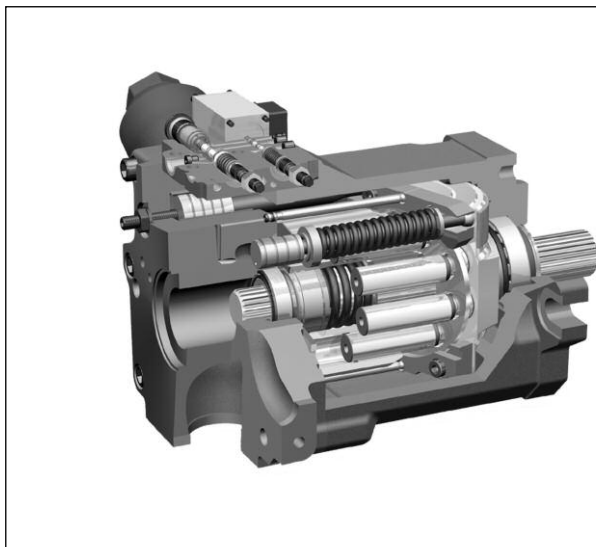


HPR

HIGH PRESSURE SELF-REGULATING PUMP FOR OPEN LOOP OPERATION SERIES 10

OPERATING PRINCIPLE



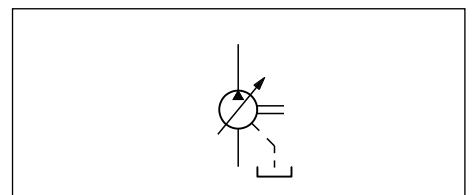
- HPR pumps are variable displacement axial-piston pumps with swash plate design, suitable for applications with open circuits.
- Seven frame sizes are available, from 55 up to 280 cm³/rev.
- The pump flow rate is proportional to the shaft speed and to the swash plate angle, which can be continuously modulated. The maximum angle can be limited mechanically by means of an adjustment screw.
- Due to the special design, these pumps are able to operate at high working pressures (420 bar continuously and 500 bar peak)
- All the pumps are equipped with a noise reduction device.

TECHNICAL SPECIFICATIONS

PUMP SIZE		55	75	105	135	165	210	280
Maximum displacement	cm ³ /rev	55	75,9	105	135,7	165,6	210,1	281,9
Maximum operating pressure	bar	420						
Rotation speed and operating flow rate		see table 3 - Performances						
Rotation direction		clockwise						
Loads on the shaft: axial load radial load	N	2000 on request						
Hydraulic connection		flange fittings - SAE 3000 suction / SAE 6000 pressure						
Type of mounting		SAE J744						
Mass (empty single pump)	kg	39	39	50	65	89	116	165

Ambient temperature range	°C	-15 / +70
Fluid temperature range	°C	-20 / +80
Fluid recommended viscosity	cSt	15 ÷ 30
Fluid contamination degree (ISO 4406:1999)		18/16/13

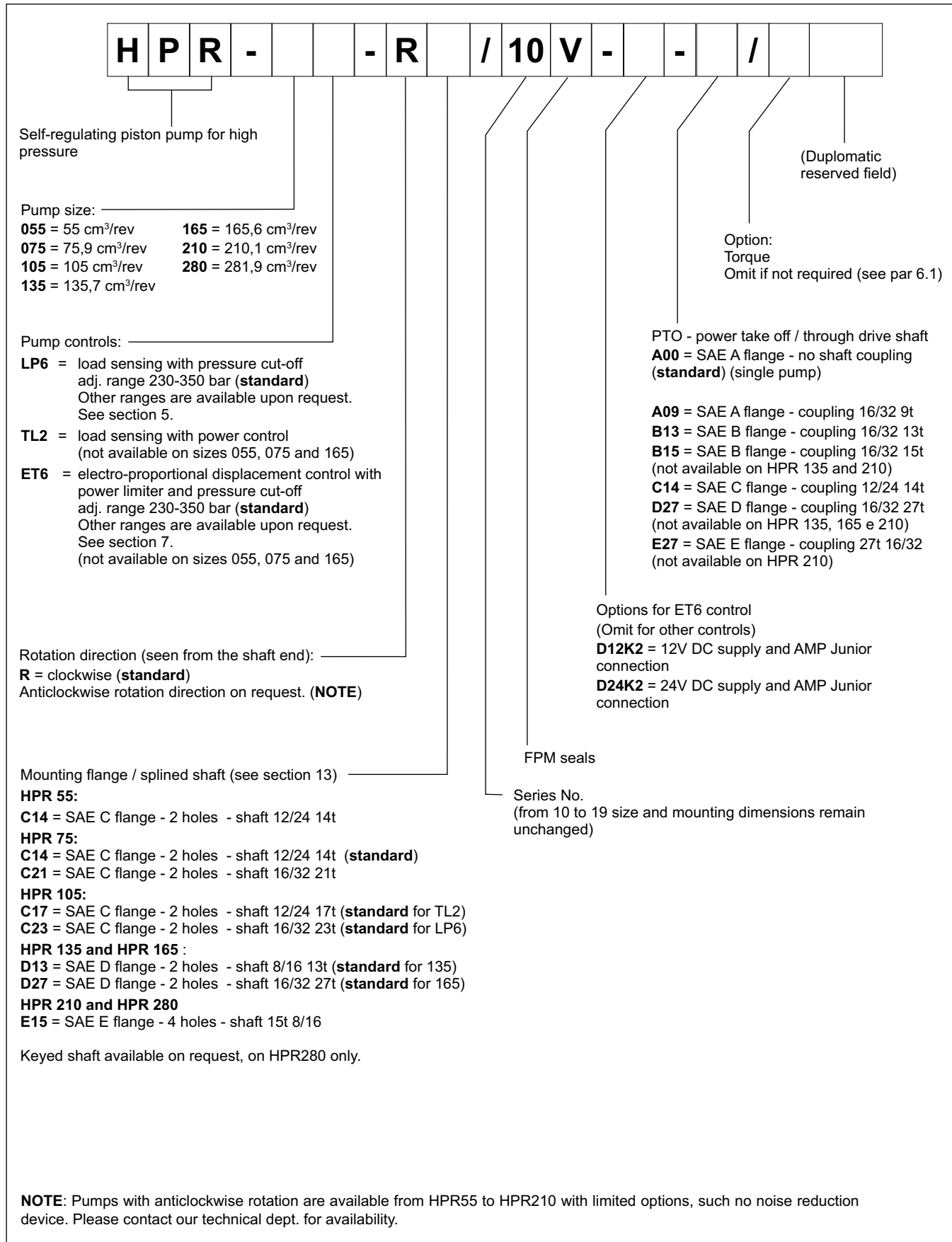
HYDRAULIC SYMBOL



NOTE: Values referring to 1 bar absolute on suction port.

1 - IDENTIFICATION CODES

1.1 - Identification code for single pumps and pumps with power take-off



2 - HYDRAULIC FLUID

2.1 - Fluid type

Use mineral oil based hydraulic fluids HLP with anti-foam and antioxidant additives according to the DIN 51524-2 standard. For use with other types of fluid, keep in mind the limitations shown here below or consult our technical department for authorization of use.

2.2 - Fluid viscosity

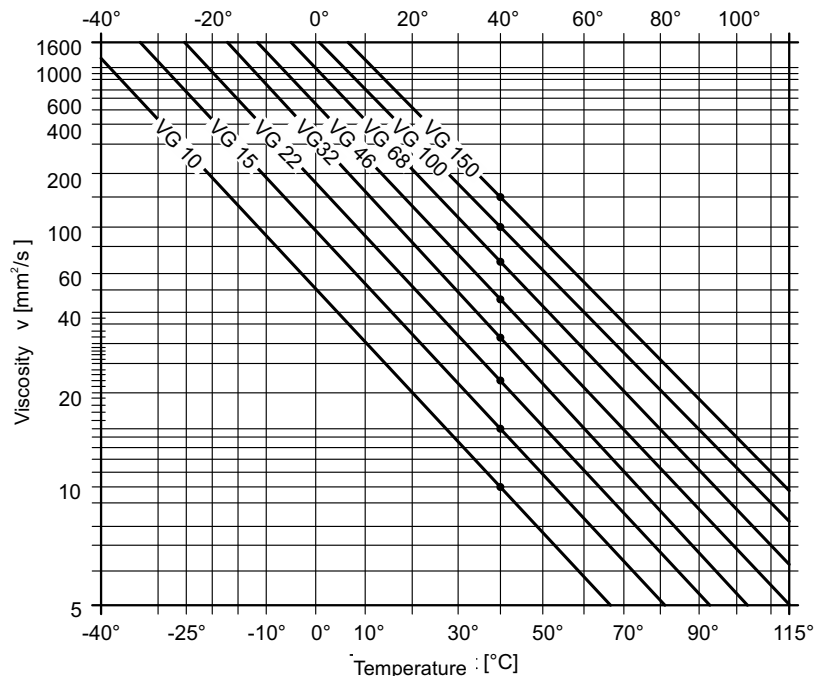
The operating fluid viscosity must be within the following range:

minimum viscosity	10 cSt	referred to a maximum temperature of 80°C for the drain line
optimum viscosity	15 + 30 cSt	referred to the fluid operating temperature in the tank.
maximum viscosity	1000 cSt	limited to the cold start-up of the pump only, which has to be carried out with the circuit at minimum pressure.

