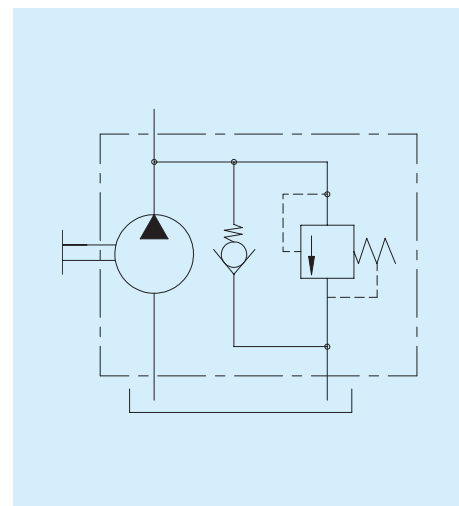
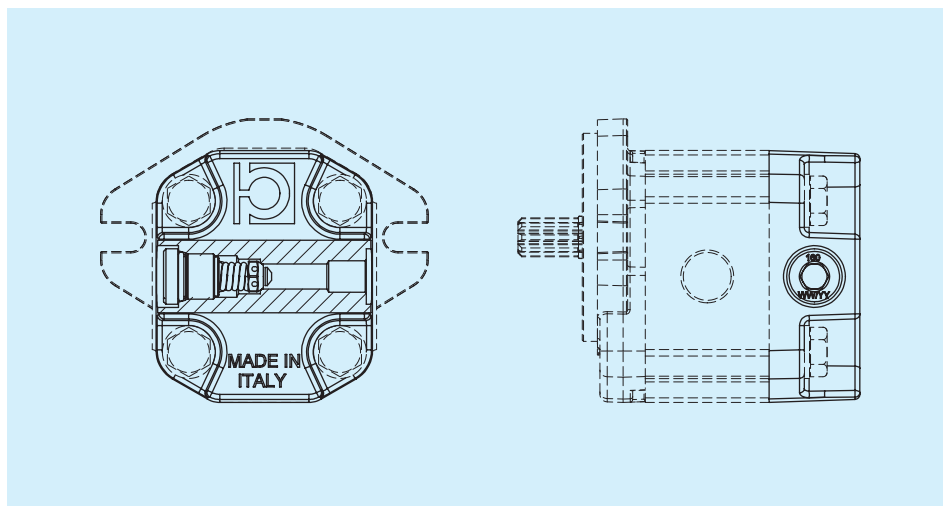
VA Check valve



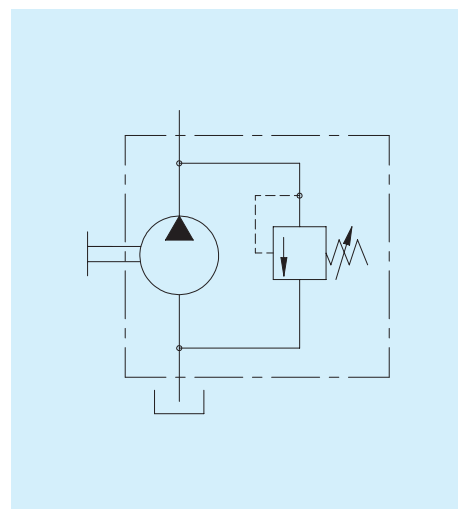
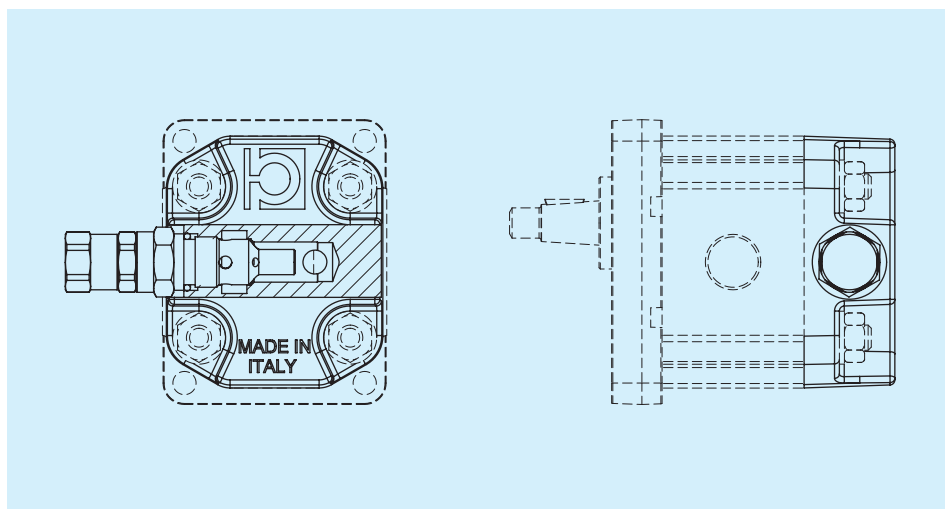
VB Fixed setting pressure relief valve with internal drain



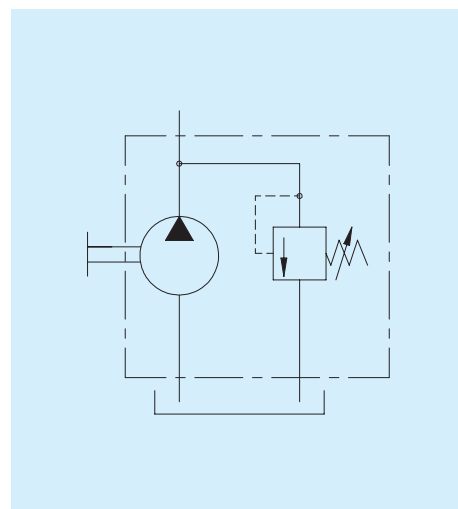
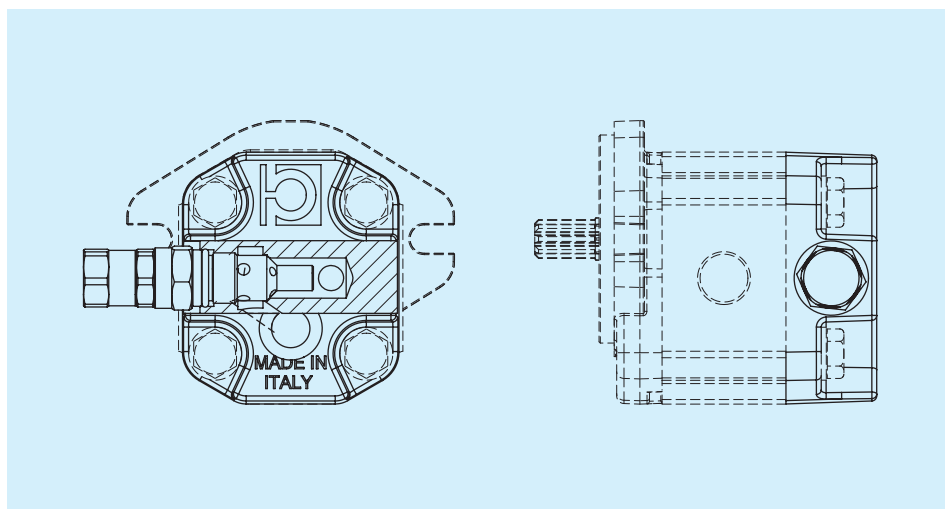
VC Fixed setting pressure relief valve with external drain



VD Adjustable pressure relief valve with internal drain



VE Adjustable pressure relief valve with external drain



For more information, please contact the technical sales department

For pressure relief valves, please indicate the setting

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HPZ														
Series														
PA2 Gear pump Group 2														
Displacement														
06			11			17			26					
09			14			21								
Direction of rotation														
S Anti-clockwise/left			D Clockwise/right											
Front flanges - Shafts														
LL European in cast iron - Tapered (1:8)			MN European - European round D15			QV SAE A 2 cast iron holes - Splined SAE A 9T			SV SAE A 2 holes - Splined SAE A 9T					
LN European in cast iron - European round D15			NM German - Tapered (1:5)			RZ German D52 - Front tooth			VM German in cast iron - Tapered (1:5)					
ML European - Tapered (1:8)			QP SAE A 2 cast iron holes - Round SAE A			SP SAE A 2 holes - Round SAE A								
IN - Inlet ports														
...			See tables Ports and Combinations											
OUT - Output ports														
...			See tables Ports and Combinations											
Seals														
B NBR Pump			R NBR High pressure pump			V Viton Pump			W Viton High pressure pump					
Covers														
ST Standard			VA Check valve			VC Fixed setting pressure relief valve with external drain			VE Adjustable pressure relief valve with external drain					
SG Cast iron version			VB Fixed setting pressure relief valve with internal drain			VD Adjustable pressure relief valve with internal drain								

