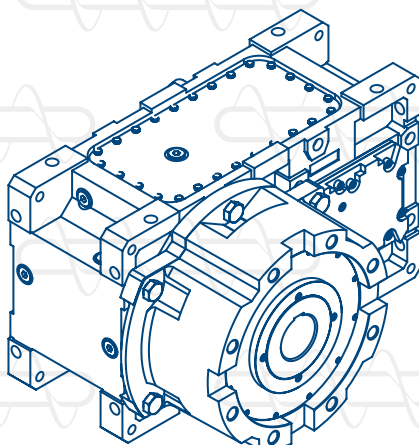


E TRUDER

PARALLEL HELICAL GEAR REDUCERS FOR SINGLE
SCREW EXTRUDERS

PBZ

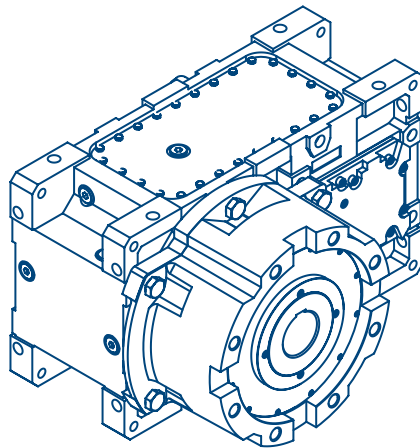


MOTOVARIO[®]
HEART OF MOTION

a **TECO Group** company

PARALLEL HELICAL GEAR REDUCERS FOR SINGLE
SCREW EXTRUDERS

PBZ



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SYMBOLS AND FORMULAS

CATEGORY	Symbol	unit of measurement symbol	Input	Output
Power	P	[kW]	P ₁	P ₂
Requested power	Pr	[kW]	Pr ₁	Pr ₂
Power	Pn	[kW]	Pn ₁	Pn ₂
Nominal thermal power	Pth	[kW]		
Torque	M	[Nm]	M ₁	M ₂
Nominal torque	Mn	[Nm]		Mn ₂
Peak torque	Mmax	[Nm]		M ₂ max
Requested torque	Mr	[Nm]	Mr ₁	Mr ₂
Speed	n	[rpm]	n ₁	n ₂
Load	F	[N]		
Radial load	Fr	[N]	Fr ₁	Fr ₂
Axial load	Fa	[N]	Fa ₁	Fa ₂
Reduction ratio	i			
Nominal reduction ratio	in			
Efficiency	η			
Service factor	f _s			
Correction service factor to account for type of load and daily operating hours	f _s a			
Correction service factor to account for number of starts per hours	f _s b			
Correction service factor to account for type of motor	f _s c			
Correction thermal factor to account for ambient temperature and run-to-rest ratio	f _t a			
Correction thermal factor to account for cooling systems	f _t b			
Correction factor to account for ambient and operating temperature ftc	f _t c			
Correction factor to account for airflow speed around gear reducer	f _t v			
Correction factor to account for input speed n1	f _t n			
Correction thermal factor to account for cooling coil	f _t s			
Correction thermal factor to account for plate exchanger	f _t p			
Additional thermal capacity Water-Oil and Air-Oil	Pta	[kW]		
Static	s			
Dynamic	d			
Calculated	c			
Maximum	max			
Minimum	min			
Moment of inertia	J	[kgm ²]	J ₁	J ₂
Ambient temperature	Tamb	[°C]		
Surface temperature of gear reducer	T _s	[°C]		
Oil temperature	T _o	[°C]		
Dimension		[mm]		

GEAR REDUCER		
Starting or stopping time	$t = \frac{v}{a}$	[s]
Velocity in rotary motion	$v = \frac{\pi \cdot d \cdot n}{60}$	[m/s]
	$v = \omega \cdot r$	
Speed velocity Angular velocity	$n = \frac{60 \cdot v}{\pi \cdot d}$	[rpm]
	$\omega = \frac{v}{r}$	[rad/s]
Acceleration or deceleration	$a = \frac{v}{t}$	[m/s ²]
Angular acceleration	$\alpha = \frac{n}{9.55 \cdot t}$	[rad/s ²]
	$\alpha = \frac{\omega}{t}$	
Starting or stopping distance (according to acceleration)	$s = \frac{a \cdot t^2}{2}$	[m]
Horizontal translation force	$F = \mu \cdot m \cdot g$	[N]
Vertical translation force (lifting)	$F = m \cdot g$	
Inclined plane translation force	$F = m \cdot g \cdot (\mu \cdot \cos\beta + \sin\beta)$	
where: m= mass [kg]; g= gravitational acceleration [m/s ²]; μ= friction coefficient; β= angle of inclination		
Moment of inertia	$J = \frac{m \cdot v^2}{\omega^2}$	[kgm ²]
Torque	$M = \frac{F \cdot d}{2}$	[Nm]
	$M = \frac{J \cdot \omega}{t}$	

DESIGN FEATURES

MAIN FEATURES OF THE PBZ SERIES

The gear reducers of the PBZ series are built according to the best design techniques and offer:

- Sturdiness and reliability
- Low vibration and low noise
- High torque ratings
- High efficiency
- Universal mounting: suitable for horizontal or vertical mounting
- Broad customization with extensive range of catalogue options
- Rigid cast-iron casing with large lubricant capacity for enhanced heat capacity
- Type of casing: monobloc (frame sizes from 179 to 349 inclusive) or split into two parts (frame sizes 399 and 409)
- Output shaft for housing extruder screw shaft, according to the Customer's specification, available hollow with key, hollow with double key, or splined and hollow
- Also available with double-ended input shaft
- IEC-normalised motor adapter, also available with NEMA adapter
- High overhung ratings both at input and output shaft ends
- Reliable, proven high performance
- Accurately ground helical spur gears
- Ground or accurately run-in Gleason bevel gear.

EFFICIENCY η

PARALLEL HELICAL	
P2Z	P3Z
0,96	0,94

FRAME SIZES AND GEARING OF THE PBZ SERIES

- Available frame sizes: 179, 199, 219, 249, 269, 279, 319, 349, 399, 409;
- Gearing: 2 and 3 states for parallel helical gear reducers.
Bevel-helical extruder version available on request.

EXTRUDER MOUNT

External support of the axial load generated by the extruder screw, thanks to a spherical roller bearing of the highest quality housed within. Suitable for applications involving the use of single screw extruders. The extruder mount is available in two versions: ES for applications with standard loads and EH to meet high loads.

MATERIALS (CASING / GEARS AND SHAFTS) OF THE PBZ SERIES

- Extruder casing and mount: spheroidal cast-iron EN-GJS400-15 UNI EN 156
- Gears: hardened and case-hardened 21NiCrMo2 steel
- Output shaft for housing extruder screw shaft, according to the Customer's specification: tempered 42CrMo4 steel.

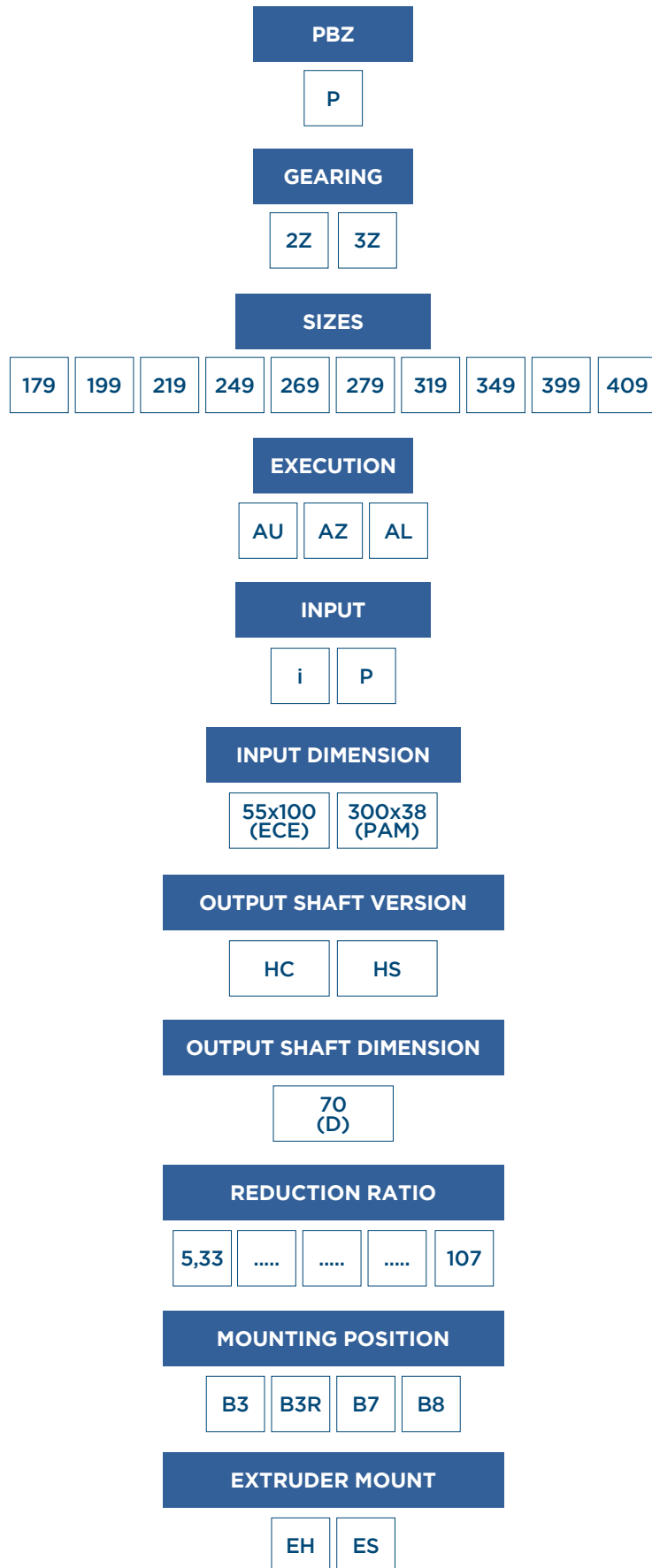
PAINT COATING

Outer protection with acrylic paint, minimum coat thickness 120 μm . C2 corrosive class according to UNI EN ISO 12944. RAL 5010 blue textured finish.

SEALS

Sealing rings in VITON on output shaft and input shaft (standard).



DESIGNATION



KEY

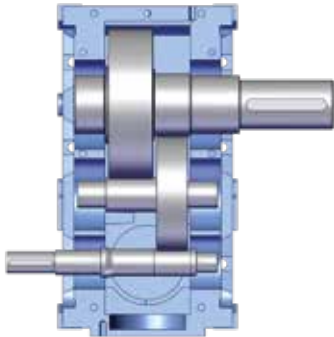
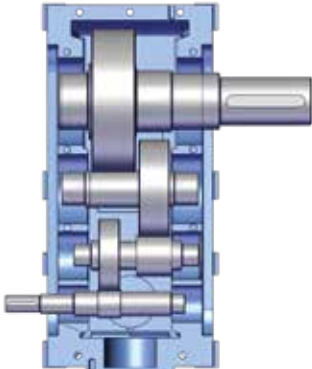
- I=solid shaft
- P=with bell housing
- HC= HOLLOW SHAFT WITH KEY
- HS= SPLINED HOLLOW SHAFT
- EH= FOR HIGH LOADS
- ES= FOR STANDARD LOADS

VERSIONS

Parallel helical gear reducers	
Solid shaft input PBZ	
Bell housing input with coupling PBZ	

Bevel helical gear reducers also available on request

GEAR TRAIN

Parallel helical gear reducers	
P2Z	
P3Z	

AVAILABLE MOTOR MOUNTING FLANGES

The tables show available coupling configurations and the matching motors.

To check the availability of the motor coupling dimensions based on sizes, gears and ratios, refer to the paragraph of the Input flanges. For couplings with brake motors larger than IEC 180, or for hybrid motor coupling sizes, please contact MOTOVARIO TECHNICAL SALES SUPPORT.

PZ	IEC MOTOR							
	132	160	180	200	225	250	280	315
179	-	-	P2Z	P2Z	P2Z	P2Z	-	-
	P3Z	P3Z	P3Z	P3Z	P3Z	P3Z		
199	-	-	P2Z	P2Z	P2Z	P2Z	-	-
	P3Z	P3Z	P3Z	P3Z	P3Z	P3Z		
219	-	-	-	-	P2Z	P2Z	P2Z	P2Z
	-	P3Z	P3Z	P3Z	P3Z	P3Z	-	-
249	-	-	-	-	P2Z	P2Z	P2Z	P2Z
	-	P3Z	P3Z	P3Z	P3Z	P3Z	-	-
269	-	-	-	-	-	-	P2Z	P2Z
	-	-	P3Z	P3Z	P3Z	P3Z	P3Z	P3Z
279	-	-	-	-	-	-	P2Z	P2Z
	-	-	P3Z	P3Z	P3Z	P3Z	P3Z	P3Z
319	-	-	-	-	-	-	-	P2Z
	-	-	-	-	P3Z	P3Z	P3Z	P3Z
349	-	-	-	-	-	-	-	P2Z
	-	-	-	-	P3Z	P3Z	P3Z	P3Z

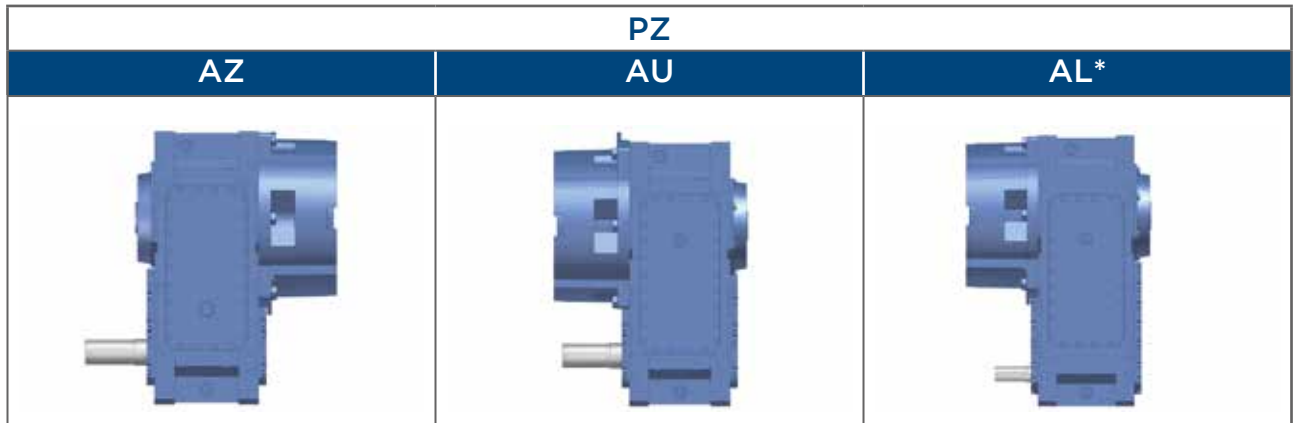
RANGE

The values indicated are calculated at $n_1=1,400$ rpm and refer to P2 and P3 gearing. Refer to the performance tables for Mn_2 values based on the reduction ratio.

