



**Positive
displacement
rotary gear pumps**

R

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Generalities

◆ Description ◆

The R series pumps are positive displacement internal gear rotary pumps with continuous flow. The creation and annulment of the volumes are made by the rotation of two cogwheels which have a design specially studied for this job. This solution grants simplicity of construction and a wide versatility of performances on pumping fluids of almost any viscosity. Furthermore, with the same pump it's possible to work with fluids of very low viscosity or up to 100.000 cSt by just changing the axial position of the rotor. The number of the teeth of the rotor is different from the one of the idler. These numbers are not multiples, hereby making the wear and tear of the two wheels uniformly distributed. This is because every tooth combines itself with all the ones of the other wheel.

The flow generated by the moving of the volumes is a function of the displacement and the RPM. The displacement is the volumetric movement created by rotating the shaft of 360°. The changing of the RPM allows the flow to change linearly up to a limit, given by the internal friction of the machine and by the viscosity of the fluid.



◆ Advantages ◆

The particular configurations of the parts of the pump grant several advantages:

- a. **Total reversibility** of the way of rotation. The performance of the pump is exactly the same whether the shaft is rotating in one way or the opposite. Only the presence of the safety by-pass valve can determine the direction of rotation, because it is unidirectional. However, most of the models can be equipped with a double by-pass valve to avoid this problem.
- b. **Facility of working** with any viscosity. It's possible to pump liquids of very low viscosity (like solvents or liquefied gases), and of very high viscosity (like bitumen, molasses, etc). All the models can be equipped with a heating jacket to liquefy products that have been solidified during the arrest of the pump.
- c. **Resistance to wear and tear** and abrasion. Thanks to the variability of the materials available and to the configuration of the wheels, the R pumps have a high resistance to the wear and tear and to the abrasion caused by materials present inside the pumped fluid.
- d. **Linearity of the flow**. The rotation of the rotor and the idler produces a flow completely without pulsations. The typical vibrations, pulsations and peaks of pressure of the positive displacement pumps with oscillating rotor are totally avoided with the R pumps.
- e. **Simplicity of maintenance**. The parts subject of more wear are easily checkable and replaceable just removing the cover of the pump.

◆ Pump identification ◆

R65	G	(R)	45	A	(+Y)
1.	2.	3.	4.	5.	6.

1. Size

Pump size.

2. Materials

- G in cast iron
- S in cast iron with bushings in graphite and shaft in stainless steel (for solvents)
- H in cast iron with bushings in bronze
- C in cast iron with heating jacket and bushing in cast iron (for chocolate)
- K in stainless steel with bushings in graphite

3. Internal options

- A with ANSI (ASA) 150 (125) FF flanges
- B with bushings in bronze
- H with pin and idler bushing in sharpen steel
- L in-line flanged ports
- R with heating jacket
- W pin and idler bushing in hard metal

4. Seals

- 1 packing gland
- 2 flushed packing gland

- 4. mechanical seal with quench
- .3 graphite, ceramic, PTFE
- .4 hard metal, ceramic, PTFE
- .5 hard metal, hard metal, PTFE
- .6 graphite, ceramic, viton
- .7 hard metal, ceramic, viton
- .8 hard metal, hard metal, viton
- 5.. mechanical seal for high temperature
- 7.. double mechanical seal in tandem
- 8.. double mechanical seal back to back
- 9.. mechanical seal external assembly

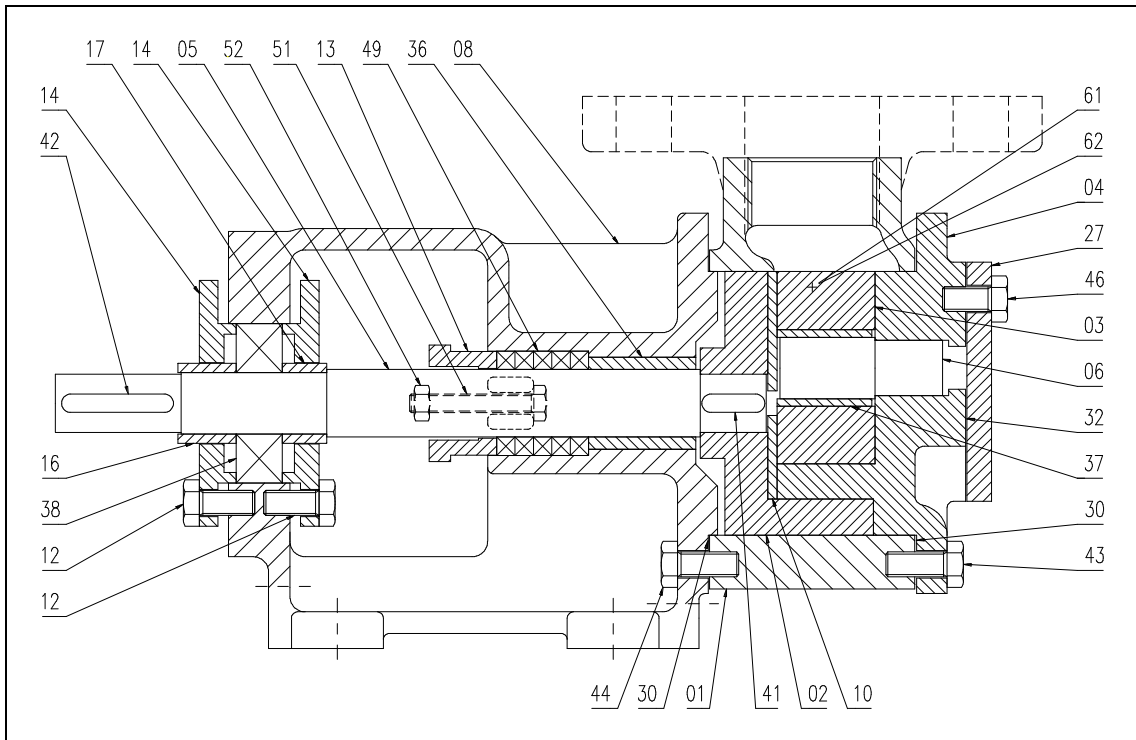
5. Arrangements

- A,B,C heavy duty pedestal
- M magnetic coupling
- / with coupling and electric motor