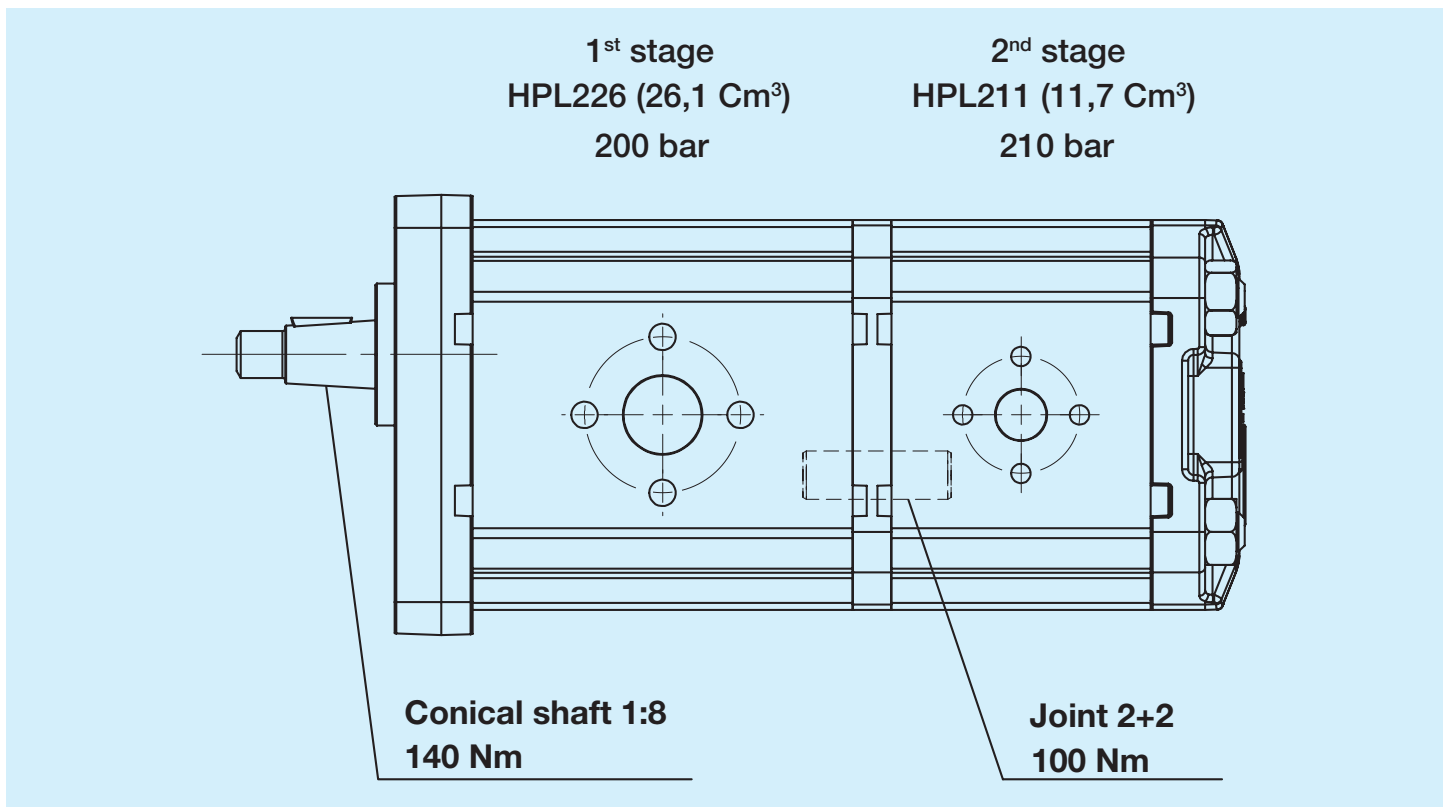
HPZ multiple pumps are combinations of two or more sections driven by a single shaft. The sections making up the multiple pump are driven by splined joints.

This multiple pump configuration can have inlet and delivery for each stage or, where possible, one inlet and several deliveries.

For individual sections, the values given in the catalogue apply, with some pressure limitations depending on the maximum torque of the drive joint and the shaft profile.

The maximum speed of a multistage pump is the lowest maximum speeds of the individual stages.

There follows a useful example for correctly dimensioning the torque that can be transmitted to the shaft profile and for each individual stage of a group 2 + group 2 double pump at given operating pressures on each stage.



Triple pump example HPZPB226DMLE5E5B211E3E3ST

The formula for calculating the torque to be used is:

$$M = \frac{\Delta p \cdot c}{62,83 \cdot \eta_m} \quad [Nm]$$

where:

M = Torque (Nm)

Δp = Pressure (bar)

c = Pump displacement (cm³)

62.83 = Conversion factor

ηm = Mechanical efficiency = 0.9

The calculation is made out from the last stage of the pump up to the primary shaft. In all stages, the resulting calculated torque must be less than or equal to the maximum permissible torque for each drive joint, including the profile of the pump shaft.

Stage 2:

Group 2, displacement 11.7 cm³, operating pressure 210 bar.

$$M_2 = 43.4 \text{ Nm.}$$

The intermediate joint condition is satisfied (maximum limit 100 Nm).

Stage 1:

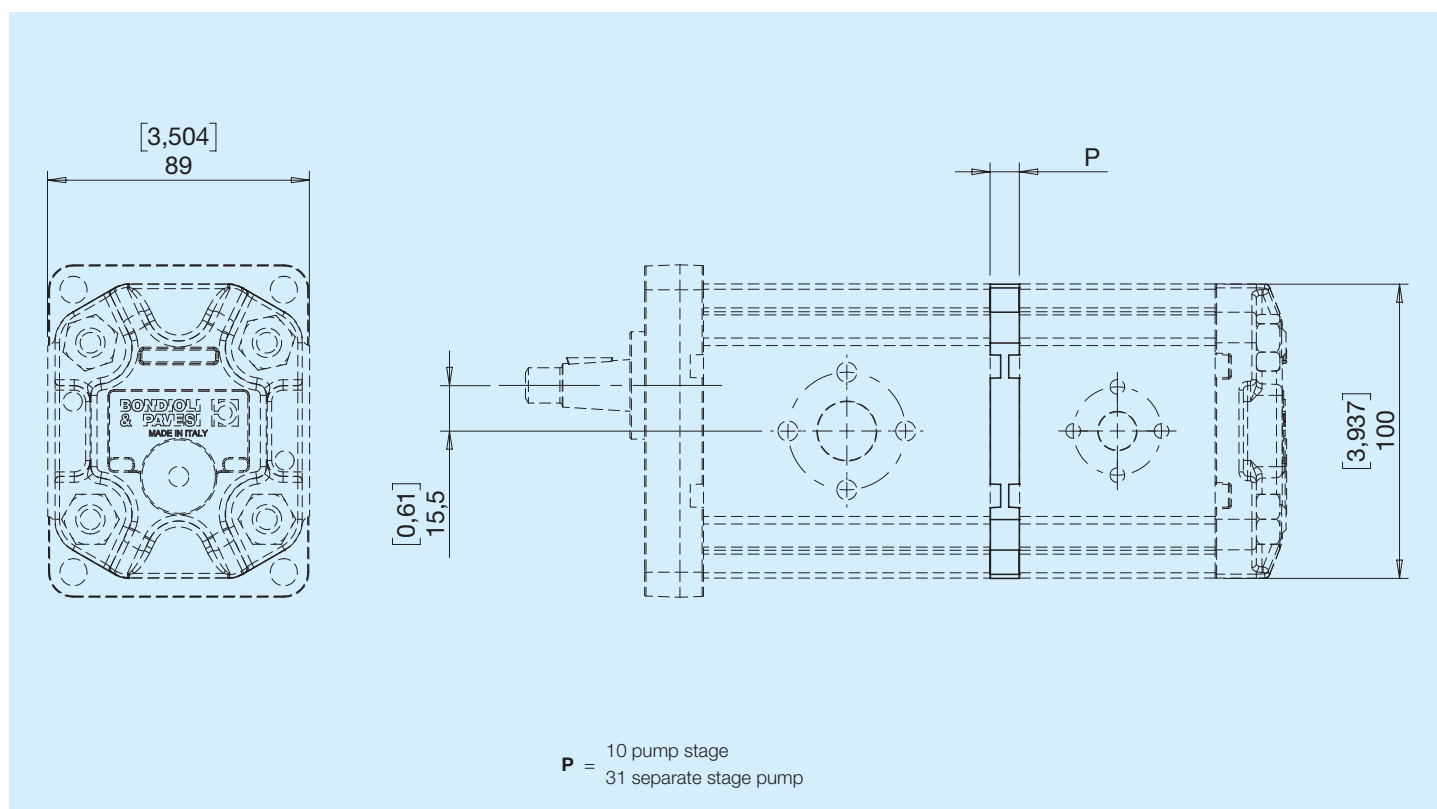
Group 2, displacement 26.1 cm³, operating pressure 160 bar.

$$M_1 = 61.1 \text{ Nm.}$$

$$M_2 + M_1 = 104.5 \text{ Nm.}$$

The drive shaft condition is met (maximum limit 140 Nm).