PZ	Mn_2 [Nm]	i	
		Min	Max
179	9.000	6,37	86,2
199	11.000	7,91	107
219	19.000	6,28	81,3
249	24.000	7,96	103
269	29.000	6,44	82,3
279	36.000	7,96	102
319	55.000	6,33	73,2
349	70.000	8,14	94,1
399	90.000	6,62	80
409	110.000	8,01	96,8

EXECUTIONS

PARALLEL HELICAL GEAR REDUCERS



All executions are available with either EH extruder mount or ES extruder mount.

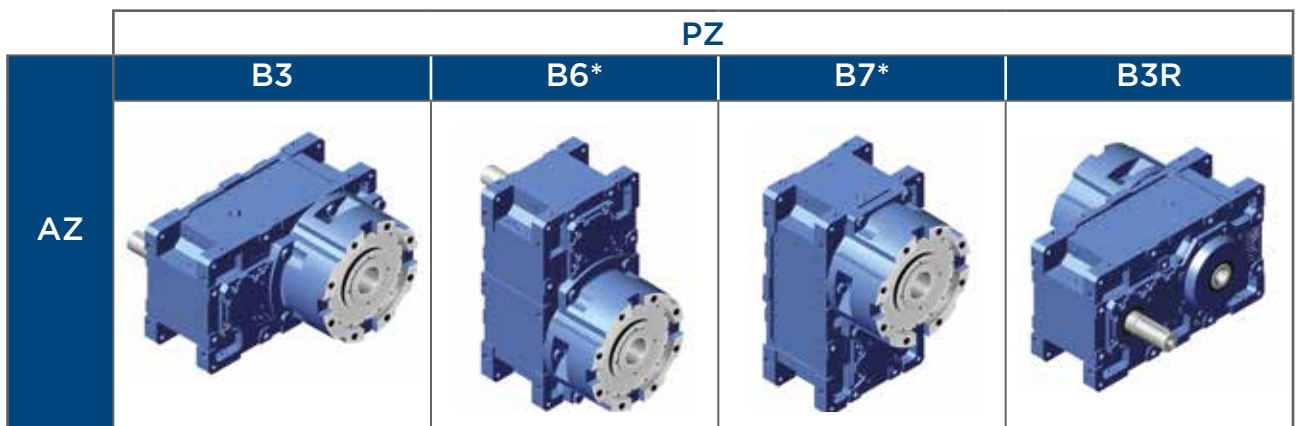
* AL optional execution: available with P2Z reduction ratios, version with "long" casing.
Contact MOTOVARIO TECHNICAL SALES SUPPORT

MOUNTING POSITIONS

PARALLEL HELICAL GEAR REDUCERS

The mounting position denotes the orientation of a gear reducer. Due to technical considerations, mounting position B3 should be preferred whenever possible, as it ensure less oil splashing, improved lubrication and less overheating.

Unless otherwise indicated, gear reducers are supplied for the B3 mounting position.



(*) Possible need of bearing forced lubrication, please contact MOTOVARIO TECHNICAL SALES SUPPORT

PRODUCT SELECTION

FOLLOW THIS PROCEDURE TO SELECT YOUR GEAR REDUCER PROPERLY:

Before selecting the gear reducer, obtain the main application data, including:

required gear reducer output shaft torque, installed power, nominal speed and maximum motor speed, required gear reducer output speed, ambient temperature (maximum and minimum) during operation, application work cycle (i.e. hours of operation per day and number of starts per hour), mounting position, type of motor connection, type of output shaft required, etc. Furthermore, it is necessary to find out the geometry of the screw (i.e. diameter and length of the shaft, external diameter), in addition to the axial operating load. Alternatively, extruder screw diameter and working pressure.

1. Calculate the reduction ratio

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

2. Calculate the output shaft torque

$$M_2 = \frac{P_1 \cdot 9550 \cdot \eta}{n_2} \quad [Nm]$$

3. Determine the service factor **f_s** required by the application according to:

- Type of load (uniform, moderate, heavy)
- Daily hours of operation
- Number of starts per hour
- Type of motor installed.

Refer to the following tables: Table **f_sa**, Table **f_sb** and Table **f_sc**

4. Determine the required performance of the gear reducer

$$Mn_2 = M_2 \cdot f_s \quad [Nm]$$

5. Select gear reducer frame size, gearing and reduction ratio according to Mn_2 , n_2 and n_1 .

6. Identify the type of extruder mount (EH or ES) required for the application by calculating the thrust bearing load capacity according to the operating conditions. The nominal life of the thrust bearing is calculated in accordance with ISO 281 using the formula:

$$L_{10} = \frac{10^6}{n_2 \cdot 60} \cdot \left(\frac{C}{F_{ad}} \right)^{\frac{10}{3}} \quad [h]$$

where:

- C [kN] is the thrust bearing load capacity (see “Extruder mount” chapter)
- F_{ad} [kN] is the axial load generated by the extruder screw, acting on the thrust bearing, which can be obtained from the extruder’s design data:

$$F_{ad} = \left(\frac{d^2}{4} \right) \pi \cdot 10^2 \cdot P$$

- d [m] = external diameter of the extruder screw
- P [bar] = maximum working pressure of the extruder

SERVICE FACTOR

The service factor required by application is defined by this formula $f_s = f_{sa} \cdot f_{sb} \cdot f_{sc}$ (see relevant tables). It takes into account how heavy-duty the application is; it depends on operating conditions, inverter type and frequency of gear reducer starts. The service factor of a gear reducer is calculated by dividing the nominal torque by the available torque (both referring to the output shaft). The parameters that need to be taken into account in order to select the most suitable service factor are reported in tables f_{sa}, f_{sb} and f_{sc}.

VERIFICATIONS

1. Verify thermal capacity and ensure that the thermal capacity of the gear reducer under actual operating conditions is higher than the installed power at input shaft. See tables P_{th} (nominal thermal capacity) and relative corrections, P_{ta} (additional thermal capacity).
2. When overloading occurs due to starts under full load, braking, high inertia loads, check that instantaneous peak loading ($M_{2,max}$) is $M_{2,max} \leq 1,8 \cdot Mn_2$
Note: instantaneous peak loading is an overload event lasting no more than 10 seconds.
3. For radial and thrust loading on input shaft, please see the relevant tables.
4. For input speeds higher than $n_1 = 2,000$ rpm, please contact MOTOVARIO TECHNICAL SALES SUPPORT.

f_{sa} - Operating conditions

Nature of load applied	Daily operating hours [h/d]				
	2	4	8	16	24
Uniform	0,80	0,90	1,00	1,25	1,35
Moderate	1,00	1,15	1,25	1,50	1,75
Heavy	1,25	1,50	1,75	2,00	2,25

f_{sb} - Frequency of starts

Nature of load applied	Number of starts per hour [st/h]			
	< 8	8 ÷ 32	32 ÷ 64	64 ÷ 128
Uniform	1,00	1,25	1,35	1,50
Moderate	1,00	1,15	1,25	1,35
Heavy	1,00	1,05	1,15	1,25

Moderate load: with overloads 1.5*normal load

Heavy load: with overloads 2.5*normal load

f_{sc} - Type of drive

Type of motor used	f _{sc}
Electric motor	1,00
Reciprocating multiple-cylinder motor	1,25
Reciprocating single-cylinder motor	1,50

THERMAL POWER

INFORMATION

Nominal thermal capacity Pth is the maximum mechanical power that a gear reducer can transmit (under continuous duty) without its internal temperature rising to such a degree as to damage gear reducer components. Thermal capacity may be increased by using seals made from special rubber and synthetic oil, or suitable cooling devices. In the event of short duty cycles followed by periods of rest long enough to allow for gear reducer to cool down appropriately, thermal capacity loses significance and may be disregarded.

The scheme below indicates the nominal thermal power capacity [kW] according to the following conditions:

- Mounting position B3;
- Continuous operation at input speed ≤ 1500 rpm;
- Environment temperature Tamb = 20 °C;
- Sea level altitude;
- Air speed around the gear reducer ≥ 1 m/s;
- Absence of external radial and/or axial loads;
- Lubricant oil up to 85 °C (mineral oil) and 95 °C (synthetic oil).

Nominal thermal power Pth

	Pth [kW]									
	179	199	219	249	269	279	319	349	399	409
P2Z	59	71	85	99	131	133	181	210	283	319
P3Z	41	44	63	72	91	94	136	155	208	225

When a thermal capacity up to Pth is applied to the gear reducer under the reference conditions outlined above, the proper lubrication and operation of the gear reducer are guaranteed.

VERIFICATION

Verification of the application

The thermal limit of a gear reducer under real-life application conditions must be verified for each and every application using the following formula: $P_1 < P_{th} \cdot f_{ta} \cdot f_{tb} \cdot f_{ta} \cdot f_{tn} \cdot f_{ts} \cdot f_{tp} \cdot f_{tv}$

where:

P_1 = installed power [kW]

P_{th} = thermal capacity under reference conditions [kW] (see table "Nominal thermal capacity");

f_{ta} = sea-level elevation correction factor (see table);

f_{tb} = cooling fan correction factor (see table);

f_{ta} = ambient and operating temperature correction factor (see table);

f_{tn} = Input speed correction factor n_1 ;

f_{ts} = cooling coil correction factor (see table);

f_{tp} = plate exchanger correction factor (see table);

f_{tv} = airflow speed correction factor around the gear reducer (see table).

Correction factors reflect operating conditions other than the reference conditions and are obtained from the following ISO14179 tables

$f_{t,a}$ - Sea-level factor elevation correction

Altitude [m]	$f_{t,a}$
0	1
750	0,95
1500	0,90
2250	0,85
3000	0,81

$f_{t,b}$ - Cooling fan correction factor

	n_1 [rpm]	$f_{t,b}$
P2Z - P3Z	1400	1,80

$f_{t,c}$ - Duty and ambient temperature correction factor

$f_{t,c}$		Duty per hour of operation %				
		100	80	60	40	20
Ambient temperature [°C]	10	1,15	1,25	1,35	1,50	2,00
	20	1	1,05	1,15	1,35	1,75
	30	0,90	1	1,05	1,25	1,50
	40	0,75	0,80	0,90	1	1,35
	50	0,60	0,63	0,70	0,80	1

$f_{t,n}$ - Input speed correction factor n_1

$f_{t,n}$	n_1 [rpm]						
	700	900	1140	1400	1800	2250	2800
P2Z	1,10	1,07	1,05	1	0,90	0,85	0,75
P3Z	1,07	1,05	1,05	1	0,95	0,90	0,80

$f_{t,s}$ - Cooling coil correction factor

	$f_{t,s}$
P2Z - P3Z	2,25

$f_{t,p}$ - Plate exchanger correction factor

	$f_{t,p}$
P2Z - P3Z	3,00

$f_{t,v}$ - Correction factor to account for airflow speed around gear reducer

Ambient air speed	$f_{t,v}$
Stagnant air (<0,5 m/s)	0,75
Indoor installation with light ventilation	1
Indoor installation with good ventilation (>1,4 m/s)	1,40

If unit is to operate at input speeds higher than 2800 rpm, or at ambient temperatures exceeding 50 °C, please contact MOTOVARIO TECHNICAL SALES SUPPORT.

COOLING UNIT

They are auxiliary cooling systems to be used if fan and coil are not enough to carry out the thermal check.

- UR O/W (Oil/Water) - Heat exchanger consisting of motor pump, plate exchanger, pressure gauge, thermometer and minimum pressure switch;
- UR O/A (Oil/Air) - Heat exchanger consisting of motor pump, motor fan, thermometer, thermostat, minimum pressure switch, and pressure gauge.

The following accessories are available upon request:

- PT100 oil temperature sensor for heat exchanger control;
- Flow meter.

The heat exchanger provides the unit with an additional thermal capacity (Pta) to be added to the standard thermal capacity, as explained by relation:

$$P_i \leq (P_{th} \cdot f_{t,a} \cdot f_{t,c} \cdot f_{t,n} \cdot f_{t,v}) + (P_{ta} \cdot f_{tUR})$$

where:

Pta= additional thermal power [kW], for UR O/W or for UR O/A

f_{tUR} = correction factor due to a temperature value other than +20 °C of water for UR O/W or of air for UR O/A, respectively

P_i = installed power [kW],

P_{t,h}, f_{t,a}, f_{t,c}, f_{t,n}, f_{t,v} = as specified in paragraph Thermal Capacity

Pta - additional thermal capacity [kW]

UR O/W (Oil/Water) with water temperature at 20 °C

UR O/W	P2Z	P3Z
4	100	67
7	175	105
12	300	180
18	450	270
29	725	435
40	1000	600
50	1250	750

Correction factors for water temperature values other than the standard ones specified in the catalogue

Water temperature [°C]	f _{tUR O/W}
10	1,05
20	1
25	0,93
30	0,80
35	0,80

Pta - additional thermal capacity [kW]

UR O/A (Oil/Air) with air temperature at 20 °C

UR O/A	P2Z	P3Z
4	100	56
7	175	99
12	300	169
18	450	254
29	725	410
40	1000	565
50	1250	706

Correction factors for air temperature values other than the standard ones specified in the catalogue

Air temperature [°C]	f _{tUR O/A}
20	1
30	0,88
40	0,75
45	0,70
50	0,63

INPUT SPEED

The value of maximum input speed n_{1max} shown in the table reflects continuous duty S1 (operation under steady loading for a period long enough to achieve thermal balance) and the B3 mounting position. Continuous speeds above 1800 rpm are nevertheless not recommended since they could cause overheating and early deterioration of seals, bearings and lubricant.

Contact MOTOVARIO TECHNICAL SALES SUPPORT for application verification in case of $n_1 > 1,800$ rpm, as mounting positions other than B3 could make it necessary to use dedicated forced lubrication systems, while the transmission ratio could in some cases originate a further limitation of the permissible maximum input speed B3 max, contact MOTOVARIO TECHNICAL SERVICE.

For intermittent service, contact MOTOVARIO TECHNICAL SALES SUPPORT.

