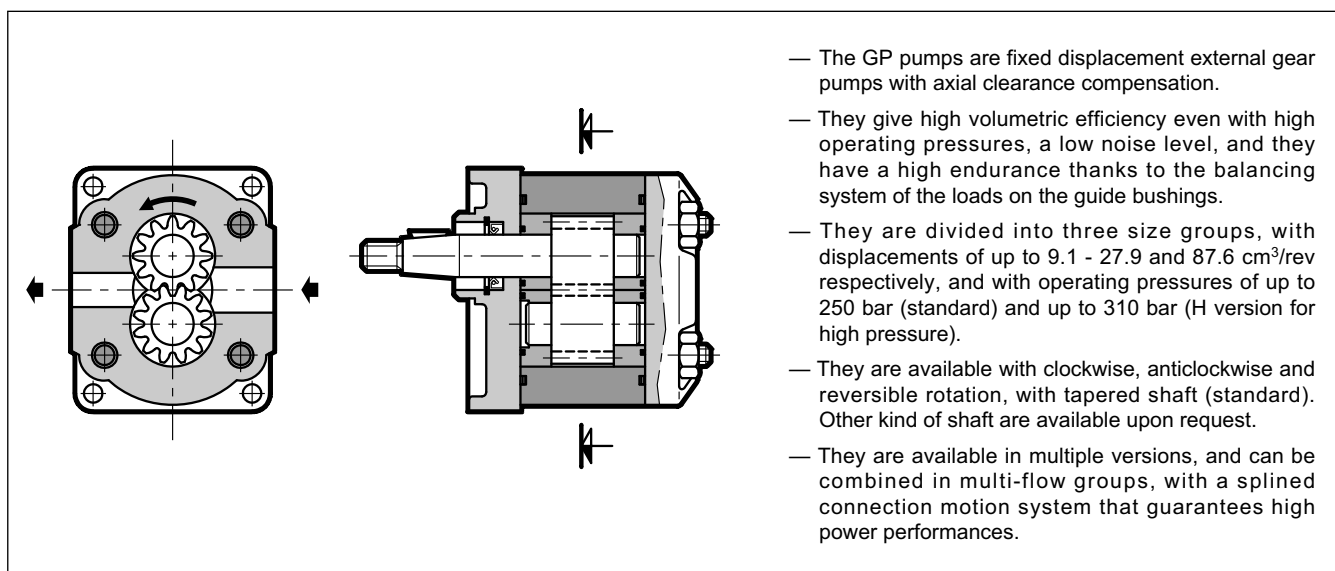


# GP

## EXTERNAL GEAR PUMPS

### SERIES 20

#### OPERATING PRINCIPLE

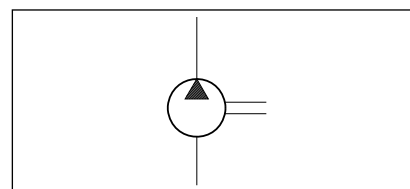


#### TECHNICAL SPECIFICATIONS

GP PUMP SIZE		GP1	GP2	GP3
Displacement range	cm <sup>3</sup> /rev	1.3 ÷ 9.1	7 ÷ 27.9	20.7 ÷ 87.6
Flow rate and operating pressures		see table 3 - Performances		
Rotation speed		see table 3 - Performances		
Rotation direction		clockwise, anticlockwise or reversible (seen from the shaft side)		
Loads on the shaft		radial and axial load are not allowed		
Max torque applicable to the shaft		see paragraph 14.1		
Hydraulic connection		flanged fittings (see paragraph 16)		
Type of mounting		4-holes flange - rectangular type		
Mass: standard version H version	kg	1.2 ÷ 1.6 1.9 ÷ 2.3	2.6 ÷ 3.5 3.8 ÷ 4.7	6 ÷ 8.5 8.7 ÷ 11.2

Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-15 / +80
Fluid viscosity range	see paragraph 2.2	
Fluid contamination degree	see paragraph 2.3	
Recommended viscosity	cSt	25 ÷ 100

#### HYDRAULIC SYMBOL



## 1 - IDENTIFICATION CODE

### 1.1 - Identification code for single and front pumps

<b>G</b>	<b>P</b>			<b>-</b>						<b>/</b>	<b>20</b>	<b>N</b>	
----------	----------	--	--	----------	--	--	--	--	--	----------	-----------	----------	--

External gear pump \_\_\_\_\_

Pump size: \_\_\_\_\_  
**1** = from 1.3 to 9.1 cm<sup>3</sup>/rev  
**2** = from 7.0 to 27.9 cm<sup>3</sup>/rev  
**3** = from 20.7 to 87.6 cm<sup>3</sup>/rev