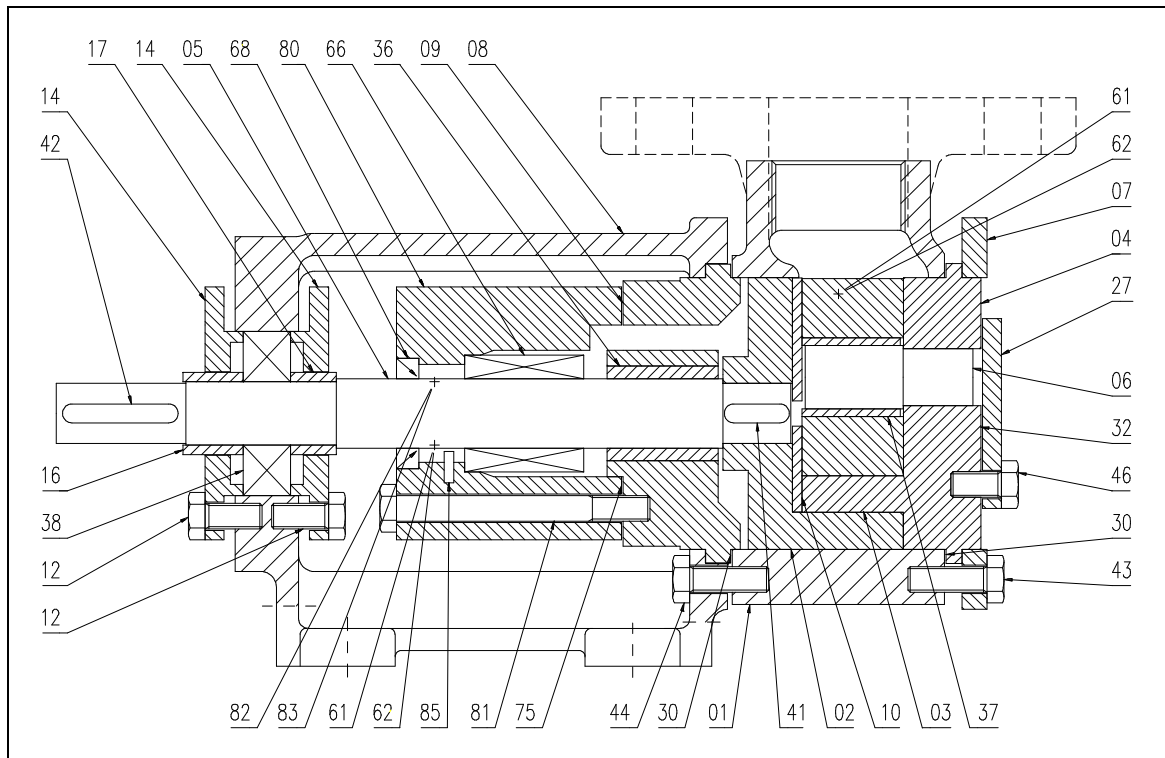
6. External options

- +O₂ quench reservoir
- +Y with by-pass safety valve
- +YR with heated by-pass safety valve
- +YY with double by-pass safety valve for reversible pumps

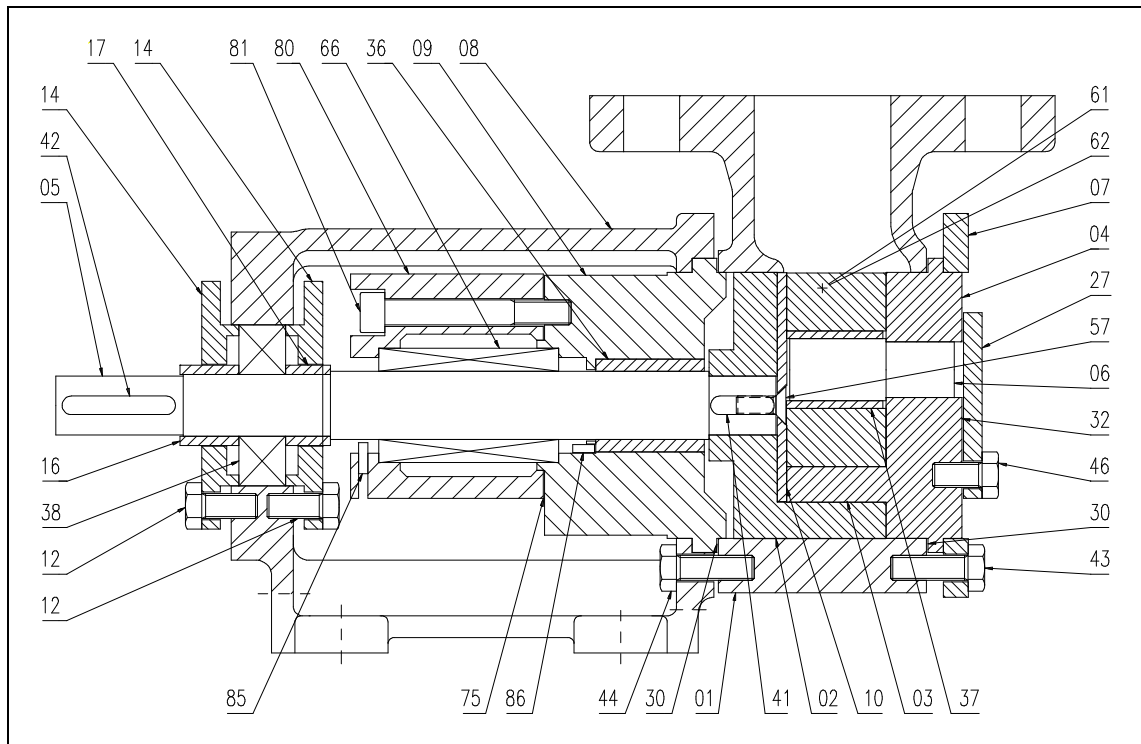
◆ Typical section pump with packing gland ◆