MAXIMUM PERMISSIBLE INPUT SPEED n_{1max}

n_{1max} [rpm]		
PZ	P2Z	P3Z
179	2800	2800
199	2800	2800
219	2800	2800
249	2400	2800
269	2240	2800
279	2240	2800
319	1800	2400
349	1800	2400
399	1800	2000
409	1400	1800

LUBRICATION

INFORMATION

Proper lubrication makes for:

- Lower friction;
- Less heating;
- Increased efficiency;
- Lower oil temperature;
- Less wear.

Motovario gear reducers of the PBZ series have been designed for oil bath lubrication.

In particular operating conditions, pressure-fed lubrication may be necessary using a mechanical pump (external, driven directly by input or intermediate shaft) or a motor pump (external, driven by electric motor), see chapter DEVICES.

Contact MOTOVARIO TECHNICAL SALES SUPPORT.

Unless expressly requested, gear reducers are supplied dry, (to request oil supply, see table LUBRICANTS RECOMMENDED BY MOTOVARIO).

To extend lubrication intervals and ambient temperature range, or reduce oil temperature, we recommend using synthetic oil (polyalphaolefin- or polyglycol-based).

Choose the most appropriate oil depending on operating conditions:

- For light, intermittent duty without significant temperature fluctuations, use mineral oil;
- For heavy, continuous duty with significant temperature fluctuations, use polyalphaolefin or polyglycol-based synthetic oil depending on the application. Polyglycol-based synthetic oils mix with water and are not compatible with other oils, as their lubricating properties degrade very quickly. Use them with great care.

LUBRICANTS

Specifications of LUBRICANTS RECOMMENDED BY MOTOVARIO

	Mineral oil	Polyalphaolefin synthetic oil (PAO)	Polyglycol synthetic oil (PG)
ENI	BLASIA FMP	BLASIA FSX	-
SHELL	OMALA S2 GX	OMALA S4 GXV	OMALA S4 WE
KLUBER	KLUBEROIL GEM 1-...N	KLUBERSYNTH GEM 4-...N	KLUBERSYNTH GH 6
MOBIL	MOBILGEAR XMP	SHC GEAR	GLYGOYLE
CASTROL	ALPHA SP	ALPHASYN T	ALPHASYN PG
BP	ENERGOL GR-XP	ENERSYN EP-XF	ENERSYN SG-XP
TOTAL	CARTER EP	CARTER SH	CARTER SY

Based on the output speed n_2 , check the oil type to be used in table ISO VISCOSITY GRADES, that provides the average kinematic speed value [cSt] at 40 °C.

Lubrication viscosity selection

n2 [rpm]	Tamb	
	Mineral oil	Synthetic oil
	0 °C ÷ +40 °C	-10 °C ÷ +50 °C
> 210	150	150
210 ÷ 20	150	220
20 ÷ 5	220	320
< 5	320	460

Amount

For the gear reducers of the PBZ series, it is always necessary to specify the mounting position.

Refer to the following tables for the amount of oil for each size and for the mounting position. The amount of oil in general is merely indicative only and for the proper topping up you will have to refer to the level plug or the dipstick, if any.

Any deviations in level can depend on construction tolerances but also by the placement of the unit or by the mounting surface at the customers' premises.

For this reason it is appropriate that the customer checks and, if necessary, restores the level when the unit are installed.

	P2Z EH									
	179	199	219	249	269	279	319	349	399	409
B3	14	17	24	34	40	55	70	95	140	155
B3R	14	17	24	34	40	55	70	95	140	155
B6	18	27	32	48	63	80	109	152	192	236
B7	21	23	32	46	57	72	103	130	195	226

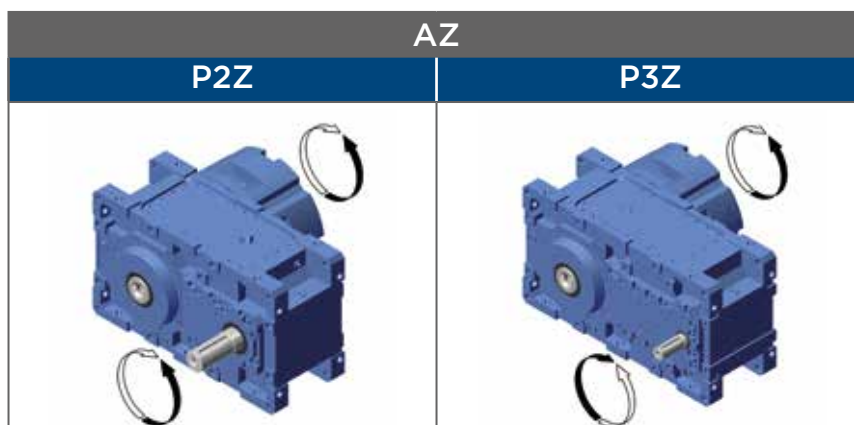
	P3Z EH									
	179	199	219	249	269	279	319	349	399	409
B3	15	19	25	35	47	58	78	105	155	160
B3R	15	19	25	35	47	58	78	105	155	160
B6	21	27	46	53	68	88	116	167	207	247
B7	20	26	44	48	66	89	110	158	200	236

	P2Z ES									
	179	199	219	249	269	279	319	349	399	409
B3	14	18	23	33	39	50	64	94	141	-
B3R	14	18	23	33	39	50	64	94	141	-
B6	20	25	40	48	63	80	109	152	192	-
B7	19	24	39	53	58	77	105	131	189	-

	P3Z ES									
	179	199	219	249	269	279	319	349	399	409
B3	15	20	24	34	42	58	65	100	152	-
B3R	15	20	24	34	42	58	65	100	152	-
B6	21	27	46	53	68	88	116	167	207	-
B7	19	25	42	46	64	86	113	152	192	-

DIRECTION OF ROTATION

Gear reducers are supplied as “standard” with the direction of rotation as shown in the diagram.



INPUT RADIAL/AXIAL LOADS

INFORMATION

Permissible radial load [N] values are indicated in the following table and refer to the load applied at shaft midpoint in the worst conditions, in terms of angle of application and direction of rotation. In the event of special conditions that exceed the ratings given in the catalogue, please contact MOTOVARIO TECHNICAL SALES SUPPORT and submit the full application data: direction of loading, direction of rotation of shaft, type of duty.

For a double-ended input shaft, where radial loading is to be applied at both ends, maximum permissible loads must be determined according to specific operating conditions, when this is the case, please contact MOTOVARIO TECHNICAL SALES SUPPORT.

Shaft radial loading is calculated by the following formula:

$$Fr_e = \frac{2000 \cdot M \cdot fz}{D} \leq Fr_1$$

where:

- Fr_e [N] Resultant radial load
- M [Nm] Shaft torque
- D [mm] Diameter of transmission element mounted on the shaft
- Fr_1 [N] Maximum permissible radial loading (see relevant tables)
- $fz =$
 - 1,1 straight-cut gear drive
 - 1,1 chain drive
 - 1,4 timing belt drive
 - 2,5 V-belt drive

Fr_1 [N] is the permissible radial load value from the gear reducer in continuous service, applied at the centre line of the shaft, considering input speed $n_1 = 1400$ rpm.

For radial load application positions other than on the centre line, contact MOTOVARIO TECHNICAL SALES SUPPORT.

Fr_1 [N]	179	199	219	249	269	279	319 (1)	349 (2)	399 (3)	409 (4)
P2Z	6000	6000	8000	8000	10000	10000	17000	17000	21000	21000
P3Z	4700	4700	6100	6100	9000	9000	12000	12000	15000	15000

- (1) In case of $i \leq 11,55$
- (2) In case of $i \leq 14,85$
- (3) In case of $i \leq 10,94$
- (4) In case of $i \leq 13,24$

and presence of radial load Fr_1 , contact MOTOVARIO TECHNICAL SALES SUPPORT.

EXTRUDER MOUNT

The gear reducer is fitted with an external mount, on the extruder side, in two different versions:

- EH, for applications with high axial thrusts
- ES, for applications with standard axial loads

The external mount complements the standard PBZ configuration, enabling it to reliably withstand the high axial thrusts generated by the extruder screw during normal operation.

The gear reducer casing is free from any axial thrust generated by the extruder screw.

An auxiliary axial roller thrust bearing, suitably sized and of the highest quality, is housed in the external mount.

The features of each bearing are listed in the table below for each gear reducer size.

The possibility of choosing between two versions, EH and ES, also allows the necessary performance required by the individual application to be selected ad hoc.

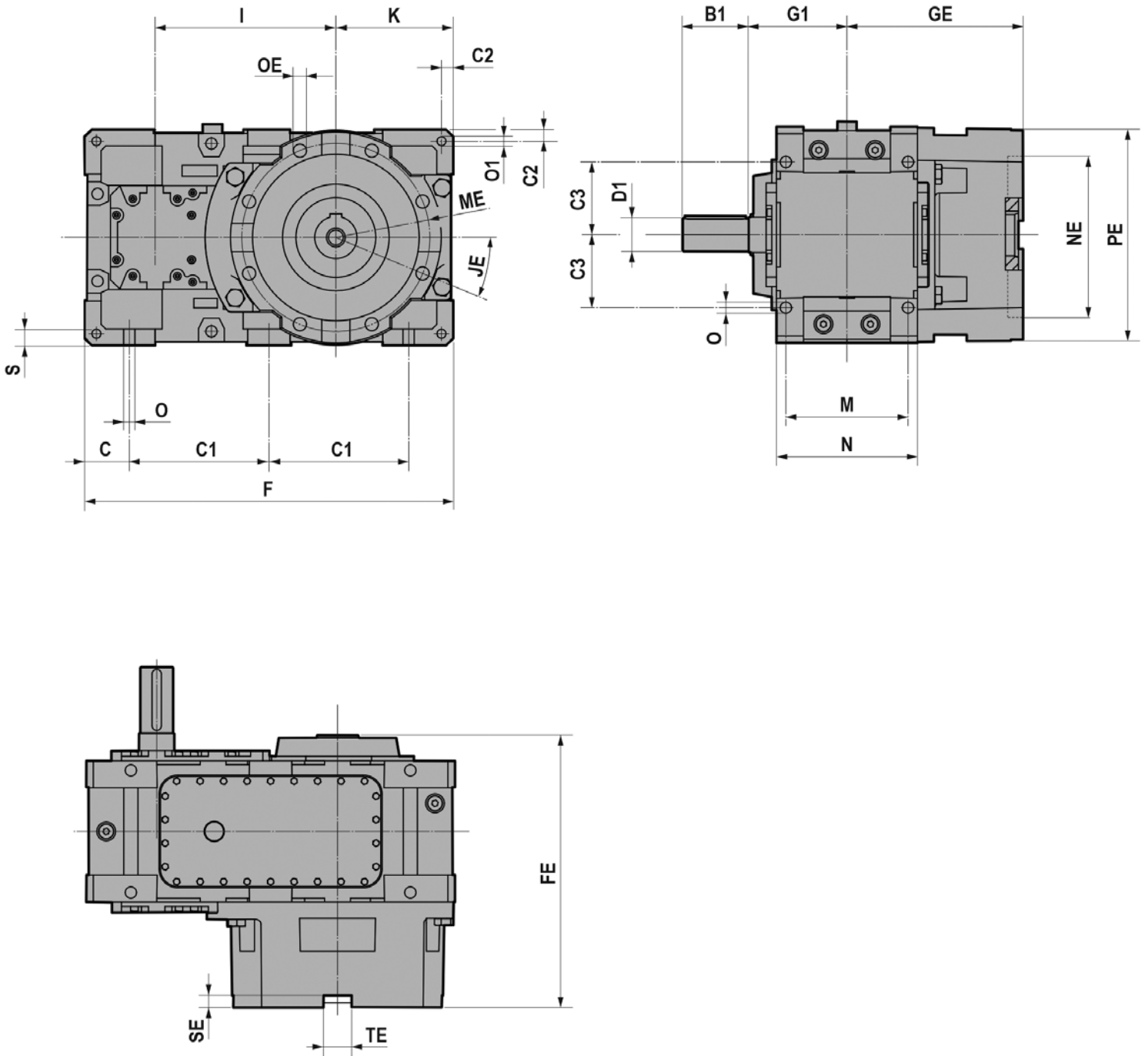
Motovario's chosen design is based on a single lubrication chamber for gear reducer and extruder mount.

DYNAMIC LOAD CAPACITY OF THE THRUST BEARING C

P2Z P3Z	EH - High loads		ES - Standard loads	
	Bearing	C [kN]	Bearing	C [kN]
179	29424 E	1.170	29420 E	863
199	29428 E	1.400	29424 E	1.170
219	29430 E	1.610	29426 E	1.380
249	29434 E	2.020	29430 E	1.610
269	29436 E	2.250	29432 E	1.790
279	29440 E	2.760	29436 E	2.250
319	29444 E	2.880	29440 E	2.760
349	29448 E	2.990	29444 E	2.880
399	29452 E	3.510	29448 E	2.990
409	29456 E	4.310	-	-