Omit for single pumps (**standard**) \_\_\_\_\_  
**F** = only for front pump to be coupled

Nominal size \_\_\_\_\_  
 (see table 3 - Performances)

Direction of rotation (seen from the shaft side) \_\_\_\_\_  
**R** = clockwise (**standard**)  
**L** = anticlockwise  
**D** = reversible (option available for single pumps only)

Mounting flange \_\_\_\_\_  
**9** = 4-holes - rectangular type (**standard**)  
**0** = SAE J744 - 2 holes

**H** = version for high pressure.  
 Omit for standard pressure.

NBR seals for mineral oils

Series No.  
 (from 20 to 29 sizes and mounting dimensions remain unchanged)

Hydraulic connection  
**F** = flanged ports (**standard**)  
**B** = BSP threaded ports  
**U** = UNF threaded ports

Shaft end type - see **NOTE 1**  
**7** = tapered keyed with thread (**standard**)  
**5** = cylindrical keyed  
 (available for single pumps only)  
**0** = cylindrical keyed SAE-J744  
**1** = splined SAE-J744

**NOTE 1:** See at table 1.4 compatibility among mounting flange, type of shaft and type of hydraulic connection.

### 1.2 - Identification code for intermediate and rear pumps

<b>G</b>	<b>P</b>			<b>-</b>						<b>/</b>	<b>20</b>	<b>N</b>	
----------	----------	--	--	----------	--	--	--	--	--	----------	-----------	----------	--

External gear pump \_\_\_\_\_

Pump size: \_\_\_\_\_  
**1** = from 1.3 to 9.1 cm<sup>3</sup>/rev  
**2** = from 7.0 to 27.9 cm<sup>3</sup>/rev  
**3** = from 20.7 to 87.6 cm<sup>3</sup>/rev

Pump position: \_\_\_\_\_  
**M** = intermediate  
**R** = rear

Nominal size \_\_\_\_\_  
 (see table 3 - Performances)

Direction of rotation (seen from the shaft side) \_\_\_\_\_  
**R** = clockwise (**standard**)  
**L** = anticlockwise

**H** = version for high pressure.  
 Omit for standard pressure.

NBR seals for mineral oils

Series No.  
 (from 20 to 29 sizes and mounting dimensions remain unchanged)

Hydraulic connection  
**F** = flanged ports (**standard**)  
**B** = BSP threaded ports  
**U** = UNF threaded ports

**NOTE 2:** Front, intermediate and rear pumps for multiple groups are supplied without mating joint, which must be ordered separately (see paragraph 1.5). To order a group of one or more pumps completely assembled see paragraph 1.3.

### 1.3 - Identification code for multiple pumps

identification code front pump      +      identification code intermediate pump (omit for double pumps)      +      identification code rear pump

### 1.4 - Compatibility among mounting flange, type of shaft and type of hydraulic connection

FLANGE CODE	SHAFT CODE				HYDRAULIC CONNECTION CODE		
	7	5	0	1	F	B	U
9	yes	yes	no	no	yes	yes	no
0	no	no	yes	yes	yes	no	yes

### 1.5 - Identification code for mating joints

FIRST PUMP	SECOND PUMP		
	GP1	GP2	GP3
GP1	3101100003	-	-
GP2	3101100004	3101100005	-
GP3	3101100006	3101100007	3101100008

### 1.6 - Examples

a) single pump size 1 - 1.3 cm<sup>3</sup>/rev - anticlockwise rotation - standard flange and shaft

**GP1-0013L97F/20N**

b) single pump size 2 - 14 cm<sup>3</sup>/rev - clockwise rotation - standard flange and shaft

**GP2-0140R97F/20N**

c) single pump size 3 - 22.5 cm<sup>3</sup>/rev - clockwise rotation - SAE flange and shaft

**GP3-0225R01F/20N**

d) double pump made of:

- pump size 2 - 7 cm<sup>3</sup>/rev - clockwise rotation
- pump size 1 - 2 cm<sup>3</sup>/rev - high pressure

**GP2F-0070R97F/20N + GP1R-0020RF/20NH**

e) triple pump made of:

- pump size 3 - 22.5 cm<sup>3</sup>/rev
- pump size 2 - 14 cm<sup>3</sup>/rev
- pump size 1 - 2 cm<sup>3</sup>/rev

**GP3F-0225R97F/20N + GP2M-0140RF/20N + GP1R-0020RF/20N**

## 2 - HYDRAULIC FLUID

### 2.1 Type of fluid

Use mineral oil based hydraulic fluids with anti-foam and antioxidant additives, in conformity with the requisites of the following standards:

- FZG test - 11<sup>th</sup> stage
- DIN 51525
- VDMA 24317

For use with other types of fluid (water glycol, phosphate esters and others), consult our technical dept. Operation with fluid at a temperature greater than 80°C causes a premature deterioration of the fluid quality and of the seals. The physical and chemical properties of the fluid must be maintained.

