ROBUS IN-LINE HELICAL GEARBOX

motive







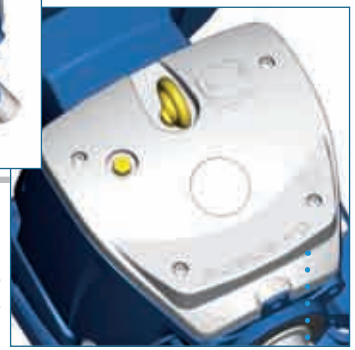
ROBUS 36
ijlod.
dgp.

INDEX

motive®

TECHNICAL CHARACTERISTICS

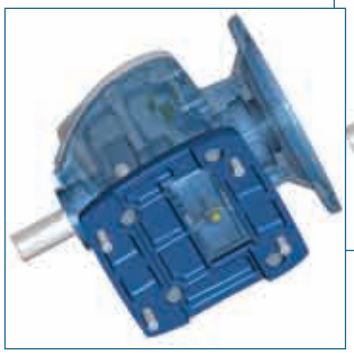
Uniquely contoured, rigid, precise, monobloc, cast iron Body, Base and Flange ensure extreme robustness.

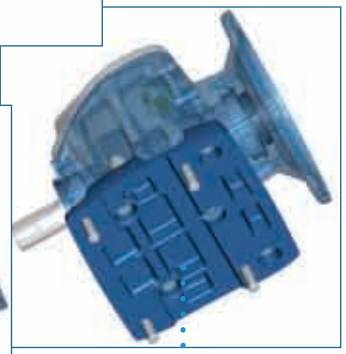


A large top cover in light weight aluminium alloy facilitates the inspection

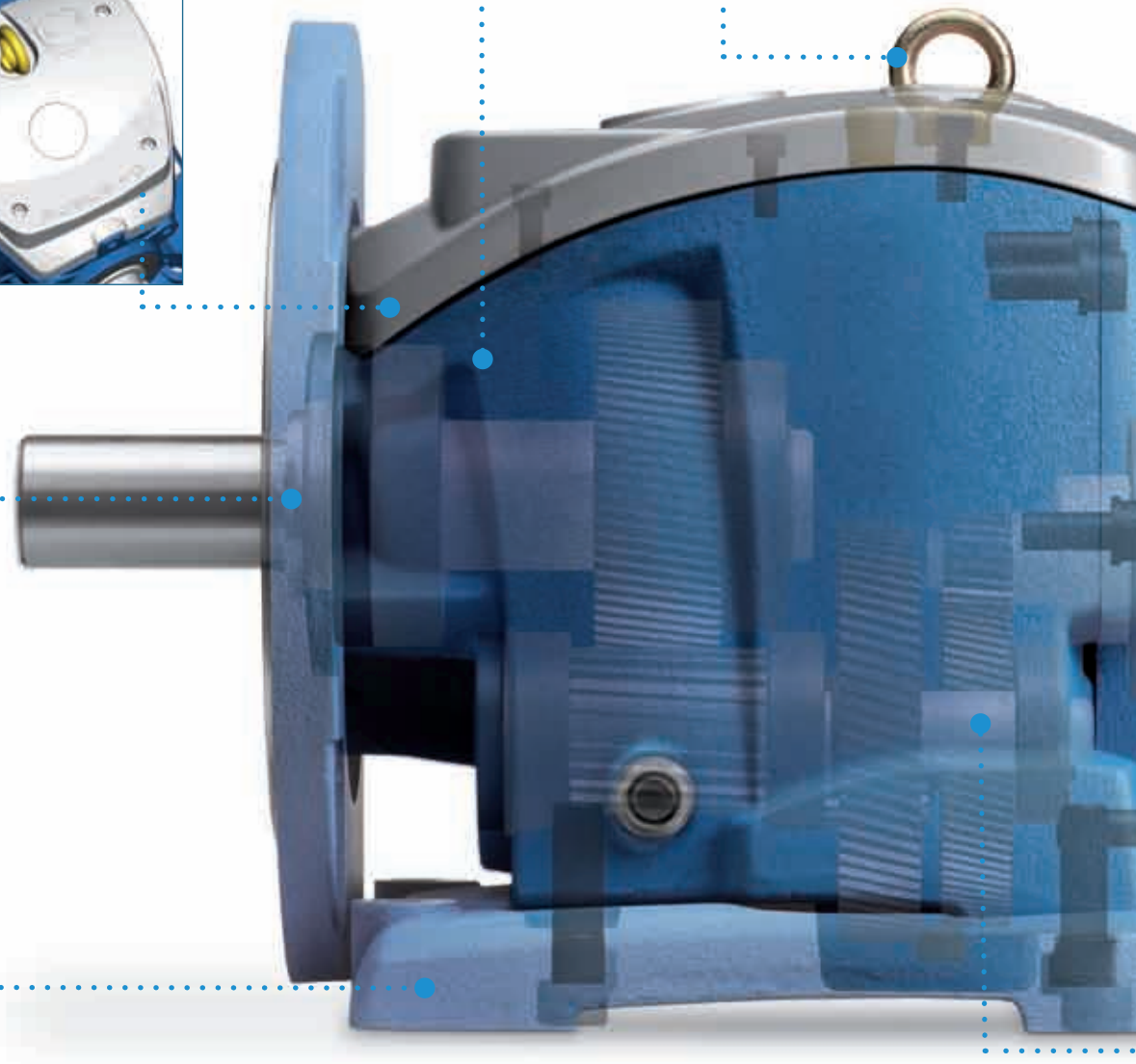
Except Robus 20, all Robus sizes have a screw-on lifting eyebolt

Modular design with detachable output flange and foot base allows easy and quick conversion between foot and flange mounting



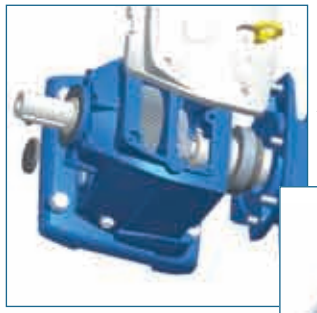


Various detachable foot bases in solid cast iron make Robus interchangeable with any other gearbox brand



PATENTED

FLEXIBLE MOUNTING



Easy to examine and maintan.

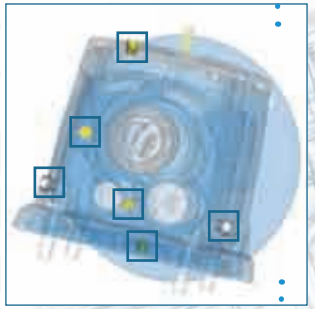
Minimum maintenance requirement.
All sizes are supplied with long-life synthetic oil.

IEC flange and hollow shaft.

Choice of hollow input flanges permits direct mounting of any standard motor

Unique construction of Robus makes it possible to mount any size in any position.
This flexibility is achieved by:

+ ZZ autolubricating bearings on input and output shaft



+ 6 interchangeable plugs, including one breather plug and a level plug

+ mechanical parts locked in their positions by snap rings and spacers. This also ensures better absorbtion of axial thrust and prolongs the life of bearings

ENGINEERED FOR HIGHER RELIABILITY

Use of high strength steels like 15CrMo4 and case hardening to 58 ±2 HRC reduce the wear rate in wheels. All wheels are profile ground to Din 3962 class 6 accuracy for low noise and high efficiency.

Shafts are made from 42CrMo4 steel and tempered to reach a hardness of 23-35 HRC, thus increasing their capacity to withstand shearing stresses.

If the mechanical robustness and the service factor of an helical gearbox are mainly influenced by the centres distance of the last stage, Robus confirms to be very robust (see "X2" at page 19)

Single stages ratios between 2 and 6, together with proper gears sizes, result mathematically in higher teeth number and size (module) of each wheel and a better fractioned load among the reduction stages. That influences both durabilty and torque transmission capability

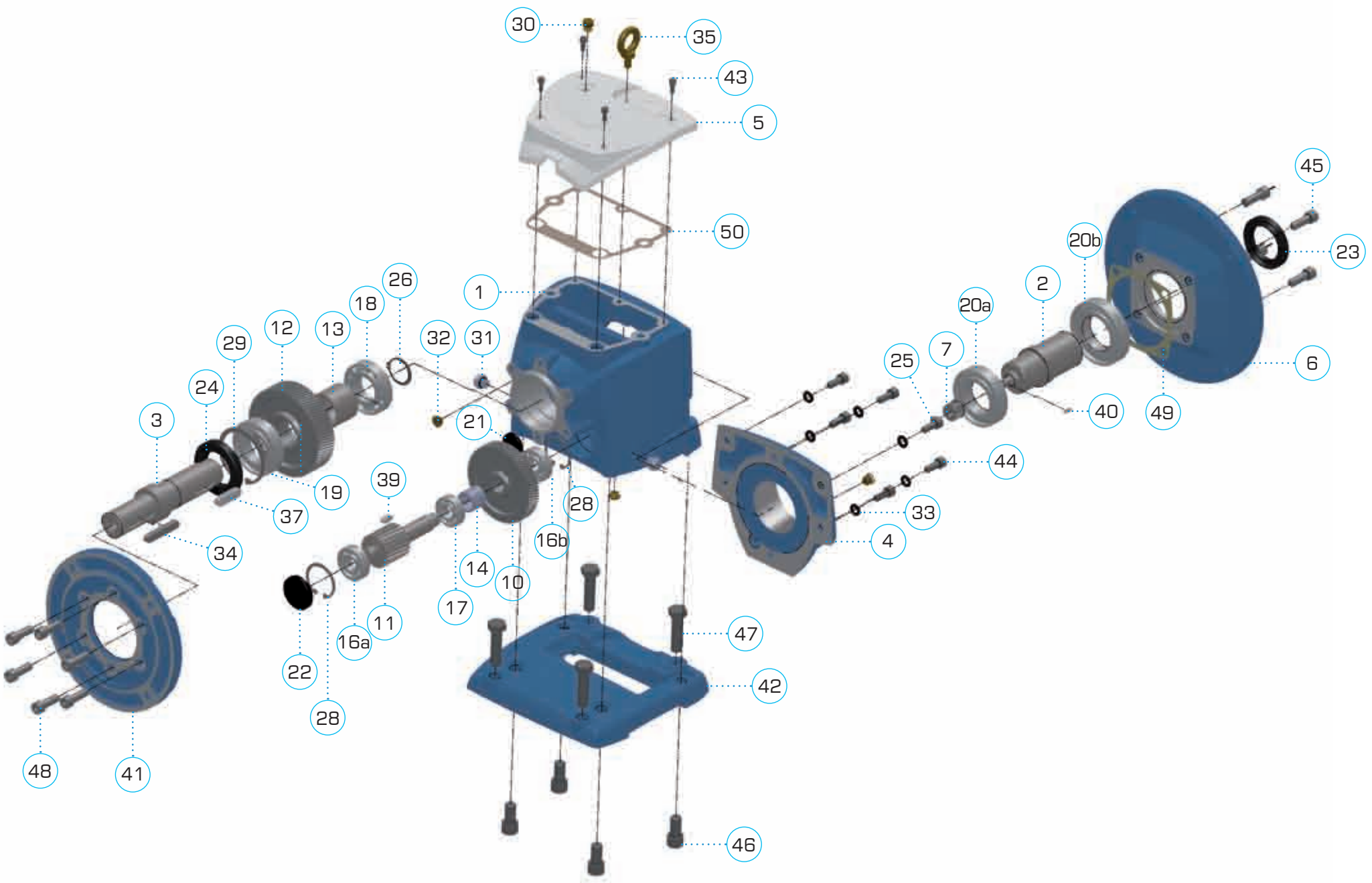
Dual bearing support on the input shaft assures precise alignment of the first stage gears and reduces vibrations and consequent gear wear