DIMENSIONAL TABLES

P2Z EH



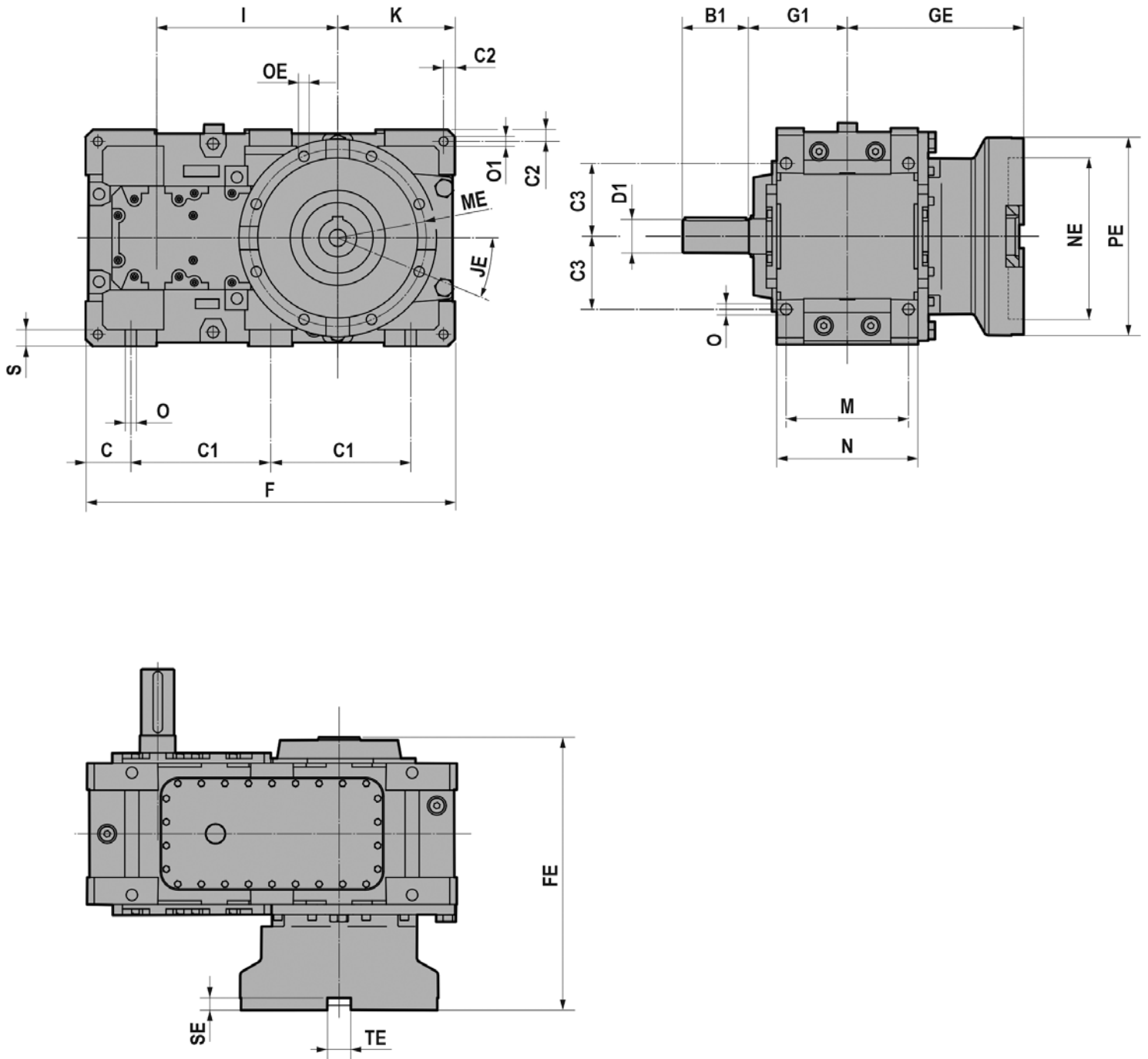
P2Z	C	CI	C2	C3	F	FE	GE	G1	i	JE	K
179	75	245	22,5	137,5	640	496	320	195	315	22°30'	205
199	80	280	22,5	150	720	513	340	195	350	22°30'	250
219	95	297,5	25	155	785	580	375	210	385	22°30'	250
249	105	340	30	180	890	597	392	210	430	22°30'	310
269	105	360	30	195	930	697	460	240	455	22°30'	300
279	117,5	395	35	210	1025	707	465	240	500	22°30'	350
319	127,5	425	35	220	1105	803	512	275	545	22°30'	345
349	140	490	40	265	1260	824	526	275	615	22°30'	430
399	115	545	95	300	1320	964	615	330	665	22°30'	405
409	127,5	600	95	300	1455	995	650	330	730	22°30'	475

P2Z	M	ME	N	NE	O	O1	OE	PE	S	SE	TE
179	220	325	255	290	19	19	M20x37	370	28	27	50
199	220	375	255	340	19	19	M20x37	420	30	26	50
219	260	400	300	355	24	24	M24x40	450	35	26	60
249	260	440	300	395	24	28	M24x40	490	40	26	70
269	320	480	370	425	28	28	M30x64	540	40	36	70
279	320	500	370	455	28	32	M30x64	560	40	36	80
319	370	560	430	500	35	32	M36x64	630	50	36	100
349	370	600	430	535	35	32	M36x64	680	50	36	100
399	475	650	550	575	35	35	M36x72	730	60	36	120
409	475	700	550	635	35	35	M36x72	770	60	36	120

P2Z	i	D1	B1
179	6,37 - 11,4	55	100
	13,7 - 16,8	45	90
	18,2 - 20,9	40	80
199	7,91 - 14,1	55	100
	17,0 - 20,9	45	90
	22,6 - 26,0	40	80
219	6,28 - 10,03	70	140
	11,0 - 14,7	55	100
	16,1 - 18,9	50	110
249	7,96 - 12,7	70	140
	13,9 - 18,6	55	100
	20,4 - 24,0	50	110
269	6,44 - 11,1	80	140
	12,0 - 16,3	65	120
	17,5 - 20,7	55	100
279	7,96 - 13,8	80	140
	14,9 - 20,1	65	120
	21,6 - 25,6	55	100
319	6,33 - 11,6	95	160
	13,3 - 15,5	80	140
	16,7 - 20,5	70	130
349	8,14 - 14,9	95	160
	17,1 - 20,0	80	140
	21,5 - 26,3	70	130
399	6,62 - 10,9	100	205
	12,3 - 17,2	85	170
	18,6 - 20,2	85	170
409	8,01 - 13,2	100	205
	14,8 - 20,8	85	170
	22,5 - 24,4	85	170

DIMENSIONAL TABLES

P2Z ES



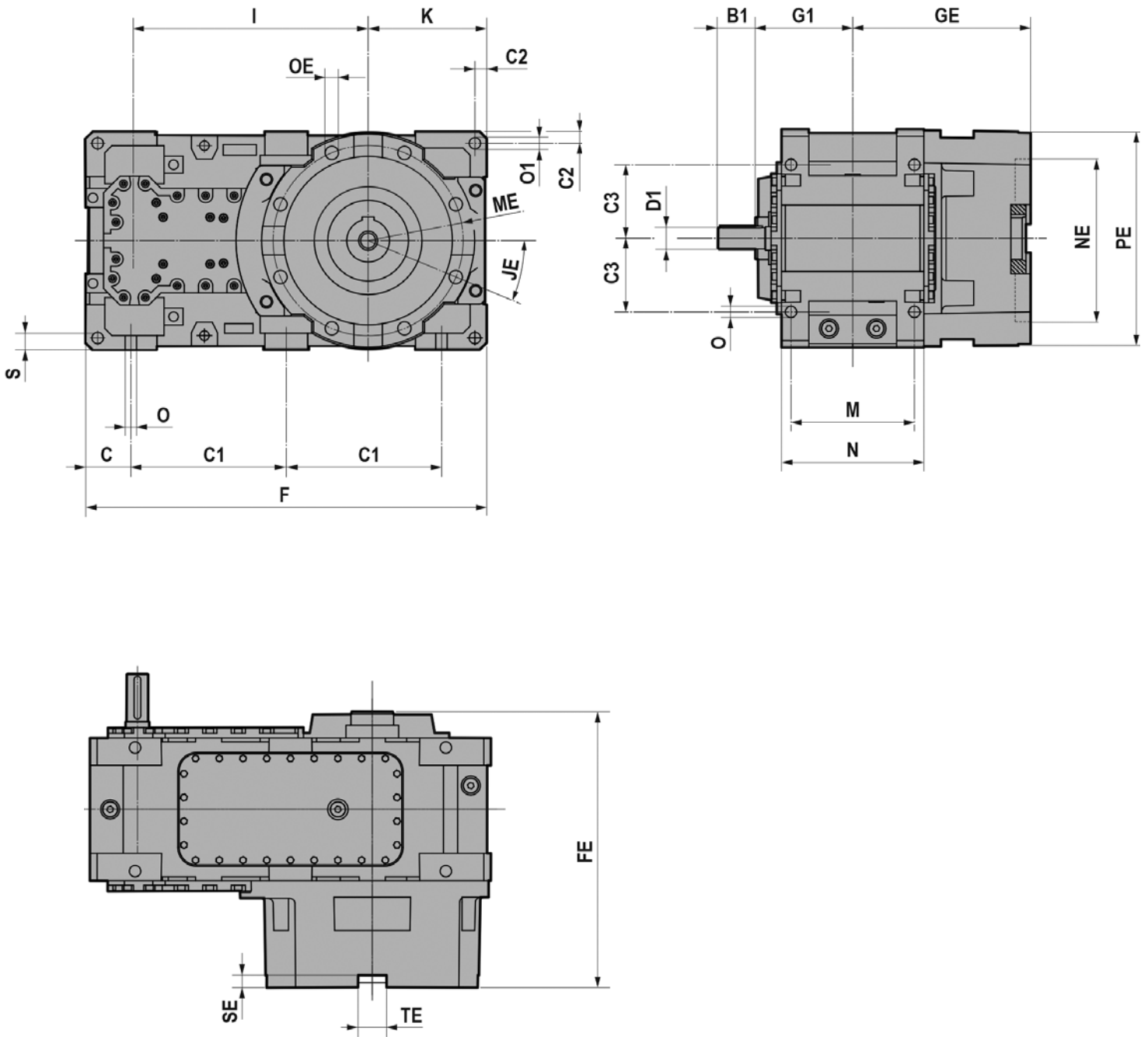
P2Z	C	CI	C2	C3	F	FE	GE	G1	i	JE	K
179	75	245	22,5	137,5	640	496	320	195	315	22°30'	205
199	80	280	22,5	150	720	513	340	195	350	22°30'	250
219	95	297,5	25	155	785	580	375	210	385	22°30'	250
249	105	340	30	180	890	597	392	210	430	22°30'	310
269	105	360	30	195	930	697	460	240	455	22°30'	300
279	117,5	395	35	210	1025	707	465	240	500	22°30'	350
319	127,5	425	35	220	1105	803	512	275	545	22°30'	345
349	140	490	40	265	1260	824	526	275	615	22°30'	430
399	115	545	95	300	1320	964	615	330	665	22°30'	405

P2Z	M	ME	N	NE	O	O1	OE	PE	S	SE	TE
179	220	280	255	250	19	19	M20x35	315	28	24	50
199	220	325	255	290	19	19	M20x40	370	30	26	50
219	260	375	300	340	24	24	M20x50	420	35	26	50
249	260	400	300	355	24	28	M24x50	450	40	26	60
269	320	440	370	395	28	28	M24x50	490	40	26	70
279	320	480	370	425	28	32	M30x60	540	40	36	70
319	370	500	430	455	35	32	M30x60	560	50	36	80
349	370	560	430	500	35	32	M36x60	630	50	36	100
399	475	600	550	535	35	35	M36x72	680	60	36	120

P2Z	i	D1	B1
179	6,37 - 11,4	55	100
	13,7 - 16,8	45	90
	18,2 - 20,9	40	80
199	7,91 - 14,1	55	100
	17,0 - 20,9	45	90
	22,6 - 26,0	40	80
219	6,28 - 10,03	70	140
	11,0 - 14,7	55	100
	16,1 - 18,9	50	110
249	7,96 - 12,7	70	140
	13,9 - 18,6	55	100
	20,4 - 24,0	50	110
269	6,44 - 11,1	80	140
	12,0 - 16,3	65	120
	17,5 - 20,7	55	100
279	7,96 - 13,8	80	140
	14,9 - 20,1	65	120
	21,6 - 25,6	55	100
319	6,33 - 11,6	95	160
	13,3 - 15,5	80	140
	16,7 - 20,5	70	130
349	8,14 - 14,9	95	160
	17,1 - 20,0	80	140
	21,5 - 26,3	70	130
399	6,62 - 10,9	100	205
	12,3 - 17,2	85	170
	18,6 - 20,2	85	170

DIMENSIONAL TABLES

P3Z EH



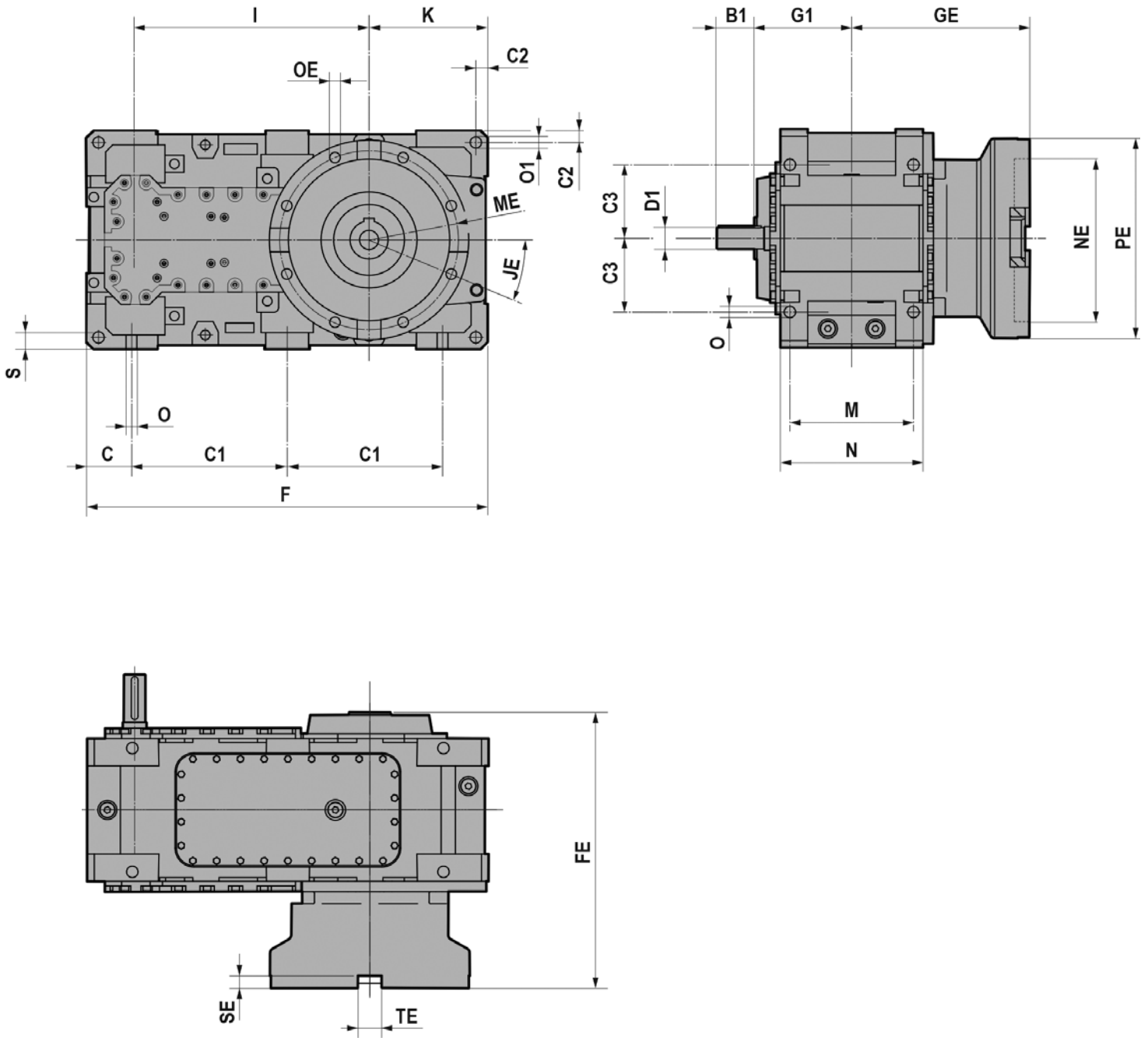
P3Z	C	CI	C2	C3	F	FE	GE	G1	i	JE	K
179	75	270	22,5	137,5	690	496	320	160	405	22°30'	205
199	80	305	22,5	155	770	513	340	160	440	22°30'	250
219	95	327,5	25	155	845	580	375	185	495	22°30'	250
249	105	375	35	180	960	597	392	185	540	22°30'	315
269	105	400	30	195	1005	697	460	230	585	22°30'	300
279	117,5	432,5	40	210	1100	707	465	230	630	22°30'	350
319	127,5	472,5	30	220	1200	803	512	255	705	22°30'	345
349	140	537,5	40	265	1355	824	526	255	775	22°30'	430
399	115	597,5	95	300	1425	964	615	310	850	22°30'	405
409	127,5	652,5	95	300	1560	995	650	310	915	22°30'	475