Coupling joint	Maximum transmissible torque
HPZP2 + HPZP2	100 Nm



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HPZ																	
1 2	Product																
	PB Double pump					PC Triple pump					PD Quadruple pump						
3	Group 2																
	2																
4 5	Displacement																
	06					11					17					26	
	09					14					21						
6	Direction of rotation																
	S Counter clockwise/left					D Clockwise/right											
7 8	Front flanges																
	LL European in cast iron - Conical (1:8)					MN European - Round D15 European					QV SAE A cast iron 2 holes - Splined SAE A 9T					SV SAE A 2 holes - Splined SAE A 9T	
	LN European in cast iron - Round D15 European					NM German - Conical (1:5)					RZ German D52 - Front tooth					VM German in cast iron - conical (1:5)	
	ML European - Conical (1:8)					QP SAE A cast iron 2 holes - Round SAE A					SP SAE A 2 holes - Round SAE A						
9 10	IN ports - Inlet *																
	... See HPZ..2 tables																
11 12	OUT port - Outlet *																
	... See HPZ..2 tables																
13	Seals																
	B NBR					R NBR high pressure					X Viton separate stages						
	S NBR separate stages					V Viton					W Viton high pressure						
14	Series																
	Z Subsequent stages																
15	Group 2																
	2																

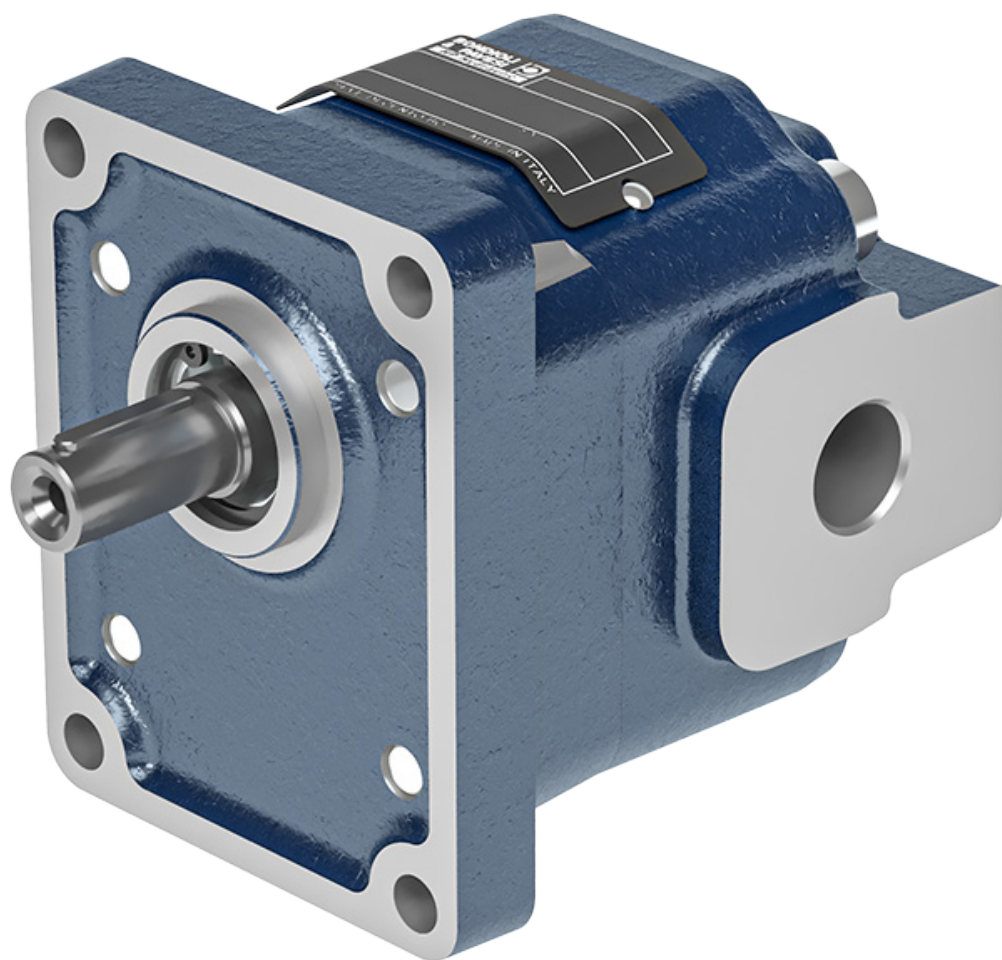
18 19	20 21	22 23
 	 	 

16 17  	Displacement
	 See HPZ..2 tables
18 19  	IN ports - Inlet *
	 See HPZ..2 tables
20 21  	OUT port - Outlet *
	 See HPZ..2 tables
22 23  	Covers
	 ST Standard  EU Single inlet*  SG Cast iron version  V... With valve**

* For EU versions, contact the technical sales department

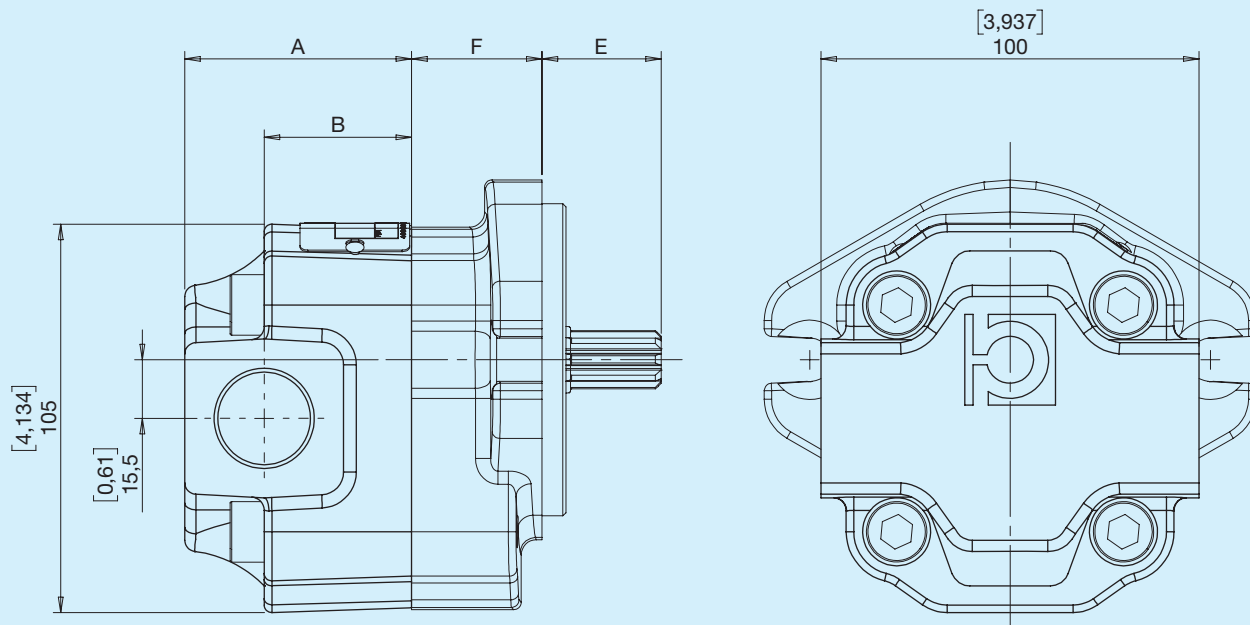
** See sections Covers with HPZ.2 valves