◆ Typical section pump with mechanical seal ◆



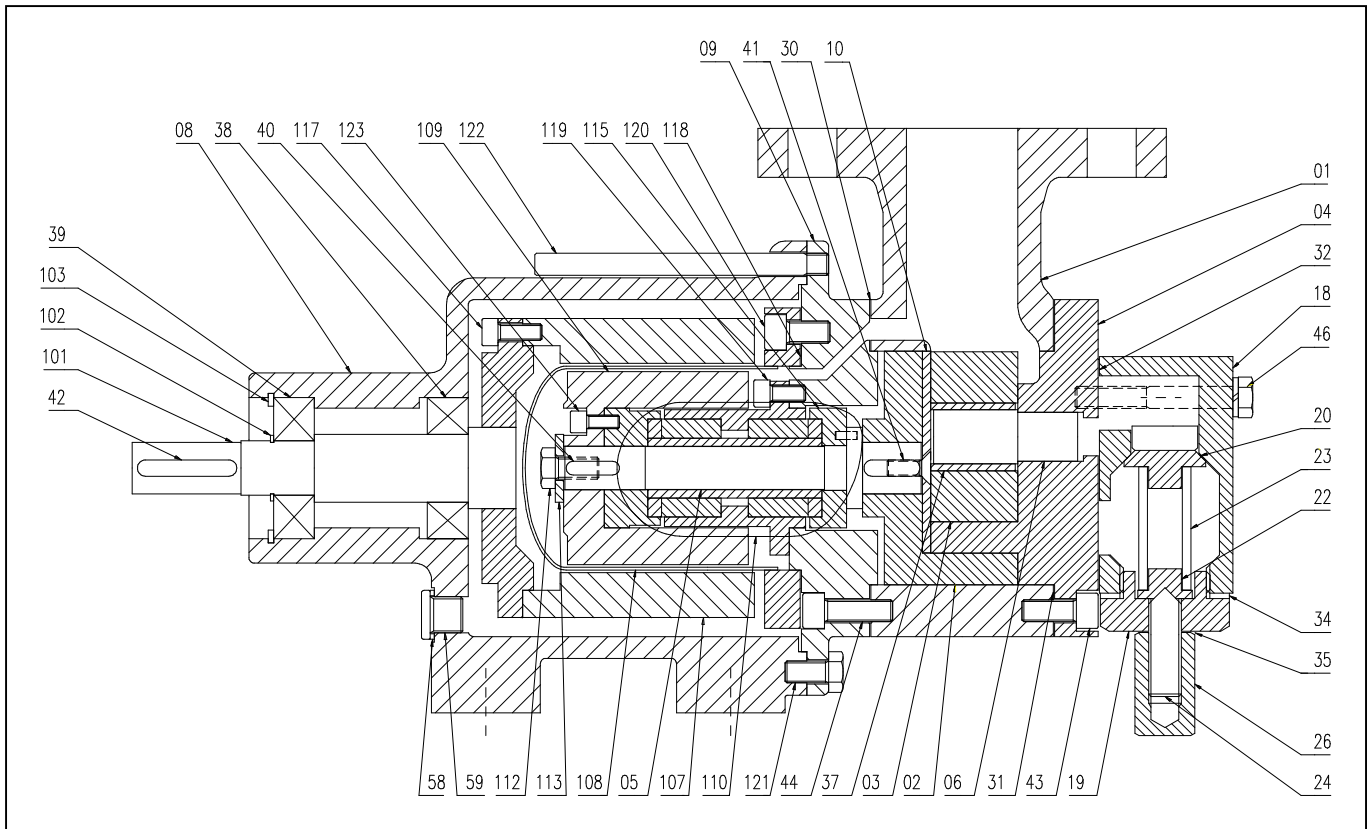
◆ Typical section pump with double mechanical seal ◆



◆ Spare parts list ◆

01	Body	16	Sleeve	49	Packing set
02	Rotor	17	Sleeve	51	Eyebolt
03	Idler	27	By-pass flange	52	Screw
04	Cover	30	Casing gasket	61	Plug
05	Shaft (with 41,42)	32	By-pass gasket	62	Gasket
06	Idler pin	36	Bearing bush	66	Mechanical seal
07	Cover ring	37	Idler bushing	75	Gasket
08	Bearing housing	38	Ball bearing	80	Seal box
09	Rear cover	41	Key	81	Screw
10	Plate	42	Key	82	Oil lubricator
12	Screw	43	Screw	83	Bend
13	Gland	44	Screw		
14	Bearing cover	46	Screw		

◆ Typical section pump with magnetic coupling ◆



◆ Spare parts list ◆

01	Body	31	Gasket	107	Outer magnet
02	Rotor	32	Gasket	108	Can
03	Idler	34	Gasket	109	Inner magnet
04	Cover	35	Gasket	110	Outer collar
05	Shaft (with 41,42)	37	Idler bushing	111	Sleeve
06	Idler pin	38	Ball bearing	112	Screw
08	Bearing housing	39	Lock nut	113	Washer
09	Rear cover	40	Key	114	Bush housing
10	Plate	41	Key	115	Collar
18	By-pass casing	42	Key	116	Pin
19	By-pass cover	43	Screw	117	Screw
20	Valve	46	Screw	118	Gasket
22	Guide	58	Plug	119	Screw
23	Spring	59	Gasket	120	Screw
24	Setting screw	101	Outer shaft	121	Screw
26	Cap	102	Circlip	122	Slide bar
30	Gasket	103	Circlip	123	Screw

Construction

◆ Hydraulic system ◆

The rotary parts which generate the flow are the rotor and the idler. The rotor is an internal profile gear with an axial overhanging tooth supported by a plate. The idler is an external profile gear moved by the rotor around a pin. The profiles of the gears are conjugated to create a constant flow without pulsations, and they are designed to have a sufficient seal between the two parts in pressure and in suction.

Both the rotor and the idler are supported by bushings oiled by the pumped liquid. Particular care is needed in the choice of the bushings when the fluids to be pumped are not viscous and thereby not able to oil the bushings, or when they are too abrasive.

◆ Mechanical system ◆

The shaft is made of hardened steel with a high diameter to carry high pressures given by the low velocity. The bearing is easily adjustable in the axial direction through the blocking screws of the bearing covers. Between the two points where the shaft is supported there is enough space to install several types of axial seals.

◆ Materials ◆

The materials of the construction of the R pumps have to be chosen by the function of the fluid, the abrasivity, the pumping temperature, the rotation speed and the viscosity. Please contact VIESSE Pompe for the best choice. The following table is a list of the availability of the materials.

Code	Body	Cover	Housing	Rotor	Idler	Shaft	Pin	Bushings
G	G	G	G	S	G	T	T	F
S	G	G	G	S	G	K9	K9	GR
H,HR	G	G	G	S	G	T	T	B
C	G	G	G	S	G	T	T	G
K	K	K	G	K	K9	K9	K9	GR

B bronze
 F sintered iron

G grey iron
 GS ductile iron
 GR graphite

K AISI 316
 K4 AISI 440 C
 K9 AISI 329

S steel
 T hardened steel

◆ Seals ◆

The seal is a very important part for the security and safe guard of the ambient. The choice of the seal depends on the chemical and physical characteristics of the fluid: temperature, acidity, basicity, viscosity, abrasiveness, toxicity, inflammation, working pressure, etc.