Intermediate shaft is rigidly supported by 3 bearings, with no overhang wheel, thus imparting greater flexural strengh and better meshing. This increases the overloading capacity and takes to lower noise

Smaller overhang distance of output shaft from supporting bearing in order to withstand higher radial loads

Abounding bearings size (pages 5 and 7), in order to withstand higher loads

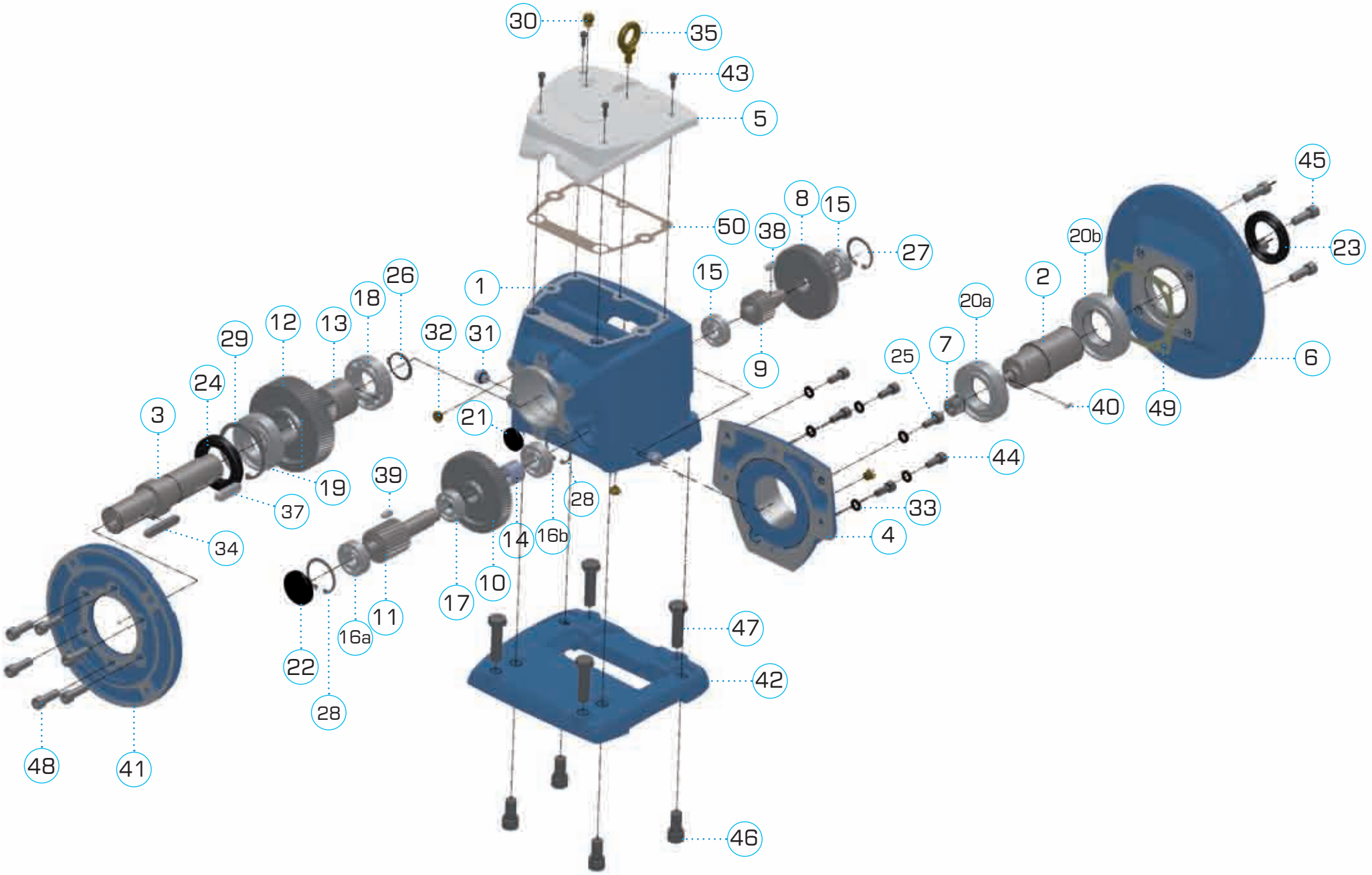
LIST OF COMPONENTS ROBUS-2 (2 REDUCTION STAGES)



LIST OF COMPONENTS ROBUS-2 (2 REDUCTION STAGES)

		ROBUS20-2		ROBUS25-2		ROBUS30-2		ROBUS35-2		ROBUS40-2		ROBUS50-2		ROBUS60-2	
item	code	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty
1	HOU	housing	1	housing	1	housing	1	housing	1	housing	1	housing	1	housing	1
2	ISH	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1
3	OSH	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1
4	ICV	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1
5	TCV	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1
6	IFL	input flange 63B14 71B14 80B14	1	input flange 63B5 71B5 80B5 90B5	1	input flange 63 71 80 90 100/112	1	input flange 63 71 80 90 100/112	1	input flange 80 90 100/112 132	1	input flange 90 100/112 132 160	1	input flange 100/112 132 160 180	1
7	P1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1
10	G2	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1
11	P3	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1
12	G3	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1
13	SP	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1
14	SP	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1	spacer	1
16a	BEA			bearing 6202	1	bearing 6302	1	bearing 6304	1	bearing 6304	1	bearing 6306	1	Bearing 6307	1
16b	BEA	bearing 6201	1	bearing 6202	1	bearing 6203	1	bearing 6204	1	bearing 6304	1	bearing 6306	1	Bearing 6307	1
17	BEA	bearing 6201	1	bearing 6003	1	bearing 6004	1	bearing 6205	1	bearing 6205	1	bearing 6207	1	Bearing 6208	1
18	BEA	bearing 6201	1	bearing 6205	1	bearing 7206	1	bearing 7207	1	bearing 7208	1	bearing 6210	1	Bearing 6212	1
19	BEA	bearing 6204	1	bearing 6206ZZ	1	bearing 7207ZZ	1	bearing 7208ZZ	1	bearing 7209ZZ	1	bearing 6311ZZ	1	Bearing 6313-zz	1
20a	BEA									bearing 6210ZZ	1	bearing 6212ZZ	1	bearing 6215-zz	1
20b	BEA									bearing 6211ZZ	1	bearing 6213ZZ	1	bearing 6216-zz	1
20	BEA	bearing 6005	2	bearing 6008ZZ	2	bearing 6009ZZ	2	bearing 6009ZZ	2			bearing 6009ZZ	2		
21	COV			plug seal D25	1	plug seal D30	1	plug seal D35	1	plug seal D35	1	plug seal D42	1	plug seal D52	1
22	COV			plug seal D35	1	plug seal D42	1	plug seal D52	1	plug seal D52	1	plug seal D72	1	plug seal D80	1
23	OS	oil seal 25x47x6	1	oil seal 40x55x8	1	oil seal 45x60x9	1	oil seal 60x45x9	1	oil seal 55x80x10	1	oil seal 65x90x12	1	oil seal 80x105x13	1
24	OS	oil seal 25x47x6	1	oil seal 62x35x11	1	oil seal 40x72x10	1	oil seal 50x80x10	1	oil seal 55x85x12	1	oil seal 65x120x15	1	oil seal 72x140x12	1
25	SNR			snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1
26	SNR	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1
27	SNR			snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	1
28	SNR			snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2
29	SNR	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1
30	BPL	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1
31	FPL	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6
32	LPL			level plug	1	level plug	1	level plug	1	level plug	1	level plug	1	level plug	1
33	WSH	washer	4	washer	4	washer	4	washer	4	washer	4	washer	4	washer	4
34	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
35	KEY			eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1
37	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
39	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
40	KEY			key	1	key	1	key	1	key	1	key	1	key	1
41	OFL	output flange 120	1	output flange 200 160	1	output flange 200 160	1	output flange 250 200	1	output flange 300 250	1	output flange 350 300	1	output flange 450 350	1
42		base	1	base	1	base	1	base	1	base	1	base	1	base	1
	FSW	SW		SW		SW		SW		SW		SW		SW	
	FBF	BF		BF		BF		BF		BF		BF		BF	
43	SCR			screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
44	SCR	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
45	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
46	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
47	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
48	SCR	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
49	GK49	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1
50	GK50	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1

LIST OF COMPONENTS ROBUS-3 (3 REDUCTION STAGES)