HPX Series Group 2



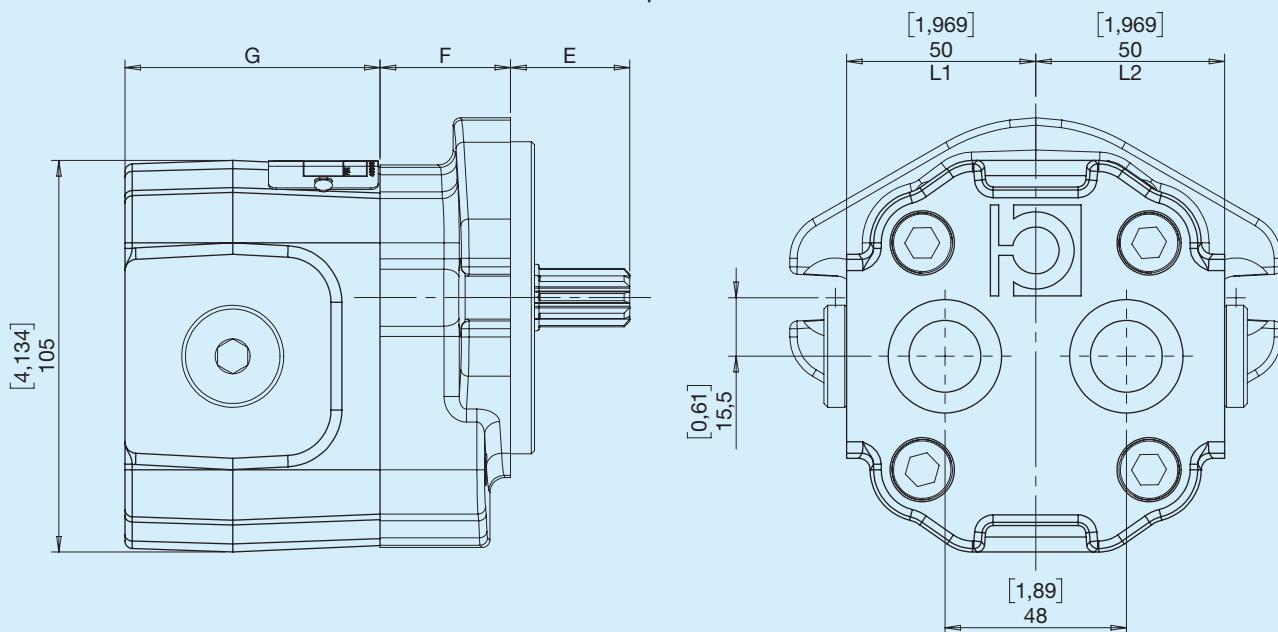
Before use, carefully read the GENERAL INSTRUCTIONS FOR USE OF GEAR PUMPS AND MOTORS.

Side ports



E - See section on shafts F - See section on flanges

Rear ports

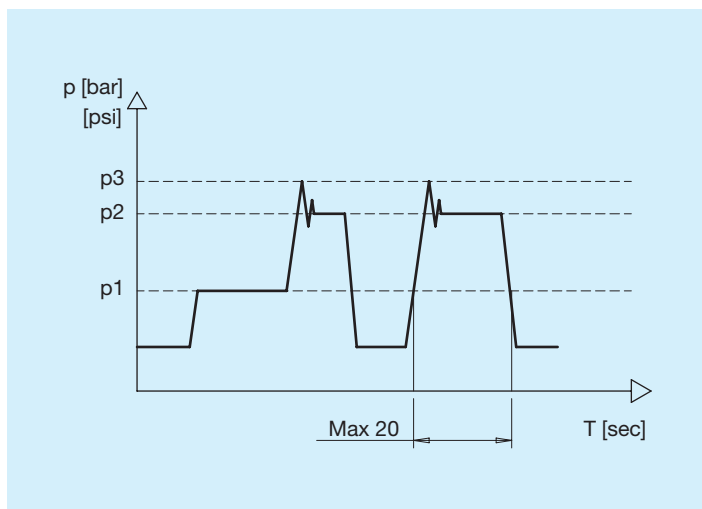


E - See section on shafts F - See section on flanges

L1=50.5 for displacements 14 -26

L2=55.5 for displacements 14-26

Pressure definition

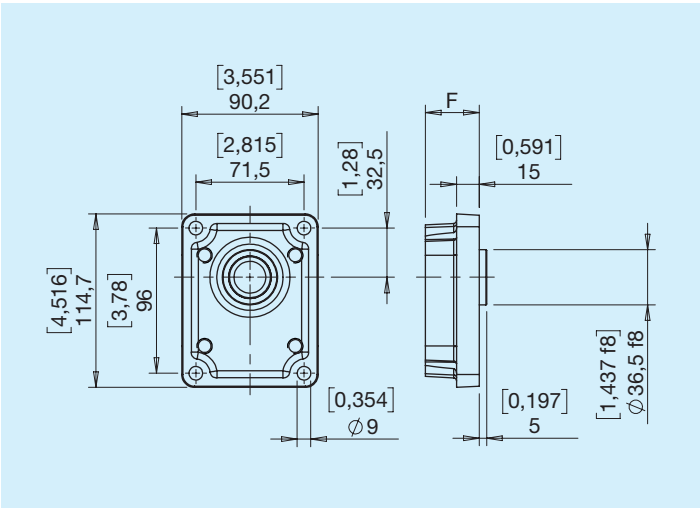


p1	Continuous pressure
A,B - Use	Intermittent pressure Maximum pressure permitted for short periods (max. 20 sec)
L1, L2 - Drain port	Peak pressure Maximum permitted pressure intended as peak pressure of Vmax

Pump dimensions and technical data

HPXPA2	Nominal displacement		Continuous pressure		Intermittent pressure		Peak pressure		Rotational speed		Weight		A		B		G	
	cm ³	in ³	bar	psi	bar	psi	bar	psi	min ⁻¹	min ⁻¹	kg	lbs	mm	in	mm	in	mm	in
06	6.30	0.38	270	3916	290	4206	320	4641	3500	500	4.46	9.84	53.8	2.12	32.8	1.29	61,3	2.41
09	9.20	0.56	270	3916	290	4206	320	4641	3500	500	4.65	10.24	60	2.36	39	1.54	67,5	2.66
11	11.70	0.71	250	3626	270	3916	300	4351	3000	500	4.86	10.72	68.2	2.69	36.2	1.43	73,2	2.88
14	14.40	0.88	250	3626	270	3916	300	4351	3000	500	5.41	11.93	74	2.91	42	1.65	79	3.11
17	17.40	1.06	250	3626	270	3916	280	4061	3000	500	5.64	12.44	80	3.15	47	1.85	99	3.89
21	21.80	1.33	210	3046	230	3336	250	3626	3000	500	5.84	12.87	89.5	3.52	56.5	2.22	108,5	4.27
26	26.10	1.59	180	2611	190	2756	210	3046	2500	500	6.71	14.79	98.9	3.89	65.9	2.59	117,9	4.64