When selecting the fluid type, check its viscosity is within the range specified above at the operating temperature.

Recommended viscosity values are indicated in the table and diagram.

Operating temperature [°C]	Viscosity class [cSt at 40°C]
from 30 to 40	22
from 40 to 60	32
from 60 to 80	46 or 68



2.3 - Degree of fluid contamination

In order to guarantee long-term proper function and high efficiency of the hydraulic pumps the purity of the operating fluid must comply with the following class according to the ISO 4406:1999. High purity oil can extend the service time of the hydraulic system significantly.

For reliable proper function and long service life 18/16/13

Minimum requirements 20/18/15

Commissioning The minimum purity requirement for the hydraulic oil is based on the most sensitive system component. For commissioning we recommend a filtration in order to achieve the required purity

Filling and operation of hydraulic systems The required purity of the hydraulic oil must be ensured during filling or topping up. When drums, canisters or large-capacity tanks are used the oil generally needs to be filtered.

We recommend the implementation of suitable measures (e.g. filters) to ensure the required minimum purity of the oil is also achieved during these tasks.



3 - PERFORMANCES

(values obtained with mineral oil with a viscosity of 36 cSt at 50°C)

PUMP SIZE		055	075	105	135	165	210	280
Max displacement	cm ³ /rev	55	75.9	105	135.7	165.6	210.1	281.9
Max flow:								
- at 1500 rpm	l/min	82.5	113.9	157.5	203.5	248.2	315.5	422.9
- at max rotation speed		148.5	189.8	262.5	318.9	364.1	441.2	563.8
Minimum operating speed	rpm	500						
Maximum operating speed	rpm	2700	2500	2500	2350	2200	2100	2000
Max delivery pressure:								
- continuous	bar	420						
- intermittent		500						
Inlet pressure:	bar abs	from 0.8 up to 20 bar (see par. 12)						
Max housing pressure	bar	1,5						
Max power ($\Delta p = 420$ bar):								
- at 1500 rpm	kW	57.8	79.7	110.3	142.5	173.8	220.6	296
- at max rotation speed		104	132.8	183.8	223.2	254.9	308.8	394.7
Max absorbed torque:								
$\Delta p = 100$ bar	Nm	87	121	167	216	263	334	446
$\Delta p = 420$ bar		368	507	702	907	1106	1404	1884
Moment of inertia on the shaft	kgm ² x 10 ⁻²	0,79	0,79	1,44	2,15	3,41	4,68	8,34

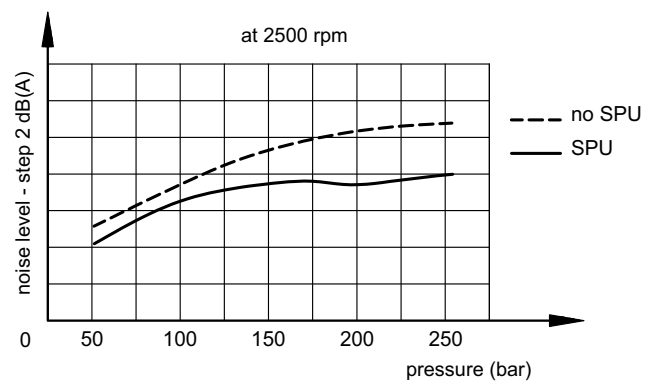
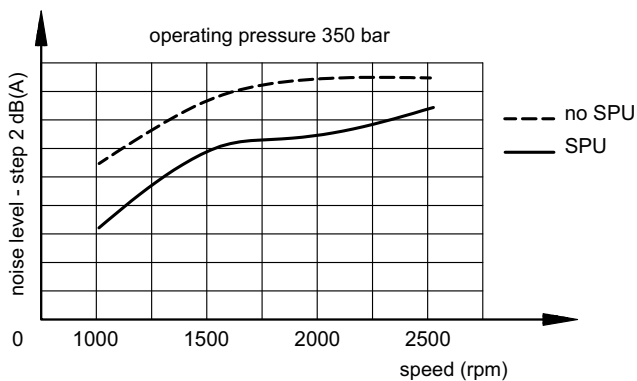
4 - NOISE REDUCTION DEVICE

All the HPR-02 hydraulic pumps are optimized with respect to pulsation characteristics and therefore noise generation. In addition to common primary measures such as exclusive use of noise-optimized port plates, the SPU noise reduction device is available.

Without affecting the functionality and efficiency of the pump, this system reduces pressure noise by up to 70%, irrespective of pressure, speed or temperature.

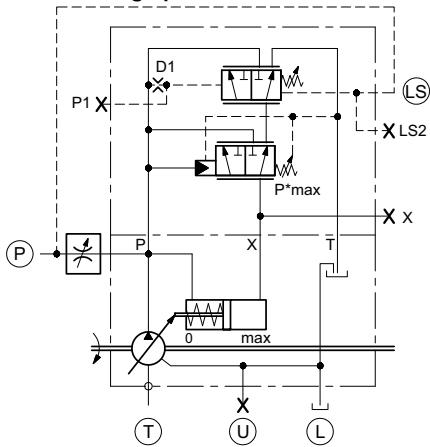
The SPU system is adaptive over the entire operating range. No setting up or maintenance is required.

Comparison of noise pressure levels for a HPR 75 pump with and without SPU



5 - LP6 - LOAD SENSING WITH PRESSURE CUT-OFF CONTROL

Load sensing operation



This load sensing control allows the pump flow rate to be regulated according to the Δp pressure drop measured on both the sides of a throttle valve installed on the working line.

NOTE: The connection pipe between the LS port and the flow line downstream the restrictor (or valve) is always in customer's charge. **The restrictor is not supplied.**

The maximum operating pressure can be set manually adjusting the P*max valve.

LP* FEATURES:

- pressure adjustment range:

LP6 = 230 ÷ 350 (standard)
default setting = 350 bar

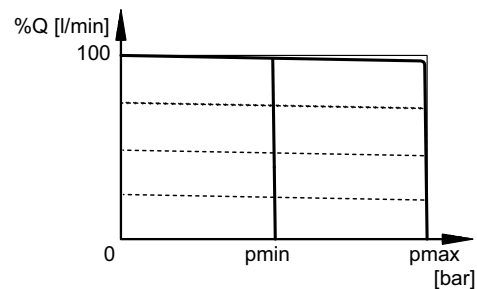
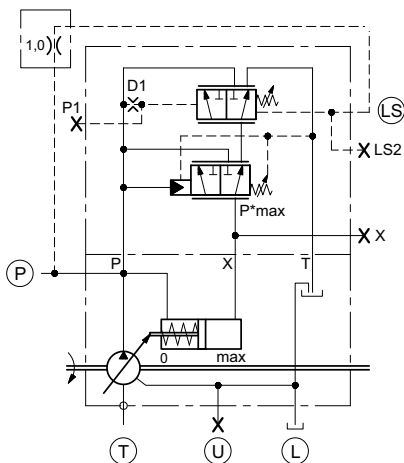
LP5 = 125 ÷ 230 (upon request)

LP7 = 350 ÷ 420 (upon request)