LIST OF COMPONENTS ROBUS-3 (3 REDUCTION STAGES)

		ROBUS20-3		ROBUS25-3		ROBUS30-3		ROBUS35-3		ROBUS40-3		ROBUS50-3		ROBUS60-3	
item	code	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty	description	q.ty
1	HOU	housing	1	housing	1	housing	1	housing	1	housing	1	housing	1	housing	1
2	ISH	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1	input shaft	1
3	OSH	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1	output shaft	1
4	ICV	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1	input cover	1
5	TCV	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1	top cover	1
6	IFL	input flange 63B14 71B14 80B14	1	input flange 63B5 71B5 80B5 90B5	1	input flange 63 71 80 90 100/112	1	input flange 63 71 80 90 100/112	1	input flange 80 90 100/112 132	1	input flange 90 100/112 132 160	1	input flange 100/112 132 160 180	1
7	P1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1	pinion 1	1
8	G1	gear 1	1	gear 1	1	gear 1	1	gear 1	1	gear 1	1	gear 1	1	gear 1	1
9	P2	pinion 2	1	pinion 2	1	pinion 2	1	pinion 2	1	pinion 2	1	pinion 2	1	pinion 2	1
10	G2	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1	gear 2	1
11	P3	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1	pinion 3	1
12	G3	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1	gear 3	1
13	SP	spacer D25xL21	1	spacer D30.5xL24	1	spacer D35.5xL32.5	1	spacer D40.5xL36.6	1	spacer	1	spacer D55.5xL45	1	spacer D65.5xL50	1
14	SP	spacer D18x8	1	spacer D20xL22	1	spacer D20.5xL23.5	1	spacer D21.5xL24.5	1	spacer	1	spacer D35xL32	1	spacer D40.5xL38	1
15	BEA	bearing 6201	2	bearing 6002	2	bearing 6003	2	bearing 6203	2	bearing 6204	2	bearing 6206	2	Bearing 6207	2
16a	BEA	bearing 6201	1	bearing 6202	1	bearing 6302	1	bearing 6304	1	bearing 6304	1	bearing 6306	1	Bearing 6307	1
16b	BEA	bearing 6201	1	bearing 6202	1	bearing 6203	1	bearing 6204	1	bearing 6304	1	bearing 6306	1	Bearing 6307	1
17	BEA			bearing 6003	1	bearing 6004	1	bearing 6205	1	bearing 6205	1	bearing 6207	1	Bearing 6208	1
18	BEA	bearing 6201	1	bearing 6205	1	bearing 7206	1	bearing 7207	1	bearing 7208	1	bearing 6210	1	Bearing 6212	1
19	BEA	bearing 6204	1	bearing 6206	1	bearing 7207ZZ	1	bearing 7208ZZ	1	bearing 7209ZZ	1	bearing 6311ZZ	1	Bearing 6313ZZ	1
20a	BEA									bearing 6210ZZ	1	bearing 6212ZZ	1	bearing 6215ZZ	1
20b	BEA									bearing 6211ZZ	1	bearing 6213ZZ	1	bearing 6216ZZ	1
20	BEA	bearing 6005	2	bearing 6008	2	bearing 6009ZZ	2	bearing 6009ZZ	2			bearing 6009ZZ	2		
21	COV		1	plug seal D25	1	plug seal D30	1	plug seal D35	1	plug seal D35	1	plug seal D42	1	plug seal D52	1
22	COV		1	plug seal D35	1	plug seal D42	1	plug seal D52	1	plug seal D52	1	plug seal D72	1	plug seal D80	1
23	OS	oil seal 25x47x6	1	oil seal 40x55x8	1	oil seal 45x60x9	1	oil seal 60x45x9	1	oil seal 55x80x10	1	oil seal 65x90x12	1	oil seal 80x105x13	1
24	OS	oil seal 25x47x6	1	oil seal 35x62x11	1	oil seal 40x72x10	1	oil seal 50x80x10	1	oil seal 55x85x12	1	oil seal 65x120x15	1	oil seal 72x140x12	1
25	SNR			snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1
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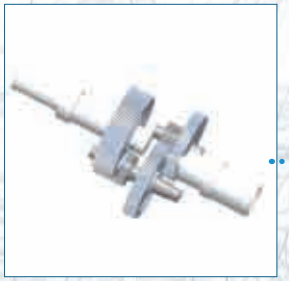
27	SNR	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	1
28	SNR		2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2	snap ring	2
29	SNR	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1	snap ring	1
30	BPL	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1	breather plug	1
31	FPL	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6	filler plug	6
32	LPL			level plug	1	level plug	1	level plug	1	level plug	1	level plug	1	level plug	1
33	WSH	washer	4												
34	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
35	KEY			eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1	eye-bolt	1
37	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
38	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
39	KEY	key	1	key	1	key	1	key	1	key	1	key	1	key	1
40	KEY			Key	1	Key	1	Key	1	Key	1	Key	1	Key	1
41	OFL	output flange 120	1	output flange 200 160	1	output flange 200 160	1	output flange 250 200	1	output flange 300 250	1	output flange 350 300	1	output flange 450 350	1
42		base	1	base	1	base	1	base	1	base	1	base	1	base	1
	FSW	SW		SW		SW		SW		SW		SW		SW	
	FBF	BF		BF		BF		BF		BF		BF		BF	
43	SCR			screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
44	SCR	screw	4	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
45	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
46	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
47	SCR			screw	4	screw	4	screw	4	screw	4	screw	4	screw	4
48	SCR	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6	screw	6
49	GK49	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1
50	GK50	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1	gasket	1

CODE SYSTEM



1 first 4 digits describe the ROBUS size

RB40	=ROBUS 40
RB50	=ROBUS 50
etc	

2 then 1 digit tell the nr of stages

2	=2 stages
3	=3 stages

3 then 3 digits are the rated ratio

020	=i:20
120	=i:120
etc	

4 then 3 digits for the mounting type

FSW	=base type SW (page19)
FBF	=base type BF (page19)
FMS	=base type MS

140	=output flange 63B5 KP=140
160	=output flange 71B5 KP=160
200	=output flange 80/90B5 KP=200
250	=output flange 100/112B5 KP=250
300	=output flange 132B5 KP=300
350	=output flange 160/180 KP=350
450	=output flange 200 KP=450

UNV	=without foot or output flange

5 than 3 digits for the input flange (that determines the input hole diameter too)

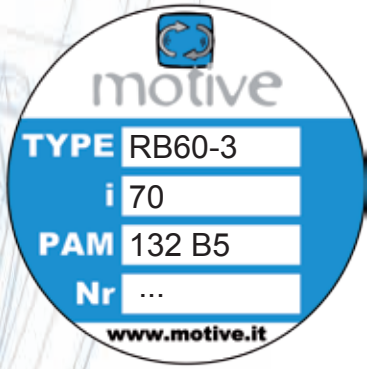
714	=71B14 (page18)
805	=80B5 (page18)
905	=90B5 (page18)
125	=100-112B5 (page18)
135	=132B5 (page18)
	etc ...

For instance:

RB603070FSW135

- ROBUS 60
- 3 stages
- ratio i:70
- SW foot mounting
- input PAM flange 132 B5

Plate:



KW / SIZE / RATIO

service factor fs ≥ 1.5

input n1 = 1450rpm

input PAM	63			71			80			90			100/112				132				160		180		
	11 mm			14 mm			190 mm			24 mm			28 mm				38 mm				42 mm		48 mm		
P_{n1} kW	0,13	0,18	0,25	0,25	0,37	0,55	0,55	0,75	1,1	1,1	1,5	2,2	2,2	3	4	5,5	5,5	7,5	9,2	11	11	15	18,5	22	
P_{n1} Hp	0,18	0,25	0,35	0,35	0,5	0,75	0,75	1	1,5	1,5	2	3	3	4	5,5	7,5	7,5	10	12,5	15	15	20	25	30	
120			25	25	30	35	40	40		50	50	50	50	50	60										120
110																									110
100																									100
90					25	30																			90
80	20	20					35	35	40	40	40				50	60	60	60							80
70				25		25																			70
60							30	30	35			40													60
55																			60						55
50																50									50
45									30	35	35	35	40	40						60					45
40							25	25									50				60	60			40
35				20	20				25			30	35	35	40			50							35
30										30	30												60	60	30
25																									25
20						20						30			35				50	50			60	60	20
15						20	20	20		25	25		30	30		40	40	40			50	50			15
10									20			25			30				40	40			50	50	10
5																									5

ROBUS ratio i:

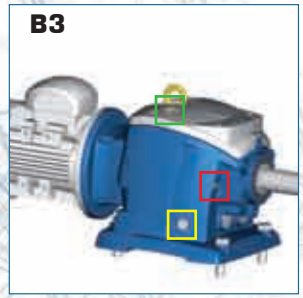
= 3 stages

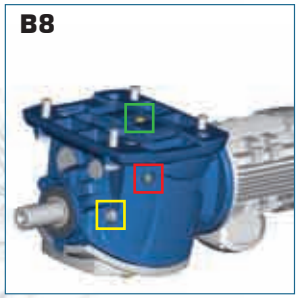
= 2 stages

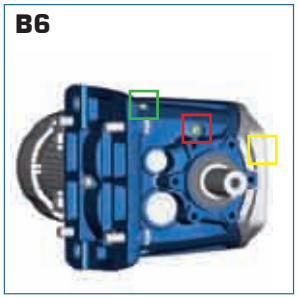
LUBRICATION

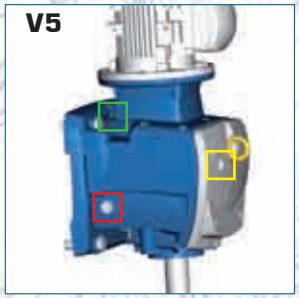
Each Robus is supplied with long-life synthetic oil and do not require any maintenance.
The oil quantity is suitable for B3 mounting position