### 2.2 - Fluid viscosity

The operating fluid viscosity must be within the following range:

minimum viscosity	12 cSt	referred to the maximum fluid temperature of 80 °C
optimum viscosity	25 + 100 cSt	referred to the operating temperature of the fluid in the tank
maximum viscosity	1600 cSt	limited to only the start-up phase of the pump

### 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.

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 in paragraph 13.

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

### 3 - PERFORMANCE RATINGS

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

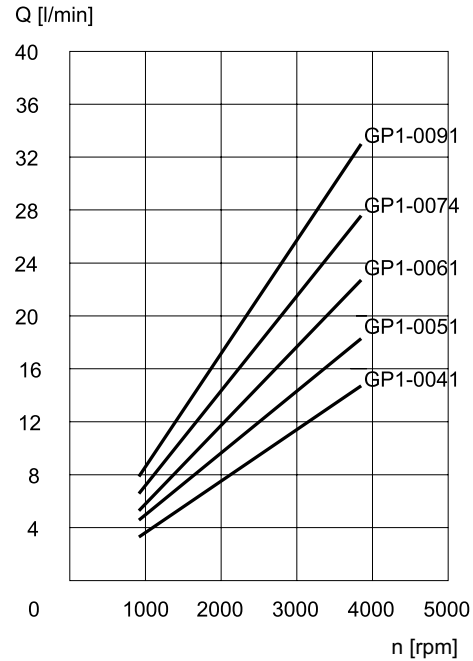
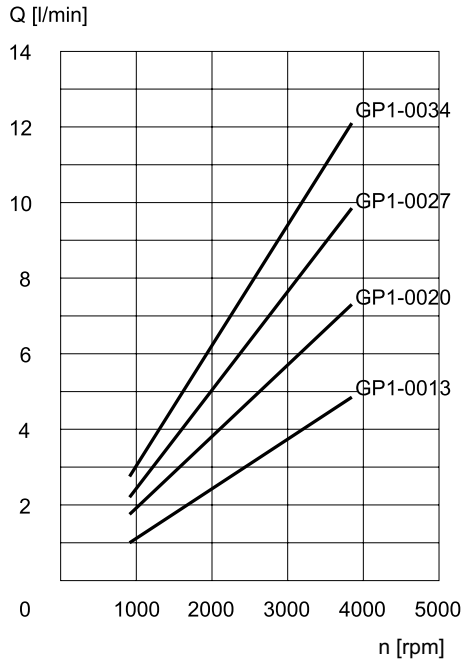
Values in brackets refer to the version **H**, for high pressure. The max pressure values for reversible high pressure pumps (rotation type **D**) must be reduced by 15%.

PUMP SIZE	NOMINAL SIZE	DISPLACEMENT [cm³/rev]	MAX FLOW RATE at 1500 rpm [l/min]	MAX PRESSURE at 1500 rpm [bar]		SPEED [rpm]		
				continuous operating	peak	max flange = 9	max flange = 0	min
GP1	0013	1.3	2.0	250 (270)	290 (310)	6000	6000	800
	0020	2.0	3.0					
	0027	2.7	4.0					
	0034	3.4	5.1					
	0041	4.1	6.1	230 (260)	260 (290)	4000	4000	
	0051	5.1	7.6			4000	3500	
	0061	6.1	9.1			3800	3000	
	0074	7.4	11.1			200 (230)	230 (290)	3200
	0091	9.1	13.6	180 (210)	210 (240)	2600	3000	600
GP2	0070	7.0	10.5	250 (280)	290 (310)	4000	4000	600
	0095	9.5	14.2			3000		
	0113	11.3	16.9	230 (280)	270 (310)	4000	4000	
	0140	14.0	21.0	230 (260)	270 (300)		3200	
	0158	15.8	23.7	210 (260)	240 (290)	3600	3800	500
	0178	17.8	26.7				2500	
	0208	20.8	31.2	180 (230)	210 (260)	3200	2200	
	0234	23.4	35.1			3000	2000	
	0279	27.9	41.8	170 (200)	200 (230)	2500	1800	
GP3	0207	20.7	31.0	230 (280)	270 (310)	3500	3500	500
	0225	22.5	33.7					
	0264	26.4	39.6					
	0337	33.7	50.5	230 (270)	270 (300)	3000	3300	
	0394	39.4	59.1	220 (260)	260 (290)		3000	
	0427	42.7	64.0	210 (250)	250 (280)	2800	2800	
	0514	51.4	77.1	200 (230)	240 (260)	2400	2500	
	0600	60.0	90.0	190 (210)	220 (240)	2800	2800	
	0696	69.6	104.4	170 (200)	200 (230)	2500	2500	
	0776	77.6	116.4	160 (180)	190 (210)	2300	2300	
	0876	87.6	131.4	140 (160)	170 (190)	2000	2000	400