The packing gland is commonly used with clean or lightly turbid liquids, which create no problem in contact with the ambient and can be evacuated with the waste water. This is not suggested for toxic, flammable or corrosive liquids, nor in the case of long suction pipes from the ambient in depression. The kind of gland can be chosen from the following:

Code	Name	Utilization
1	Packing gland	Any liquid except flammable, polluting and toxic ones.
2	Flushed packing gland	Clear or abrasive fluids. External flushing.

The single mechanical seal can be used with clear high lubricating liquids for temperatures from 20°C up to the boiling point of the pumped fluid. This seal is externally lubricated from the oil present in the space between the seal back and an apposite ring (see image). The lubrication is important to avoid the heating of the seal rings when it runs dry, or when it's not lubricated by the fluid. The level of the oil has to be checked every 300 – 500 hours.

The double mechanical seal is mostly used with fluids that are dangerous to the atmosphere, neither toxic, flammable, crystallizing, etc. The flushing between the two seals is necessary in this case.

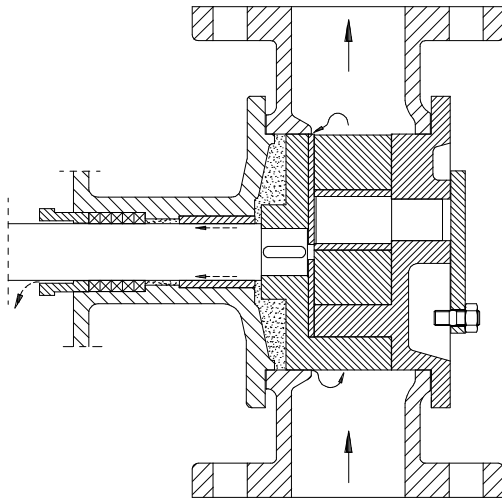
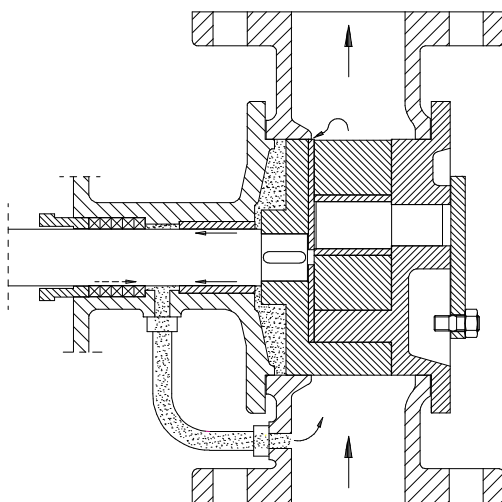
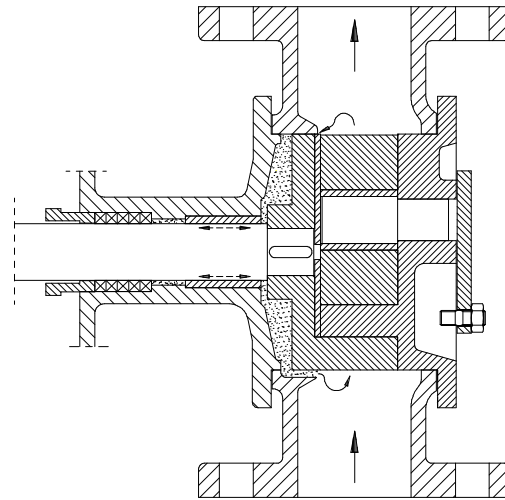
Code	Stationery ring	Rotary ring	Gaskets	Utilization
43	Graphite	Ceramic	PTFE	universal for clear liquids
44	Hard metal	Ceramic	PTFE	universal for abrasive or crystallizing fluids
45	Hard metal	Hard metal	PTFE	
46	Graphite	Ceramic	Viton	clear liquids (except solvents)
47	Hard metal	Ceramic	Viton	abrasive or crystallizing fluids
48	Hard metal	Hard metal	Viton	

◆ Flushings ◆

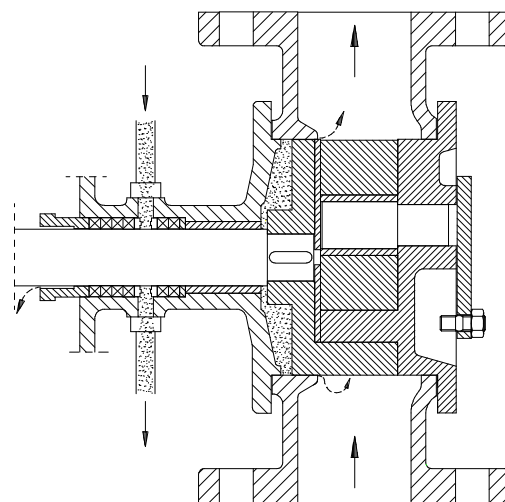
In addition to the standard PLAN API 610, R pumps can mount other kinds of typical flushings of these pumps.