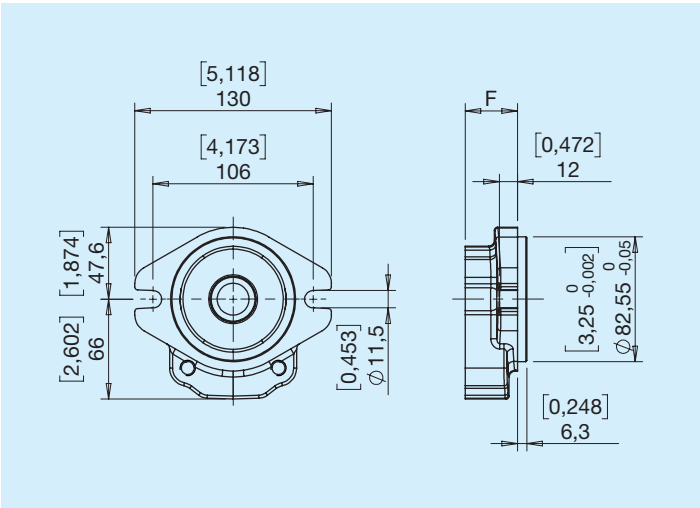
L European



L flange thickness table

	Displacement	
	mm	in
N6	19	0.75

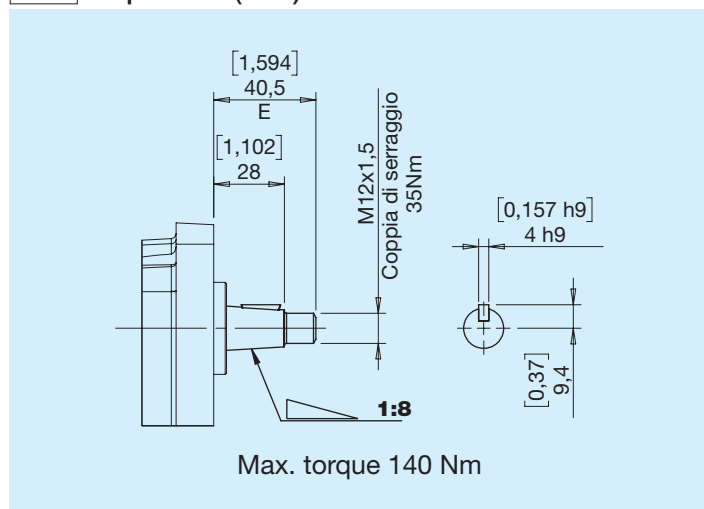
Q SAE A 2 holes



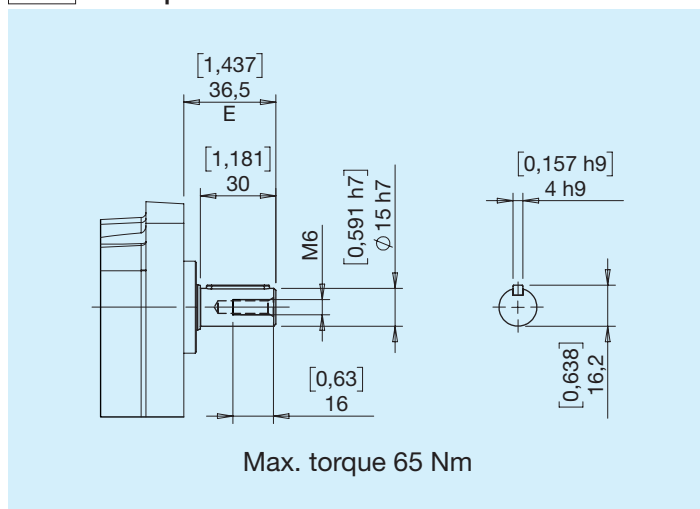
Q flange thickness table

	Displacement	
	mm	in
N6	19	0.75

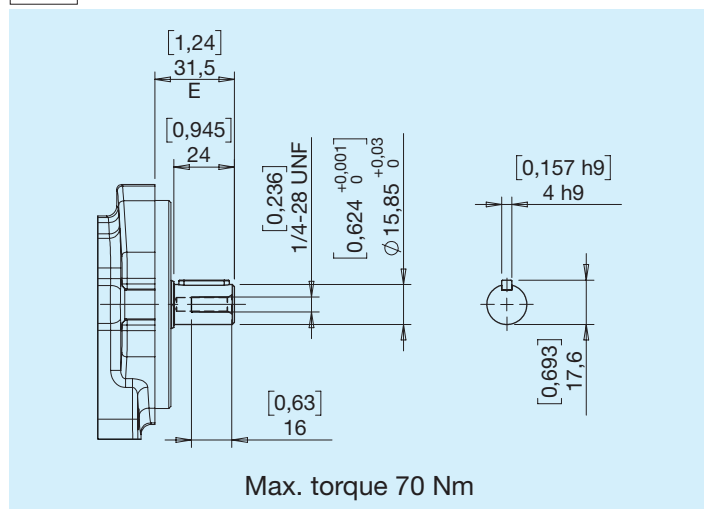
L Tapered (1:8)



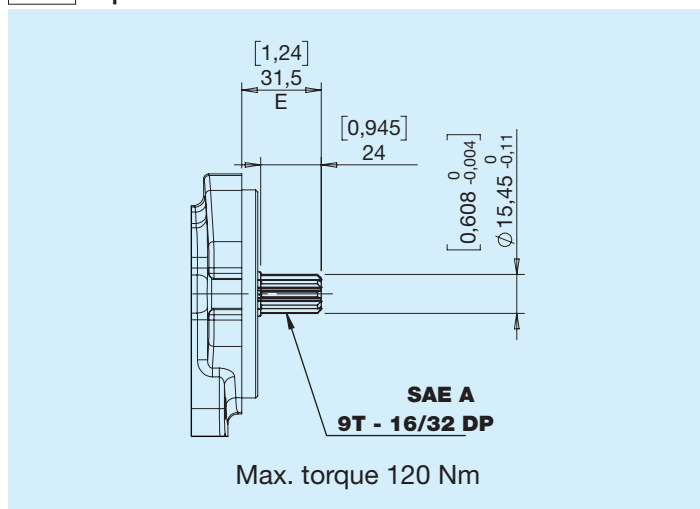
N European round D15



P Round SAE A

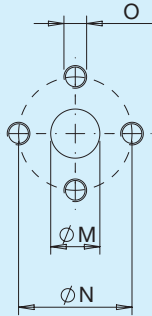


V Splined SAE A 9T



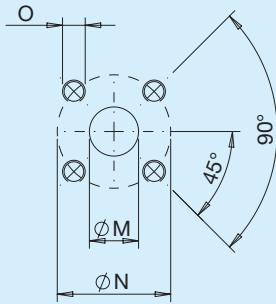
Shafts	Flanges	
	L	Q
L	•	
N	•	
P		•
V		•

E Lateral



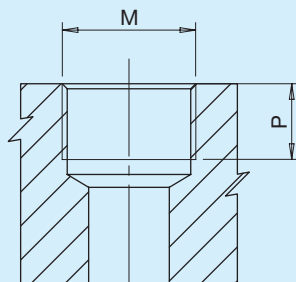
Type	M		N		O	
	mm	in	mm	mm		Nm
E3	13	0.51	30	1.18	M6	10
E5	20	0.79	40	1.57	M8	17
E7	27	1.06	51	2.01	M10	38

X Lateral



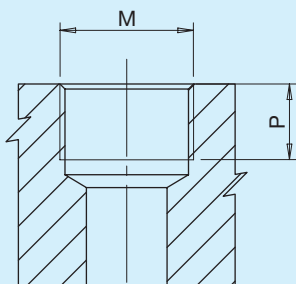
Type	M		N		O	
	mm	in	mm	mm		Nm
X4	15	0.59	35	1.38	M6	10
X5	15	0.59	40	1.57	M6	10
X6	20	0.79	40	1.57	M6	10

G Lateral



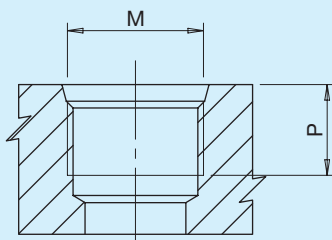
Type	M	Nm	P	
			mm	in
G4	PORT ISO 1179-1-G 1/2	70	16	0.63
G6	PORT ISO 1179-1-G3/4	90	19	0.75
G7	PORT ISO 1179-1-G 1	160	19	0.75

T Rear



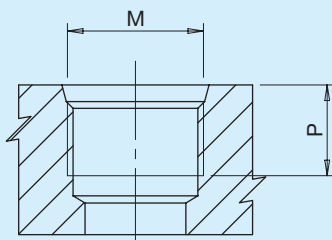
Type	M	Nm	P	
			mm	in
T4	PORT ISO 1179-1-G 1/2	70	16	0.63
T6	PORT ISO 1179-1-G3/4	90	19	0.75

U Lateral



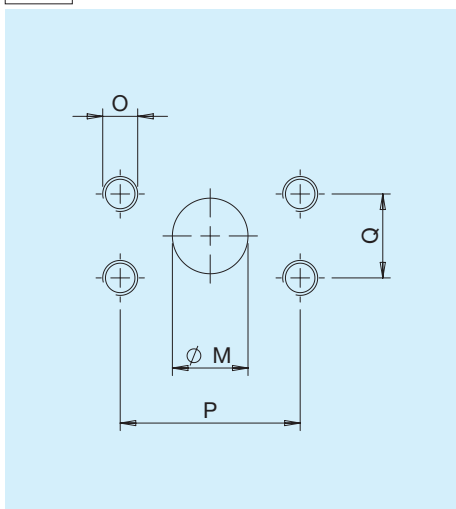
Type	Dim.	M	Nm	P	
				mm	in
U5	5/8'	PORT ISO 11926-1 - 7/8-14	70	17	0.67
U6	3/4'	PORT ISO 11926-1 - 1 1/16-12	90	19	0.75
U7	1'	PORT ISO 11926-1 - 1 5/16-12	160	20	0.79

C Rear



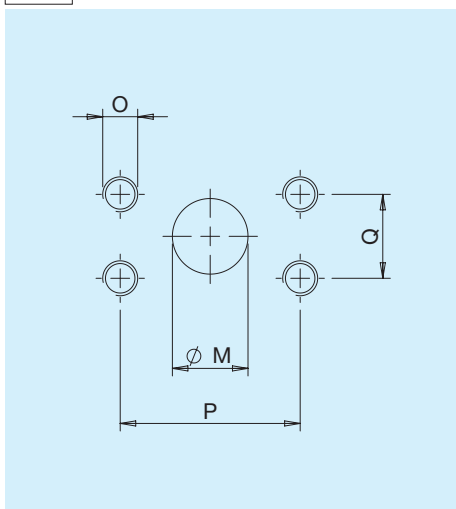
Type	Dim.	M	Nm	P	
				mm	in
C5	5/8'	PORT ISO 11926-1 - 7/8-14	70	17	0.67
C6	3/4'	PORT ISO 11926-1 - 1 1/16-12	90	19	0.75

N Lateral



Type	Dim.	M		P		Q		O	Nm
		mm	in	mm	in	mm	in		
N4	1/2'	13	0.51	38.1	1.49	17.5	0.68	5/16-18 UNC-2B	17
N6	3/4'	20	0.79	47.6	1.87	22.2	0.87	3/8-16 UNC-2B	38
N7	1'	27	1.06	52.4	2.60	26.2	1.03	3/8-16 UNC-2B	38