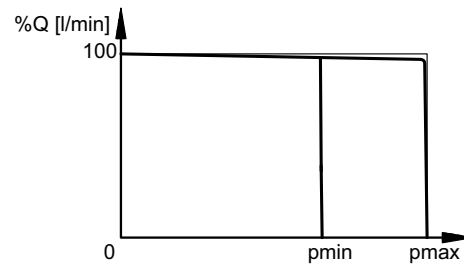
- differential pressure regulating range = 16 ÷ 27 bar

- default setting = 20 bar

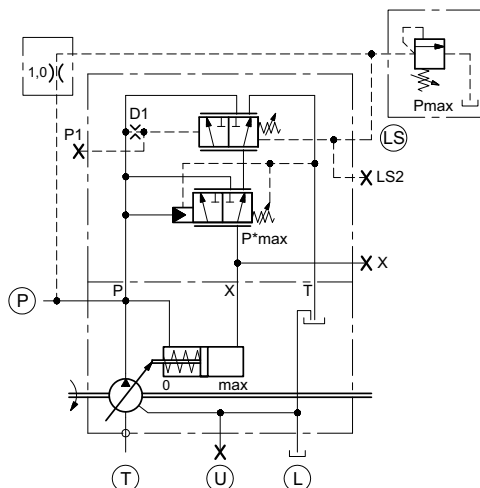
Pressure control operation



Bypassing both P and LS ports with an external connection and an orifice (both in customer's charge) the pump will operate as pressure control that works at maximum displacement up to the set pressure P*max.

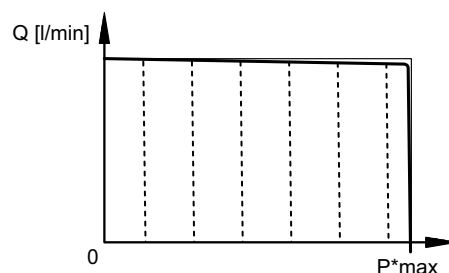


Remote pressure operation

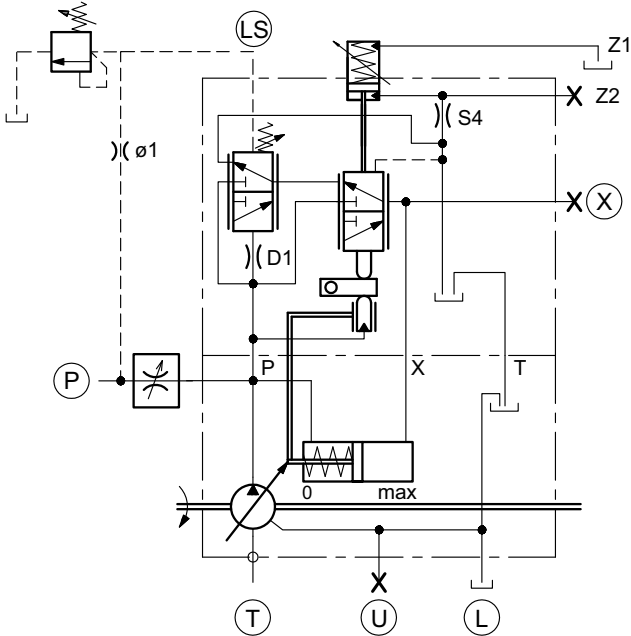


It is possible to create a remote pressure control by means of both an external pressure relief valve and an orifice (both in customer's charge) as shown in the schema.

This configuration allows to regulate remotely the maximum pressure up to P*max. When the pressure it's lower than the set value P*max the pump is at its maximum displacement.



6 - TL2 - LOAD SENSING WITH POWER CONTROL



The TL2 control is available for pumps HPR105, HPR135, HPR210 and HPR280.

This control combines the load sensing function typical of LP control with a power limiter with hyperbolic characteristic. Such limiter keeps the pump torque at a constant level by changing the displacement according to the delivery pressure, so that the absorbed power remains unchanged (at constant pump speed).

The Z1 port must always be connected to the tank separately and without back pressure. The Z2 port is plugged.

NOTE: The pipe connection between the LS port and the delivery of the pump, the orifice and the external pressure relief valve are always charged to the customer.

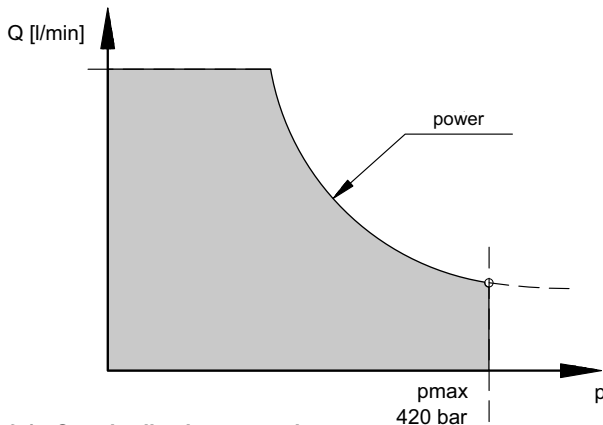
NOTE: The feature of the pressure cut-off is not present on this control, it is necessary to provide suitable external valve, as shown in the diagram at side.

TL2 FEATURES:

- differential pressure adjustment range = 16 ÷ 27 bar
default setting = 20 bar
- pressure adjustment range for torque regulation:
HPR105, HPR135 = 60 ÷ 250 bar
HPR210, HPR280 = 80 ÷ 250 bar
default setting = 250 bar

The power control is factory set. The setting value has to be specified with the order, by stating into the identification code the Nm torque value.

Start of the regulation: looking at values table below.



6.1 - Standardized torque values

PUMPS	ELECTRICAL MOTOR 4 POLES (at 50 Hz)										
	Power [kW]	18.5	22	30	37	45	55	75	90	110	132
	N [rpm]	1500									
	torque [Nm]	118	140	191	236	286	350	477	573	700	840
105	start of pressure regulation [bar]	63	75	103	127	154	189	-	-	-	-
135		-	-	80	98	119	146	199	239	-	-
210		-	-	-	-	-	94	129	154	188	226
280		-	-	-	-	-	-	96	115	140	169

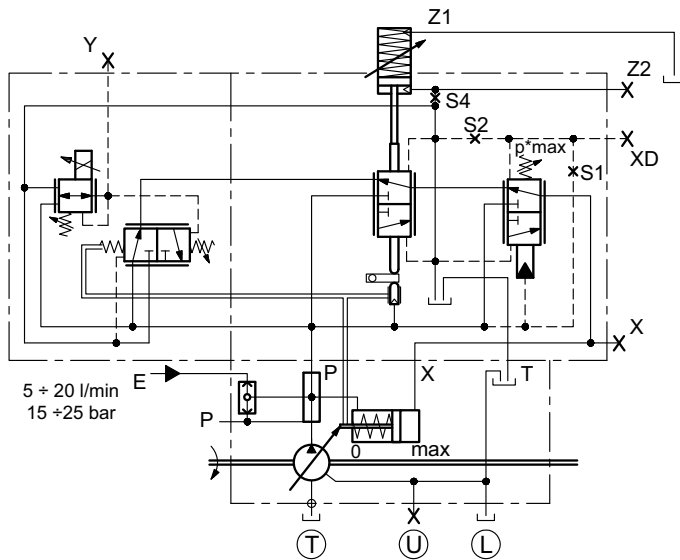
7 - ET6 - ELECTRO-PROPORTIONAL DISPLACEMENT CONTROL WITH POWER LIMITER AND REMOTE PRESSURE CUT-OFF

The ET6 control is available for pumps HPR105, HPR135, HPR210 and HPR280.

It combines a pump displacement regulation proportional to the current supplied to the solenoid with a constant input torque control. The limitation of maximum pressure is also available.

With no current the pump is in null displacement, so it is required a supply pressure on port E (located on the pump body) for the start of the control.

Once the P port is pressurized, then the shuttle valve on the pump excludes the piloting of port E and picks the fluid directly from the pump delivery line.