Packing gland version

Code 1 - Standard version

Code 1 variant N -
Internal flushing back-motor

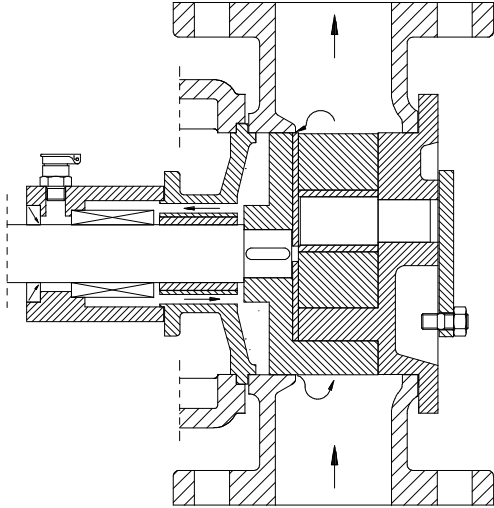
Code 2 - Internal flushing



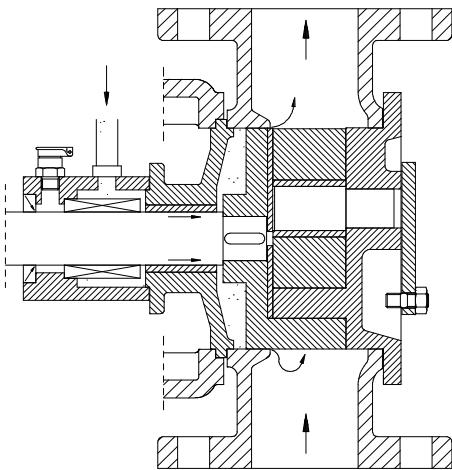
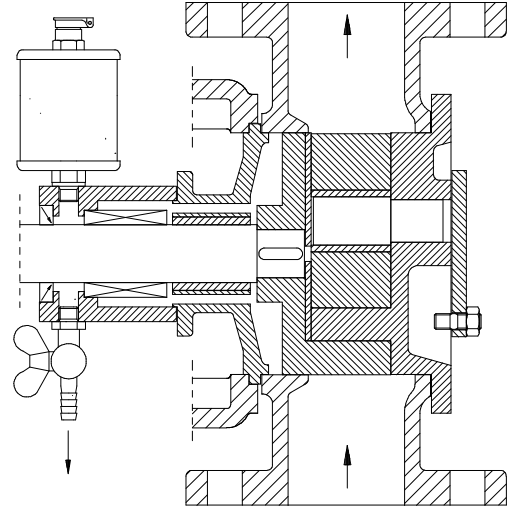
Code 3 - External flushing

Mechanical seal version

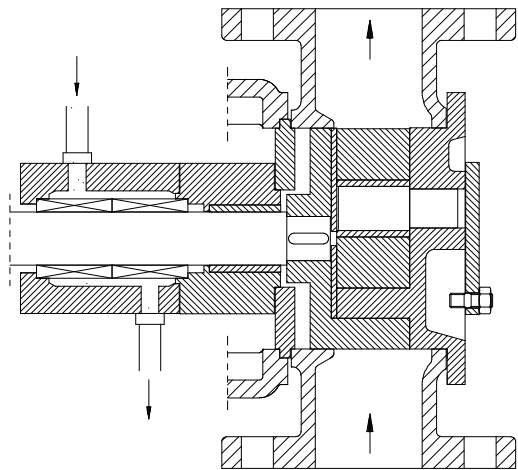
Standard version



External flushing +O



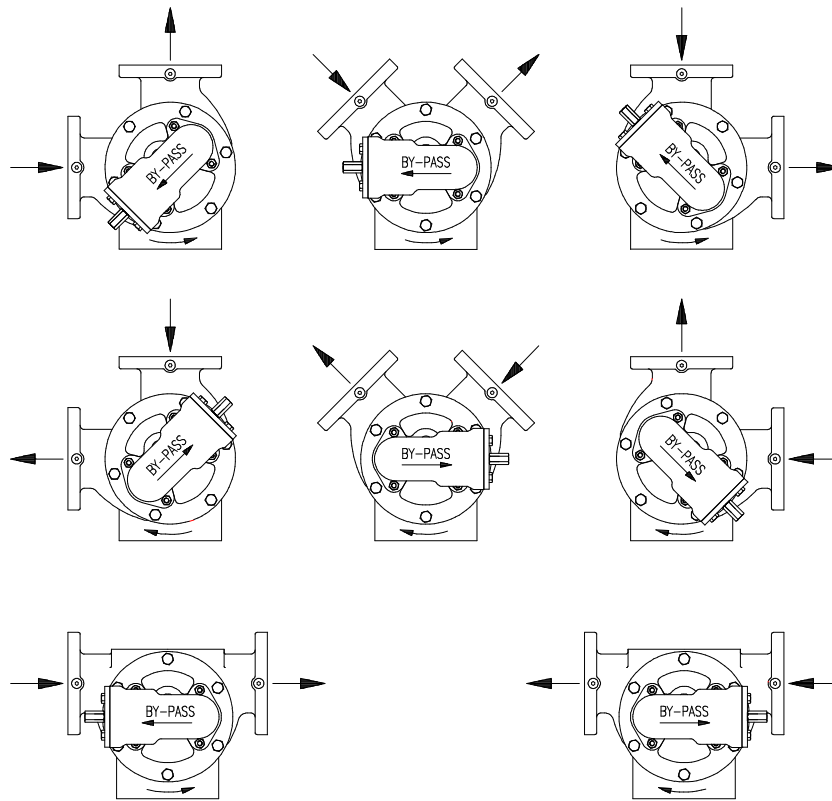
Internal flushing E
Single mechanical seal



External flushing +D
Double mechanical seal

◆ Ports configuration ◆

R pumps are assembled with 90° ports, but have a body which can rotate, creating several possible configurations. The body can rotate 45° or 90° from the original position (R35 and R40 only 90°).



To rotate the body it's sufficient to remove the apposite screws, turn it to the desired configuration and then reinsert the screws.

The by-pass valve needs a particular attention: having an orientation it has to be installed on the right verse.

◆ Heating jacket ◆

All the R pumps and most of the by-pass valves can be equipped with a heating jacket, a special accessory which allows a circulation of a heating fluid in contact with the pump. It is used to melt the product inside the pump when it's been stopped for a long time, or keep the product hot if needed. The heating fluid can be water, vapour, oil with temperatures up to 200°C and pressures up to 7 bar.

◆ Magnetic coupling ◆

The R pumps with magnetic coupling are used when pumping clear or turbid liquids with non abrasive dust (Mohs hardness max 3), or with viscosity up to 4000 cSt. They are also used if a hermetic seal is required for security or pollution reasons (corrosion, toxicity, etc.)

They are composed of a single block, internally divided in:

- pumping body (gears) in steel or stainless steel
- drawing body (coupling and magnets),

The coupling is assembled with permanent magnets. The shaft of the gears is separated from the drawing body by a cover of stainless steel AISI 316, and it rotates on bearings in silicon carbide.

The code of these pumps is composed as follows:

GS	2	4	M
1.	2.	3.	4.

1. Material of the pump

2. Size of the magnetic coupling

3. Number of magnets

4. Magnetic execution

The material can be:

GS: cast iron pump with steel body

K : pump in stainless steel AISI 316

For any size of pump, several magnetic couplings are available. They can be selected in the following table in function of the maximum torque.

