6

IF Series

Gear Pumps for High Pressure and Low Viscosity.

6.1 MAIN CHARACTERISTICS AND NOMINAL FLOW RATES

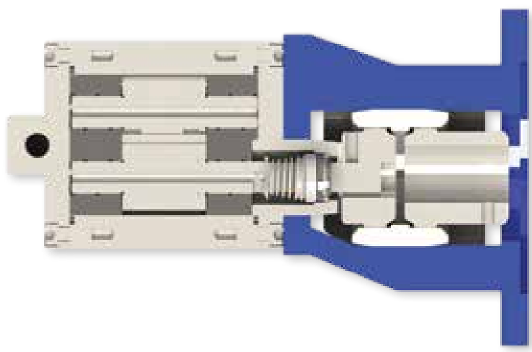
IF pumps are volumetric gear pumps suitable for transferring low viscous liquids without any suspended solids or abrasive substances. They are self-priming pumps used for a wide range of liquids with a viscosity from 1 to 1.000 cSt (when driven by a standard industrial electric motor). The speed of rotation is chosen according to the viscosity of the liquid. Flowrate range is from 5 to 25 L/min. These pumps are designed to reach a maximum pressure of 25 bar.

The standard construction consists of pump housing, cover, shafts and gears in stainless steel, O-rings in Viton, sleeve bushings in graphite and mechanical seal in ceramic-graphite-Viton. IF pumps are supplied with a pressure relief valve in stainless steel AISI 316.

Nozzles in inlet and outlet are of the same diameter and positioned on the same axis.

A short and straight alignment of the flow channels provides for a good suction capability and a quiet running.

Fig. 601 – IF pump, standard version



IF pumps are designed to be coupled to an IEC electric motor IMB34 by means of coupling.

The electric motor can be supplied on request.
Available flanges are listed as follows:

Tab. 601 – Flanges available for coupling to IEC electric motors IMB34 on IF pumps

PUMP SIZE (IF)	IEC Frame size				
	71	80	90	100	112
5	■	■	■		
10	■	■	■		
15	■	■	■	■	
25	■	■	■	■	■

As a special execution IF pumps can be equipped with feet in order to be mounted on a skid and coupled to electric motors of different sizes through elastic coupling. Motors must be in frame B3.

Table 602 shows the possible flow rates considering a non-pressurized pumping (Δp=0) and a fluid with viscosity same as water.
The flow rate of gear pumps is virtually proportional to their speed. The selected speeds are the most common speeds at rated power of industrial electric motors at 50 and 60Hz.

Tab. 602 - Nominal flow rates

PUMP SIZE (IF)	Geometrical displacement V_{geo} [cm³/rev]	Nominal flow rate Q_{teo} [L/min] at Speed n [1/min]			
		950	1150	1400	1750
5	4,5	4,3	5,2	6,3	7,9
10	9,1	8,6	10,5	12,7	15,9
15	13,6	12,9	15,7	19,1	23,9
25	18,2	17,3	20,9	25,5	31,8

6.2 MAIN OPTIONS

The main options available are:

- Clockwise rotation (see paragraph 6.3)
- Special seals according to liquids and temperatures (see paragraph 6.4)
- Options on relief valve (see paragraph 6.5)
- Motors (see paragraph 6.6)
- Accessories (see paragraph 6.7)