ET6 FEATURES:

- pressure adjustment range:

ET6 = 230 ÷ 350 (standard)
default setting = 350 bar

ET5 = 125 ÷ 230 (on request)

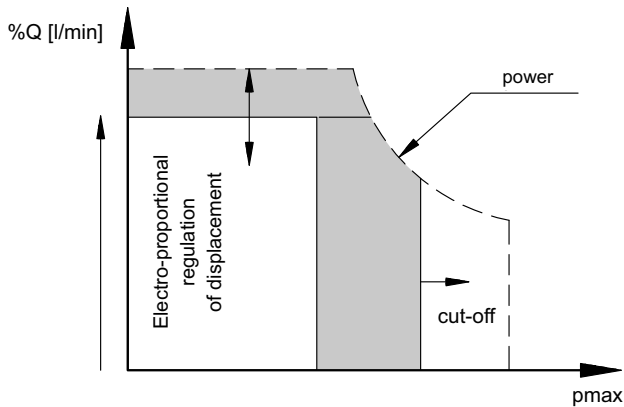
ET7 = 350 ÷ 420 (on request)

- pressure adjustment range for torque regulation:

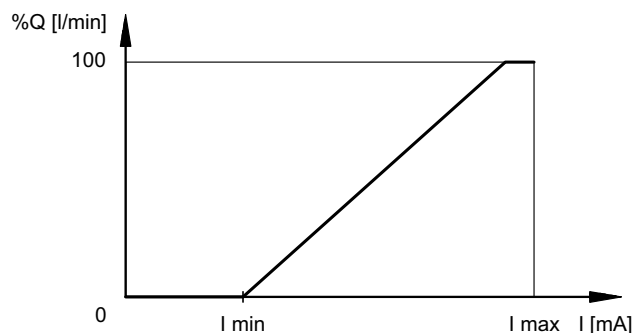
HPR105, HPR135 = 60 ÷ 250 bar

HPR210, HPR280 = 80 ÷ 250 bar

default setting = 250 bar



		D12K2	D24K2
Nominal voltage	V CC	12	24
Coil connection	AMP Junior (2 pin)		
Power consumption	W	15,6	
Nominal current	A	1,2	0,6
Relative duty cycle	100%		
Protection class (EN 60529)	IP 67		



regulation	pump	ET1	ET2
I min	105, 135	464 mA	232 mA
	210	490 mA	245 mA
	280	524 mA	262 mA
I max	ALL	1200 mA	600 mA



8 - PUMPS WITH LP6 CONTROL - OVERALL DIMENSIONS

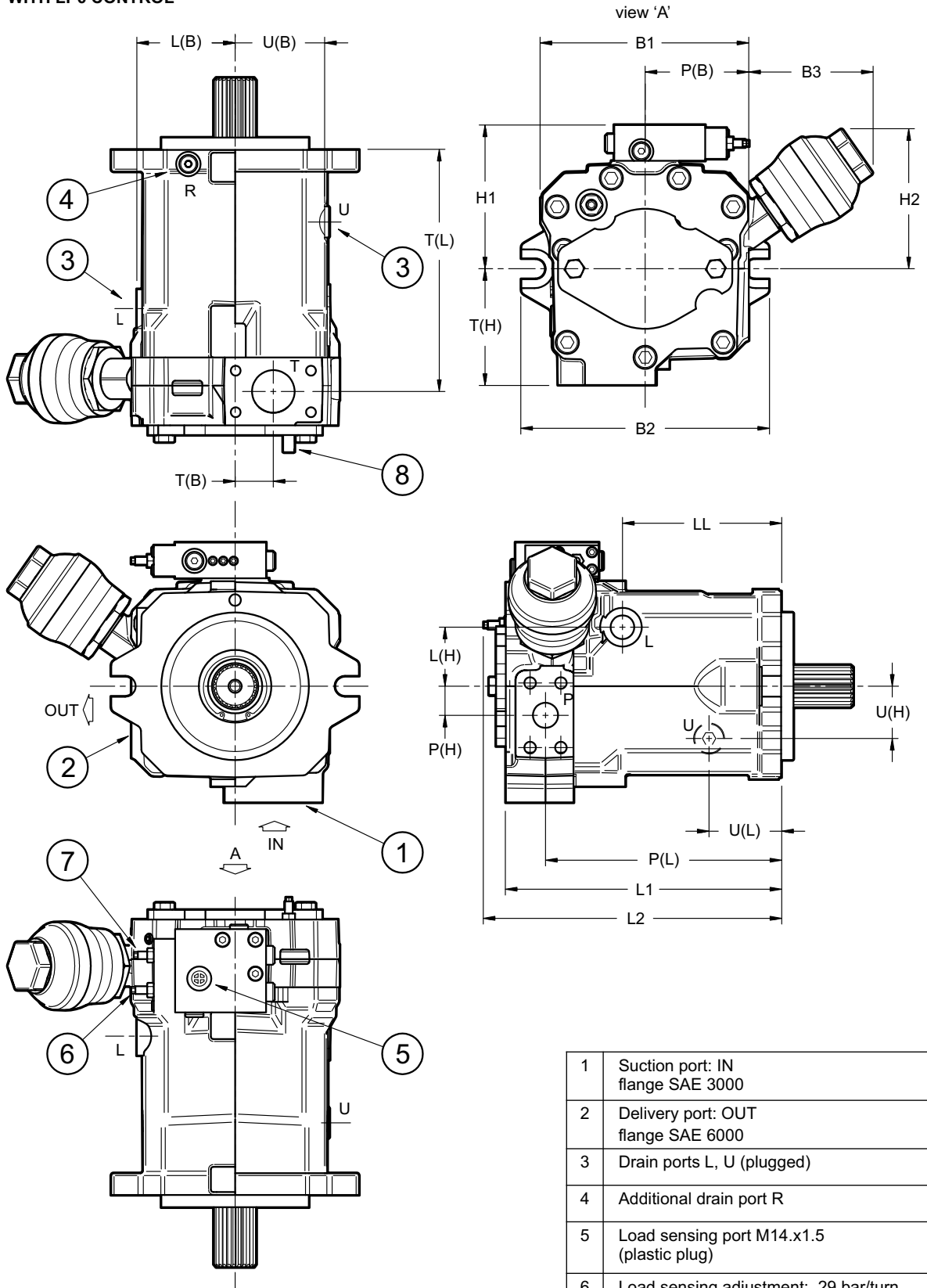
dimensions in mm

PUMP	55	75	105	135	165	210	280
Ø of flange	127		152.4		165.1		
L1	220.3	231.8	262	284.5	333.1	348	403
L2	259.3	270.8	301	323.5	372.1	387	442
H1	137	139	140.5	148.5	165.5	171.5	189
H2	146	146	136	145.5	152.4	143.5	238
B1	11	190.3	199.6	216	251.5	268	306.1
B2	208		207	256	269	268.8	314.5
B3	120	111	122	129	128.9	126.5	125.1

PUMP	55	75	105	135	165	210	280
P delivery (SAE)	3/4"		1"	1 1/4"		1 1/2"	
P (L)	182.8	194.3	218	243.5	283.1	295	344.5
P (H)	23.5		26	30	43	27	46
P (B)	91	90.5	100	107	134.5	134.5	149.5
T suction (SAE)	1 1/2"		2"	2"	2 1/2"	3"	3 1/2"
T (L)	189.8	201.3	227	249.5	285.6	298	344.5
T (H)	94		103.5	120	119	149	167
T (B)	21		25	30	0	57	
L, U drain ports	M22x1.5			M27x2			M33x2
L (L)	112.8	124.3	142	164	180.6	197.5	215.5
L (H)	52		53	61	65	71.5	80.5
L (B)	86.5		85	101.5	108	128	145
U (L)	72		72	74.5	81.1	83	109
U (H)	44		54	54	62	60	68
U (B)	78.5		92.5	92.5	101	118	129.5
R - additional drain port	M14x1.5, 13 deep (NOTE)						

NOTE: If the pump is set vertically with shaft upward then the R port is strictly to be connected. The port R is located on the flange, at side (like U port) or bottom (like suction port) depending on the pump shape.