## 4 - CURVES AND CHARACTERISTIC DATA OF GROUP GP1 PUMPS

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

### 4.1 - Flow rate curves $Q = f(n)$ obtained with operating pressure 0 bar



### 4.2 - Efficiencies

PUMP NOMINAL SIZE	VOLUMETRIC EFFICIENCY [%]	TOTAL EFFICIENCY [%]
0013	0.90	0.82
0020	0.90	0.85
0027	0.95	0.90
0034	0.91	0.87
0041	0.94	0.90
0051	0.96	0.92
0061	0.96	0.92
0074	0.96	0.90
0091	0.96	0.88

The volumetric and total efficiencies for the various nominal dimensions of the Group GP1 pumps, measured at 1500 rpm and with 150 bar operating pressure, are shown in the table.

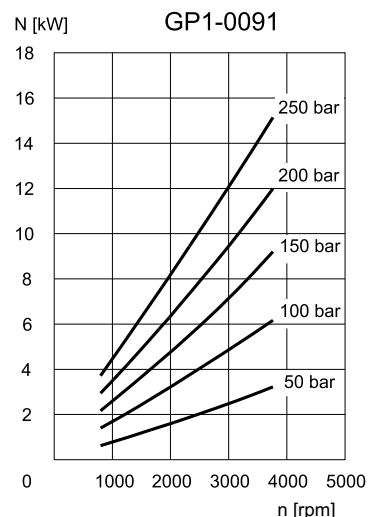
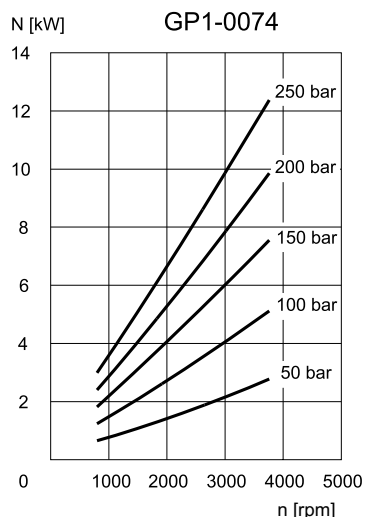
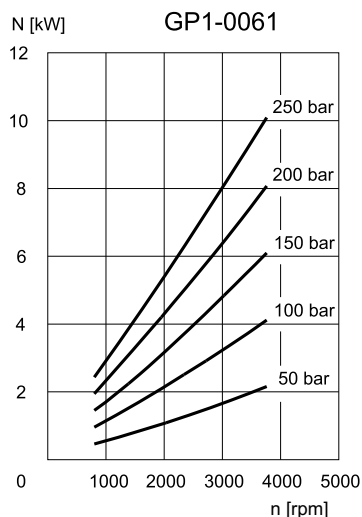
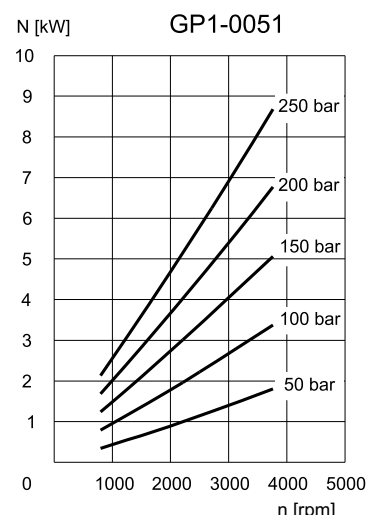
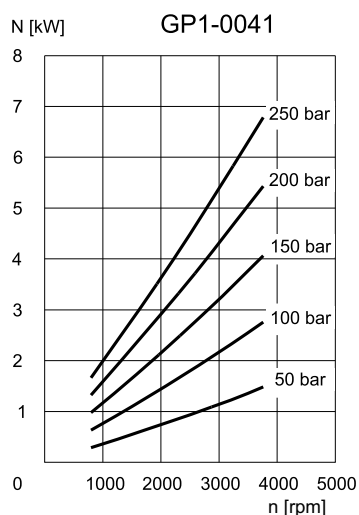
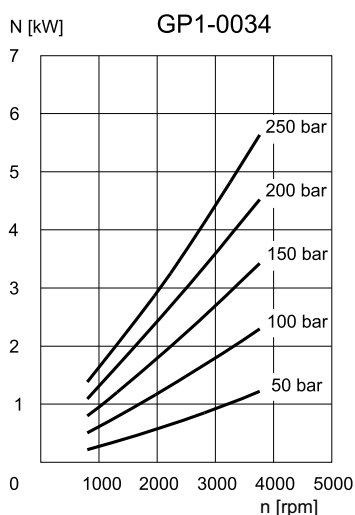
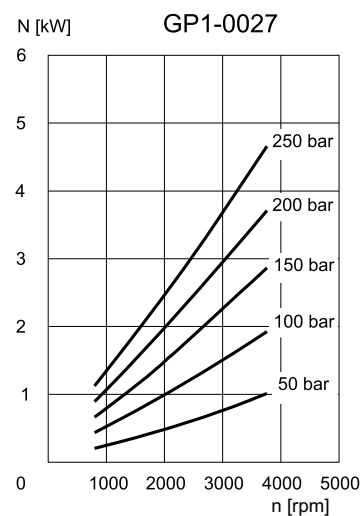
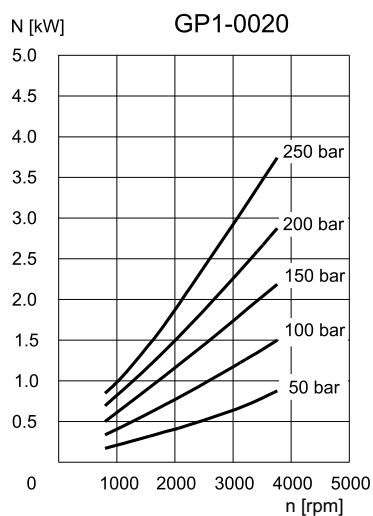
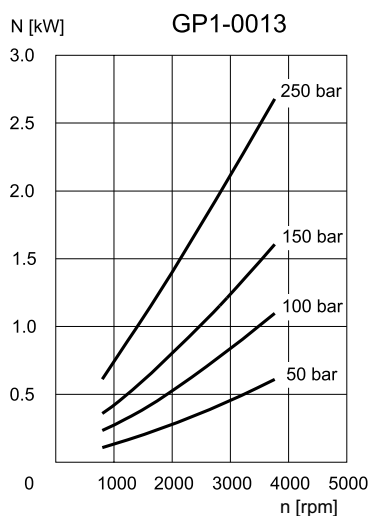
The total efficiency considers the volumetric efficiency and the mechanical efficiency of the pump in the specified operating conditions.