6.3 SENSE OF ROTATION AND FLOW DIRECTION

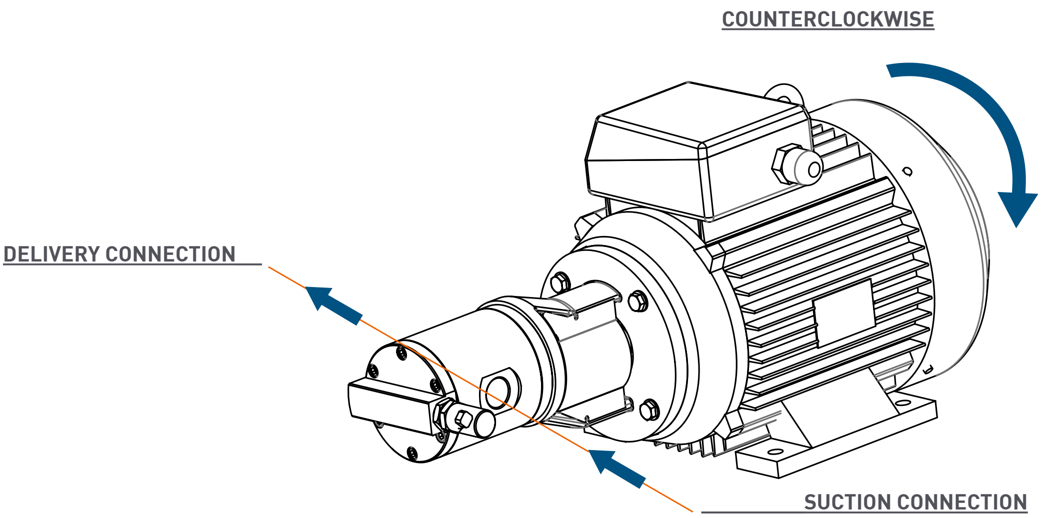
The standard version of IF pumps can operate only in one direction of rotation: counterclockwise watching the pump shaft end.

The direction of the fluid flow is shown by an arrow placed nearby the piping connections.

A proper mounting will keep the nameplate on the top side. In this case the flow direction will be from the left side to the right side watching the pump shaft end and the pressure side (delivery) will be at the right-hand side.

On request a clockwise version can be supplied.

Fig. 602 – Sense of rotation and flow direction on IF pumps



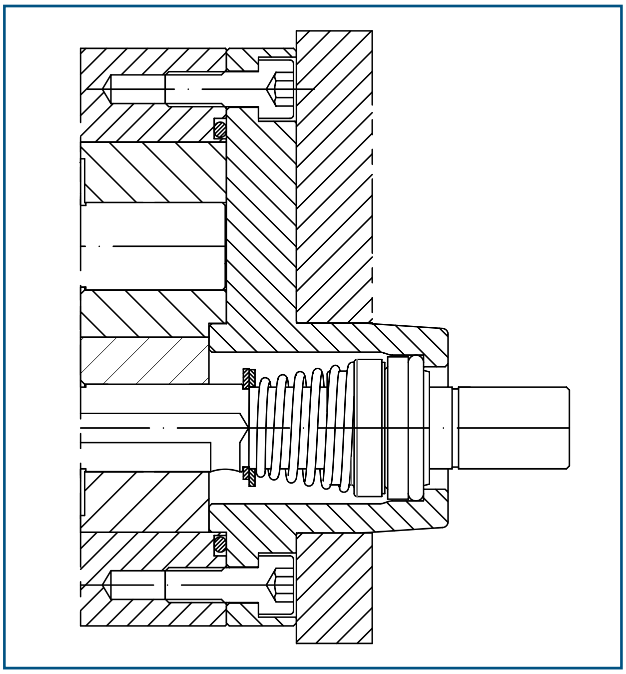
6.4 SHAFT-END SEALS

The standard version is with mechanical seal in ceramic-graphite-Viton. A number of different seals materials can be supplied for different liquids and operating temperatures.

On request:

- Seal for high temperatures up to 200°C
- Reversible mechanical seal

Fig. 603 – Mechanical seal



6.5 PRESSURE RELIEF VALVE

IF pumps are supplied with a stainless steel AISI 316 pressure relief valve as a standard. It works only on outlet, in one direction.

It may be used as a safety valve only for short-term operations. When a partial discharge flow has to be drained over a prolonged period of time, a separate by-pass valve with return to the suction tank has to be installed into the piping.

The pressure relief valve is designed as a spring-preloaded piston valve. It is integrated into the pump's end cover.

The spring pretension and the relative opening pressure can be adjusted by means of a screw.

Different springs are also available to reach the desired adjustment range.

As an option the pumps can be supplied without relief valve.