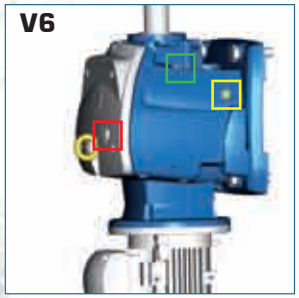
ROBUS	oil (lt)						ISO	temp.	oil type	
	B3	B6	B7	B8	V5	V6				
20	0,25	0,4	0,35	0,55	0,55	0,35	VG 220	-25 +80°C	Mobil Glygoyle 30	Shell Tivela S220
25	0,3	0,75	0,95	0,95	1,05	0,85				
30	0,7	1,5	1,5	1,5	1,65	1,6				
35	1,1	1,8	2	2	3,5	1,6				
40	1,2	2,5	3,4	3,4	4,1	3,8				
50	2,3	6,3	6,5	6,5	7,7	6,7				
60	4,6	11,3	11,7	11,7	13,4	11,7				

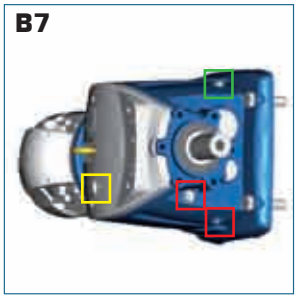












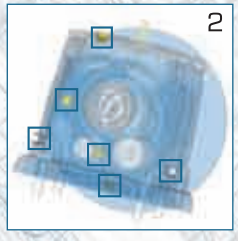
breather plug

level plug

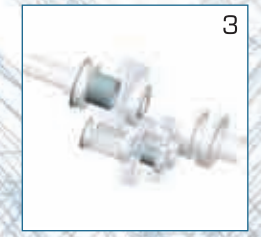
filler plug

After adapting the oil quantity, each Robus can be mounted in ANY position, thus giving big advantages in the stock management and lead time, thanks to the following 3 characteristics:

ZZ autolubricating bearings on input and output shaft



6 interchangeable plugs, including one breather plug and a level plug. Level and breather plug must be positioned according to this chart



mechanical parts locked in their positions by circlips and spacers. This also ensures better absorbtion of axial thrust and prolongs the life of bearings

Rated output torque M_{n2} [Nm]
Torque output transmissible under uniform loading and referred to the input speed n_1 and the corresponding output speed n_2.
The output torque can be calculated with the following formula:

$$M_{n2} = \frac{P_{n1}\,[kW] \cdot 9550}{n_2} \cdot \eta$$

Torque demand M_{r2} [Nm]
Torque calculated based on application requirements. It must be ≤ M_{n2} of the chosen BOX unit.

Input power P_{n1} [kW]
This is the power value of the motor applied to the input shaft and corresponding to a certain input speed n_1, a service factor $f_s = 1$ and a duty service S_1.
It is even possibile to calculate the motor-size necessary by using the formula:

$$P_{n1}\,[kW] = \frac{M_{r2} \cdot n_2}{9550 \cdot \eta}$$

Since the value calculated in this way could not really correspond to an input power actually available in the IEC standardised motors, it will be necessari to choose, among the input powers available, the one which is immediately higher, checking this in the Motive catalogue of the motors.

Efficiency η [%]

An inherent factor in the selection worm-gear boxes is the efficiency h, defined as the ratio between the mechanical power coming out from the output shaft, and the power in the input shaft:

$$\eta = \frac{P_{n2}}{P_{n1}}$$

The efficiency in helical gearboxes is mainly determined by the gearing and bearing friction.
The efficiency of ROBUS varies with the nr of stages: it's 94% when the reduction stages are 3, 96% when the stages are 2.
The starting efficiency is always less than the efficiency at rated speed

Gear ratio i
It is the relationship of the input speed n1and the output speed n_2

$$i = \frac{n_1}{n_2}$$

In the combined, the total ratio is the result of the product of the ratio of the two single boxes.

Input speed n_1 [rpm]
It is the speed the BOX unit is driven at.

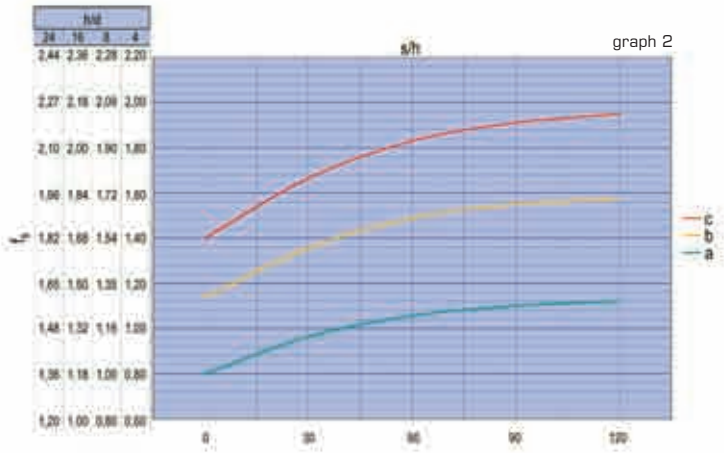
Output speed n_2 [rpm]
It is the rotation speed of the output shaft.

Service factor f_s
It is a numeric value describing the BOX unit service duty. With unavoidable approximation, it takes into consideration:

- the daily working hours **h/d**
- the load classification (see table 2), and then the moment of inertia of the driven masses.
- The number of starts per hour **s/h**
- The presence of brake motors, for which it is necessary to multiply for 1.12 the service factor value deducted by the graph 2.
- The significance of the application in terms of safety, for example lifting of parts

In the graph 2, the service factor f_{sr} required by a certain application can be attained, after having selected the proper "daily working hours" (h/d) column, by intersecting the number of starts per hour (s/h) and one of the a, b or c curves. The curves a, b and c are linked with the load classification described in the table 2.

graph 2



tab. 2

	load classification	application
c	uneven operation, heavy loads, larger masses to be accelerated	conveyors with violent jerks; compressors ad alternate pumps with 1 or more cylinders; machinery for bricks, tiles and clay; kneaders; milling machines; lifting winches with buckets; rotting furnaces; heavy fans or mining purposes; mixers for heavy materials; machine-tools; planing kinds; alternating saws; shears; tumbling barrels; vibrators; shredders; turntables
b	starting with moderate loads, uneven operating conditions, medium size masses to be accelerated	belt conveyors with varied load with transfer of bridge trucks for light duty; levelling machines; shakers and mixed for liquid with variable density and viscosity; machines for the food industry (kneading troughs, mincing machines, slicing machines, etc); sifting machines for sand gravel; textile industry machines; cranes, hoists, goodstifts; fertilizer scrapers; concrete mixers; folding machines; winches; crane mechanisms
a	easy starting, smooth operation, small masses be accelerated	belt conveyors for light material; centrifugal pumps; rotary gear pumps; screw feeders for light materials; lifts; bottling machines; auxiliary controls of tool machines; fans; power generators; fillers; small mixers

If, after the selection of the right M_{r2} and n_2 in the following performance tables, you don't find a BOX unit whose service factor f_s is ≥ of the requested one f_{sr}, you can choose a BOX unit in which $M_{n2} > M_{r2}$.
In fact, in order to satisfy f_{sr}, you can choose another BOX unit whose output torque is ≥ M_{c2} output torque, where:
$M_{c2} = M_{r2} \cdot f_{sr}$
Note: This rule is valid only if the new BOX unit that has been selected in this way has a service factor $f_s \geq 1$ in the performance tables.
From another point of view, the value of f_s in the performance tables refers to a case in which the effective torque requested by the application M_{r2} matches perfectly with the one appearing on the catalogue M_{n2}.
Whenever the torque indicated in the performance table is higher than the requested one, the offered service factor of the performance table can be increased according to the formula:

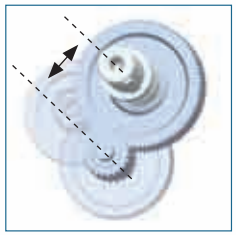
$$f_s \text{ real} = \frac{f_s \text{ on the table} \cdot M_{n2} \text{ on the table}}{M_{r2}}$$

The value of f_s calculated in this way must be ≥ f_{sr}.

Offered service factor

Which features determine the service factor offered by an helical gearbox?

The service factor of a gearbox is its capacity to withstand operating load and overloads, a certain number of starts, the duration of operating time, and mechanical shocks and vibrations. Thus, higher the service factor, greater is the possibility of trouble-free operation and increased life. Without aiming to be completely exhaustive, we list here the main features that influence the service factor:



Amongst all parts, the last stage gears are subjected to highest mechanical stresses. Higher centre distance which in turn results in higher module considerably increases the service factor. ROBUS excels in the area (see measures at page 22)

Compared to fractioned or Aluminium body, the monobloc cast-iron body of ROBUS provides higher rigidity and mechanical robustness.

Use of high strength steels like 15CrMo4 and case hardening to 58 ±2 HRC reduce the wear rate in wheels. All wheels are profile ground to Din 3962 class 6 accuracy

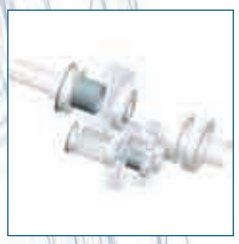
Shafts are made from 42CrMo4 steel and tempered to reach a hardness of 23-35 HRC, thus increasing their capacity to withstand shearing stresses and torsion effect.

Optimal ratios (between 2 and 6) in the several stages, together with appropriate centre distances, result in higher number of teeth and size (module) of each wheel and better torque transmission fractioning through various stages. This improves the overall durability.