### 4.3 - Noise level

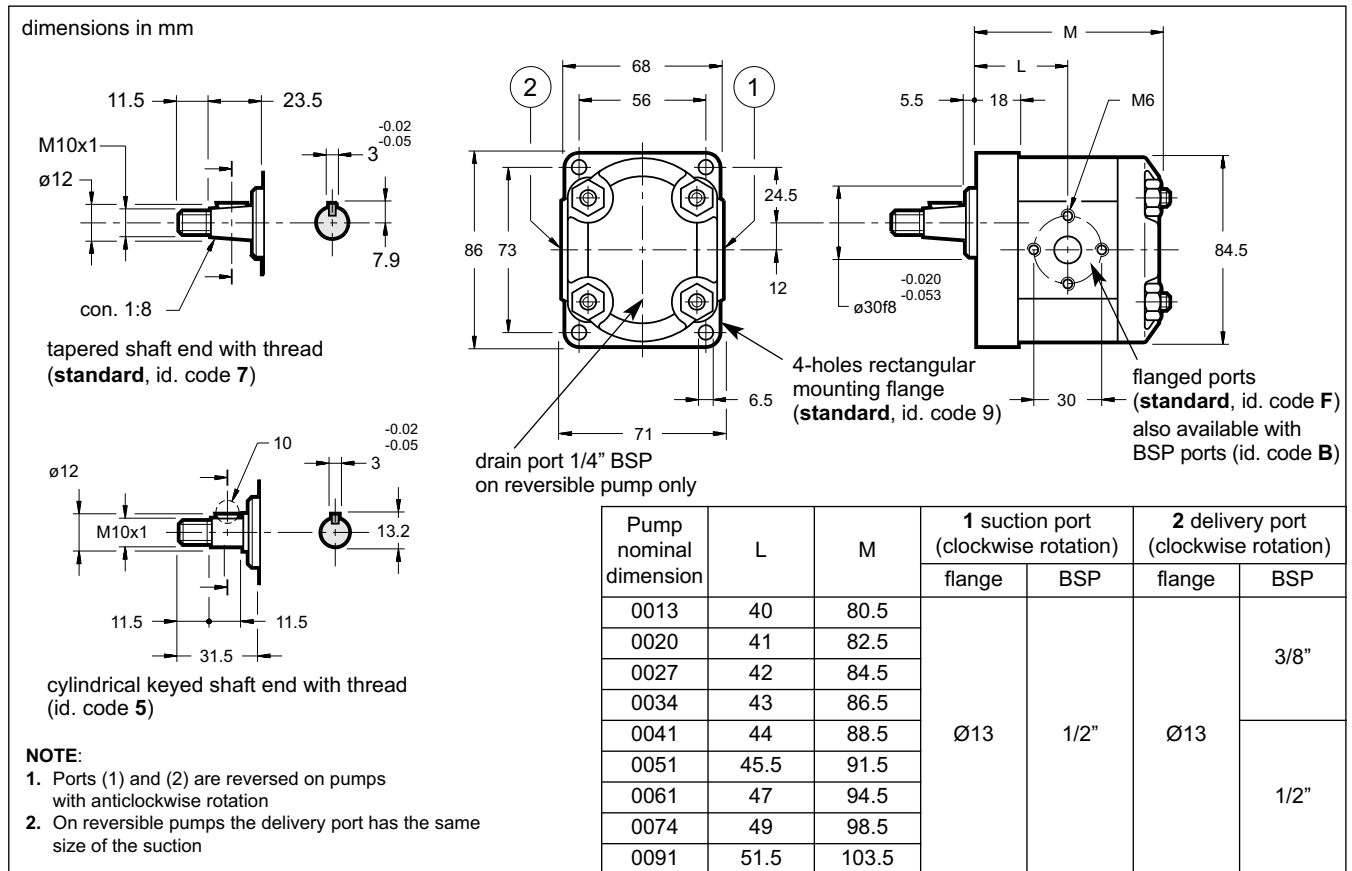
PUMP NOMINAL SIZE	NOISE LEVEL [dB (A)]
0013	65
0020	66
0027	68
0034	68
0041	70
0051	73
0061	73
0074	73
0091	77