6.6 MOTORIZATION

The most common installed electric motors have the following characteristics:

- Standard motors in IP55, insulation class F available at 4, 6 and 8 poles
- Standard voltages for Three-phase motors ≤ 4kW 230/400V 50Hz - 265/460V 60Hz
- Standard voltages for Three-phase motors ≥ 5,5kW 400/690V 50Hz - 460/795V 60Hz
- Standard voltages for Single-phase motors 230V 50Hz

Special options on electric motors:

- Atex motors
- Motors with built-in frequency converter
- Motors suitable for frequency converter connection
- Motor with forced ventilation
- Tropicalization
- Special voltages
- Protection IP56/IP65
- Protection IP67/IP68
- Thermistors PTC
- Special treatment for corrosive and saline environment
- Motors according to UL-CSA, NEMA, cURus and Marine regulations
- Insulation class H

Special motors available:

- Internal combustion engines
- Gearmotor
- Mechanical variator
- DC motors at 12V and 24V

6.7 ACCESSORIES

- Pump on trolley
- Control panel
- ON/OFF switches
- Reversing switches
- Piping
- Heated piping
- Valves
- Pressure gauge and pressure switch
- Electric cables

6.8 SOUND LEVEL

The sound level has been measured in dB(A) at 1m distance, at 1450 1/min with water.

Tab. 603 – Sound level

PUMP SIZE (IF)	Sound level dB(A) at pressure			
	5 bar	10 bar	15 bar	25 bar
5	72	73	74	80
10	72	73	74	80
15	72	73	74	80
25	72	73	74	80

6.9 PUMP SELECTION AND PERFORMANCE DATA

In table 604 are listed the actual delivery Q_{eff} and required power P_{mec} for each pump size at different speeds and pressures.

The data refer to tests carried out with water.

The rated power for the drive motor should be 20% higher than the required power P_{mec}.

For different viscosities please ask the performances (delivery and power) to our technical department.

As a general rule the flow rate is approximately proportional to the speed.

A higher viscosity may lead to an increase of the net delivery.

When dimensioning please consider the maximum viscosity, usually at the start-up phase.

Pump selection, delivery and required power at different speeds:

1) Given the project delivery Q_{pro} [L/min] and speed n_{pro} [1/min] calculate the project displacement V_{pro} [cm3/rev]:

$$V_{pro} = 1000 \times Q_{pro} / n_{pro}$$

2) Select the Pump Type with the geometrical displacement V_{geo} closer to V_{pro},

3) Read from the Performance Table the delivery at 1450 1/min and at the given pressure p:

$$Q_{1450,\,p} \text{ [L/min]}$$

4) Calculate the actual delivery Q [L/min] at n_{pro} and p:

$$Q = Q_{1450,\,p} + V_{geo} \times (n_{pro} - 1450) / 1000$$

5) Read from the Performance Table the required power and actual delivery of the selected Pump Type at the closer speed nx to n_{pro} and at p:

$$P_{nx,\,p} \text{ [kW]}, Q_{nx,\,p} \text{ [L/min]}$$

6) Calculate the actual required power P at n_{pro} and p [kW]:

$$P = P_{nx,\,p} \times Q / Q_{nx,\,p}$$

Tab. 604 - Performance data at 950, 1150, 1450, 1750 1/min and 1 cSt viscosity

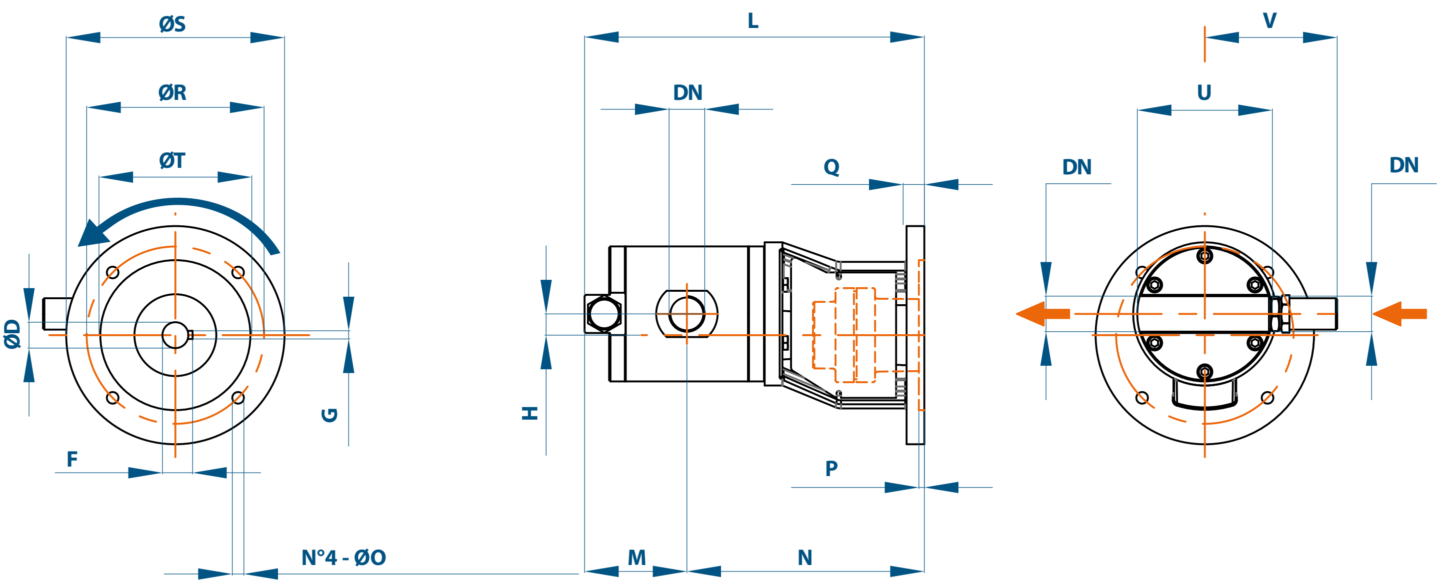
PUMP SIZE (IF)	Geometrical displacement V_{geo} [cm³/rev]	Pressure p [bar]	Speed n [1/min]							
			950		1150		1450		1750	
			Q_{eff} [L/min]	P_{mec} [kW]	Q_{eff} [L/min]	P_{mec} [kW]	Q_{eff} [L/min]	P_{mec} [kW]	Q_{eff} [L/min]	P_{mec} [kW]
5	4,5	5	2,6	0,09	3,3	0,11	4,3	0,14	5,3	0,17
		10	2,4	0,16	3,0	0,19	3,9	0,25	4,9	0,31
		15	2,3	0,22	2,8	0,27	3,7	0,36	4,6	0,44
		25	2,1	0,34	2,6	0,42	3,4	0,55	4,3	0,68
10	9,1	5	5,8	0,11	7,2	0,13	9,3	0,17	11,4	0,21
		10	5,4	0,20	6,7	0,25	8,6	0,32	10,6	0,39
		15	5,2	0,29	6,4	0,36	8,3	0,46	10,2	0,57
		25	4,9	0,45	6,0	0,56	7,8	0,73	9,6	0,90
15	13,6	5	9,0	0,22	11,1	0,27	14,3	0,35	17,6	0,43
		10	8,4	0,41	10,3	0,51	13,4	0,66	16,5	0,81
		15	8,0	0,60	9,9	0,73	12,8	0,95	15,8	1,17
		25	7,5	0,93	9,3	1,15	12,1	1,49	14,9	1,84
25	18,2	5	13,1	0,40	16,2	0,50	20,9	0,64	25,6	0,79
		10	12,2	0,75	15,1	0,93	19,4	1,20	23,9	1,48
		15	11,7	1,08	14,4	1,33	18,6	1,72	22,9	2,12
		25	10,9	1,70	13,6	2,10	17,6	2,72	21,7	3,35

Different viscosities, working pressure, rotational speed and ambient conditions can change performance data shown in the table.