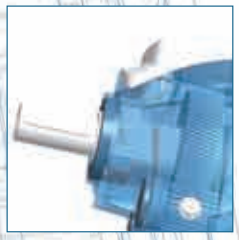
Dual bearing support on the input shaft ensures precise alignment of the first stage gears and reduces vibrations and consequent gear wear

An intermediate shaft rigidly supported by 3 bearings instead of 2, with no overhang wheel, imparts greater flexural strengh and smoother meshing

Oversized bearings (see ROBUS bearings list at pages 5 and 7), allow the gearbox to withstand higher operating loads



Mechanical parts locked in their position by snap rings and spacers. This ensures better absorbtion of axial thrust and prolongs the life of bearings



Smaller overhang of output shaft from supporting bearing in order to withstand higher radial loads

PERFORMANCE TABLE 20-25

service factor f_s =1.5

rpm n_1=1450*	rated	real	input power P_{n1}		output P_{n2}				input connection **B14** IEC 72-1										
ROBUS	ratio i:	ratio i:	kW	Hp	n_2 [rpm]	M_2[Nm]	M_2[Kgm]	stages	63	71	80	90	100	112	132S	132M	160M	160L	180
20	80	79,85	0,19	0,26	18,2	95	9,6	3											
	70	68,73	0,22	0,30	21,1	92	9,3	3											
	60	59,23	0,26	0,35	24,5	95	9,6	3											
	50	49,90	0,31	0,42	29,1	95	9,6	3											
	45	45,45	0,34	0,46	31,9	95	9,6	3											
	40	39,61	0,39	0,53	36,6	95	9,6	3											
	35	35,17	0,44	0,60	41,2	96	9,7	3											
	30	29,36	0,52	0,71	49,4	95	9,6	3											
	25	24,76	0,62	0,84	58,6	95	9,6	3											
	20	19,69	0,78	1,06	73,6	95	9,6	3											
	15	15,02	0,88	1,20	96,6	84	8,4	2											
	12,5	12,65	0,97	1,32	114,6	78	7,8	2											
	10	10,04	1,10	1,50	144,4	70	7,1	2											
	7,5	7,44	1,28	1,74	194,8	60	6,1	2											
	5	4,99	1,58	2,15	290,4	50	5,0	2											
	4	4,05	1,99	2,71	358,0	51	5,1	2											

service factor f_s =1.5

rpm n_1=1450*	rated	real	input power P_{n1}		output P_{n2}				input connection **B5** IEC 72-1										
ROBUS	ratio i:	ratio i:	kW	Hp	n_2 [rpm]	M_2[Nm]	M_2[Kgm]	stages	63	71	80	90	100	112	132S	132M	160M	160L	180
25	120	119,93	0,22	0,30	12,1	164	16,5	3											
	110	106,18	0,26	0,36	13,7	174	17,5	3											
	100	96,44	0,31	0,42	15,0	184	18,6	3											
	90	91,47	0,44	0,60	15,9	250	25,2	3											
	80	79,29	0,49	0,66	18,3	238	24,0	3											
	70	69,57	0,55	0,74	20,8	236	23,8	3											
	60	59,94	0,63	0,85	24,2	232	23,4	3											
	55	57,20	0,73	1,00	25,3	259	26,2	3											
	50	49,28	0,82	1,12	29,4	250	25,2	3											
	45	46,07	0,84	1,14	31,5	239	24,1	3											
	40	39,27	0,97	1,32	36,9	236	23,8	3											
	35	32,51	1,23	1,68	44,6	249	25,1	3											
	30	30,18	1,23	1,68	48,0	231	23,3	3											
	25	24,81	1,41	1,92	58,4	217	21,9	3											
	20	20,99	2,03	2,76	69,1	264	26,6	3											
	25	24,50	0,97	1,32	59,2	150	15,2	2											
	20	19,95	1,41	1,92	72,7	178	18,0	2											
	15	15,75	1,85	2,52	92,1	184	18,6	2											
	13	12,68	2,12	2,88	114,4	170	17,1	2											
	10	10,42	2,21	3,00	139,2	145	14,7	2											
	7	6,84	3,00	4,08	212,0	130	13,1	2											
	5	4,88	3,09	4,20	297,1	95	9,6	2											
	4	4,00	3,65	4,97	362,5	92	9,3	2											

* with n_1=2900, multiply for 1,8 the max input power

PERFORMANCE TABLE 30-35

service factor f_s = 1.5

rpm n_1=1450*	rated	real	input power P_{n1}		output P_{n2}				input connection **B5** IEC 72-1									
ROBUS	ratio i:	ratio i:	kW	Hp	n_2 [rpm]	M_2[Nm]	M_2[Kgm]	stages	63	71	80	90	100	112	132S	132M	160M	160L	180
30	120	120,20	0,44	0,60	12,1	328	33,1	3											
	110	106,30	0,44	0,60	13,6	290	29,3	3											
	100	102,47	0,44	0,60	14,2	280	28,2	3											
	90	91,24	0,53	0,72	15,9	299	30,2	3											
	80	84,26	0,57	0,78	17,2	299	30,2	3											
	70	72,29	0,71	0,96	20,1	316	31,9	3											
	60	60,16	0,97	1,32	24,1	361	36,5	3											
	55	55,56	1,06	1,44	26,1	364	36,7	3											
	50	49,45	0,88	1,20	29,3	270	27,2	3											
	45	47,66	1,23	1,68	30,4	364	36,8	3											
	40	39,26	1,59	2,16	36,9	386	38,9	3											
	35	35,46	1,68	2,28	40,9	368	37,1	3											
	30	30,44	1,85	2,52	47,6	349	35,2	3											
	25	25,38	2,21	3,00	57,1	346	35,0	3											
	20	22,30	2,91	3,96	65,0	402	40,5	3											
	23	23,02	1,50	2,04	63,0	218	22,0	2											
	20	20,36	1,59	2,16	71,2	204	20,6	2											
	18	18,37	1,76	2,40	78,9	205	20,7	2											
	15	14,27	2,65	3,60	101,6	239	24,1	2											
	10	9,96	4,41	6,00	145,6	278	28,0	2											
	7	6,79	5,91	8,04	213,5	254	25,6	2											
	5	5,66	6,17	8,40	256,2	221	22,3	2											
	4	4,05	11,11	15,12	358,0	285	28,7	2											
35	120	123,20	0,49	0,67	11,8	377	38,0	3											
	110	105,60	0,57	0,78	13,7	375	37,8	3											
	100	98,82	0,71	0,96	14,7	432	43,6	3											
	90	84,70	0,88	1,20	17,1	463	46,7	3											
	80	79,85	0,97	1,32	18,2	480	48,4	3											
	70	68,44	1,06	1,44	21,2	448	45,2	3											
	60	59,29	1,59	2,16	24,5	583	58,8	3											
	55	55,61	1,32	1,80	26,1	455	46,0	3											
	50	50,82	1,85	2,52	28,5	583	58,8	3											
	45	46,13	1,50	2,04	31,4	428	43,2	3											
	40	41,29	2,21	3,00	35,1	564	56,9	3											
	35	34,25	2,56	3,48	42,3	542	54,7	3											
	30	30,17	3,09	4,20	48,1	577	58,2	3											
	25	25,51	3,79	5,16	56,8	599	60,4	3											
	20	19,71	4,85	6,60	73,6	592	59,7	3											
	15	16,34	5,47	7,44	88,7	553	55,8	3											
	25	26,40	3,79	5,16	54,9	633	63,9	2											
	20	18,79	2,82	3,84	77,2	335	33,8	2											
	15	15,07	3,97	5,40	96,2	378	38,2	2											
	13	12,53	4,50	6,12	115,7	356	36,0	2											
	10	10,05	5,64	7,68	144,3	359	36,2	2											
	8	7,46	6,79	9,24	194,4	320	32,3	2											
	5	5,23	7,32	9,96	277,2	242	24,4	2											
	4	3,96	8,72	11,86	366,2	218	22,0	2											

* with n_1=2900, multiply for 1,8 the max input power

PERFORMANCE TABLE 40-50

service factor f_s = 1.5

rpm n_1=1450*

input connection **B5** IEC 72-1

ROBUS	rated ratio i:	real ratio i:	input power P_{n1} kW	input power P_{n1} Hp	output P_{n2} n_2 [rpm]	output P_{n2} M_2[Nm]	output P_{n2} M_2[Kgm]	stages	63	71	80	90	100	112	132S	132M	160M	160L	180
40	120	116,13	0,88	1,20	12,5	634	64,0	3											
	110	105,99	0,88	1,20	13,7	579	58,4	3											
	100	101,24	0,88	1,20	14,3	553	55,8	3											
	90	92,40	1,06	1,44	15,7	605	61,1	3											
	80	79,23	1,15	1,56	18,3	562	56,7	3											
	70	70,75	1,50	2,04	20,5	657	66,3	3											
	60	63,05	1,76	2,40	23,0	689	69,5	3											
	55	52,92	2,29	3,12	27,4	751	75,8	3											
	50	50,25	2,47	3,36	28,9	768	77,5	3											
	45	44,46	2,73	3,72	32,6	753	75,9	3											
	40	40,81	2,82	3,84	35,5	713	71,9	3											
	35	33,98	3,09	4,20	42,7	649	65,5	3											
	30	31,94	3,35	4,56	45,4	663	66,9	3											
	25	25,97	4,59	6,24	55,8	737	74,4	3											
	20	20,33	5,29	7,20	71,3	666	67,2	3											
	15	14,95	6,62	9,00	97,0	612	61,8	3											
	25	24,05	2,65	3,60	60,3	402	40,6	2											
	23	23,31	3,53	4,80	62,2	520	52,5	2											
	20	21,27	3,97	5,40	68,2	534	53,9	2											
	15	14,83	5,38	7,32	97,8	504	50,9	2											
	13	13,54	6,35	8,64	107,1	544	54,9	2											
	10	9,96	7,67	10,44	145,6	483	48,8	2											
	7	6,65	7,94	10,80	218,0	334	33,7	2											
	5	4,78	8,38	11,40	303,3	253	25,5	2											
	4	4,03	9,58	13,03	359,8	244	24,6	2											
50	120	117,17	2,65	3,60	12,4	1919	193,7	3											
	110	107,20	2,65	3,60	13,5	1756	177,2	3											
	100	100,70	2,65	3,60	14,4	1650	166,4	3											
	90	92,13	3,09	4,20	15,7	1761	177,6	3											
	80	80,06	4,41	6,00	18,1	2186	220,5	3											
	70	72,13	4,41	6,00	20,1	1969	198,7	3											
	60	61,99	4,85	6,60	23,4	1862	187,8	3											
	55	57,74	4,59	6,24	25,1	1640	165,4	3											
	50	50,35	4,67	6,36	28,8	1457	147,0	3											
	45	45,12	5,47	7,44	32,1	1528	154,1	3											
	40	38,78	5,64	7,68	37,4	1355	136,7	3											
	35	34,47	7,50	10,20	42,1	1600	161,4	3											
	30	29,90	7,76	10,56	48,5	1437	145,0	3											
	25	27,50	7,67	10,44	52,7	1306	131,8	3											
	20	21,56	11,73	15,96	67,3	1566	158,0	3											
	23	22,83	3,97	5,40	63,5	573	57,8	2											
	20	19,83	6,17	8,40	73,1	774	78,1	2											
	18	18,15	6,88	9,36	79,9	789	79,7	2											
	15	15,29	10,67	14,52	94,8	1032	104,1	2											
	10	10,37	18,26	24,84	139,8	1197	120,8	2											
	8	8,03	18,52	25,20	180,6	940	94,9	2											
	5	5,02	20,99	28,56	288,8	666	67,2	2											
	4	4,06	25,35	34,49	357,1	651	65,7	2											