The noise levels for the various nominal dimensions of the Group GP1 pumps, measured at 1500 rpm, with 150 bar operating pressure and measured at a distance of 1 metre from the pump, are shown in the table.

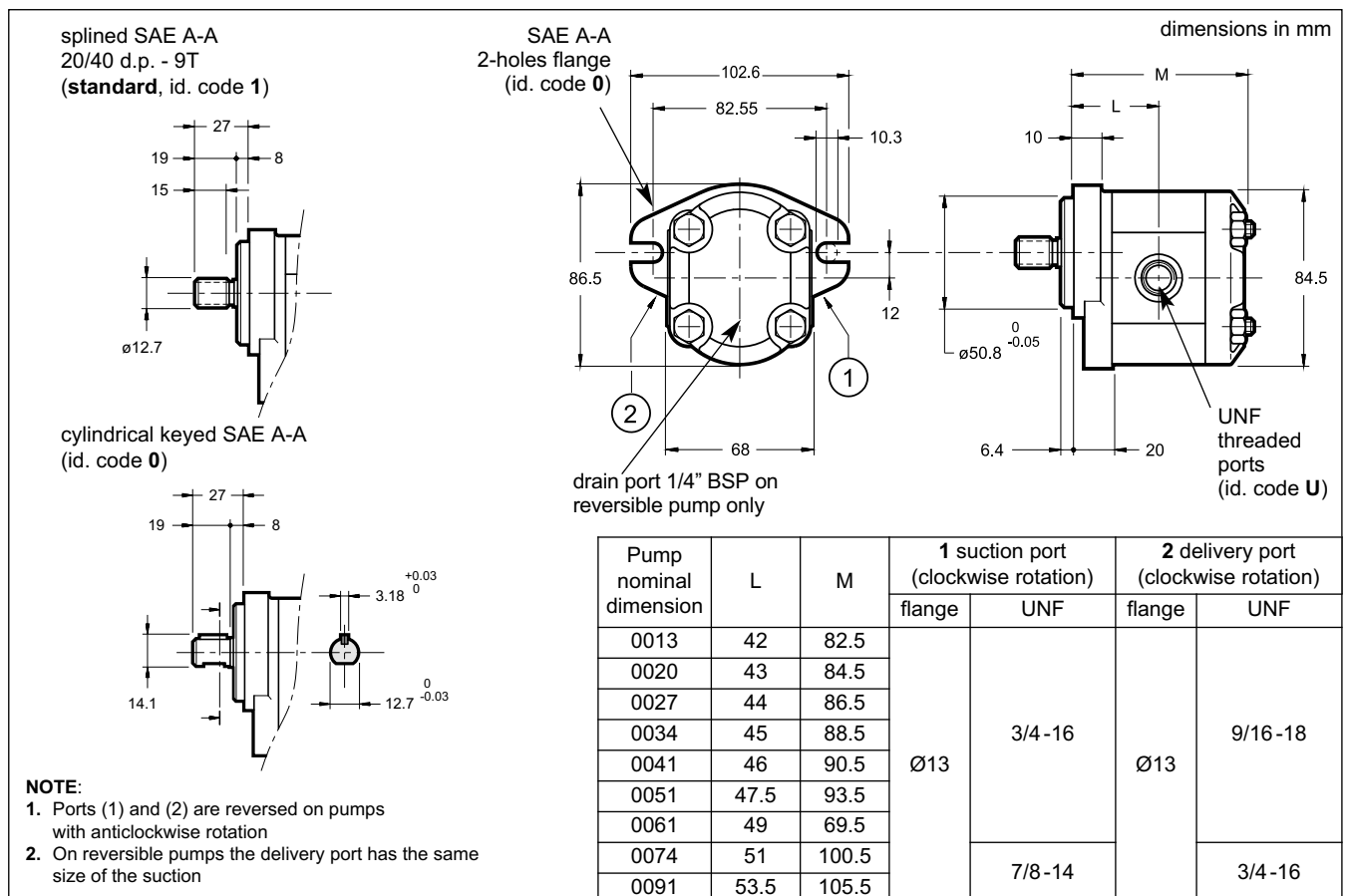
### 4.4 - Absorbed power curves $N = f(n)$ , obtained with operating pressures from 50 to 250 bar