F Lateral



Type	Dim.	M		P		Q		O	Nm
		mm	in	mm	in	mm	in		
F4	1/2'	13	0.51	38.1	1.49	17.5	0.68	M8	17
F6	3/4'	20	0.79	47.6	1.87	22.2	0.87	M10	38
F7	1'	25.4	1	52.4	2.60	26.2	1.03	M10	38

Combination of ports/flanges

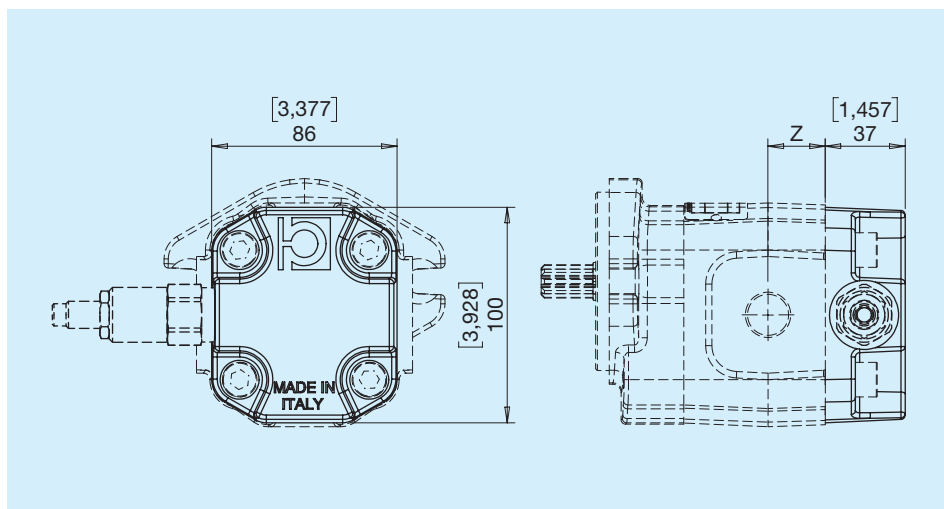
Ports	Flanges	
	L	Q
E	•	
X	•	
G	•	•
T	•	•
U		•
C		•
N		•
F		•

Combination of round ports for one-way pumps

Ports	Round			
	6 9	11	14 17 21	26
	IN/OUT ports	IN/OUT ports	IN/OUT ports	IN/OUT ports
E	E3 E3	E5 E3	E5 E5	E7 E5
X	X5 X4	X6 X4	X6 X4	X6 X5
G	G4 G4	G4 G4	G6 G4	G7 G6
T	T4 T4	T4 T4	T6 T4	-
U	U6 U5	U6 U5	U6 U5	U7 U6
C	C5 C5	C5 C5	C6 C5	-
N	N4 N4	N4 N4	N6 N4	N7 N6
F	F4 F4	F4 F4	F6 F4	F7 F6

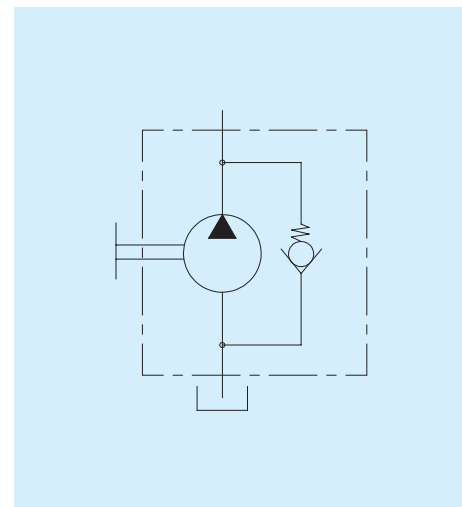
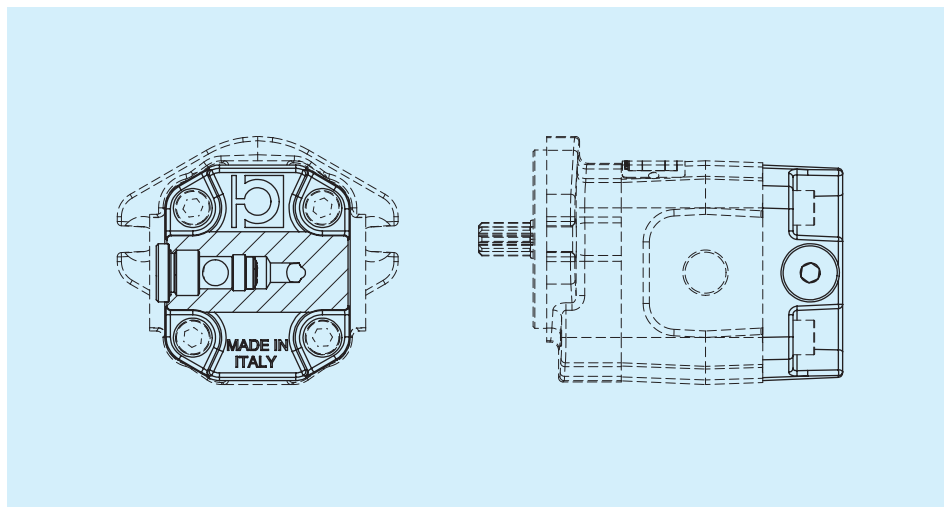
Other combinations of ports are available. For more information, please contact our technical sales department.

Pumps and motors with integrated valves

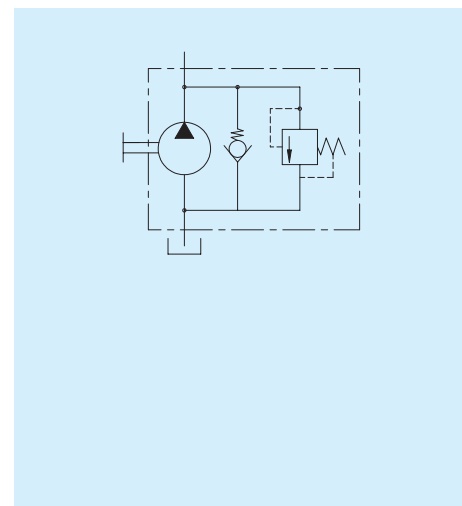
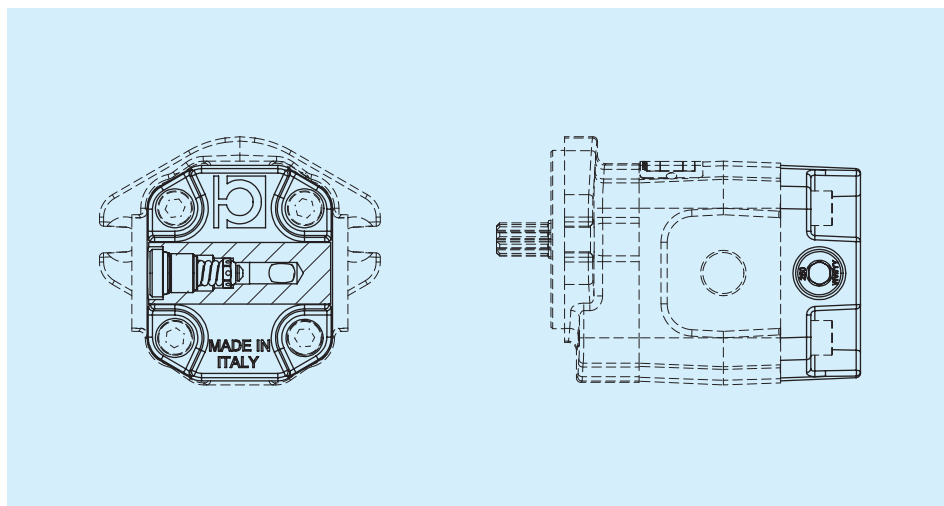