6.10 OVERALL DIMENSIONS AND WEIGHTS

6.10.1 IF

Fig. 605 - IF dimensional drawing



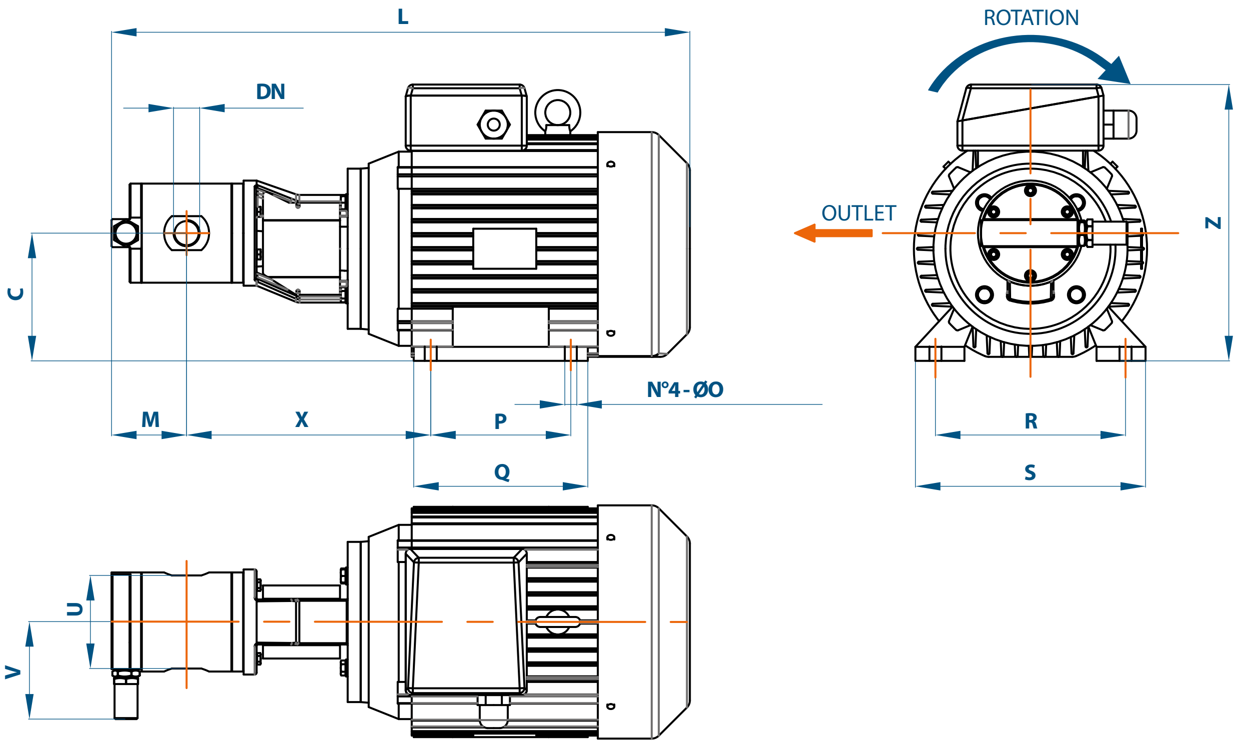
Tab. 605 - IF overall dimensions and weight