Magnetic coupling size	Torque Nm	R35	R40	R50	R65	R80
.12.	10	x	x			
.14.	22	x	x			
.16.	35	x	x			
.23.	37	x	x	x	x	
.24.	52	x	x	x	x	
.25.	66	x	x	x	x	
.26.	80	x	x	x	x	
.35.	102			x	x	x
.36.	124			x	x	x
.38.	168			x	x	x
.48.	249				x	x
.410.	315				x	x

To choose the coupling please follow these steps:

1. calculate the RPM of the pump (n') considering the viscosity of the fluid and the requested flow and head
2. find the absorbed power (KW) following the apposite tables
3. calculate the absorbed torque with the formula:

$$\text{Torque (Nm)} = 9740 \frac{\text{KW}}{n'}$$

4. choose coupling with the immediate superior torque in the previous table.

Applications

◆ Operating conditions ◆

The operating conditions of the R pumps depend on the construction materials and the lubricating power of the pumped liquids. In the following table you can find the limits of the different models:

Pump type	Pressure bar					Viscosity mm ² /s (cSt)		Temperature °C		pH
	1	2	3*	4	5	min	max	min	max	

Pumps in cast iron

G1A	16	8	4	16	20	100	100.000	-40	+200	6-13
G44A	16	8	4	16	20	100	100.000	-40	+200	6-13
GW44A	-	-	8	16	20	100	100.000	-40	+180	6-13
H1A	16	8	4	16	20	20	100.000	-40	+200	6-8
HR1A	16	8	4	16	20	20	100.000	-40	+300	6-8
S43A	-	8	-	16	20	1	4.000	-40	+120	6-13

Pumps in stainless steel

K1A	12	8	-	12	16	20	4.000	-60	+200	2-14
KB1A	12	8	4	12	16	100	100.000	-60	+200	6-8
K43A	12	8	-	12	16	20	4.000	-60	+120	2-14
K44A	12	8	-	12	16	100	10.000	-60	+180	2-14

- 1: Maximum differential pressure with lubricating liquids (viscosity > 100 mm²/s).
- 2: Maximum differential pressure with non lubricating liquids.
- 3: Maximum differential pressure with abrasive liquids (viscosity > 100 mm²/s).
- 4: Maximum operating pressure.
- 5: Test pressure.

* To increase the life of the pump with abrasive liquids, reduce the pump speed to 1/3 of the rated speed.

If higher limits are needed please contact VIESSE POMPE.

◆ Choosing the pump ◆

The following table gives some indications to help in the choice of the pump, by the function of the fluid to pump.

Pump code	Type of fluid
G	Clear lubricating fluids, oil products, chemical or viscous products, etc
S	Non lubricating or non clear products, solvents, liquefied gases, etc.
H	Same products as G class, but at high temperature and viscosity.
C	Chocolate or similar.
K	Chemical products both acid or basic and clear (pH 2-14), alimentary or pharmaceutical products, resins, etc.

The fluids that can be handled by the R pumps are numerous. Here a table with some of them:

A	Acetates Acetone Additives Adhesive Acids Alcohol Alkalis Asphalt	L	Lacquer Lard Latex Lubricating oil
B	Benzene Bitumen Blood Brine Bunker fuel oil	M	Meat Methanol Milk of lime Mineral oil Molasses Monomer Must Mustard
C	Cacao butter Chemicals Chocolate Coatings Colours Cream Creosote	N	Naphtha
D	Detergents Diesel Fuel Diisocynate	O	Oil
E	Emulsions Epoxy resins Ethanol Ether	P	Paint Paper coatings Paraffin Petrol Petroleum Pitch Plastifiers Polymer Polyol Printing ink
F	Fats Fish solubles Foams Fruit juices Fuel oil	R	Resin
G	Gasoline Gelatine Glucose Glue Glycerine Glycol Grease	S	Soap Sodium silicate Solvents Starch Syrup
H	Heat transfer oil Hot melt Hydraulic fluids	T	Tar TDI Tuolene Transformator oil Trichloroethylene
I	Ink Iron oxide slurries Isocyanate	V	Varnish Viscose
K	Kerosene	W	Wax Wine

Performances

In the following pages you can find the performances of the positive displacement gear pumps R, in tables for a better research of the data. If the required information is not specifically written, you can find it easily with a linear interpolation between the given information.

TYPE R	PORTS DN(mm)	DISPLAC. l	VISCOS. cSt	RPM 1/min	PRESSURE (bar)				
					2	4	8	12	16
					FLOW (l/min)				
R35	40	0,04	2	1450	60	54	42	-	-
			20	1450	64	63	61	58	-
			200	1450	64	64	62	61	59
			1000	1150	51	51	50	49	48
			4000	960	43	43	42	42	41
			12000	720	32	32	32	32	31
			25000	560	25	25	25	25	25
50000	560	25	25	25	25	25			
R40	40	0,08	2	1450	111	103	87	-	-
			20	1450	117	116	112	109	-
			200	1450	118	117	115	113	110
			1000	1150	94	93	92	90	89
			4000	960	78	78	78	77	76
			12000	720	59	59	58	58	58
			25000	560	46	46	46	45	45
50000	560	46	46	46	46	46			
R50	50	0,23	2	960	205	188	156	-	-
			20	960	217	213	205	197	-
			200	960	218	216	211	205	200
			1000	720	164	162	159	156	153
			4000	720	165	164	163	161	159
			12000	560	128	128	127	126	125
			25000	450	103	103	102	102	101
50000	350	80	80	80	80	80			
R65	65	0,5	2	720	331	301	243	-	-
			20	720	353	346	331	317	-
			200	580	285	280	271	261	252
			1000	580	287	284	278	272	266
			4000	450	223	222	219	216	213
			12000	350	174	173	171	169	168
			25000	280	139	139	138	137	136
50000	220	110	110	109	109	108			
R80	80	1,2	2	580	652	609	521	-	-
			20	580	682	669	641	614	-
			200	580	687	678	660	642	624
			1000	460	546	540	529	517	506
			4000	360	429	426	420	414	408
			12000	280	334	333	329	326	323
			25000	220	263	262	260	258	256
50000	180	216	215	214	213	213			