P3Z	M	ME	N	NE	O	O1	OE	PE	S	SE	TE
179	220	325	255	290	19	19	M20x37	370	28	27	50
199	220	375	255	340	19	19	M20x37	420	28	26	50
219	260	400	300	355	24	24	M24x40	450	35	26	60
249	260	440	300	395	24	28	M24x40	490	40	26	70
269	320	480	370	425	28	28	M30x64	540	40	36	70
279	320	500	370	455	28	32	M30x64	560	40	36	80
319	370	560	430	500	35	32	M36x64	630	50	36	100
349	370	600	430	535	35	32	M36x64	680	50	36	100
399	475	650	550	575	35	35	M36x72	730	60	36	120
409	475	700	550	635	35	35	M36x72	770	60	36	120

P3Z	i	D1	B1
179	24,5 - 42,9	35	80
	46,4 - 68,2	30	80
	73,9 - 86,2	25	70
199	30,5 - 53,3	35	80
	57,7 - 84,7	30	80
	91,8 - 107	25	70
219	22,6 - 41,5	45	100
	49,8 - 62,7	35	90
	70,5 - 81,3	30	90
249	28,6 - 52,6	45	100
	63,1 - 79,4	35	90
	89,4 - 103	30	90
269	25,1 - 44,7	55	120
	53,9 - 66,1	45	110
	71,5 - 82,3	40	100
279	31,0 - 55,3	55	120
	66,6 - 81,7	45	110
	88,5 - 102	40	100
319	24,3 - 38,8	70	160
	42,4 - 56,8	55	120
	62,3 - 73,2	50	130
349	31,2 - 49,9	70	160
	54,5 - 73,0	55	120
	80,1 - 94,1	50	130
399	24,9 - 43,2	80	160
	46,6 - 63,0	65	140
	67,6 - 80,0	55	120
409	30,2 - 52,2	80	160
	56,4 - 76,2	65	140
	81,8 - 96,8	55	120

DIMENSIONAL TABLES

P3Z ES



P3Z	C	C1	C2	C3	F	FE	GE	G1	i	JE	K
179	75	270	22,5	137,5	690	496	320	160	405	22°30'	205
199	80	305	22,5	155	770	513	340	160	440	22°30'	250
219	95	327,5	25	155	845	580	375	185	495	22°30'	250
249	105	375	35	180	960	597	392	185	540	22°30'	315
269	105	400	30	195	1005	697	460	230	585	22°30'	300
279	117,5	432,5	40	210	1100	707	465	230	630	22°30'	350
319	127,5	472,5	30	220	1200	803	512	255	705	22°30'	345
349	140	537,5	40	265	1355	824	526	255	775	22°30'	430
399	115	597,5	95	300	1425	964	615	310	850	22°30'	405

P3Z	M	ME	N	NE	O	O1	OE	PE	S	SE	TE
179	220	280	255	250	19	19	M20x35	315	28	24	50
199	220	325	255	290	19	19	M20x40	370	28	26	50
219	260	375	300	340	24	24	M20x50	420	35	26	50
249	260	400	300	355	24	28	M24x50	450	40	26	60
269	320	440	370	395	28	28	M24x50	490	40	26	70
279	320	480	370	425	28	32	M30x60	540	40	36	70
319	370	500	430	455	35	32	M30x60	560	50	36	80
349	370	560	430	500	35	32	M36x60	630	50	36	100
399	475	600	550	535	35	35	M36x72	680	60	36	120

P3Z	i	D1	B1
179	24,5 - 42,9	35	80
	46,4 - 68,2	30	80
	73,9 - 86,2	25	70
199	30,5 - 53,3	35	80
	57,7 - 84,7	30	80
	91,8 - 107	25	70
219	22,6 - 41,5	45	100
	49,8 - 62,7	35	90
	70,5 - 81,3	30	90
249	28,6 - 52,6	45	100
	63,1 - 79,4	35	90
	89,4 - 103	30	90
269	25,1 - 44,7	55	120
	53,9 - 66,1	45	110
	71,5 - 82,3	40	100
279	31,0 - 55,3	55	120
	66,6 - 81,7	45	110
	88,5 - 102	40	100
319	24,3 - 38,8	70	160
	42,4 - 56,8	55	120
	62,3 - 73,2	50	130
349	31,2 - 49,9	70	160
	54,5 - 73,0	55	120
	80,1 - 94,1	50	130
399	24,9 - 43,2	80	160
	46,6 - 63,0	65	140
	67,6 - 80,0	55	120

WEIGHTS

The following table shows the weight of the gear reducer, based on size, gearing and type of extruder mount.

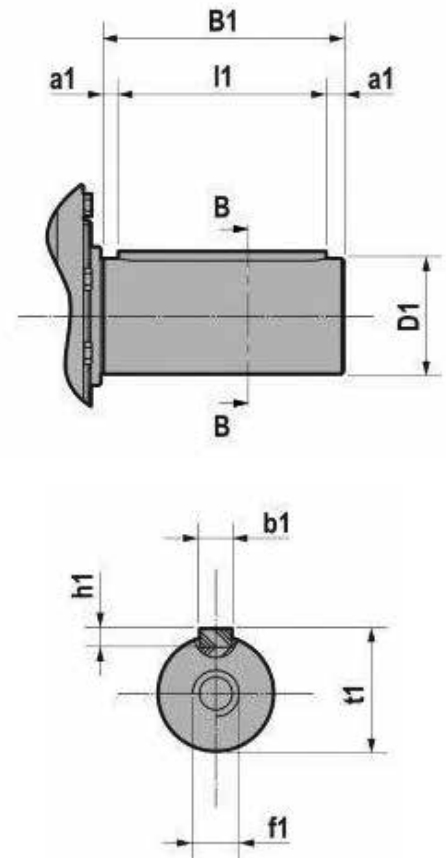
The weight indicated refers to the gear reducer, without lubricant and any accessories.

[kg]	EH		ES	
	P2Z	P3Z	P2Z	P3Z
179	385	405	378	398
199	490	510	484	504
219	711	751	705	745
249	841	881	825	865
269	1090	1170	1069	1149
279	1414	1474	1395	1455
319	1714	1814	1711	1811
349	2279	2369	2274	2364
399	3415	3615	3390	3590
409	3820	4020	-	-

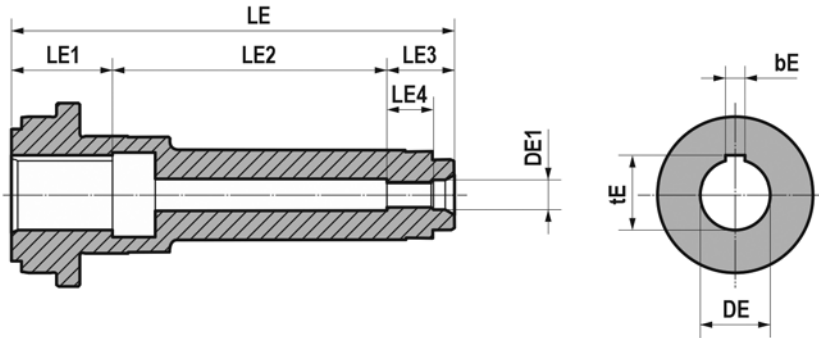
SHAFT END

Input shaft end

D1	B1	b1	t1	f1	b1 x h1 x l1	a1
25 k6	70	8	28	M10	8x7x60	5
25 k6	80	8	28	M10	8x7x70	5
28 k6	80	8	31	M10	8x7x70	5
30 k6	80	8	33	M10	8x7x70	5
30 k6	90	8	33	M10	8x7x80	5
35 k6	80	10	38	M12	10x8x70	5
35 k6	90	10	38	M12	10x8x80	5
35 k6	100	10	38	M12	10x8x90	5
35 k6	110	10	38	M12	10x8x100	5
40 k6	80	12	43	M16	12x8x70	5
40 k6	100	12	43	M16	12x8x90	5
40 k6	120	12	43	M16	12x8x100	10
45 k6	90	14	48,5	M16	14x9x80	5
45 k6	100	14	48,5	M16	14x9x90	5
45 k6	110	14	48,5	M16	14x9x100	5
45 k6	130	14	48,5	M16	14x9x110	10
50 k6	110	14	53,5	M16	14x9x100	5
50 k6	130	14	53,5	M16	14x9x110	10
50 k6	140	14	53,5	M16	14x9x120	10
55 m6	100	16	59	M20	16x10x90	5
55 m6	120	16	59	M20	16x10x100	10
55 m6	130	16	59	M20	16x10x110	10
60 m6	140	18	64	M20	18x11x120	10
65 m6	120	18	69	M20	18x11x100	10
65 m6	140	18	69	M20	18x11x120	10
70 m6	130	20	74,5	M20	20x12x110	10
70 m6	140	20	74,5	M20	20x12x120	10
70 m6	160	20	74,5	M20	20x12x130	15
80 m6	140	22	85	M20	22x14x120	10
80 m6	160	22	85	M20	22x14x130	15
80 m6	165	22	85	M20	22x14x140	12,5
85 m6	170	22	90	M20	22x14x140	15
95 m6	160	25	100	M24	25x14x130	15
100 m6	205	28	106	M24	28x16x170	17,5



Output shaft end



PZ - EH	DE	DE1	bE	tE	LE	LE1	LE2	LE3	LE4
179	70 ^{+0,03/0}	M30x3,5	20	74,9	489,5	130	286,5	73	50
199	80 ^{+0,03/0}	M36x4	22	85,4	506	130	289	87	60
219	90 ^{+0,04/0}	M36x4	25	95,4	570	130	353	87	60
249	100 ^{+0,04/0}	M36x4	28	106,4	588	140	361	87	60
269	110 ^{+0,04/0}	M45x4,5	28	116,4	687	140	465	82	60
279	120 ^{+0,04/0}	M45x4,5	32	127,4	696	160	454	82	60
319	130 ^{+0,04/0}	M45x4,5	32	137,4	794	160	552	82	60
349	140 ^{+0,04/0}	M45x4,5	36	148,4	815	190	533	82	60
399	160 ^{+0,07/+0,05}	M45x4,5	40	169,4	949	190	617	82	60
409	170 ^{+0,07/+0,05}	M45x4,5	40	179,4	980	260	638	82	60

PZ - ES	DE	DE1	bE	tE	LE	LE1	LE2	LE3	LE4
179	60 ^{+0,03/0}	M30x3,5	18	64,4	489,5	110	311,5	68	50
199	70 ^{+0,03/0}	M36x4	20	74,9	506	130	289	87	60
219	80 ^{+0,03/0}	M36x4	22	85,4	570	130	353	87	60
249	90 ^{+0,04/0}	M36x4	25	95,4	588	130	376	82	60
269	100 ^{+0,04/0}	M45x4,5	28	106,4	687	140	465	82	60
279	110 ^{+0,04/0}	M45x4,5	28	116,4	696	140	474	82	60
319	120 ^{+0,04/0}	M45x4,5	32	127,4	794	160	552	82	60
349	130 ^{+0,04/0}	M45x4,5	32	137,4	815	160	573	82	60
399	160 ^{+0,07/+0,05}	M45x4,5	40	169,4	949	190	617	82	60

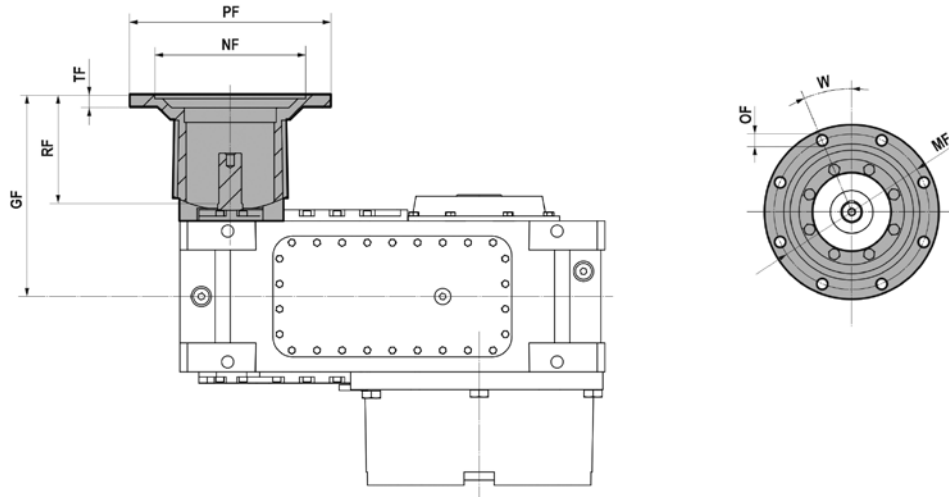
Contact MOTOVARIO TECHNICAL SALES SUPPORT for customised requirements.
Output shaft with double keyway or grooved available on request.

INPUT FLANGES

The following tables refer to motor setup for AZ execution.

For AU execution, check coupling feasibility based on the size of the input flange in relation to the size of the extruder mount.

Contact [MOTOVARIO TECHNICAL SALES SUPPORT](#) in case of verification.