* with n_1=2900, multiply for 1,8 the max input power

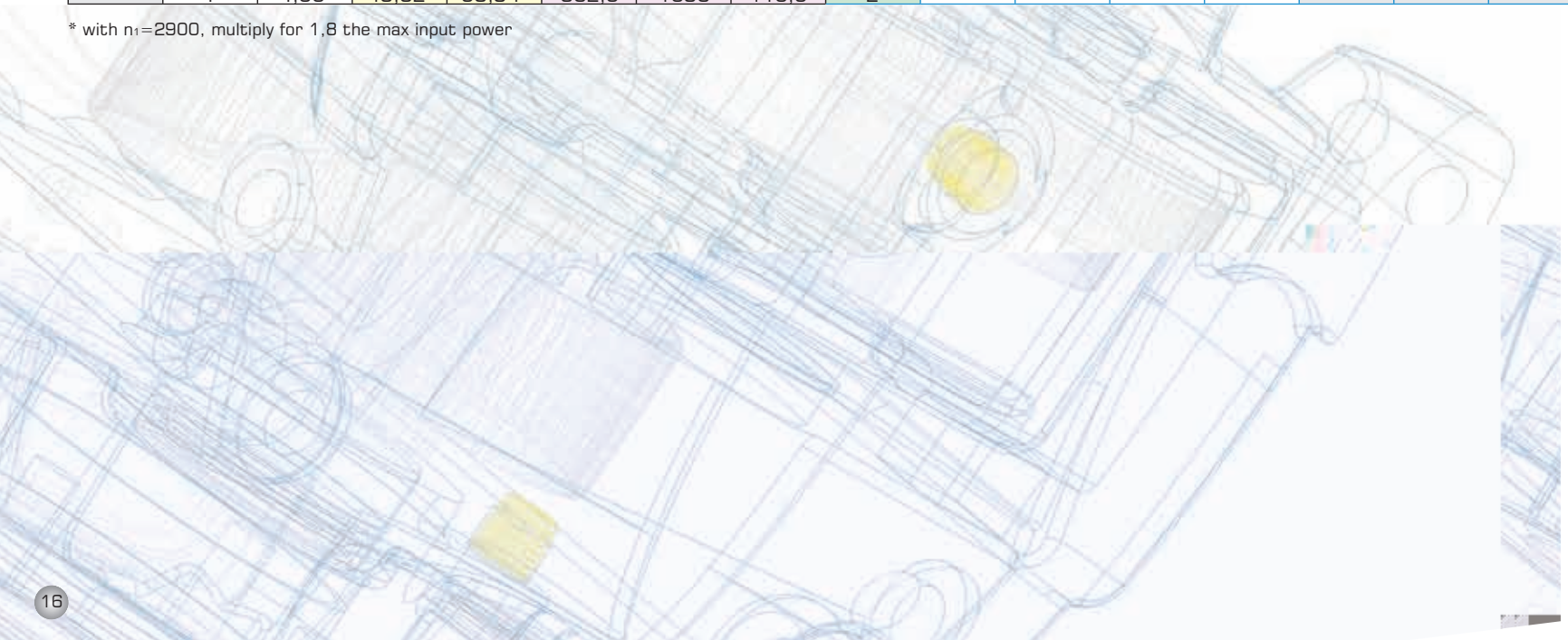
PERFORMANCE TABLE 60

service factor f_s = 1.5

input connection **B5** IEC 72-1

rpm n_1=1450*	rated	real	input power P_{n1}		output P_{n2}												
ROBUS	ratio i:	ratio i:	kW	Hp	n_2 [rpm]	M_2[Nm]	M_2[Kgm]	stages	63	71	80	90	100	112	132S	132M	160M	160L	180
60	120	115,43	4,41	6,00	12,6	3152	318,0	3											
	110	111,72	4,41	6,00	13,0	3050	307,7	3											
	100	101,79	4,41	6,00	14,2	2779	280,4	3											
	90	89,28	4,41	6,00	16,2	2438	245,9	3											
	80	81,51	6,62	9,00	17,8	3338	336,8	3											
	70	69,95	6,62	9,00	20,7	2865	289,0	3											
	60	60,82	6,62	9,00	23,8	2491	251,3	3											
	55	55,42	8,82	12,00	26,2	3026	305,3	3											
	50	48,03	9,97	13,56	30,2	2964	299,0	3											
	45	44,72	10,85	14,76	32,4	3004	303,0	3											
	40	38,36	13,23	18,00	37,8	3142	317,0	3											
	35	35,72	13,94	18,96	40,6	3082	310,9	3											
	30	28,33	19,67	26,76	51,2	3450	348,1	3											
	25	24,63	20,73	28,20	58,9	3161	318,9	3											
	20	19,69	29,11	39,60	73,6	3548	358,0	3											
	15	15,32	30,87	42,00	94,6	2928	295,4	3											
	23	22,96	5,64	7,68	63,2	819	82,7	2											
	20	20,92	6,26	8,52	69,3	828	83,6	2											
	17	16,75	10,58	14,40	86,6	1121	113,1	2											
	15	15,26	13,23	18,00	95,0	1277	128,8	2											
	13	13,38	18,96	25,80	108,4	1604	161,9	2											
	10	9,74	30,43	41,40	148,9	1874	189,1	2											
	7	7,34	31,75	43,20	197,5	1474	148,7	2											
	5	5,42	32,63	44,40	267,5	1118	112,8	2											
	4	4,00	43,32	58,94	362,5	1096	110,5	2											

* with n_1=2900, multiply for 1,8 the max input power



WEIGHTS

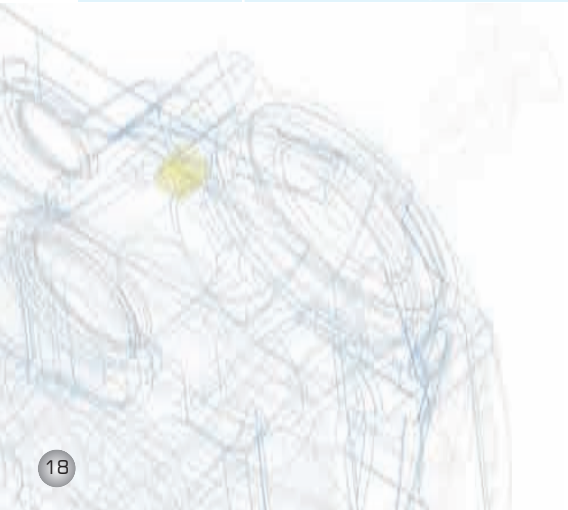
Weights including oil in Kg

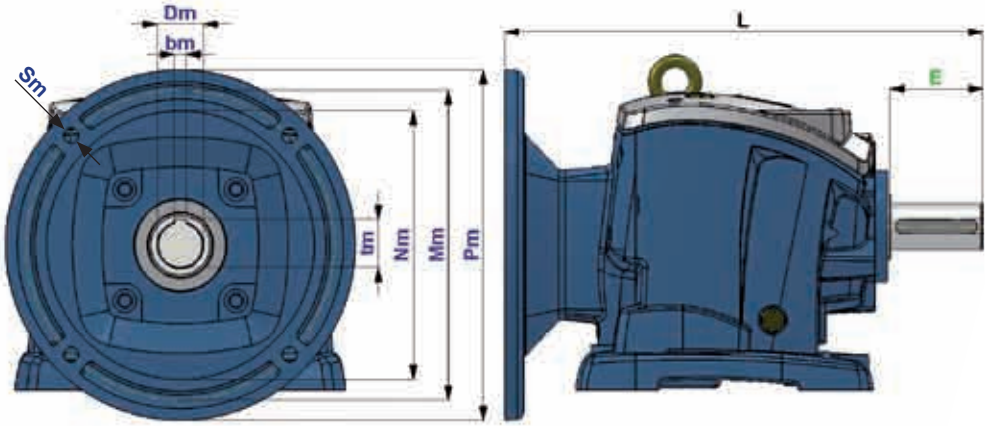
input		ROBUS20		ROBUS25		ROBUS30		ROBUS35		ROBUS40		ROBUS50		ROBUS60	
		2	3	2	3	2	3	2	3	2	3	2	3	2	3
63 B14	UNV	7,3	7,7	-	-	-	-	-	-	-	-	-	-	-	-
71 B14		7,5	7,9	-	-	-	-	-	-	-	-	-	-	-	-
80B14		8,8	9,0	-	-	-	-	-	-	-	-	-	-	-	-
63/71 B5		-	-	12,8	13,4	22,2	23,4	32,0	33,5	-	-	-	-	-	-
80/90 B5		-	-	13,7	14,3	23,4	24,2	32,5	34,2	39,4	41,7	74,0	78,6	-	-
100/112 B5		-	-	-	-	24,7	25,7	34,2	35,7	40,9	43,1	75,1	82,9	135,8	141,2
132 B5		-	-	-	-	-	-	-	-	47,3	49,6	87,5	92,0	136,9	142,3
160 B5		-	-	-	-	-	-	-	-	-	-	89,9	-	139,3	144,3
180 B5		-	-	-	-	-	-	-	-	-	-	-	-	139,0	144,4
63 B14	FSW	8,8	9,2	-	-	-	-	-	-	-	-	-	-	-	-
71 B14		9,0	9,4	-	-	-	-	-	-	-	-	-	-	-	-
80 B14		10,3	10,5	-	-	-	-	-	-	-	-	-	-	-	-
63/71 B5		-	-	14,7	15,3	25,8	27,0	37,2	38,7	-	-	-	-	-	-
80/90 B5		-	-	15,6	16,2	27,0	27,8	37,7	39,4	45,9	48,2	88,0	92,6	-	-
100/112 B5		-	-			28,3	29,3	39,4	40,9	47,4	49,6	89,1	96,9	164,8	170,2
132 B5		-	-	-	-	-	-	-	-	53,8	56,1	101,5	106,0	165,9	171,3
160 B5		-	-	-	-	-	-	-	-	-	-	103,9	-	168,3	173,3
180 B5		-	-	-	-	-	-	-	-	-	-	-	-	168,0	173,4
63 B14	FBF	8,9	9,3	-	-	-	-	-	-	-	-	-	-	-	-
71B14		9,1	9,5	-	-	-	-	-	-	-	-	-	-	-	-
80 B14		10,4	10,6	-	-	-	-	-	-	-	-	-	-	-	-
63/71 B5		-	-	15,6	16,2	26,6	27,8	39,5	41,0	-	-	-	-	-	-
80/90 B5		-	-	16,4	17,1	27,8	28,6	40,0	41,7	49,7	52,0	95,7	100,3	-	-
100/112 B5		-	-	-	-	29,1	30,1	41,7	43,2	51,2	53,4	96,8	104,6	162,2	167,6
132 B5		-	-	-	-	-	-	-	-	57,6	59,9	109,2	113,7	163,3	168,7
160 B5		-	-	-	-	-	-	-	-	-	-	111,6	-	165,7	170,7
180 B5		-	-	-	-	-	-	-	-	-	-	-	-	165,4	170,8