TYPE R	PORTS DN(mm)	DISPLAC. l	VISCOS. cSt	RPM 1/min	PRESSURE (bar)			
					2	4	8	12
					FLOW (l/min)			
R105	100	2,4	2	450	994	907	735	-
			20	450	1056	1032	984	-
			200	450	1063	1046	1012	978
			1000	355	840	828	803	779
			4000	280	664	656	640	624
			12000	224	531	525	512	500
			25000	180	426	420	409	397
			50000	140	331	325	315	304
R150	150	8	2	355	2622	2405	2187	-
			20	355	2758	2675	2593	-
			200	280	2183	2125	2068	2010
			1000	224	1752	1712	1672	1632
			4000	180	1415	1390	1365	1340
			12000	140	1104	1089	1073	1057
			25000	112	886	876	866	856
			50000	112	892	887	883	878
R200	200	16	2	280	4208	3935	3663	-
			20	280	4320	4159	3999	-
			200	224	3473	3361	3250	3138
			1000	180	2803	2725	2648	2571
			4000	140	2192	2144	2096	2048
			12000	112	1763	1735	1706	1677
			25000	112	1774	1755	1737	1718
			5000	90	1431	1423	1414	1405
R250	250	22	2	260	5437	5155	4872	-
			20	260	5548	5376	5204	-
			200	224	4810	4692	4574	4456
			1000	180	3880	3800	3720	3640
			4000	140	3032	2980	2937	2890
			12000	140	3052	3023	2995	2967
			25000	112	2446	2428	2410	2391
			50000	90	1971	1963	1954	1946

Please note that the data of these tables is the result of special algorithms calculated by the computer, and that they represent the medium values of the performances. The real ones can be different for a maximum of:

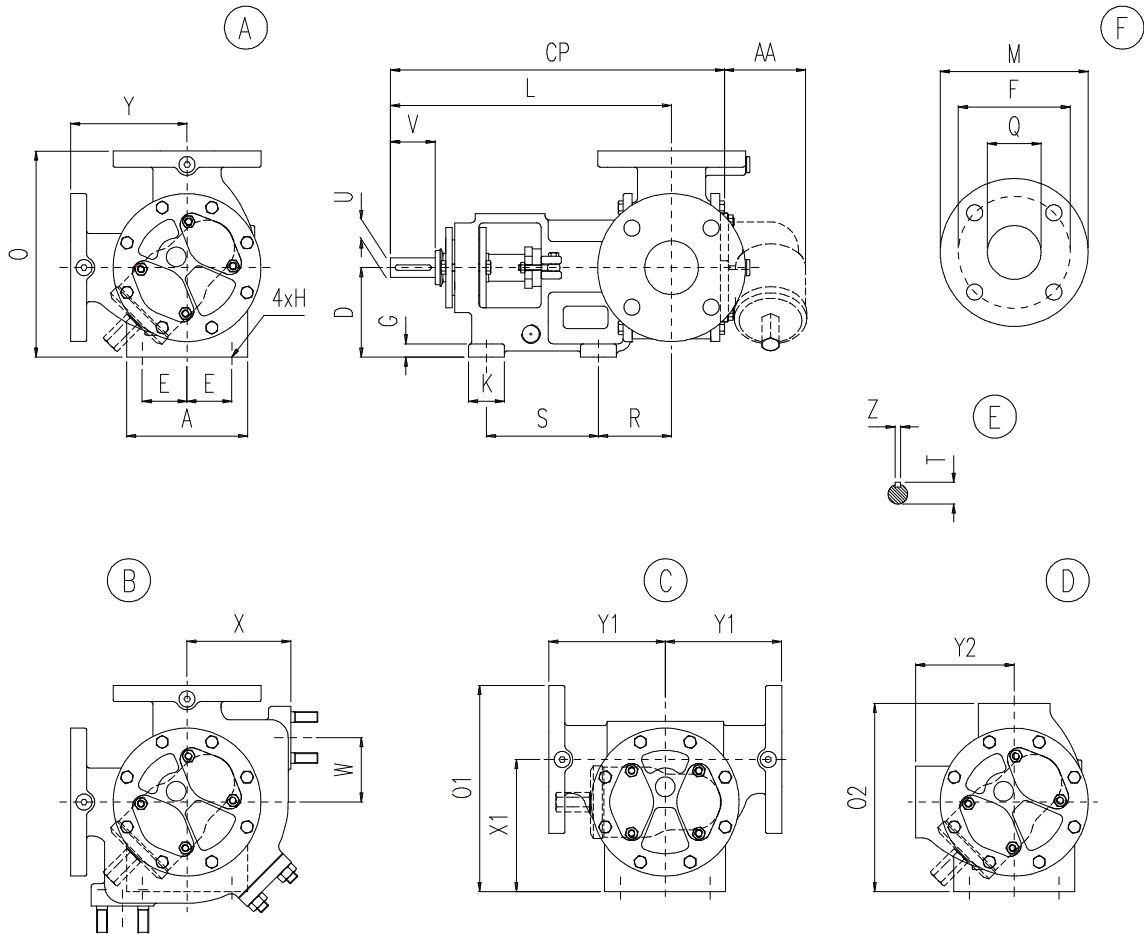
Flow $\pm 10\%$

Power $\pm 5\%$

The real values are conditioned by the installation plant and the construction tolerances.

To calculate more accurately the data please refer to the next tables.

Dimensions



	A															+Y	
	A	D	E	G	H	K	L	O	R	S	U	V	Y	AA	CP	Kg	Kg
R 35,40	120	80	47,5	12	∅12	30	247	180	65	90	19	40	100	37,7	312,8		
R 50	135	100	50	15	∅12	40	313,5	230	81,5	125	22	50	130	63	400		
R 65	180	132	70	18	∅14	50	347	297	91,5	140	28	60	165	68,5	442		
R 80	200	160	80	20	∅14	60	430	360	117	160	32	80	200	99	533		
R 105	220	180	90	22	∅18	60	505	405	135	180	42	110	225	115	633,5		

	B			C				D			E		F		
	X	W	Kg	X1	O1	Y1	Kg	O2	Y2	Kg	T	Z	M	F	Q
R 35,40	65	80	-	-	-	-	-	160	80	-	21,5	6	-	-	DN40
R 50	116	72	-	-	-	-	-	210	110	-	24,5	6	165	125	DN50
R 65	140	100	-	187	279,5	160	-	-	-	-	31	8	185	145	DN65
R 80	170	120	-	225	325	195	-	-	-	-	32	10	200	160	DN80
R 105	-	-	-	-	-	-	-	-	-	-	45	12	220	180	DN100

2 mm²/s (cSt)

Table with 5 columns for flow rates (1750, 1450, 960, 720, 560) and 4 rows for pressures (2, 4, 6, 8 bar). Each cell contains three values for flow, volume, and power.