	Displacement		
	mm	in	17 ... 26
N6	19	0.75	49,50

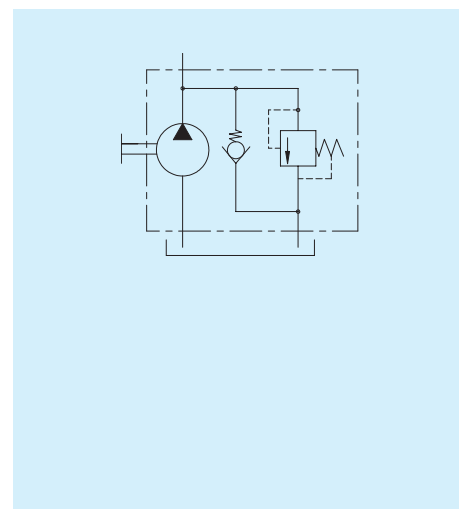
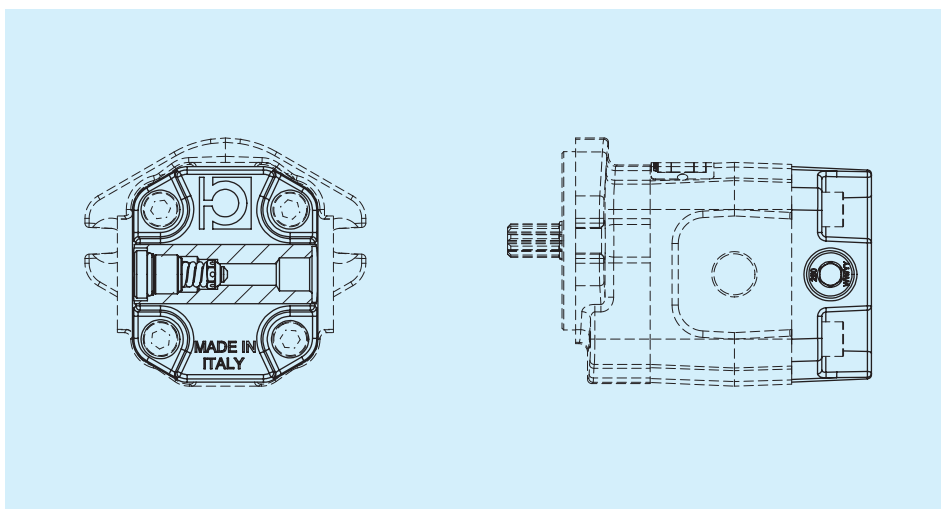
VA Check valve



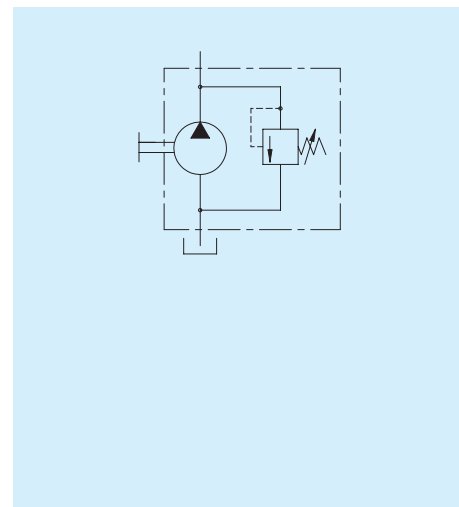
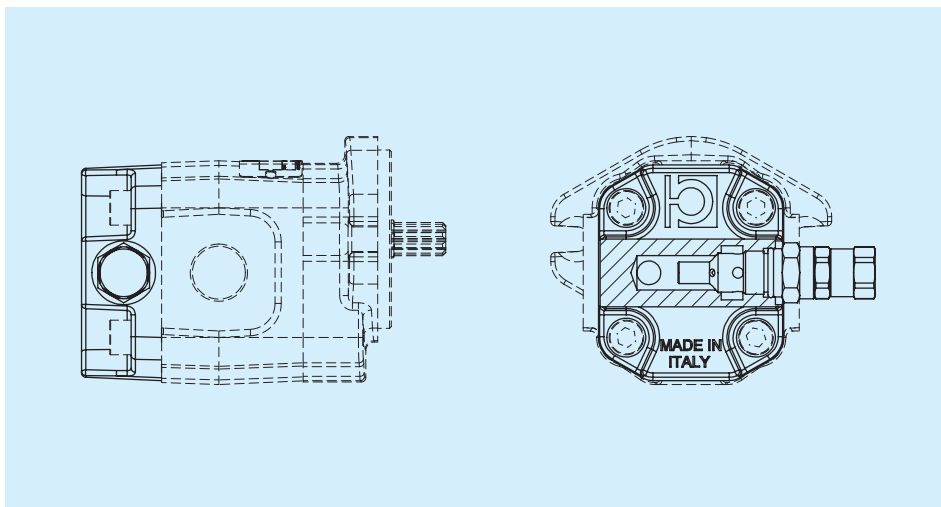
VB Fixed setting pressure relief valve with internal drain



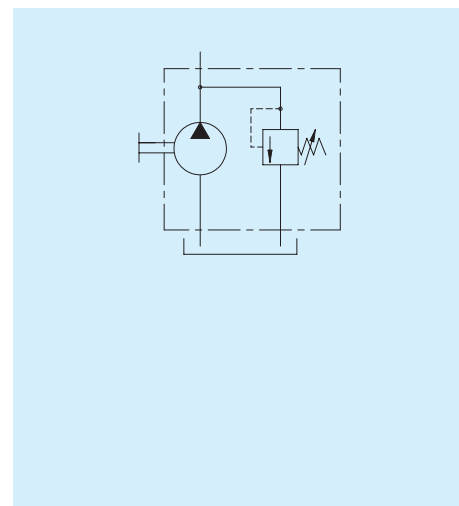
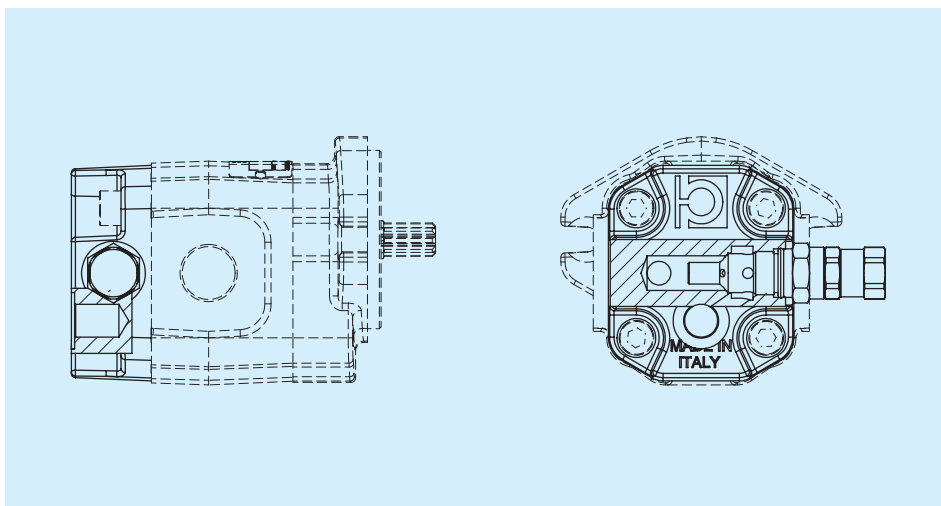
VC Fixed setting pressure relief valve with external drain



VD Adjustable pressure relief valve with internal drain



VE Adjustable pressure relief valve with external drain



For more information, please contact the technical sales department

For pressure relief valves, please indicate the setting

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HPX														
Series														
PA2 Gear pump Group 2														
Displacement														
06			11			17			26					
09			14			21								
Direction of rotation														
S Anti-clockwise/left			D Clockwise/right											
Front flanges - Shafts														
LL European in cast iron - Tapered (1:8)			LN European in cast iron - European round D15			QP SAE A 2 cast iron holes - Round SAE A			QV SAE A 2 cast iron holes - Splined SAE A 9T					
IN - Inlet ports														
...			See tables Ports and Combinations											
OUT - Output ports														
...			See tables Ports and Combinations											
Seals														
B NBR Pump			R NBR High pressure pump			V Viton Pump			W Viton High pressure pump					
Covers														
ST Standard closed body			VB Fixed setting pressure relief valve with internal drain			VD Adjustable pressure relief valve with internal drain								
VA Check valve			VC Fixed setting pressure relief valve with external drain			VE Adjustable pressure relief valve with external drain								