PUMP WITH LP6 CONTROL



1	Suction port: IN flange SAE 3000
2	Delivery port: OUT flange SAE 6000
3	Drain ports L, U (plugged)
4	Additional drain port R
5	Load sensing port M14.x1.5 (plastic plug)
6	Load sensing adjustment: 29 bar/turn
7	P*max adjustment: 22.8 bar/turn
8	Max displacement limit adjustment see par. 11



9 - SINGLE PUMPS WITH TL2 CONTROL - OVERALL DIMENSIONS

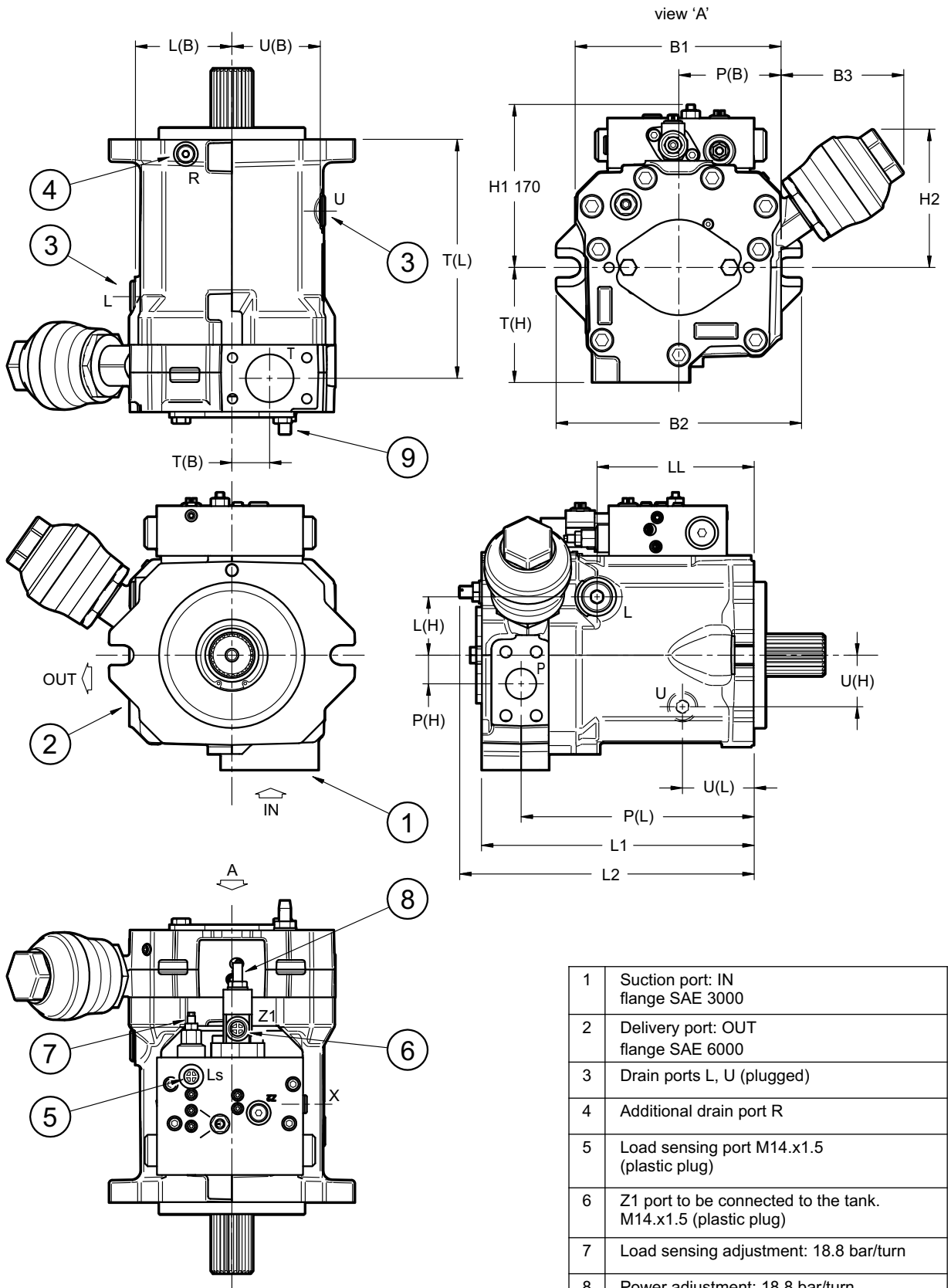
dimensions in mm

PUMP	105	135	210	280
Ø flange	127	152.4	165.1	165.1
L1	262	284.5	348	403
L2	301	323.5	387	442
H1	163	170	193	210.5
H2	134	144	144.3	200.7
H3	104.5	104	135	135
B1	194.5	214.8	266.3	314.5
B2	208	256.5	269	272
B3	118	106.7	102.4	119.5

PUMP	105	135	210	280
P delivery (SAE)	1"	1¼"	1½"	
P (L)	218	243.5	295	344.5
P (H)	26	30	27	46
P (B)	100	107	144.5	154.1
T suction (SAE)	2"	2"	3"	3½"
T (L)	227	249.5	298	344.5
T (H)	104	120	149	167
T (B)	25	39.5	27	44
L, U drain ports	M22x1.5	M27x2	M27x2	M33x2
L (L)	142	164	191	215.5
L (H)	53	61	97.5	80.5
L (B)	92.5	101	128	129.5
U (L)	72	74.5	83	109
U (H)	54	54	60	68
U (B)	85	92	118	159.5
R - additional drain port	M14x1.5 deep 13 (NOTE)			

NOTE: If the pump is set vertically with shaft upward then the R port is strictly to be connected. The port R is located on the flange, at side (like U port) or bottom (like suction port) depending on the pump shape.

PUMP WITH TL2 CONTROL



1	Suction port: IN flange SAE 3000
2	Delivery port: OUT flange SAE 6000
3	Drain ports L, U (plugged)
4	Additional drain port R
5	Load sensing port M14.x1.5 (plastic plug)
6	Z1 port to be connected to the tank. M14.x1.5 (plastic plug)
7	Load sensing adjustment: 18.8 bar/turn
8	Power adjustment: 18.8 bar/turn
9	Max displacement limit adjustment see par. 11



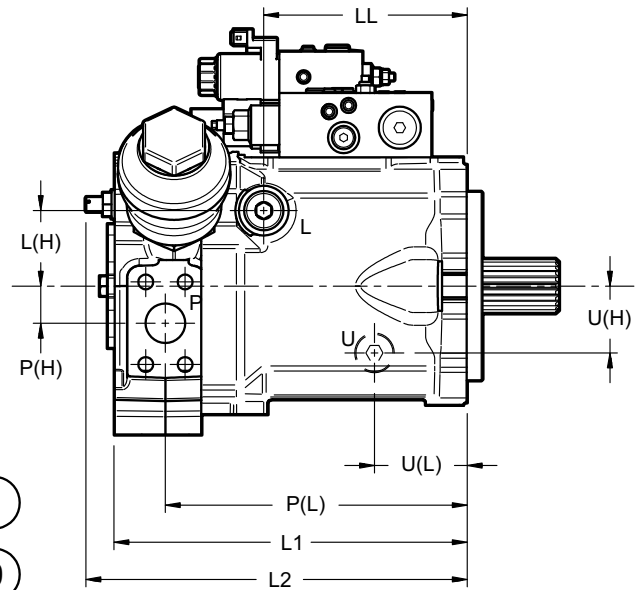
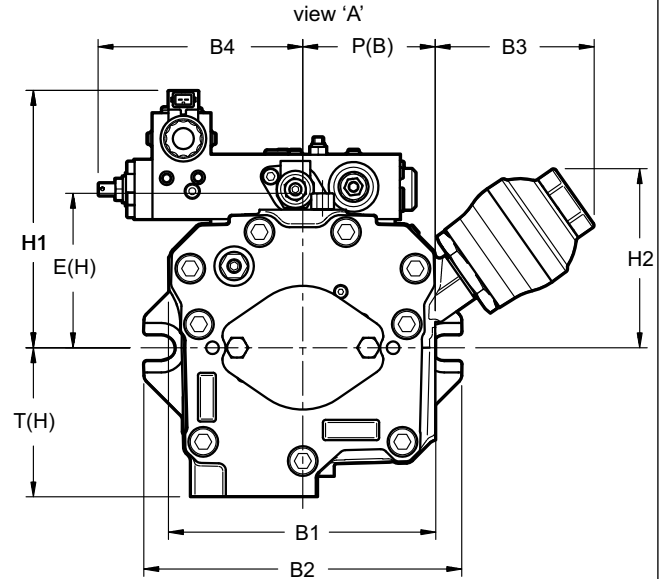
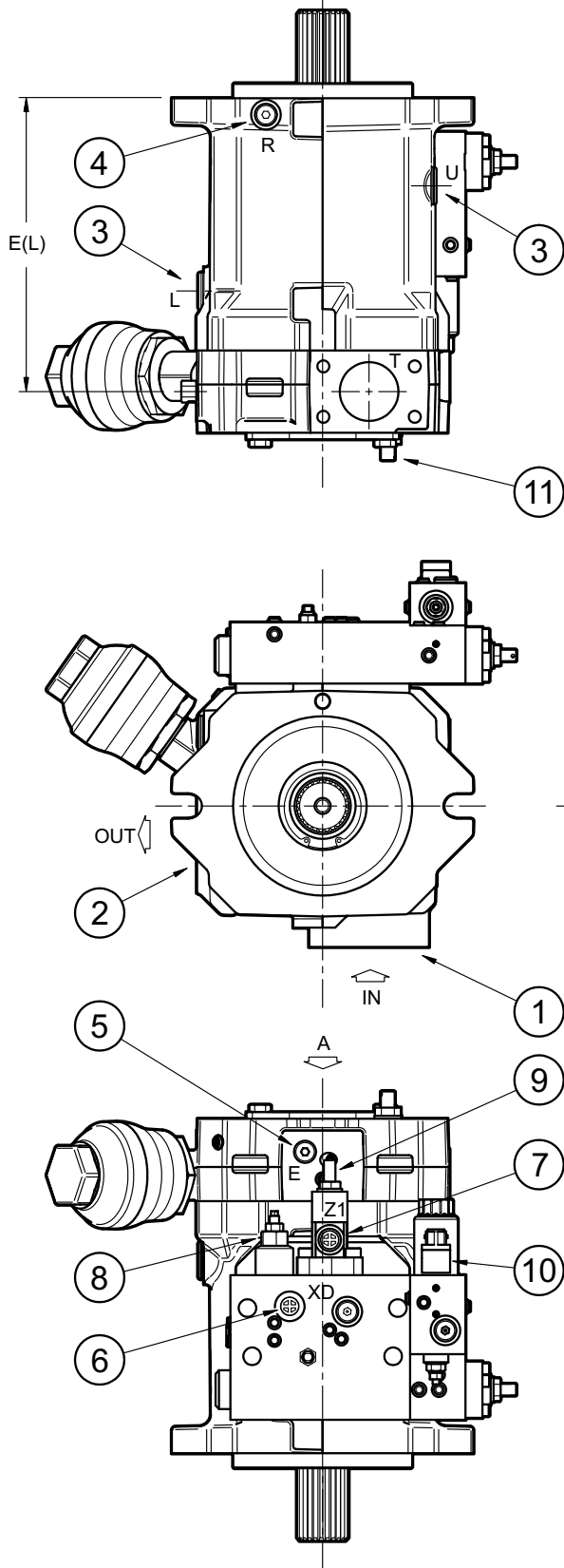
10 - SINGLE PUMPS WITH ET6 CONTROL - OVERALL DIMENSIONS