4.000 mm²/s (cSt)

Table with 5 columns for flow rates (720, 560, 450, 355, 280) and 9 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

20 mm²/s (cSt)

Table with 5 columns for flow rates (1750, 1450, 960, 720, 560) and 6 rows for pressures (2, 4, 6, 8, 10, 12 bar). Each cell contains three values for flow, volume, and power.

12.000 mm²/s (cSt)

Table with 5 columns for flow rates (560, 450, 355, 280, 224) and 9 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

200 mm²/s (cSt)

Table with 5 columns for flow rates (1450, 960, 720, 560, 450) and 8 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

25.000 mm²/s (cSt)

Table with 5 columns for flow rates (450, 355, 280, 224, 180) and 9 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

1.000 mm²/s (cSt)

Table with 5 columns for flow rates (960, 720, 560, 450, 355) and 8 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

50.000 mm²/s (cSt)

Table with 5 columns for flow rates (355, 280, 224, 180, 140) and 8 rows for pressures (2, 4, 6, 8, 10, 12, 14, 16 bar). Each cell contains three values for flow, volume, and power.

2 mm²/s (cSt)

min ⁻¹		315			250			200			160			125		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		4306	258	28,2	3396	204	20,5	2696	162	15,2	2136	128	11,4	1646	99	8,3
4		4201	252	43,1	3291	197	32,3	2591	155	24,6	2031	122	18,8	1541	92	14,1
6		4097	246	57,8	3187	191	43,9	2487	149	33,9	1927	116	26,3	1437	86	19,9

4.000 mm²/s (cSt)

min ⁻¹		200			160			125			100			80		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		2790	167	35,6	2230	134	25,0	1740	104	17,1	1390	83	12,2	1110	67	8,7
4		2779	167	45,7	2219	133	33,0	1729	104	23,2	1379	83	17,0	1099	66	12,6
6		2769	166	55,5	2209	133	40,7	1719	103	29,2	1369	82	21,8	1089	65	16,4
8		2759	166	65,0	2199	132	48,3	1709	103	35,1	1359	82	26,5	1079	65	20,1
10		2749	165	74,5	2189	131	55,9	1699	102	40,9	1349	81	31,1	1069	64	23,8
12		2738	164	84,0	2178	131	63,4	1688	101	46,8	1338	80	35,8	1058	64	27,5

20 mm²/s (cSt)

min ⁻¹		315			250			200			160			125		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		4374	262	30,6	3464	208	22,1	2764	166	16,3	2204	132	12,1	1714	103	8,8
4		4339	260	45,7	3429	206	34,0	2729	164	25,7	2169	130	19,6	1679	101	14,6
6		4303	258	60,4	3393	204	45,7	2693	162	35,0	2133	128	27,0	1643	99	20,4
8		4267	256	75,1	3357	201	57,3	2657	159	44,3	2097	126	34,4	1607	96	26,2

12.000 mm²/s (cSt)

min ⁻¹		160			125			100			80			63		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		2234	134	33,8	1744	105	22,7	1394	84	16,0	1114	67	11,3	876	53	7,8
4		2227	134	42,1	1737	104	29,1	1387	83	21,0	1107	66	15,2	869	52	10,9
6		2221	133	50,1	1731	104	35,2	1381	83	25,8	1101	66	19,0	863	52	13,9
8		2215	133	57,8	1725	103	41,2	1375	82	30,5	1095	66	22,8	857	51	16,9
10		2208	132	65,5	1718	103	47,1	1368	82	35,3	1088	65	26,6	850	51	19,8
12		2202	132	73,1	1712	103	53,0	1362	82	40,0	1082	65	30,3	844	51	22,7

200 mm²/s (cSt)

min ⁻¹		315			250			200			160			125		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		4385	263	37,2	3475	209	26,4	2775	167	19,2	2215	133	14,0	1725	104	10,0
4		4361	262	52,4	3451	207	38,4	2751	165	28,7	2191	131	21,6	1701	102	15,9
6		4336	260	67,3	3426	206	50,2	2726	164	38,1	2166	130	29,1	1676	101	21,7
8		4311	259	82,1	3401	204	61,9	2701	162	47,4	2141	128	36,5	1651	99	27,5
10		4287	257	96,8	3377	203	73,5	2677	161	56,7	2117	127	43,9	1627	98	33,3

25.000 mm²/s (cSt)

min ⁻¹		125			100			80			63			50		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		1746	105	28,0	1396	84	19,5	1116	67	13,6	878	53	9,4	696	42	6,6
4		1742	105	34,6	1392	84	24,6	1112	67	17,7	874	52	12,5	692	42	9,0
6		1738	104	40,8	1388	83	29,5	1108	66	21,6	870	52	15,5	688	41	11,4
8		1734	104	46,9	1384	83	34,4	1104	66	25,4	866	52	18,5	684	41	13,8
10		1730	104	52,9	1380	83	39,1	1100	66	29,2	862	52	21,5	680	41	16,1
12		1727	104	58,9	1377	83	43,9	1097	66	32,9	859	52	24,4	677	41	18,4

1.000 mm²/s (cSt)

min ⁻¹		250			200			160			125			100		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		3483	209	35,1	2783	167	25,0	2223	133	17,9	1733	104	12,5	1383	83	9,1
4		3466	208	47,4	2766	166	34,7	2206	132	25,6	1716	103	18,5	1366	82	13,9
6		3449	207	59,4	2749	165	44,2	2189	131	33,2	1699	102	24,4	1349	81	18,5
8		3432	206	71,2	2732	164	53,6	2172	130	40,7	1682	101	30,2	1332	80	23,2
10		3415	205	83,0	2715	163	63,0	2155	129	48,1	1665	100	36,0	1315	79	27,8
12		3399	204	94,7	2699	162	72,3	2139	128	55,6	1649	99	41,8	1299	78	32,4

50.000 mm²/s (cSt)

min ⁻¹		100			80			63			50			40		
bar		l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW	l/min	m ³ /h	kW
2		1398	84	23,8	1118	67	16,6	880	53	11,3	698	42	7,8	558	34	5,5
4		1397	84	29,1	1117	67	20,7	879	53	14,5	697	42	10,3	557	33	7,5
6		1395	84	34,1	1115	67	24,6	877	53	17,5	695	42	12,7	555	33	9,4
8		1394	84	39,0	1114	67	28,5	876	53	20,6	694	42	15,1	554	33	11,3
10		1392	84	43,9	1112	67	32,4	874	52	23,6	692	42	17,5	552	33	13,2
12		1390	83	48,7	1110	67	36,2	872	52	26,5	690	41	19,8	550	33	15,1