# **7 - GP1 PUMPS WITH STANDARD FLANGE - OVERALL AND MOUNTING DIMENSIONS**



# **8 - GP1 PUMPS WITH SAE FLANGE - OVERALL AND MOUNTING DIMENSIONS**



### 13 - INSTALLATION

- The GP gear pumps can be installed with shaft oriented in any position.
- Check that the rotation direction of the motor corresponds to the direction of the arrow marked on the pump before commissioning.
- Before the first start up vent the air from the delivery port.
- 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 passage of the fluid. Bends and restrictions or an excessive length of the pipeline can affect the correct operation of the pump. It is advisable not to exceed the speed of 1 ÷ 2 m/sec in suction hose.
- The minimum permissible suction pressure is -0.3 bar relative. Standard pumps cannot work with pressure at suction port, except reversible pumps, which are able to withstand pressurized inlet
- Gear pumps must not operate with a rotation speed lower than the minimum rotation speed indicated in table 3 - performance. **The pumps must be filled with the same operating fluid as the circuit before being installed.** Filling can be done through the ports connections. Rotate the pump manually if needed.
- The motor-pump connection must be carried out directly with a flexible coupling able to compensate any offsets. Couplings that generate axial or radial loads on the pump shaft are not allowed.
- The drain port of the reversible pumps must always be connected to the tank. Maximum permitted pressure rise is 6 bar

### 14 - MULTIPLE PUMPS

It's possible to create multi-flow groups with independent hydraulic circuits coupling several pumps together. While sizing multiple pumps the following conditions must be taken into account:

- Assembly can take place between pumps of the same group, or in decreasing order of size.
- The max. rotation speed is determined by the pump with the lowest speed.
- The values of the max. applicable torque can not be exceeded.

#### 14.1 - Maximum applicable torque

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

$$M = \frac{9550 \cdot N}{n} = [\text{Nm}] \quad n = \text{rotation speed [rpm]}$$

where the absorbed power (N) is given by:

$$N = \frac{Q \cdot \Delta p}{600 \cdot \eta_{\text{tot}}} = [\text{kW}] \quad \begin{aligned} Q &= \text{flow rate [l/min]} \\ \Delta p &= \text{differential pressure between the pump suction and delivery [bar]} \\ \eta_{\text{tot}} &= \text{total efficiency (see diagrams in par. 4.2 - 5.2 - 6.2).} \end{aligned}$$

or it can be obtained from the diagrams ABSORBED POWER (see paragraphs 4.4 - 5.4 - 6.4).

If several pumps are coupled, the torque of each single pump has to be added to the torque of subsequent pumps when they are loaded simultaneously.

The obtained torque value for each pump has to be lower than the value specified in the table below.