Motor mounting flanges - P2Z

P2Z	IEC (B5)	i	PF	MF	NF H7	GF	TF	RF	OF	W
179	180	16,8 - 20,9	350	300	250	412,5	8	217,5	19 (n° 4)	45°
	200	13,7 - 20,9	400	350	300	412,5	7	217,5	19 (n° 4)	45°
	225	9,64 - 19,2	450	400	350	442,5	8	247,5	19 (n° 8)	22°30'
	250	6,37 - 15,6	550	500	450	442,5	8	247,5	19 (n° 8)	22°30'
199	180	20,9 - 26,0	350	300	250	412,5	8	217,5	19 (n° 4)	45°
	200	17,0 - 26,0	400	350	300	412,5	7	217,5	19 (n° 4)	45°
	225	12,0 - 22,6	450	400	350	442,5	8	247,5	19 (n° 8)	22°30'
	250	7,91 - 19,3	550	500	450	442,5	8	315	19 (n° 8)	22°30'
219	225	16,1 - 18,9	450	400	350	495	8	285	19 (n° 8)	22°30'
	250	12,7 - 18,9	550	500	450	495	8	285	19 (n° 8)	22°30'
	280	6,28 - 17,4	550	500	450	495	8	285	19 (n° 8)	22°30'
	315	6,28 - 14,7	660	600	550	495	8	315	19 (n° 8)	22°30'
249	225	20,4 - 24,0	450	400	350	495	8	285	19 (n° 8)	22°30'
	250	18,6 - 24,0	550	500	450	495	8	285	19 (n° 8)	22°30'
	280	7,96 - 22,1	550	500	450	495	8	285	19 (n° 8)	22°30'
	315	7,96 - 18,6	660	600	550	525	8	315	19 (n° 8)	22°30'
269	280	14,2 - 20,7	550	500	450	525	8	285	19 (n° 8)	22°30'
	315	6,44 - 18,9	660	600	550	555	8	315	24 (n° 8)	22°30'
279	280	17,5 - 25,6	550	500	450	525	8	285	19 (n° 8)	22°30'
	315	7,96 - 23,4	660	600	550	555	8	315	24 (n° 8)	22°30'
319	315	6,33 - 20,5	660	600	550	610	8	335	24 (n° 8)	22°30'
349	315	8,14 - 26,3	660	600	550	610	8	335	24 (n° 8)	22°30'

Motor mounting flanges - P3Z

P3Z	IEC (B5)	i	PF	MF	NF H7	GF	TF	RF	OF	W
179	132	51,4 - 86,2	300	265	230	342,5	8	182,5	19 (n° 4)	45°
	160	28,0 - 79,8	350	300	250	357,5	8	197,5	19 (n° 4)	45°
	180	24,5 - 51,4	350	300	250	357,5	8	197,5	19 (n° 4)	45°
	200	24,5 - 32,1	400	350	300	357,5	7	197,5	19 (n° 4)	45°
	225	24,5 - 28,0	450	400	350	385,5	8	225,5	19 (n° 8)	22°30'
	250	24,5 - 28,0	550	500	450	387,5	8	227,5	19 (n° 8)	22°30'
199	132	63,9 - 107	300	265	230	342,5	8	182,5	19 (n° 4)	45°
	160	34,8 - 99,1	350	300	250	357,5	8	197,5	19 (n° 4)	45°
	180	30,5 - 57,7	350	300	250	357,5	8	197,5	19 (n° 4)	45°
	200	30,5 - 39,8	400	350	300	357,5	7	197,5	19 (n° 4)	45°
	225	30,5 - 34,8	450	400	350	385,5	8	225,5	19 (n° 8)	22°30'
	250	30,5	550	500	450	387,5	8	227,5	19 (n° 8)	22°30'
219	160	57,8 - 81,3	350	300	250	400	8	215	19 (n° 4)	45°
	180	38,3 - 81,3	350	300	250	400	8	215	19 (n° 4)	45°
	200	28,7 - 62,7	400	350	300	400	7	215	19 (n° 4)	45°
	225	22,6 - 41,5	450	400	350	428	8	243	19 (n° 8)	22°30'
	250	22,6 - 33,0	550	500	450	430	8	245	19 (n° 8)	22°30'
249	160	73,3 - 103	350	300	250	400	8	215	19 (n° 4)	45°
	180	48,6 - 103	350	300	250	400	8	215	19 (n° 4)	45°
	200	36,4 - 79,4	400	350	300	400	7	215	19 (n° 4)	45°
	225	28,6 - 63,1	450	400	350	428	8	243	19 (n° 8)	22°30'
	250	28,6 - 41,9	550	500	450	430	8	245	19 (n° 8)	22°30'
269	180	61,2 - 82,3	350	300	250	470	8	240	19 (n° 4)	45°
	200	41,1 - 82,3	400	350	300	470	7	240	19 (n° 4)	45°
	225	28,1 - 71,5	450	400	350	500	8	270	19 (n° 8)	22°30'
	250	25,1 - 53,9	550	500	450	500	8	270	19 (n° 8)	22°30'
	280	25,1 - 37,9	550	500	450	500	8	270	19 (n° 8)	22°30'
	315	25,1 - 28,1	660	600	550	530	8	300	24 (n° 8)	22°30'
279	180	75,7 - 102	350	300	250	470	8	240	19 (n° 4)	45°
	200	50,9 - 102	400	350	300	470	7	240	19 (n° 4)	45°
	225	34,8 - 88,5	450	400	350	500	8	270	19 (n° 8)	22°30'
	250	31,0 - 66,6	550	500	450	500	8	270	19 (n° 8)	22°30'
	280	31,0 - 46,9	550	500	450	500	8	270	19 (n° 8)	22°30'
	315	31,0 - 34,8	660	600	550	530	8	300	24 (n° 8)	22°30'
319	225	56,8 - 73,2	450	400	350	560	8	305	19 (n° 8)	22°30'
	250	42,4 - 73,2	550	500	450	580	8	305	19 (n° 8)	22°30'
	280	28,2 - 67,4	550	500	450	580	8	305	19 (n° 8)	22°30'
	315	24,3 - 49,1	660	600	550	590	8	335	24 (n° 8)	22°30'
349	225	73,0 - 94,1	450	400	350	560	8	305	19 (n° 8)	22°30'
	250	54,5 - 94,1	550	500	450	580	8	305	19 (n° 8)	22°30'
	280	36,2 - 86,6	550	500	450	580	8	305	19 (n° 8)	22°30'
	315	31,2 - 63,1	660	600	550	590	8	335	24 (n° 8)	22°30'

DEVICES

COOLING AND HEATING UNIT

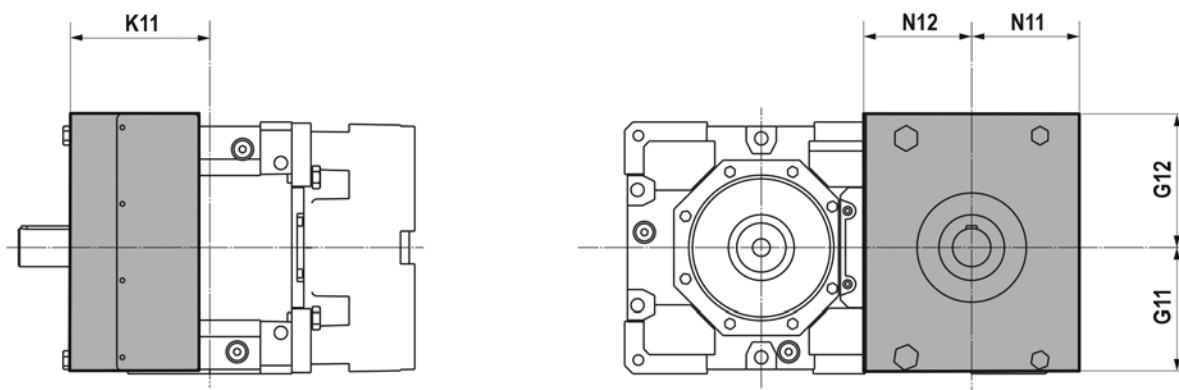
On request the gear reducer can be supplied with:

- Cooling fan
- Cooling coil
- External plate exchanger
- Air-oil or water-oil cooling unit
- Oil heater

LUBRICATION AND MONITORING UNIT

- On request the gear reducer can be supplied with:
- Bearings lubrication pump
- Bearings lubrication motor pump
- Pressure switch
- Oil temperature sensor and bearing temperature sensor PT100
- Expansion tank

Cooling fan

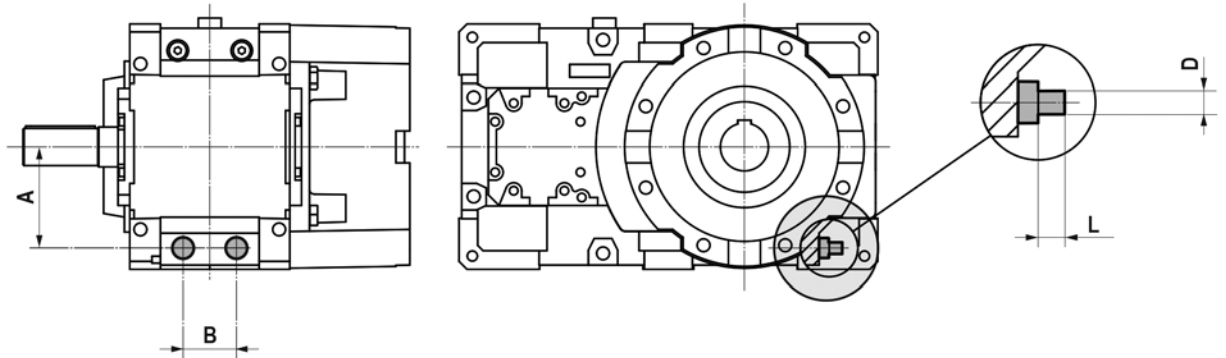


PZ	P2Z					P3Z				
	G11	G12	K11	N11	N12	G11	G12	K11	N11	N12
179	197	215	230	175	175	197	215	220	175	175
199	227	245	230	175	175	227	245	230	175	175
219	225	245	255	197	197	225	245	255	197	197
249	274	300	355	210	210	274	300	355	210	210
269	272	295	285	238	238	272	295	285	238	238
279	312	328	285	238	238	312	328	285	238	238
319	312	340	325	285	285	312	340	325	265	265
349	390	415	325	285	285	390	415	325	285	285
399	430	450	420	315	315	430	450	420	315	315
409	430	450	420	315	315	430	450	420	315	315

Cooling fan attached to the input shaft of the gear reducer, supplied with painted protective cover.

Not recommended for B6 mounting position, unless verified by MOTOVARIO TECHNICAL SALES SUPPORT.

Cooling coil



PZ	A	B	D	L
179	164	70	G 1/2"	17
199	192	70	G 1/2"	15
219	193	90	G 1/2"	25
249	193	90	G 1/2"	20
269	236	120	G 3/4"	35
279	276	120	G 3/4"	35
319	277	140	G 3/4"	30
349	350	140	G 3/4"	23
399	382	200	G 3/4"	32
409	382	200	G 3/4"	32

PZ	Minimum water capacity (l/min)	Max. Water inlet temperature °C
179-249	4...6	20
269-409	8...10	

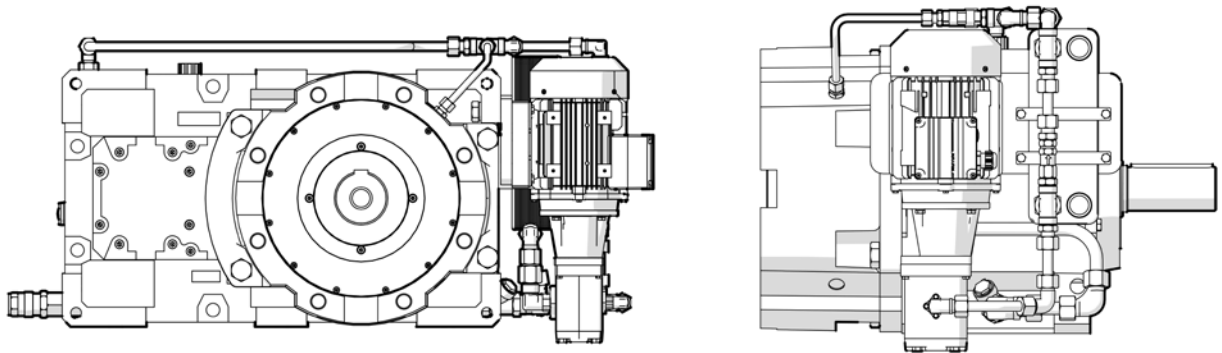
The device improves the thermal performance of the gear reducer through heat exchange with a flow of water at a set temperature (Customer's responsibility) inside the coil.

The coil is made with a copper pipe fitted at the bottom of the gear reducer, supplied complete with external connectors.

The cooling coil is only recommended for B3 and B3R mounting positions.

For assistance with the cooling coil in the other gear reducer mounting positions, contact [MOTOVARIO TECHNICAL SALES SUPPORT](#).

Plate exchanger



The plate exchanger is a water/oil cooling system, which can be fed by a motor pump as shown, or by a mechanical pump.

It is advisable to use a motor pump if the work cycles of the gear reducer rotate in both directions. The gear reducer will be supplied with the exchanger, suitably sized for the additional thermal power required.

Exchanger	Motor pump [kW]	Minimum water capacity [l/min]	Max. Water inlet temperature °C
HE1	0,18	2,2	20
HE2	0,18	5,6	
HE3	0,37	7,2	
HE4	0,75	14	
HE5	1,50	29	
HE6	2,20	43	
HE7	3,00	65	
HE8	3,00	80	
HE9	7,50	115	
HE10	7,50	140	

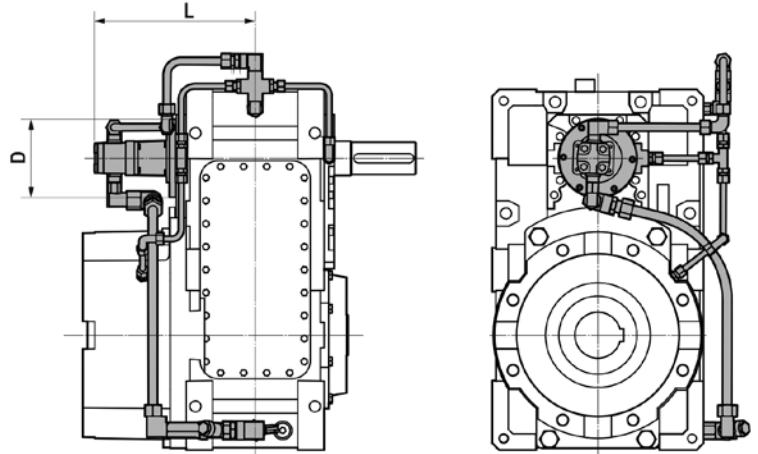
Bearings lubrication pump

Mechanical pump for bearing lubrication supplied mounted on the gear reducer (e.g. mounting position B6). Rotation of the input shaft enables the pump to operate.