PUMP	105	135	210	280
Ø flange	127	152.4	165.1	165.1
L1	262	284.5	348	403
L2	301	323.5	387	442
L3	108.9	82.8	138.5	168
H1	200.5	207.5	230.5	248
H2	134	144	144.3	200.7
H3	104.5	104	135	135
B1	194.5	214.8	266.3	314.5
B2	208	256.5	269	272
B3	118	106.7	102.4	119.5
B4	165	165	165	146.5

PUMP	105	135	210	280
P delivery (SAE)	1"	1¼"	1½"	
P (L)	218	243.5	295	344.5
P (H)	26	30	27	46
P (B)	100	107	144.5	154.1
T suction (SAE)	2"	2"	3"	3½"
T (L)	227	249.5	298	344.5
T (H)	104	120	149	167
T (B)	25	39.5	27	44
L, U drain ports	M22x1.5	M27x2	M27x2	M33x2
L (L)	142	164	191	215.5
L (H)	53	61	97.5	80.5
L (B)	92.5	101	128	129.5
U (L)	72	74.5	83	109
U (H)	54	54	60	68
U (B)	85	92	118	159.5
R - additional drain port	M14x1.5 deep 13 (NOTE)			
E - external supply pressure	M14.x1.5			
E (L)	240.8	249.5	303	375
E (H)	135.6	142.6	165.6	183.1
E (B)	15	16	20	20

NOTE: If the pump is set vertically with shaft pointing upward then the R port is strictly to be connected. The port R is located on the flange, at side (like U port) or bottom (like suction port) depending on the pump shape.

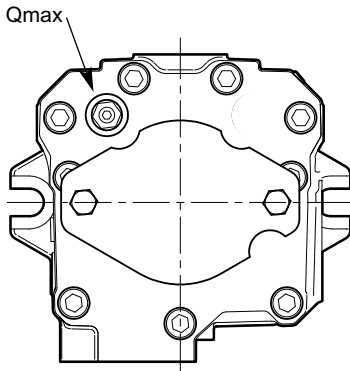
PUMP WITH ET6 CONTROL



1	Suction port IN: flange SAE 3000
2	Delivery port OUT: flange SAE 6000
3	Drain ports L, U (plugged)
4	Additional drain port R
5	External supply pressure E
6	Port XD M14x1.5 to be plugged (plastic plug)
7	Port Z1 M14x1.5 to be connected to tank (plastic plug)
8	Pressure limiter adjustment: 18.8 bar/turn
9	Power adjustment: 18.8 bar/giro
10	Valve for proportional control of displacement AMP Junior connection
11	Max displacement limit adjustment see par. 11

11 - MAXIMUM DISPLACEMENT LIMITATION

The max angle for the swash plate is adjustable. The adjustment screw is placed on pump back. Values for pumps with rotary clockwise.

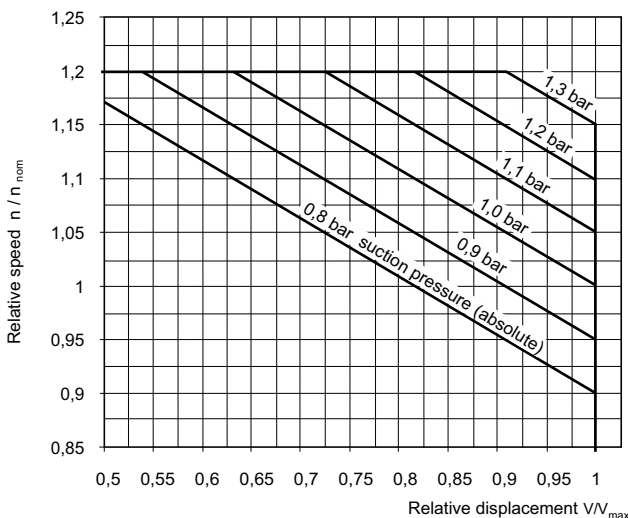


	Q max (cm ³ /turn)	displacement range (cm ³)
55	4.9	35 - 55
75	5.2	50 - 75
105	6.2	75 - 105
135	7	105 - 135
165		135 - 165
210	9.4	165 - 210
280		210 - 280

12 - INSTALLATION AND START-UP

It is recommended to install the pump below the oil level and horizontally as shown. For installations above oil level and / or vertically, contact our technical dept. The maximum allowed input speed is also directly dependent on the suction pressure.

The temperature should not exceed 80 °C in any part of the system.



Suction

- Provide suction/inlet line continuously rising towards the tank.
- Avoid cavitation events providing adequate flooded suction or pressurized inlet should be of adequate supply as to guard against cavitation.
- On designing the suction line attention must be paid to a straight, short conduct largely avoiding bends. If bends are required, the bending radius must be as large as possible. The suction inlet in the hydraulic tank must have as largest section as possible.
- The suction line itself must be installed in such a way that it ends more than ≥ 100 mm above the tank bottom. In order to enlarge the entry diameter of the suction boss in the hydraulic tank, its end must be cut under 45°. The distance between entry and oil surface must be large enough to avoid air suction, recommended ≥ 200 mm.
- Take care of the tightness of the pipe/hose so that air is not drawn in.

Case drain

- Positive venting is vital for the correct operation of the hydraulic system.
- **The pump must be always filled with oil, both at start-up and during stops, also long term stops.**
- All case drain lines must be mounted continuously rising towards the tank. This allows any entrapped air to escape freely from the pump housing.
- **The highest case drain port of the pump housing (ports U, L and R) must be connected separately to the tank.** As a rule drain lines have to be kept separate from the main return line. The drain line has to enter the hydraulic tank below the oil level.
- The dimension must be ample enough that even at low temperatures the return flow pressure of the leak oil will be near zero. The case pressure (build-up) should not rise and stay higher than 2.5 bar(absolute) during operation.