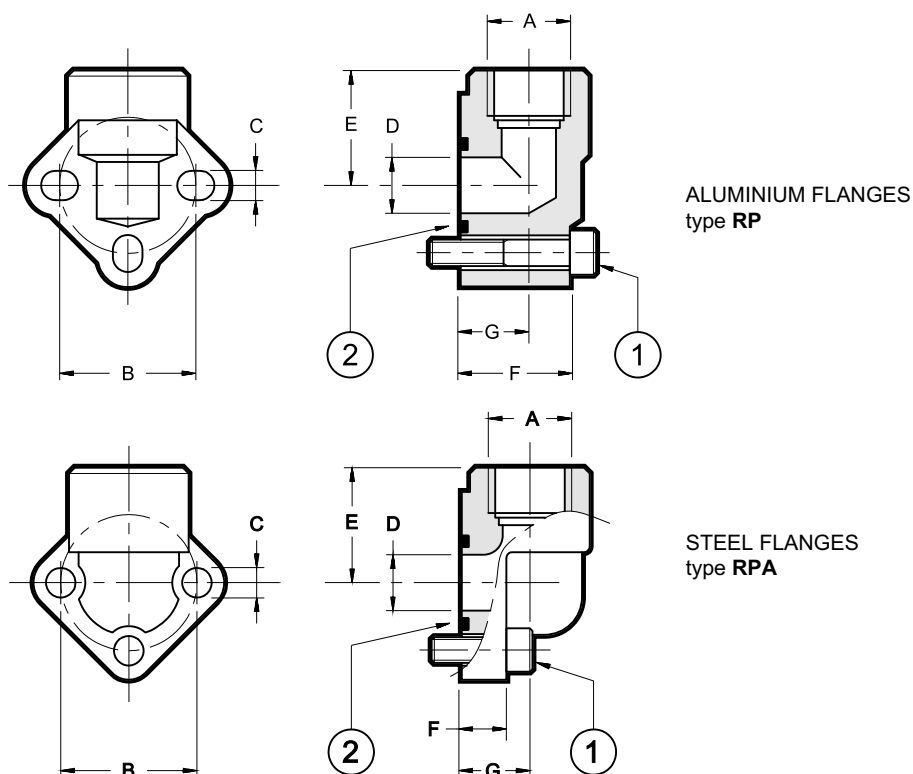
If the obtained torque values are higher than those stated in the table, reduce the working pressure value or replace the overloaded pump with a pump suitable to bear the required torque.

	MAX APPLICABLE TORQUE [Nm]					
	Front pump shaft type			Intermediate / rear pump		
front pump size	tapered, keyed code 7	SAE J744 splined code 1	SAE J744 cylindrical keyed code 0	GP1	GP2	GP3
GP1	90	55	55	50	-	-
GP2	145	110	105		110	-
GP3	280	405	295			230



**16 - CONNECTION FLANGES**

dimensions in mm


**ALUMINIUM FLANGES TYPE RP**

Fastening bolt and O-rings included

	Flange code	Flange description	$p_{max}$ [bar]	ØA	B	C	ØD	E	F	G	(1) SHC bolts	(2) seals
<b>GP1</b>	0610506	RP1 - 38	180	3/8" BSP	30	6.5	12.5	30	26	18	n°3 - M6x35	OR 121 (15.88x2.62)
	0610248	RP1 - 12		1/2" BSP	30	6.5	12.5	30	26	18		
<b>GP2</b>	0610508	RP2 - 12		1/2" BSP	40	8.5	18.5	40	31	20	n°3 - M8x45	OR 130 (22.22x2.62)
	0610249	RP2 - 34		3/4" BSP	40	8.5	18.5	40	31	20		
<b>GP3</b>	0610717	RP3 - 34		3/4" BSP	51	10.5	25	46	43	26	n°3 - M10x60	OR 4118 (29.75x3.53)
	0610250	RP3 - 100		1" BSP	56	10.5	25	46	43	26		

**STEEL FLANGES TYPE RPA**

	Flange code	Flange description	$p_{max}$ [bar]	ØA	B	C	ØD	E	F	G	(1) SHC bolts	(2) seals
<b>GP1</b>	0771048	RPA1 - 38	315	3/8" BSP	30	6.5	12	24	17	9.5	n°3 - M6x20	OR 121 (15.88x2.62)
	0771049	RPA1 - 12		1/2" BSP	30	6.5	12	24	17	9.5		
<b>GP2</b>	0771050	RPA2 - 12		1/2" BSP	40	8.5	20	36	22	11.5	n°3 - M8x25	OR 132 (23.81x2.62)
	0770615	RPA2 - 34		3/4" BSP	40	8.5	20	36	22	11.5		
<b>GP3</b>	0771051	RPA3 - 34A		3/4" BSP	51	10.5	24	46	26	13	n°3 - M10x30	OR 3125 (31.42x2.62)
	0770617	RPA3 - 100A		1" BSP	51	10.5	24	46	26	13		
	0770618	RPA3 - 34B		3/4" BSP	56	10.5	24	46	26	13		
	0770619	RPA3 - 100B		1" BSP	56	10.5	24	46	26	13		
	0771052	RPA35 - 114A		1" 1/4 BSP	62	13	31	55	35	17	n°3 - M10x35	