PUMP SIZE (IF)	for IEC electric motor Frame size	IM	DN ISO 228-1	D	F	G	H	L	M	N	O	P	Q	R	S	T	U	V	Weight [kg]
5	71	B34	G 1/2"	14	16,3	5	15,6	192	60	132	6,5	4	11	85	105	70	90	98	7,5
	80	B34	G 1/2"	19	21,8	6	15,6	192	60	132	6,5	4	11	100	120	80	90	98	7,5
	90	B34	G 1/2"	24	27,3	8	15,6	219	60	159	8,5	4	13	115	140	95	90	98	7,6
10	71	B34	G 1/2"	14	16,3	5	15,6	202	65	137	6,5	4	11	85	105	70	90	98	8,1
	80	B34	G 1/2"	19	21,8	6	15,6	202	65	137	6,5	4	11	100	120	80	90	98	8,1
	90	B34	G 1/2"	24	27,3	8	15,6	229	65	164	8,5	4	13	115	140	95	90	98	8,2
15	71	B34	G 3/4"	14	16,3	5	15,6	212	70	142	6,5	4	11	85	105	70	90	98	8,7
	80	B34	G 3/4"	19	21,8	6	15,6	212	70	142	6,5	4	11	100	120	80	90	98	8,7
	90	B34	G 3/4"	24	27,3	8	15,6	239	70	169	8,5	4	13	115	140	95	90	98	8,8
	100	B34	G 3/4"	28	31,3	8	15,6	239	70	169	8,5	4	13	130	160	110	90	98	8,8
25	71	B34	G 3/4"	14	16,3	5	15,6	222	75	147	6,5	4	11	85	105	70	90	98	9,3
	80	B34	G 3/4"	19	21,8	6	15,6	222	75	147	6,5	4	11	100	120	80	90	98	9,3
	90	B34	G 3/4"	24	27,3	8	15,6	249	75	174	8,5	4	13	115	140	95	90	98	9,4
	100	B34	G 3/4"	28	31,3	8	15,6	249	75	174	8,5	4	13	130	160	110	90	98	9,4
	112	B34	G 3/4"	28	31,3	8	15,6	249	75	174	8,5	4	13	130	160	110	90	98	9,4

Dimensions in mm; tolerances allowed.

6.10.2 IF with IEC electric motor

Fig. 606 - IF dimensional drawing with motor



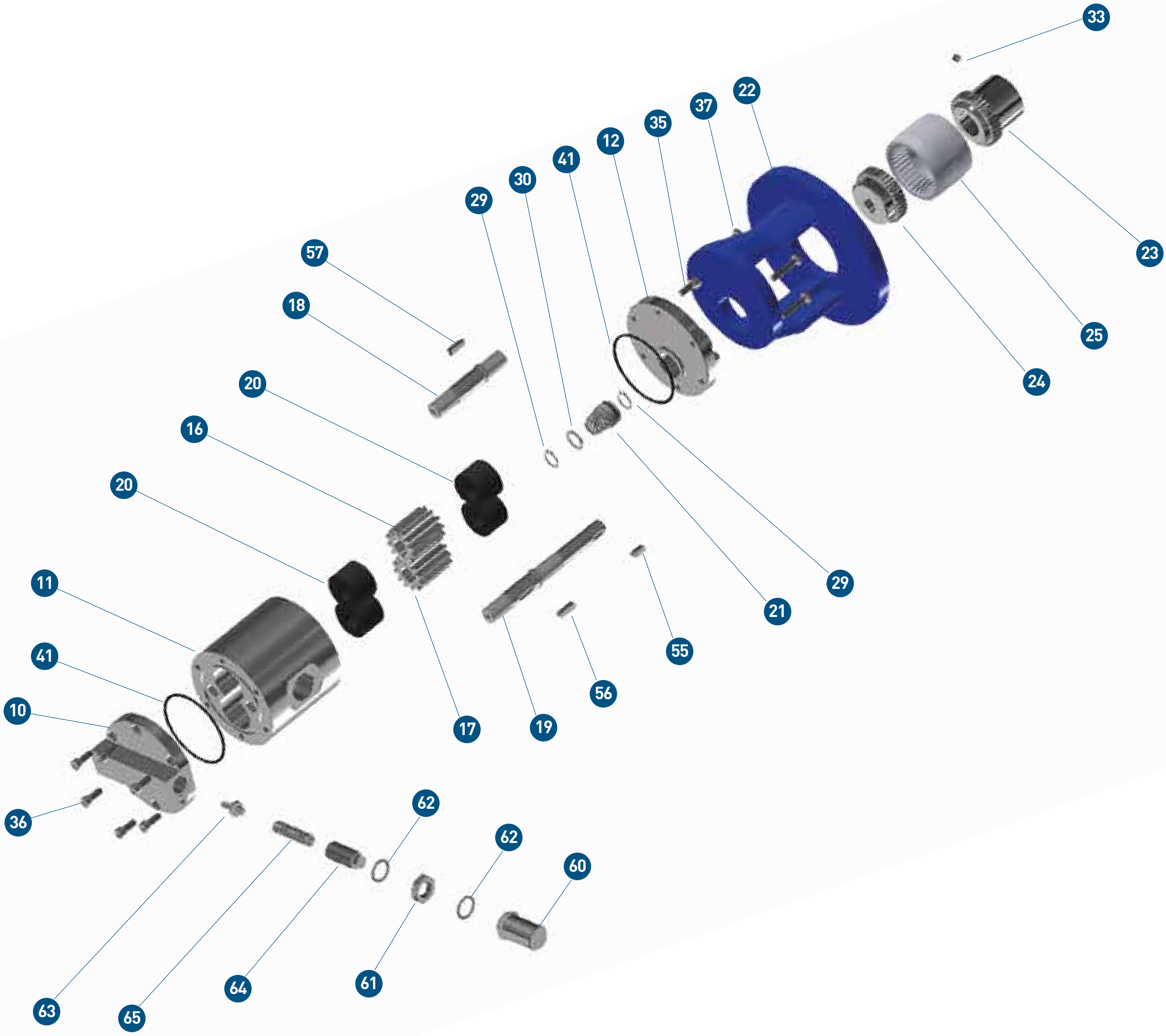
Tab. 606 - IF with motor overall dimensions and weight