It is essential that while ordering you specify the direction of free rotation of the output shaft.

For the overall measurements, contact [MOTOVARIO TECHNICAL SALES SUPPORT](#).

	D	L
PZ 179	170	330
PZ 199	170	330
PZ 219	220	355
PZ 249	220	355
PZ 269	260	393
PZ 279	260	393
PZ 319	290	428
PZ 349	290	428
PZ 399	360	489
PZ 409	360	489

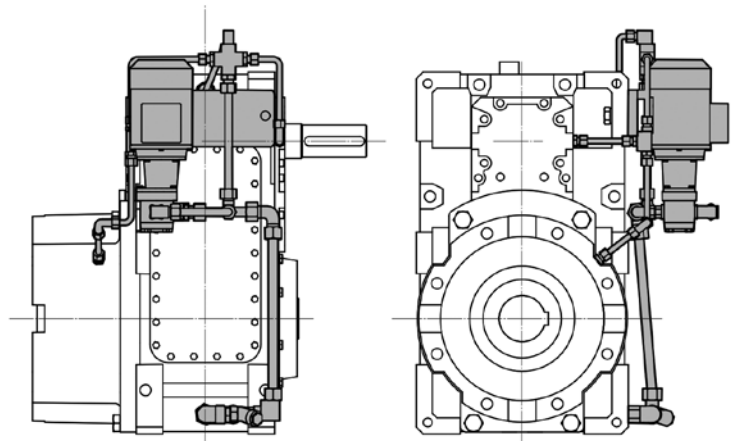


Bearings lubrication motor pump

Motor pump for bearing lubrication supplied already mounted on the gear reducer (example for mounting position B6).

For the overall measurements, contact [MOTOVARIO TECHNICAL SALES SUPPORT](#).

It is advisable to use a motor pump, as opposed to a mechanical pump, if the work cycles of the gear reducer rotate in both directions.



OTHER ACCESSORIES AND OPTIONS

On request the gear reducer can be supplied with:

- Filling plug with filter;
- Special painting with C3, C4, C5I and C5M corrosive classes according to UNI EN ISO 12944;
- Reaction bracket
- Oil expansion tank

PERFORMANCE

		P2Z 179				P2Z 199				P2Z 219				P2Z 249				P2Z 269																								
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]																					
6,5	1750	6,37	274,7	9000	269,7	6,28	278,7	13250	402,7	6,44	271,7	27000	800,3	7,5	7,14	245,1	9000	240,6	7,28	240,4	13900	364,5	7,47	234,3	28450	727,0																
	1400		219,8	9000	215,8			222,9	13250			322,2	217,4				27000	640,2																								
	900		141,3	9000	138,7			143,3	15100			236,0	139,8				29000	442,1																								
	700		109,9	9000	107,9			111,5	15950			193,9	108,7				29000	343,8																								
7,5	1750	7,14	245,1	9000	240,6	7,28	240,4	13900	364,5	7,47	234,3	28450	727,0	8	8,06	217,1	9000	213,1	7,91	221,2	11000	265,4	7,86	222,6	14300	347,3	7,96	219,8	16800	402,9												
	1400		196,1	9000	192,5			178,1	14300			277,8	175,9				16800	322,3																								
	900		126,1	9000	123,7			113,8	11000			136,5	114,5				16300	203,6			113,1	19200			236,8																	
	700		98,0	9000	96,2			88,5	11000			106,2	89,1				17250	167,6			87,9	20250			194,2																	
9	1750	8,50	181,5	9000	178,2	8,87	197,3	11000	236,7	9,22	189,8	15050	311,6	9,23	189,6	17650	365,0	8,74	200,2	29000	633,4	9,5	9,64	145,2	9000	142,6	8,87	157,8	11000	189,4	9,22	151,8	15050	249,3	9,96	175,7	18100	346,9	9,49	184,4	29000	583,3
	1400			104,5	9000			131,5	101,5			11000	121,7			97,6	17200			183,1	90,4				20700	204,0			147,5	29000			466,6									
	900			93,4	9000			91,7	78,9			11000	94,7			75,9	18150			150,3	70,3				21850	167,5			94,8	29000			300,0									
	700			72,6	9000			71,3	78,9			11000	94,7			75,9	18150			150,3	70,3				21850	167,5			73,8	29000			233,3									
10,5	1750	10,5	167,5	9000	164,4	10,0	174,8	11000	209,8	10,0	174,5	15500	295,0	10,8	162,3	18600	329,3	10,3	169,4	29000	535,9	11,5	11,4	153,9	9000	151,1	12,0	146,1	11000	175,3	11,0	159,8	15950	278,0	11,7	149,7	19100	311,9	11,1	157,1	29000	496,9
	1400		10,45	9000	131,5			10,01	11000			167,8	10,03			15500	236,0			10,78	18600				263,5	10,33			29000	428,7												
	900		10,45	9000	84,5			10,01	11000			107,9	10,03			17700	173,2			10,78	21250				193,5	10,33			29000	275,6												
	700		10,45	9000	65,8			10,01	11000			83,9	10,03			18650	142,0			10,78	22450				159,0	10,33			29000	214,3												
11,5	1750	11,4	153,9	9000	151,1	12,0	146,1	11000	175,3	11,0	159,8	15950	278,0	11,7	149,7	19100	311,9	11,1	157,1	29000	496,9	12,5	13,0	134,8	11000	161,8	12,7	137,9	16700	251,2	12,7	137,6	19650	294,9	12,0	145,5	29000	460,1				
	1400		11,37	9000	120,9			11,98	11000			140,2	10,95			15950	222,4			11,69	19100				249,5	11,14			29000	397,5												
	900		11,37	9000	77,7			11,98	11000			90,1	10,95			18200	163,2			11,69	21800				183,1	11,14			29000	255,6												
	700		11,37	9000	60,4			11,98	11000			70,1	10,95			19000	132,5			11,69	23050				150,5	11,14			29000	198,8												
12,5	1750	13,0	134,8	11000	161,8	12,7	137,9	16700	251,2	12,7	137,6	19650	294,9	12,0	145,5	29000	460,1	12,5	13,0	134,8	11000	161,8	12,7	137,9	16700	251,2	12,7	137,6	19650	294,9	12,0	145,5	29000	460,1								
	1400			12,98	11000			129,4	12,69			16700	201,0			12,72	19650				235,9	12,03			29000	368,1																
	900			12,98	11000			83,2	12,69			17450	135,0			12,72	22400				172,9	12,03			29000	236,6																
	700			12,98	11000			64,7	12,69			17550	105,6			12,72	23700				142,3	12,03			29000	184,1																

Performance at input speeds higher than n1=2000 rpm available on request.

		P2Z 279				P2Z 319				P2Z 349				P2Z 399				P2Z 409				
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	
6,5	1750					6,33	276,5	38650	1165,5					6,62	264,4	70700	2038,6					
	1400						221,2	38650	932,4						211,5	70700	1630,9					
	900						142,2	44150	684,7						136,0	80700	1196,7					
	700						110,6	46650	562,7						105,7	85250	983,2					
7,5	1750					7,31	239,4	40600	1060,2					7,57	231,2	74050	1867,2					
	1400						191,5	40600	848,1						184,9	74050	1493,8					
	900						123,1	46350	622,4						118,9	84550	1096,4					
	700						95,8	49000	511,8						92,5	89300	900,7					
8	1750	7,96	219,8	33450	802,1					8,14	215,0	49700	1165,5					8,01	218,5	85450	2036,3	
	1400		175,9	33450	641,7						172,0	49700	932,4						174,8	85450	1629,0	
	900		113,1	36000	444,0						110,6	56750	714,2						112,4	97600	1196,1	
	700		87,9	36000	345,3						86,0	59950	562,3						87,4	103050	982,3	
9	1750	9,25	189,2	35200	726,4	8,50	205,9	42700	958,9					8,72	200,7	77650	1699,8	9,16	191,0	89550	1866,1	
	1400		151,4	35200	581,1		164,7	42700	767,1						160,6	77650	1359,8		152,8	89550	1492,9	
	900		97,3	36000	382,1		105,9	48750	563,0						103,2	88650	998,0		98,3	102200	1095,3	
	700		75,7	36000	297,2		82,4	51500	462,6						80,3	90000	788,0		76,4	107950	899,8	
9,5	1750					9,73	179,9	44600	875,0	9,40	186,2	52200	1060,0	9,38	186,6	79600	1619,8					
	1400						143,9	44600	700,0		148,9	52200	848,0		149,3	79600	1295,9					
	900						92,5	50900	513,5		95,7	59650	650,0		95,9	90000	941,9					
	700						71,9	53800	422,2		74,5	63000	511,7		74,6	90000	732,6					
10,5	1750	10,8	161,9	36000	635,7	10,6	165,4	45850	827,2	10,9	160,3	54950	960,5	10,1	172,9	81600	1539,1	10,6	165,9	93900	1698,9	
	1400		10,81	36000	508,5		10,58	45850	661,8		128,2	54950	768,4		10,12	81600	1231,3		10,55	93900	1359,1	
	900		10,81	36000	326,9		10,58	52350	485,7		82,4	62700	588,2		10,12	90000	873,0		10,55	107200	997,5	
	700		10,81	36000	254,3		10,58	55000	396,9		64,1	66250	463,2		10,12	90000	679,0		10,55	110000	796,1	
11,5	1750	11,7	149,1	36000	585,3	11,6	151,5	47200	780,1					10,9	160,0	83750	1461,3	11,4	154,2	96250	1618,7	
	1400		11,74	36000	468,3		11,55	47200	624,0						10,94	83750	1169,0		11,35	96250	1295,0	
	900		11,74	36000	301,0		11,55	53850	457,7						10,94	90000	807,6		11,35	109900	950,5	
	700		11,74	36000	234,1		11,55	55000	363,6						10,94	90000	628,1		11,35	110000	740,0	
12,5	1750	12,8	136,9	36000	537,7	13,3	131,7	49400	709,5	12,5	139,9	57350	875,1	12,3	142,6	87050	1354,2	12,2	143,0	98700	1539,2	
	1400		12,78	36000	430,2		13,29	49400	567,6		111,9	57350	700,1		12,27	87050	1083,4		12,24	98700	1231,4	
	900		12,78	36000	276,5		13,29	50900	376,0		71,9	65500	536,3		12,27	90000	720,1		12,24	110000	882,2	
	700		12,78	36000	215,1		13,29	51150	293,9		56,0	69150	422,0		12,27	90000	560,0		12,24	110000	686,2	

PERFORMANCE

		P2Z 179				P2Z 199				P2Z 219				P2Z 249				P2Z 269			
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]
14	1750	13,7	127,8	9000	125,5	14,1	123,9	11000	148,7	13,9	126,1	20200	277,8	14,2	123,6	29000	390,9				
	1400		13,69	9000	100,4		99,2	11000	119,0		100,9	20200	222,2		98,9	29000	312,7				
	900		13,69	9000	64,5		63,7	11000	76,5		64,8	23050	163,0		63,6	29000	201,0				
	700		13,69	9000	50,2		49,6	11000	59,5		50,4	24000	132,0		49,4	29000	156,4				
15	1750	15,6	112,5	9000	110,4	14,7	119,2	16150	210,0	16,1	108,7	15050	178,4	16,1	108,8	21200	251,5				
	1400		15,56	9000	88,3		14,68	16150	168,0		87,0	21200	201,2		16,26	27700	260,1				
	900		15,56	9000	56,8		14,68	16400	109,7		16,1	15250	93,0		16,26	28050	169,3				
	700		15,56	9000	44,2		14,68	16450	85,6		16,1	15300	72,6		43,5	22250	105,6	16,26	28200	132,4	
16,5	1750	16,8	104,2	8640	98,2	17,0	102,9	11000	123,5	16,1	108,7	15050	178,4	16,1	108,8	21200	251,5				
	1400		16,79	8640	78,6		82,4	11000	98,8		16,1	15050	142,7		16,26	27700	260,1				
	900		16,79	8770	51,3		52,9	11000	63,5		16,1	15250	93,0		16,26	28050	169,3				
	700		16,79	8820	40,1		41,2	11000	49,4		16,1	15300	72,6		43,5	22250	105,6	16,26	28200	132,4	
18	1750	18,2	96,2	8160	85,6	17,4	100,5	14300	156,7	17,5	100,5	14300	156,7	17,5	100,3	25300	276,8				
	1400		18,19	8160	68,5		17,42	14300	125,4		17,42	14300	125,4		17,45	25300	221,4				
	900		18,19	8280	44,7		17,42	14500	81,7		17,42	14500	81,7		17,45	25700	144,6				
	700		18,19	8330	35,0		17,42	14500	63,6		17,42	14500	63,6		17,45	25850	113,1				
19,5	1750	19,2	91,1	6900	68,6	19,3	90,5	11000	108,6	18,9	92,4	13400	135,1	18,6	94,0	20500	210,2				
	1400		19,21	6900	54,8		19,33	11000	86,9		18,93	13400	108,1		18,88	25500	206,2				
	900		19,21	6990	35,7		19,33	11000	55,9		18,93	13600	70,5		48,3	20800	109,7	18,88	25850	134,4	
	700		19,21	7030	27,9		19,33	11000	43,4		18,93	13650	55,1		37,6	20850	85,5	18,88	26000	105,1	
21	1750	20,9	83,6	7050	64,3	20,9	83,9	10740	98,3	20,4	85,7	19100	178,6	20,7	84,7	21400	197,8				
	1400		20,93	7050	51,4		20,85	10740	78,7		68,6	19100	142,9		20,65	21400	158,3				
	900		20,93	7170	33,6		20,85	10900	51,3		44,1	19300	92,8		20,65	21700	103,2				
	700		20,93	7220	26,3		20,85	10960	40,1		34,3	19400	72,6		20,65	21850	80,8				
22,5	1750	22,6	77,5	10130	85,6	22,6	77,5	10130	85,6	22,1	79,2	18100	156,4	24,0	72,9	17000	135,2				
	1400		22,59	10130	68,5		22,59	10130	68,5		63,4	18100	125,1		58,3	17000	108,2				
	900		22,59	10280	44,7		22,59	10280	44,7		40,7	18300	81,3		37,5	17200	70,4				
	700		22,59	10350	35,0		22,59	10350	35,0		31,7	18400	63,6		29,2	17300	55,0				
24	1750	23,9	73,4	8570	68,6	23,9	73,4	8570	68,6	24,0	72,9	17000	135,2	24,0	72,9	17000	135,2				
	1400		23,85	8570	54,9		23,85	8570	54,9		58,3	17000	108,2		58,3	17000	108,2				
	900		23,85	8680	35,7		23,85	8680	35,7		37,5	17200	70,4		37,5	17200	70,4				
	700		23,85	8730	27,9		23,85	8730	27,9		29,2	17300	55,0		29,2	17300	55,0				
26	1750	26,0	67,3	8760	64,3	26,0	67,3	8760	64,3	26,0	67,3	8760	64,3	26,0	67,3	8760	64,3				
	1400		25,99	8760	51,5		25,99	8760	51,5		25,99	8760	51,5		25,99	8760	51,5				
	900		25,99	8910	33,7		25,99	8910	33,7		25,99	8910	33,7		25,99	8910	33,7				
	700		25,99	8960	26,3		25,99	8960	26,3		25,99	8960	26,3		25,99	8960	26,3				

Performance at input speeds higher than n₁=2000 rpm available on request.