120	56B5	=UNV+0,4													
160	71B5			=UNV+0,9		=UNV+0,9									
200	80/90B5			=UNV+1,7		=UNV+1,7		=UNV+1,8							
250	100/112B5							=UNV+3,8		=UNV+4,1					
300	132B5									=UNV+7,2		=UNV+5,8			
350	160/180B5											=UNV+9,8		=UNV+8,9	
450	200B5													=UNV+19,9	

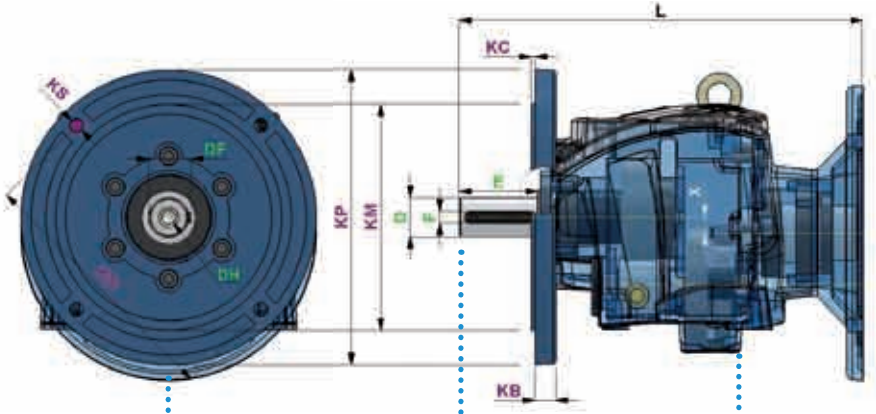
DIMENSIONS

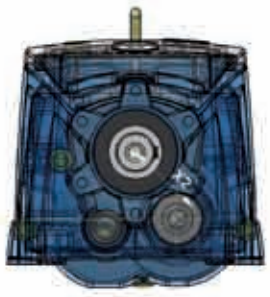
ROBUS	motor type		Nm	Mm	Pm	Sm	Dm	tm	bm	L
20	63	B14	60	75	90	M6	11	12,8	4	212,5
	71	B14	70	85	105	M7	14	16,3	5	212,5
	80	B14	80	100	120		19	21,8	6	227,0
25	63	B5	95	115	140	M8	11	12,8	4	273,0
	71	B5	110	130	160		14	16,3	5	
	80	B5	130	165	200	M10	19	21,8	6	274,0
	90	B5					24	27,3	8	
30	63	B5	95	115	140	M8	11	12,8	4	317,6
	71	B5	110	130	160		14	16,3	5	
	80	B5	130	165	200	M10	19	21,8	6	326,6
	90	B5					24	27,3	8	
	100/112	B5	180	215	250	M12	28	31,3	8	327,6
35	63	B5	95	115	140	M8	11	12,8	4	357,0
	71	B5	110	130	160		14	16,3	5	
	80	B5	130	165	200	M10	19	21,8	6	366,0
	90	B5					24	27,3	8	
	100/112	B5	180	215	250	M12	28	31,3	8	367,0
40	80	B5	130	165	200	M10	19	21,8	6	396,5
	90	B5					24	27,3	8	
	100/112	B5	180	215	250	M12	28	31,3	8	398,5
	132	B5	230	265	300		38	41,3	12	410,5
50	90	B5	130	165	200	M10	24	27,3	8	447,0
	100/112	B5	180	215	250	M12	28	31,3	8	450,0
	132	B5	230	265	300		38	41,3	12	520,0
	160	B5	250	300	350	M16	42	45,3	12	
60	100/112	B5	180	215	250	M12	28	31,3	8	567,4
	132	B5	230	265	300		38	41,3	12	585,6
	160	B5	250	300	350	M16	42	45,3	12	
	180	B5					48	51,8	14	

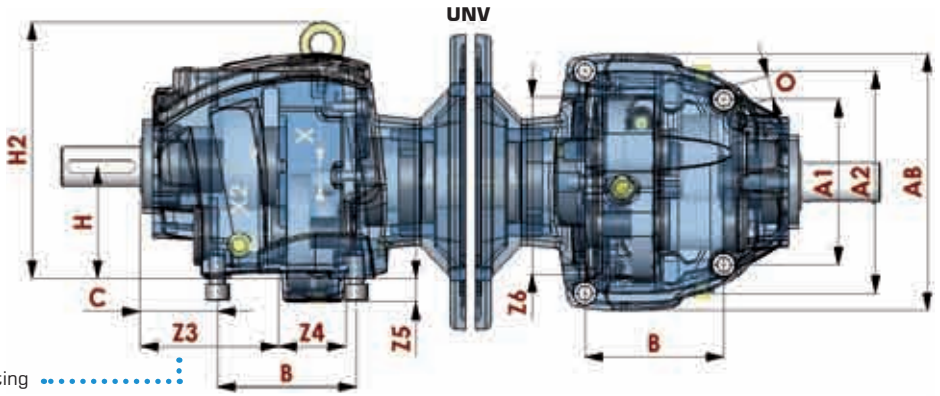




DIMENSIONS







flange mounting

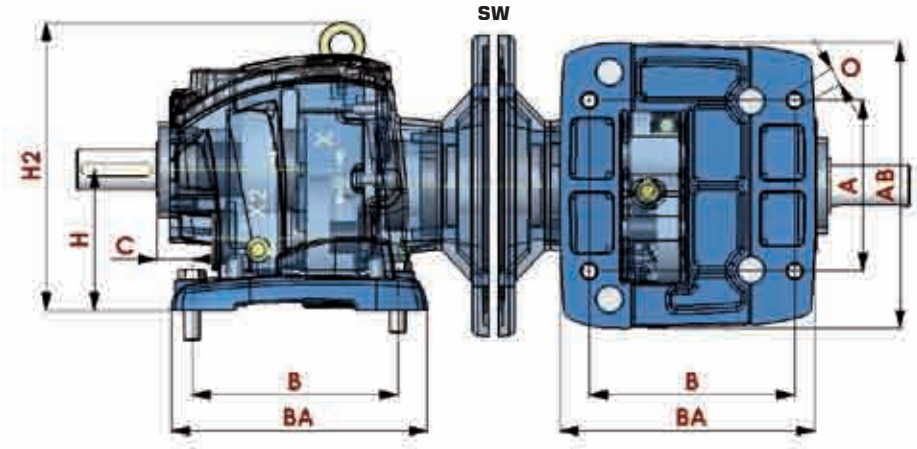
output shaft

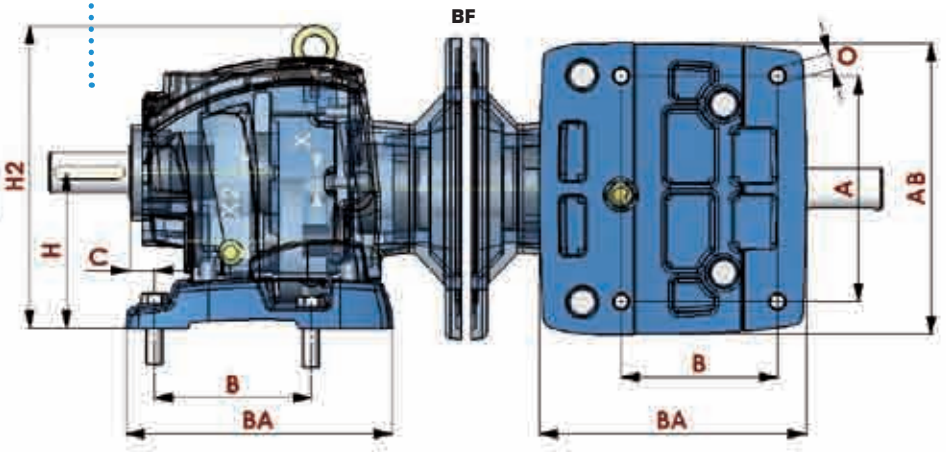
foot mounting

ROBUS	IEC	KP	KM	KN	KS	KC	KB
20	56B5	120	80	100	7	3	8
25	80/90B5	200	130	165	11	3,5	12
	71B5	160	110	130	9	3,5	10
30	80/90B5	200	130	165	11	3,5	12
	71B5	160	110	130	9	3,5	10
35	100/112B5	250	180	215	13,5	4	15
	80/90B5	200	130	165	11	4	12
40	132B5	300	230	265	14	4	21
	100/112B5	250	180	215	14	4	19
50	160/180B5	350	250	300	18	5	21
	132B5	300	230	265	14	4	19
60	200B5	450	350	400	18	5	25
	160/180B5	350	250	300	18	5	21