PUMP SIZE (IF)	with IEC electric motor		DN ISO 228-1	C	L (*)	M	O	P	Q (*)	R	S (*)	U	V	X	Z (*)	Weight [kg]
	Frame size	IM														
5	71	B34	G 1/2"	86,6	370	60	7	90	116	112	142	90	98	177	182	13,5
5	80	B34	G 1/2"	95,6	408	60	10	100	130	125	160	90	98	182	200	19,4
5	90	B34	G 1/2"	105,6	468	60	10	125	153	140	170	90	98	215	220	26,1
10	71	B34	G 1/2"	86,6	380	65	7	90	116	112	142	90	98	182	182	14,1
10	80	B34	G 1/2"	95,6	418	65	10	100	130	125	160	90	98	187	200	20
10	90	B34	G 1/2"	105,6	478	65	10	125	153	140	170	90	98	220	220	26,7
15	71	B34	G 3/4"	86,6	390	70	7	90	116	112	142	90	98	187	182	14,7
15	80	B34	G 3/4"	95,6	428	70	10	100	130	125	160	90	98	192	200	20,6
15	90	B34	G 3/4"	105,6	488	70	10	125	153	140	170	90	98	225	220	27,3
15	100	B34	G 3/4"	115,6	552	70	12	140	172	160	200	90	98	232	240	33,8
25	71	B34	G 3/4"	86,6	400	75	7	90	116	112	142	90	98	192	182	15,3
25	80	B34	G 3/4"	95,6	438	75	10	100	130	125	160	90	98	197	200	21,2
25	90	B34	G 3/4"	105,6	498	75	10	125	153	140	170	90	98	230	220	27,9
25	100	B34	G 3/4"	115,6	562	75	12	140	172	160	200	90	98	237	240	34,4
25	112	B34	G 3/4"	127,6	563	75	12	140	174	190	230	90	98	244	276	44,9

Dimensions in mm; tolerances allowed; (*) = depends on the motor manufacturer.

6.11 SPARE PARTS

Fig. 607 - IF pumps with mechanical seal



Tab. 607 - IF spare parts list

Rif.	Description	Rif.	Description	Rif.	Description	Rif.	Description
10	Pump Rear Cover	20	Sleeve Bushings	30	Ring seal	57	Feather key / Dowel pin
11	Pump Housing	21	Mechanical Seal	33	Grub Screw	60	Valve Cap
12	Pump Front Cover	22	Bell Housing	35	Screw	61	Valve Locknut
16	Driving Gear	23	Motor half-coupling	36	Screw	62	Valve Washer
17	Driven Gear	24	Pump half-coupling	41	O-ring	63	Valve Poppet
18	Driven Shaft	25	Toothed Sleeve	55	Feather key	64	Valve Adjusting Screw
19	Driving Shaft	29	Locking Ring	56	Feather key	65	Valve Spring