Piping

- Pipe work should be seamless drawn precision steel tube or hoses of suitable pressure rating.
- During installation, attention should be paid to cleanliness. The pipes must be deburred, washed and blown through.
- Scaled or rusted pipes must be scoured and then neutralized - Hoses must be brushed and flushed through when contaminated.

Cleanliness

- Oil tank and installation have to be checked again for cleanliness before the hydraulic medium is added. This procedure has to be performed immediately before pouring takes place. It may even be expedient to flush the entire installation! Make sure that the pressure fluid corresponds to the required grade of cleanliness.

Drive rotation

- **Before starting the engine** make sure that the HPR-02 pump will be driven with the correct direction of rotation. With electric motors, it must be checked that the electrical connections are correct.

Filling pump and circuit:

- The initial filling of the system must be carried out in such a way that all of the air can escape from the high pressure circuit and from the pump housing before the hydraulic units are operated.
- **The suction port and the casing of the HPR-02 are not related to each other.** Before the hydraulic components may be exposed to load, the entire circuit must be filled and vented.

- Manually fill the HPR-02 pump at the most accessible case drain port with filtered oil. Manually fill the high pressure line with filtered oil. Fill the oil tank to the maximum level with filtered oil and fill all motor housings to the maximum level via the most accessible case drain port with filtered oil.

Start-up

- If there is an on/off valve in the suction line, make sure it is completely open before starting the engine.
- Start the electric motor and allow the HPR-02 to rotate for 5 seconds.
- Switch engine off and check fluid level in the tank. Top off if necessary. Before restarting the engine, check the installation for tightness.
- Repeat previous steps at least four more times.
- Start the electric motor, then slowly actuate the pump function to allow the pump to increase to maximum displacement. Leave the function fully actuated for 30 seconds, and then repeat the step three times.

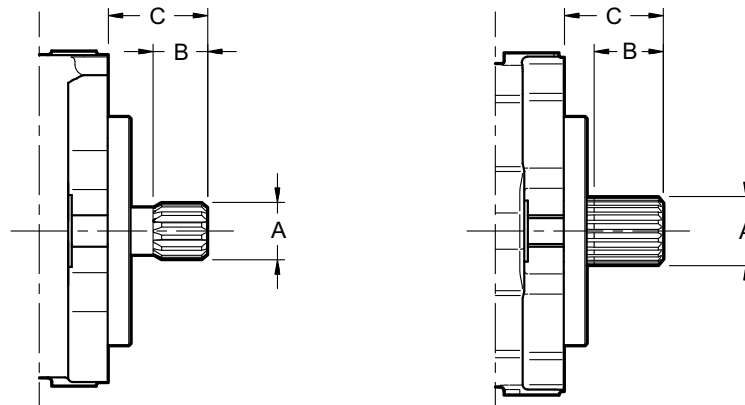
- Warm the system up by steadily increasing the pressure so as to allow any air to be purged from the fluid.
- Check the HPR-02 stand-by pressure, load sense margin pressure, pressure compensator setting (if applicable) and maximum flow setting when the hydraulic oil reaches its normal operating temperature.
- Check the oil level in the tank and refill with filtered oil if necessary before delivery of the machine.

13 - FLANGES AND SHAFTS

13.1 - Mounting flanges and splined shafts available as standard (SAE J774)

PUMP	55	75	105	135	165	210	280
Front mounting flange	SAE C - 2 holes			SAE D - 2 holes (NOTE)		SAE E - 4 holes	
Pilot diameter	127			152,4		165,1	
Shaft	SAE C 14 t 12/24 DP		SAE C-C 17 t 12/24 DP		SAE D 13 t 8/16 DP		SAE F 15t 8/16 DP
	-	21t 16/32	23t 16/32		27t 16/32		-

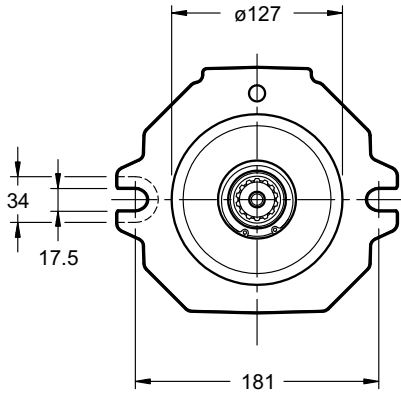
NOTE: HPR165 has also 4 additional holes $\varnothing 17.5$



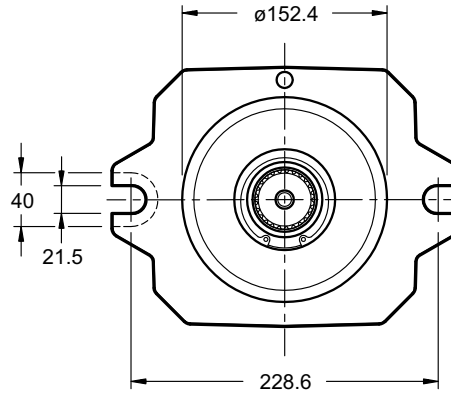
Shaft	SAE-J744 code	Type	A	B	C				
					HPR 55	HPR 75	HPR 105	HPR 135 / 165	HPR 210 / 280
14 T 12/24 DP	SAE C	with undercut	31.22	30	54	55	-	-	-
21t 16/32		no undercut	34.51	39.5					
17 t 12/24 DP	SAE C-C	with undercut	37.68	30	-	-	55	-	-
23t 16/32		no undercut	37.68	38.5					
13 t 8/16 DP	SAE D	with undercut	43.71	50	-	-	-	75	-
27t 16/32		no undercut	44.05	62					
15t 8/16 DP	SAE F	no undercut	50.06	58				-	75

13.2 - Flanges

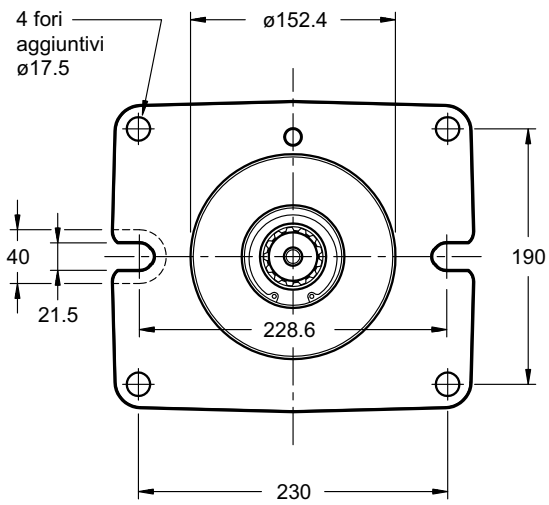
SAE C, 2 holes
for HPR 55, 75, 105



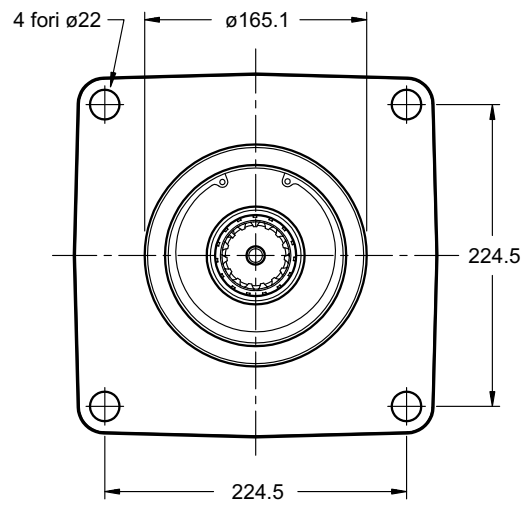
SAE D, 2 holes
for HPR 135



SAE D, 2 + 4 holes
for HPR 165



SAE E - 4 holes
for HPR 210 and 280



PUMP	55	75	105	135	165	210	280
flange thickness near fastening holes (mm)	20				25	26	30

14 - PTO - POWER TAKE OFF

The HPR pumps can be supplied with a power take-off SAE J744 type, which allows coupling with other pumps models. As for identification see par. 1 "Identification code".