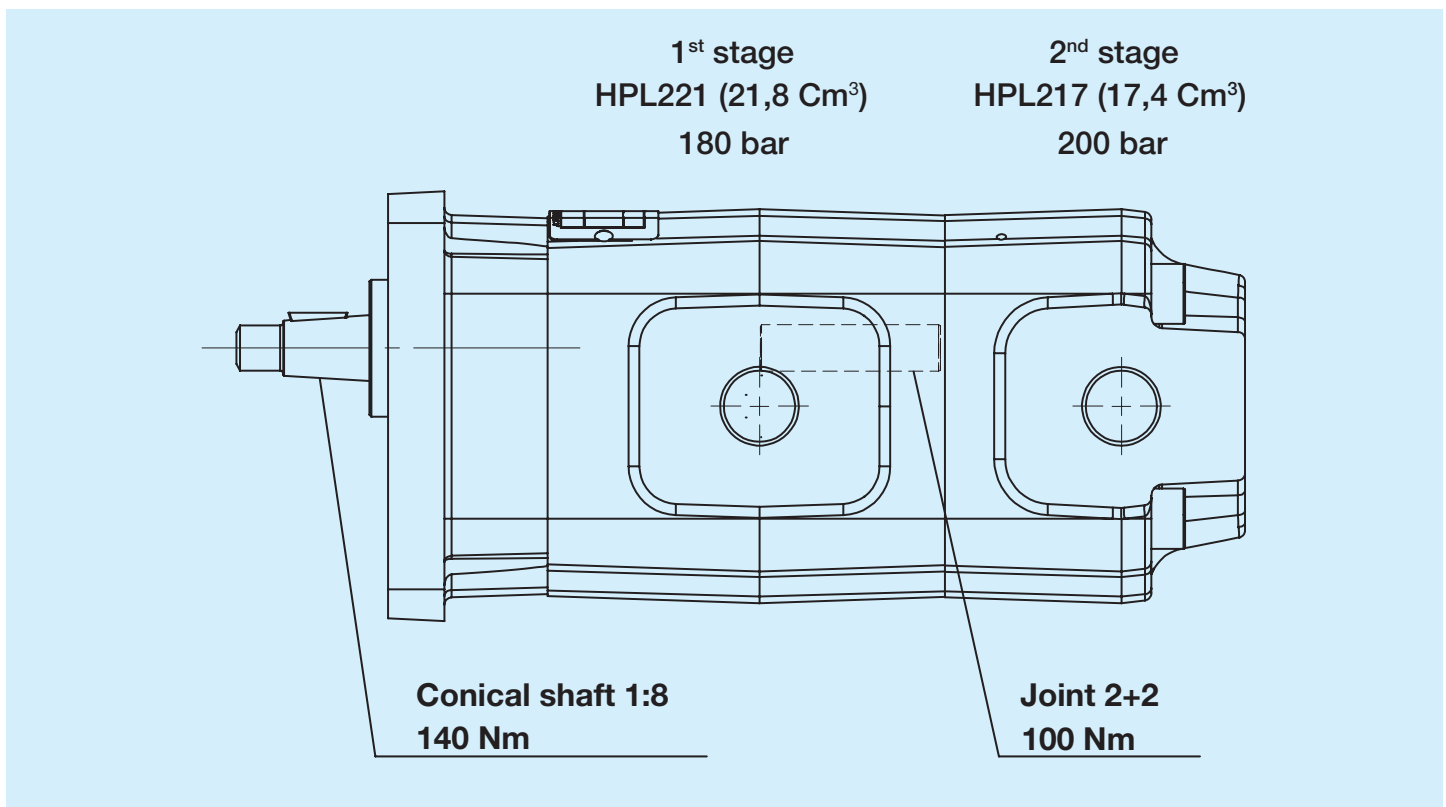
HPZ multiple pumps are combinations of two or more sections driven by a single shaft. The sections making up the multiple pump are driven by splined joints.

This multiple pump configuration can have inlet and delivery for each stage or, where possible, one inlet and several deliveries.

For individual sections, the values given in the catalogue apply, with some pressure limitations depending on the maximum torque of the drive joint and the shaft profile.

The maximum speed of a multistage pump is the lowest maximum speeds of the individual stages.

There follows a useful example for correctly dimensioning the torque that can be transmitted to the shaft profile and for each individual stage of a group 2 + group 2 double pump at given operating pressures on each stage.



Triple pump example HPXGPB221DLLG6G4BX217G6G4ST

The formula for calculating the torque to be used is:

$$M = \frac{\Delta p \cdot c}{62,83 \cdot \eta_m} \quad [Nm]$$

where:

M = Torque (Nm)

Δp = Pressure (bar)

c = Pump displacement (cm³)

62.83 = Conversion factor

η_m = Mechanical efficiency = 0.9

The calculation is made out from the last stage of the pump up to the primary shaft. In all stages, the resulting calculated torque must be less than or equal to the maximum permissible torque for each drive joint, including the profile of the pump shaft.

Stage 2:

Group 2, displacement 17.4 cm³, operating pressure 200 bar.
M₂ = 61.5 Nm.

The intermediate joint condition is satisfied (maximum limit 100 Nm).

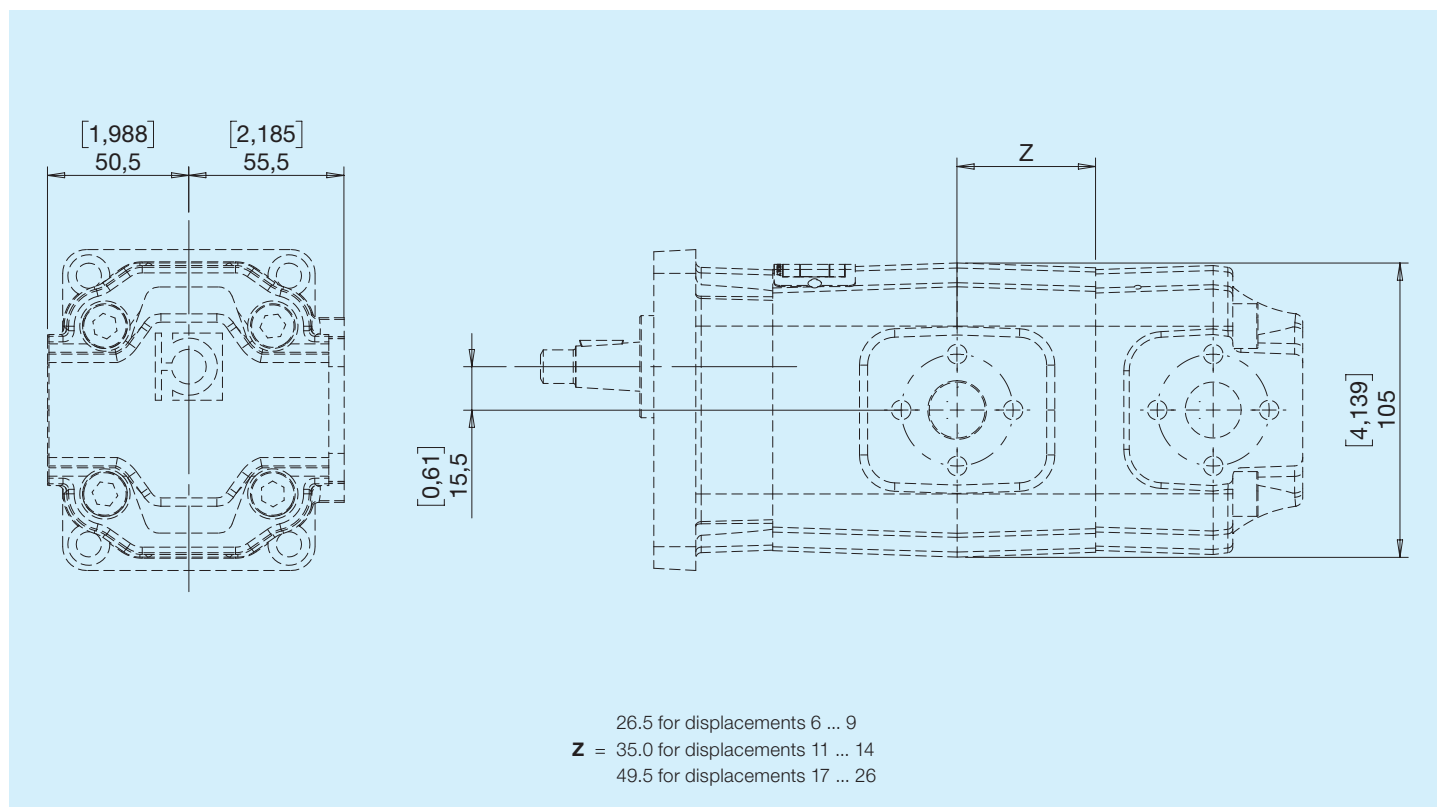
Stage 1:

Group 2, displacement 21.8 cm³, operating pressure 180 bar.
M₁ = 69.4 Nm.

M₂ + M₁ = 130.9 Nm.

The drive shaft condition is met (maximum limit 140 Nm).

Coupling joint	Maximum transmissible torque
HPXP2 + HPXP2	100 Nm



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HPX																
Product																
PB Double pump		PC Triple pump				PD Quadruple pump										
Group 2																
2																
Displacement																
06				11				17				26				
09				14				21								
Direction of rotation																
S Counter clockwise/left						D Clockwise/right										
Front flanges																
LL European in cast iron - Conical (1:8)				LN European in cast iron - Round D15 European				QP SAE A cast iron 2 holes - Round SAE A				QV SAE A cast iron 2 holes - Splined SAE A 9T				
IN ports - Inlet *																
... See HPX..2 tables																
OUT port - Outlet *																
... See HPX..2 tables																
Seals																
B NBR				R NBR high pressure				V Viton				W Viton high pressure				
Series																
X Subsequent stages																
Group 2																
2																
Displacement																
... See HPX..2 tables																

18 19	20 21	22 23
 	 	 



IN ports - Inlet *

... See HPZ..2 tables



OUT port - Outlet *

... See HPZ..2 tables



Covers

ST Standard**EU** Single inlet***SG** Cast iron version**V...** With valve**

* For EU versions, contact the technical sales department

** See sections Covers with HPZ.2 valves