D	E	F	DF	DH	X	X2
20 (k6)	40	6	23	M5x12,5	6,5	39-40
25 (k6)	50	8	28	M10x20L	11	52,5
30 (k6)	60	8	33	M10x20L	13,5	66
35 (k6)	70	10	38	M12x24L	17	72
40 (k6)	80	12	43	M16x32	16	80
50 (k6)	100	14	53,5	M16x32	18	103
60 (m6)	120	18	64	M20x40	20	120

type	B	BA	A	AB	O	H	H2	C	Z3	Z4	Z5	Z6
SW	110	143	110	153	9	75	170	18	-	-	-	-
BF	87	143	110	153	9	85	180	18	-	-	-	-
UNV	42	-	A1=116 A2=124	145	M6	59	120	50	35	100	20	145
SW	130	171,5	110	145	9	90	193,6	25	-	-	-	-
BF	107,5	173,8	130	180,5	9	100	203,5	18	-	-	-	-
UNV	90,6	-	A1=108 A2=145	170	M10	73,5	180	54,5	95	84	17	128
SW	165	209	135	233	14	115	238,6	30	-	-	-	-
BF	130	213,5	160	229	14	120	243,5	18	-	-	-	-
UNV	115,8	-	A1=130 A2=186	215	M12	94	215	62,4	115	95	22	155
SW	195	236,7	150	263,7	14	130	264	30	-	-	-	-
BF	149,5	246,8	180	269	14	140	274,5	19,5	-	-	-	-
UNV	131	-	A1=156 A2=210	243	M12	106	235	74	135	105	20	168
SW	205	255	170	283,7	18	140	287	35	-	-	-	-
BF	156	266	225	290	18	155	302	25	-	-	-	-
UNV	141	-	A1=168 A2=226	262	M16	114	262	78,5	140	65	27	190
SW	260	327,7	215	364,6	18	180	357	40	-	-	-	-
BF	180	336	250	372,5	18	195	372	25	-	-	-	-
UNV	181,3	-	A1=216 A2=291	336	M16	148	313	92	170	98	32	250
SW	310	393	250	438	22	225	428	40	-	-	-	-
BF	165	394	300	437,5	22	217	421	25	-	-	-	-
UNV	217,6	-	A1=259 A2=349	405	M16	176	381	103	185	120	43	295





TERMS OF SALE AND GUARANTEE

ARTICLE 1
GUARANTEE

1.1 Barring written agreements, entered into between the parties hereto each time, Motive hereby guarantees compliance with specific agreements.
The guarantee for defects shall be restricted to product defects following design, materials or manufacturing defects leading back to Motive.
The guarantee shall not include:

* Faults or damages ensuing from transport. Faults or damages ensuing from installation defects; incompetent use of the product, or any other unsuitable use.
* Tampering or damages ensuing from use by non-authorised staff and/or use of non-original parts and/or spare parts;
* Defects and/or damages ensuing from chemical agents and/or atmospheric phenomena (e.g. burnt out material, etc.); routine maintenance and required action or checks;
* Products lacking a plate or having a tempered plate.

1.2 Returns to credit or replace will be accepted only in exceptional cases; however returns of goods already used to credit or replace won't be accepted in any case.
The guarantee shall be effective for all Motive products, with a term of validity of 12 months, starting from the date of shipment.
The guarantee shall be subject to specific written request for Motive to take action, according to statements, as described at the paragraphs herein below. By virtue of aforesaid approval, and as regards the claim, Motive shall be bound at its discretion, and within a reasonable time-limit, to alternatively take the following actions:
a) To supply the Buyer with products of the same type and quality as those having proven defective and not complying with agreements, free ex-works; in aforesaid case, Motive shall have the right to request, at Buyer's charge, early return of defective goods, which shall become Motive's property;
b) To repair, at its charge , the defective product or to modify the product which does not comply with agreements, by performing aforesaid action at its facilities; in aforesaid cases, all costs regarding product transport shall be sustained by the Buyer.
c) To send spare parts free of charge: all costs regarding product transport shall be sustained by the Buyer.

1.3. The guarantee herein shall assimilate and replace legal guarantees for defects and discrepancies, and shall exclude any other eventual Motive liability, however caused by supplied products; in particular, the Buyer shall have no right to submit any further claims.
Motive shall not be liable for the enforcement of any further claims, as of the date the guarantee's term of validity expires.

ARTICLE 2
CLAIMS

2.1. Claims, regarding quantity, weight, gross weight and colour, or claims regarding faults and defects in quality or compliance, and which the Buyer may discover on goods delivery, shall be submitted by a max. 7 days of aforesaid discovery, under penalty of nullity.

ARTICLE 3
DELIVERY

3.1. Any liability for damages ensuing from total or partial delayed or failed delivery, shall be excluded.

3.2. Unless differently communicated by written to the Client, the transport terms have to be intended ex-works.

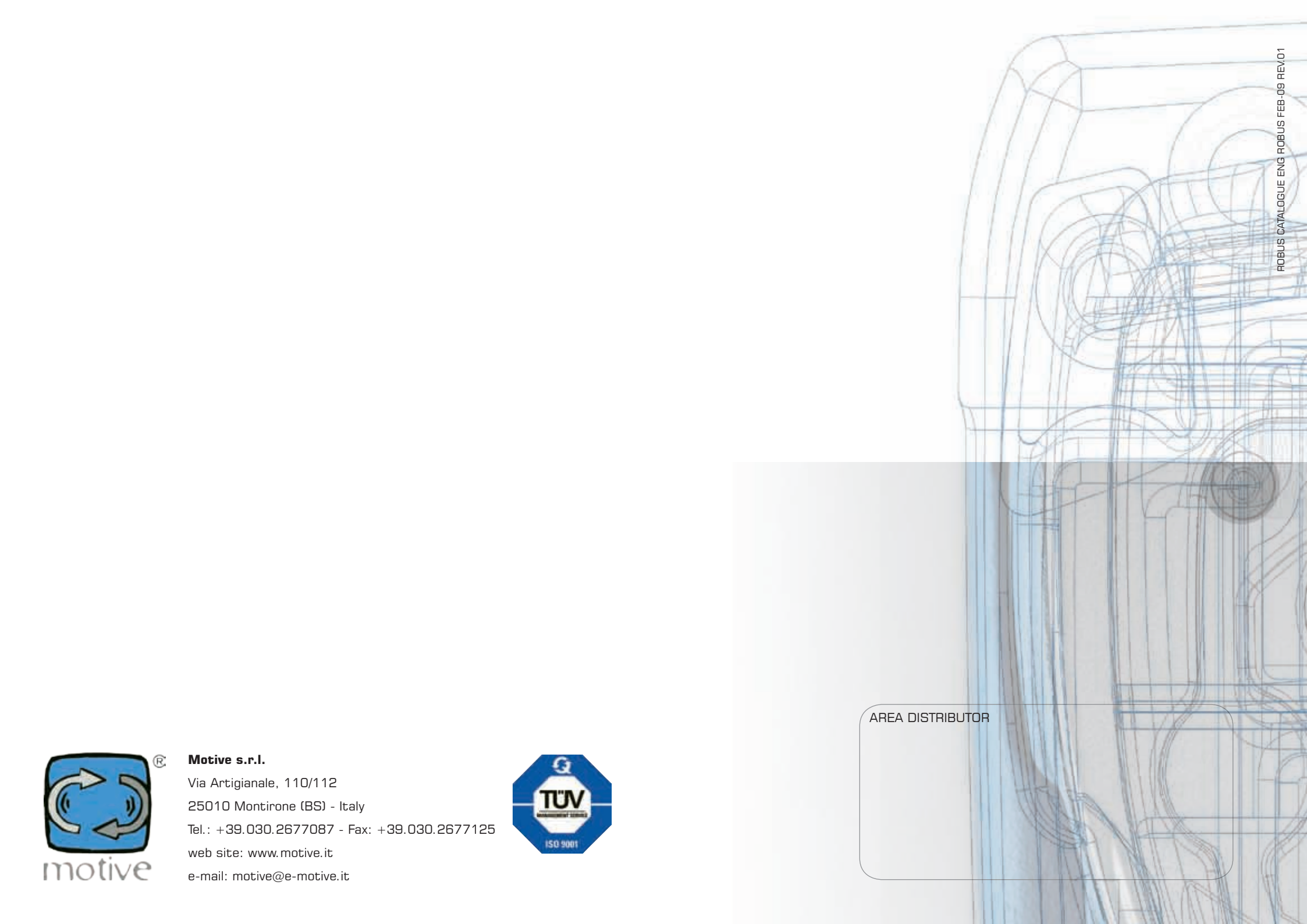
ARTICLE 4
PAYMENT

4.1. Any delayed or irregular payments shall entitle Motive to cancel ongoing agreement, including agreements which do not regard the payments at issue, as well as entitling Motive to claim damages, if any. Motive shall, however, have the right, as of payment's due date and without placing in arrears, to claim interest for arrears, to the extent of the discount rate in force in Italy, increased by 12 points. Motive shall also have the right to withhold material under repair for replacement. In the case of failed payment, Motive shall have the right to cancel all guarantees of materials, as regards the insolvent Client.

4.2. The Buyer shall be bound to complete payment, including cases whereby claims or disputes are underway.

ALL DATA HAVE BEEN WRITTEN AND CHECKED WITH THE GREATEST CARE.
WE DO NOT TAKE ANY RESPONSIBILITY FOR POSSIBLE ERRORS OR OMISSIONS.
MOTIVE CAN CHANGE THE CHARACTERISTIC OF THE SOLD ITEMS ON HIS FIRM OPINION AND IN EVERY MOMENT.

ROBUS CATALOGUE ENG ROBUS FEB-09 REV.01



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