SAE A
identification code **A09**

SAE J744 - 2 holes intermediate flange type "A"
coupling for splined shaft
SAE J744 16/32 D.P. - 9T

SAE B
identification code **B13**

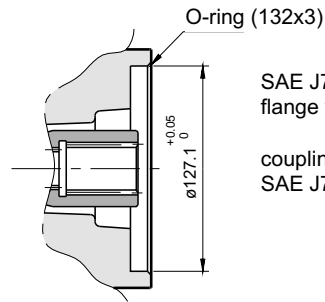
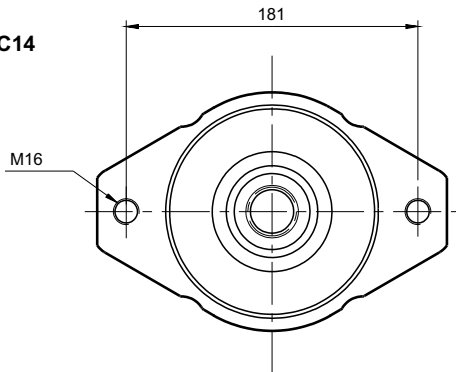
SAE J744 - 2 holes intermediate flange type "B"
coupling for splined shaft
SAE J744 16/32 D.P. - 13T

SAE BB
identification code **B15**

SAE J744 - 2 holes intermediate flange type "B"
coupling for splined shaft
SAE J744 16/32 D.P. - 15T

SAE C

identification code **C14**



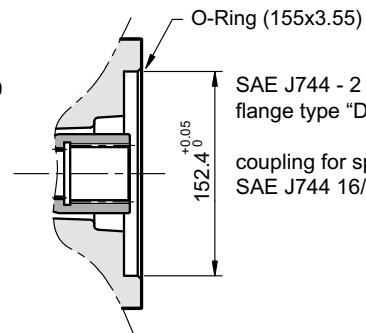
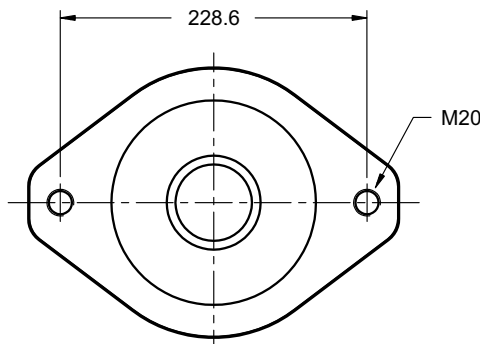
SAE J744 - 2 holes intermediate flange type "C"

coupling for splined shaft
SAE J744 12/24 D.P. - 14T

SAE D

identification code **D27**

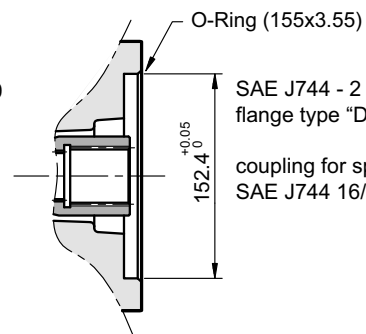
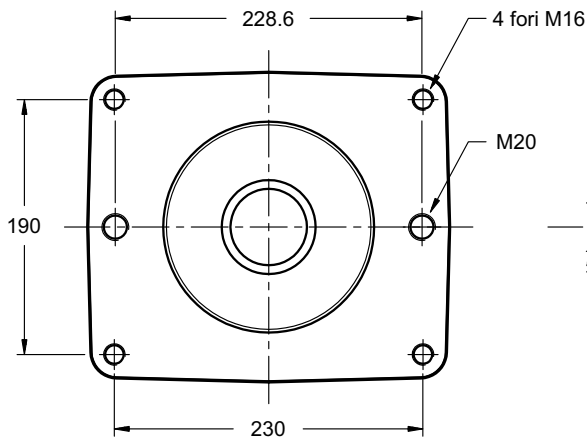
HPR 135



SAE J744 - 2 holes intermediate flange type "D"

coupling for splined shaft
SAE J744 16/32 D.P. - 27T

HPR 165 / 210

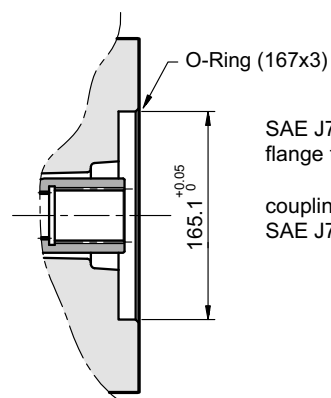
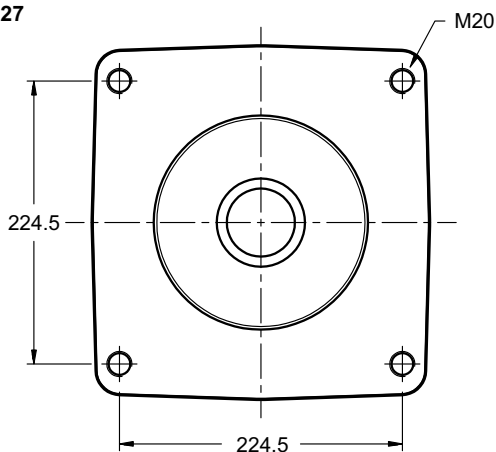


SAE J744 - 2 holes intermediate flange type "D"

coupling for splined shaft
SAE J744 16/32 D.P. - 27T

SAE E

identification code **E27**



SAE J744 - 4 holes intermediate flange type "E"

coupling for splined shaft
SAE J744 16/32 D.P. - 27T

15 - SUCTION AND DELIVERY PORTS DIMENSIONS FOR SAE FLANGE WITH METRIC BOLTS

T - SUCTION (SAE 3000)					
Pump	nominal size	A mm	B mm	C mm	D Threading and depth mm
55, 75	1 ½"	38	69,9	35,7	M12x16
105	2"	50	77,8	42,9	M12x16
135	2"	50	77,8	42,9	M12x17
165	2 ½"	64	88,9	50,8	*M12x21.5
210	3"	76.2	106,4	61,9	M16x28.5
280	3 ½"	90	120,7	69,9	M16x29

P - DELIVERY (SAE 6000)					
Pump	nominal size	A mm	B mm	C mm	D Threading and depth mm
55, 75	¾"	19	50,8	23,5	M10x17
105	1"	21	57,2	27,8	M12x17
135	1 ¼"	32	66,7	31,8	M14x19
165	1 ¼"	32	66,6	31,8	*M12x18.5
210	1 ½"	38.1	79,3	36,5	M16x25.5
280	1 ½"	38.1	79,3	36,5	M16x29

(*) deviation from standard

16 - CONNECTION FLANGES

dimensions in mm
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 SHC screws	2
SAE 3000	0610714	SAE - 1 ½"	210	1 ½" BSP	38	25	45	24	35,7	70	78	94	n° 4 - M12x40	OR 4187 (47.22x3.53)
	0610721	SAE - 2"	210	2" BSP	51	25	45	30	43	77,8	90	102	n° 4 - M12x40	OR 4225 (56.74x3.53)
	0610722	SAE - 2 ½"	172	2 ½" BSP	63	25	50	30	50,8	89	105	116	n° 4 - M12x45	OR 4275 (69,44x3.53)
	0610723	SAE - 3"	138	3" BSP	73	27	50	34	61,9	106,3	124	134	n° 4 - M16x55	OR 4337 (85.32x3.53)
	0610724	SAE - 3 ½"	34	3 ½" BSP	89	27	48	34	69,8	120,6	136	152	n° 4 - M16x55	OR 4387 (98,02x3.53)
SAE 6000	0770075	SAE - ¾"	420	¾" BSP	19	21	35	22	23,8	50,8	55	71	n° 4 - M10x35	OR 4100 (24.99x3.53)
	0770092	SAE - 1"	420	1" BSP	25	25	42	24	27,7	57,1	65	81	n° 4 - M12x40	OR 4131 (32.93x3.53)
	0770106	SAE - 1 ¼"	420	1 ¼" BSP	32	27	45	25	31,7	66,7	78	95	n° 4 - M14x45	OR 4150 (37.69x3.53)
	0773462	SAE - 1 ½"	420	1 ½" BSP	38	30	48	26	36,5	79,3	94	112	n° 4 - M16x55	OR 4187 (47.22x3.53)



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