		P2Z 279				P2Z 319				P2Z 349				P2Z 399				P2Z 409			
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]
14	1750	13,8	126,9	36000	498,3	14,4	121,2	50700	670,2	13,6	128,6	58950	826,8	13,2	132,4	89200	1287,9	13,2	132,2	101250	1459,7
	1400		101,5	36000	398,6		14,44	50700	536,2		13,61	58950	661,4		13,22	89200	1030,4		13,24	101250	1167,8
	900		65,3	36000	256,3		14,44	51200	348,1		13,61	67300	506,5		13,22	90000	668,3		13,24	110000	815,6
	700		50,8	36000	199,3		14,44	51470	272,2		13,61	70000	392,7		13,22	90000	519,8		13,24	110000	634,3
15	1750	14,9	117,5	36000	461,5	15,5	112,8	45200	555,9	14,9	117,8	60650	779,6	15,2	114,8	86350	1081,5	14,8	117,9	105250	1353,8
	1400		94,0	36000	369,2		15,52	45200	444,7		14,85	60650	623,7		15,24	86350	865,2		14,84	105250	1083,0
	900		60,4	36000	237,3		15,52	45800	289,7		14,85	69250	477,7		15,24	87950	566,5		14,84	110000	727,7
	700		47,0	36000	184,6		15,52	46050	226,5		14,85	70000	359,9		15,24	88500	443,4		14,84	110000	566,0
16,5	1750	16,7				16,7	104,6	45700	521,4	17,1	102,4	63600	710,4	17,2	101,7	73900	820,1	16,0	109,4	107850	1287,5
	1400						16,73	45700	417,1		17,09	63600	568,3		17,2	73900	656,1		15,99	107850	1030,0
	900						16,73	46350	272,0		17,09	65400	392,0		17,2	75050	428,3		15,99	110000	675,3
	700						16,73	46560	212,5		17,09	65700	293,5		17,2	75520	335,2		15,99	110000	525,3
18	1750	17,5	99,9	36000	392,2					18,6	94,3	65150	670,0	18,6	94,1	74700	766,6	18,4	94,9	104500	1081,7
	1400		17,52	36000	313,8						18,56	65150	536,0		18,6	74700	613,3		18,44	104500	865,4
	900		17,52	36000	201,7						18,56	65900	363,7		18,6	75800	400,1		18,44	106400	566,4
	700		17,52	36000	156,9						18,56	66200	272,3		18,6	76250	313,0		18,44	107100	443,5
19,5	1750	20,1	87,0	34300	325,4	19,0	92,3	40100	403,9	20,0	87,7	58100	555,9					20,2	86,6	73300	692,3
	1400		20,12	34300	260,3		18,95	40100	323,1		19,95	58100	444,7						69,3	73300	553,8
	900		20,12	34700	169,3		18,95	40650	210,6		19,95	58900	302,4						44,5	74300	360,9
	700		20,12	34900	132,4		18,95	40850	164,6		19,95	59250	226,8						34,6	74650	282,0
21	1750	21,6	81,0	31300	276,6	20,5	85,4	39150	364,9	21,5	81,3	58750	521,1	20,2	86,6	73300	692,3	20,8	84,1	89350	820,0
	1400		21,6	31300	221,3		20,48	39150	291,9		21,52	58750	416,9		69,3	73300	553,8		20,8	89350	656,0
	900		21,6	31750	144,3		20,48	39600	189,8		21,52	59600	283,7		44,5	74300	360,9		20,8	90800	428,5
	700		21,6	31950	112,9		20,48	39850	148,6		21,52	59850	212,3		34,6	74650	282,0		20,8	91350	335,3
22,5	1750													22,5	77,8	90300	766,1				
	1400														22,5	90300	612,9				
	900														22,5	91750	400,3				
	700														22,5	92250	313,0				
24	1750	23,4	74,9	31550	257,8					24,4	71,8	51550	403,9					24,4	71,6	88650	692,4
	1400		23,36	31550	206,2						24,36	51550	323,2						24,44	88650	553,9
	900		23,36	32000	134,5						24,36	52250	219,7						24,44	89850	360,9
	700		23,36	32150	105,1						24,36	52550	164,7						24,44	90350	282,3
26	1750	25,6	68,5	26500	198,0					26,3	66,5	50300	364,7								
	1400		25,55	26500	158,4						26,33	50300	291,7								
	900		25,55	26900	103,4						26,33	50950	198,2								
	700		25,55	27000	80,7						26,33	51200	148,5								

PERFORMANCE

		P3Z 179				P3Z 199				P3Z 219				P3Z 249				P3Z 269										
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]							
24	1750	24,5	71,3	9000	71,5	22,6	77,5	19000	164,0	22,6	77,5	19000	164,0	22,6	77,5	19000	164,0	22,6	22,6	77,5	19000	164,0						
	1400		57,0	9000	57,2																		22,59	19000	131,2			
	900		36,7	9000	36,8																		22,59	19000	84,3			
	700		28,5	9000	28,6																		22,59	19000	65,6			
26	1750	28,0	62,5	9000	62,7	25,1	69,7	19000	147,6	25,1	69,7	19000	147,6	25,1	69,7	19000	147,6	25,1	25,1	69,8	29000	225,6						
	1400		50,0	9000	50,1																		25,09	19000	118,1			
	900		32,2	9000	32,2																		25,09	19000	75,9			
	700		25,0	9000	25,1																		25,09	19000	59,0			
30	1750	30,5	57,4	11000	70,4	28,7	61,0	19000	129,1	28,6	61,1	24000	163,4	28,6	61,1	24000	163,4	28,6	28,6	62,3	29000	201,3						
	1400																						45,9	11000	56,3	28,7	19000	103,2
	900																						29,5	11000	36,2	28,7	19000	66,4
	700																						23,0	11000	28,1	28,7	19000	51,6
33	1750	32,1	54,6	9000	54,7	34,8	50,3	11000	61,7	33,0	53,0	19000	112,1	31,8	55,0	24000	147,1	31,8	31,8	55,2	29000	178,3						
	1400		43,7	9000	43,8																		40,3	11000	49,4			
	900		28,1	9000	28,1																		25,9	11000	31,7			
	700		21,8	9000	21,9																		20,1	11000	24,7			
36	1750	36,9	47,4	9000	47,5	36,4	48,1	24000	128,6	37,9	48,1	24000	128,6	37,9	48,1	24000	128,6	37,9	37,9	46,1	29000	149,0						
	1400		37,9	9000	38,0																		38,5	24000	102,9			
	900		24,4	9000	24,4																		24,7	24000	66,1			
	700		18,9	9000	19,0																		19,2	24000	51,4			
40	1750	39,8	44,0	11000	53,9	38,3	45,6	19000	96,6	41,1	42,6	29000	137,5	41,1	42,6	29000	137,5	41,1	41,1	42,6	29000	137,5						
	1400																						35,2	11000	43,1	38,34	19000	77,3
	900																						22,6	11000	27,7	38,34	19000	49,7
	700																						17,6	11000	21,5	38,34	19000	38,6
43	1750	42,9	40,8	9000	40,9	41,5	42,2	19000	89,3	41,9	41,8	24000	111,7	41,9	41,8	24000	111,7	41,9	41,9	41,8	29000	126,4						
	1400		32,6	9000	32,7																		41,46	19000	71,5			
	900		21,0	9000	21,0																		41,46	19000	45,9			
	700		16,3	9000	16,4																		41,46	19000	35,7			
47	1750	46,4	37,7	9000	37,8	45,9	38,1	11000	46,7	48,6	36,0	24000	96,2	44,7	39,1	29000	126,4	44,7	44,7	39,1	29000	126,4						
	1400		30,2	9000	30,2																		30,5	11000	37,4			
	900		19,4	9000	19,4																		19,6	11000	24,0			
	700		15,1	9000	15,1																		15,3	11000	18,7			

Performance at input speeds higher than n1=2000 rpm available on request.

		P3Z 279				P3Z 319				P3Z 349				P3Z 399				P3Z 409					
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]		
24	1750					24,3	72,1	55000	441,6														
	1400						57,7	55000	353,3														
	900						37,1	55000	227,1														
	700						28,8	55000	176,6														
26	1750					28,2	62,2	55000	380,9					24,9	70,2	90000	703,5						
	1400						49,7	55000	304,7						56,1	90000	562,8						
	900						32,0	55000	195,9						36,1	90000	361,8						
	700						24,9	55000	152,4						28,1	90000	281,4						
30	1750	31,0	56,4	36000	226,3	30,4	57,6	55000	352,8					29,0	60,4	90000	605,8	30,2	58,0	110000	710,8		
	1400		45,1	36000	181,0		46,1	55000	282,2						48,3	90000	484,7		46,4	110000	568,6		
	900		29,0	36000	116,4		29,6	55000	181,4						31,1	90000	311,6		29,8	110000	365,5		
	700		22,6	36000	90,5		23,0	55000	141,1						24,2	90000	242,3		23,2	110000	284,3		
33	1750	34,8	50,4	36000	202,0	32,9	53,2	55000	326,0	31,2	56,1	70000	437,1	33,9	51,7	90000	518,0						
	1400		40,3	36000	161,6		42,6	55000	260,8		44,8	70000	349,7		41,3	90000	414,4						
	900		25,9	36000	103,9		27,4	55000	167,7		28,8	70000	224,8		26,6	90000	266,4						
	700		20,1	36000	80,8		21,3	55000	130,4		22,4	70000	174,8		20,7	90000	207,2						
36	1750					35,7	49,1	55000	300,6	36,2	48,3	70000	377,0	36,8	47,6	90000	477,3	35,0	50,0	110000	612,2		
	1400						39,2	55000	240,5		38,7	70000	301,6		38,1	90000	381,8		40,0	110000	489,7		
	900						25,2	55000	154,6		24,9	70000	193,9		24,5	90000	245,5		25,7	110000	314,8		
	700						19,6	55000	120,2		19,3	70000	150,8		19,0	90000	190,9		20,0	110000	244,9		
40	1750	39,2	44,6	36000	178,9	38,8	45,1	55000	276,3	39,1	44,8	70000	349,2	40,0	43,7	90000	438,5	41,0	42,7	110000	523,4		
	1400		35,7	36000	143,1		36,1	55000	221,1		35,8	70000	279,3		35,0	90000	350,8		34,2	110000	418,7		
	900		22,9	36000	92,0		23,2	55000	142,1		23,0	70000	179,6		22,5	90000	225,5		22,0	110000	269,2		
	700		17,8	36000	71,6		18,0	55000	110,5		17,9	70000	139,7		17,5	90000	175,4		17,1	110000	209,4		
43	1750					42,4	41,3	55000	253,2	42,3	41,4	70000	322,8	43,2	40,5	90000	406,3	44,5	39,4	110000	482,2		
	1400						33,1	55000	202,5		33,1	70000	258,2		32,4	90000	325,1		31,5	110000	385,8		
	900						21,3	55000	130,2		21,3	70000	166,0		20,8	90000	209,0		20,2	110000	248,0		
	700						16,5	55000	101,3		16,6	70000	129,1		16,2	90000	162,5		15,7	110000	192,9		
47	1750	46,9	37,3	36000	149,5					45,9	38,2	70000	297,6	46,6	37,5	90000	376,3	48,4	36,2	110000	443,1		
	1400		29,8	36000	119,6						30,5	70000	238,0		30,0	90000	301,1		28,9	110000	354,4		
	900		19,2	36000	76,9						19,6	70000	153,0		19,3	90000	193,5		18,6	110000	227,9		
	700		14,9	36000	59,8						15,3	70000	119,0		15,0	90000	150,5		14,5	110000	177,2		

PERFORMANCE

		P3Z 179				P3Z 199				P3Z 219				P3Z 249				P3Z 269					
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]		
52	1750	51,4	34,0	9000	34,1	53,3	32,8	11000	40,2	49,8	35,2	19000	74,4	52,6	33,3	24000	89,0	53,9	32,5	29000	105,0		
	1400		27,2	9000	27,3		26,3	11000	32,2		28,1	19000	59,5		26,6	24000	71,2		26,0	29000	84,0		
	900		17,5	9000	17,5		16,9	11000	20,7		18,1	19000	38,3		17,1	24000	45,8		16,7	29000	54,0		
	700		13,6	9000	13,6		13,1	11000	16,1		14,1	19000	29,8		13,3	24000	35,6		13,0	29000	42,0		
57	1750	57,7	30,3	9000	30,4	57,7	30,4	11000	37,2	57,8	30,3	19000	64,1	61,2					28,6	29000	92,4		
	1400		24,3	9000	24,3		24,3	11000	29,8		24,2	19000	51,2								22,9	29000	73,9
	900		15,6	9000	15,6		15,6	11000	19,1		15,6	19000	32,9								14,7	29000	47,5
	700		12,1	9000	12,2		12,1	11000	14,9		12,1	19000	25,6									11,4	29000
64	1750	63,9				63,9	27,4	11000	33,6	62,7	27,9	18400	57,3	63,1	27,7	24000	74,2	66,1	26,5	29000	85,6		
	1400						21,9	11000	26,9		22,3	18400	45,8		22,2	24000	59,3		21,2	29000	68,5		
	900						14,1	11000	17,3		14,4	18700	29,9		14,3	24000	38,1		13,6	29000	44,0		
	700						11,0	11000	13,4		11,2	18800	23,4		11,1	24000	29,7		10,6	29000	34,2		
69	1750	68,2	25,7	9000	25,7	71,7	24,4	11000	29,9	70,5	24,8	16100	44,5	71,5					24,5	29000	79,0		
	1400		20,5	9000	20,6		19,5	11000	23,9		19,9	16100	35,6		19,6	29000	63,2						
	900		13,2	9000	13,2		12,6	11000	15,4		12,8	16350	23,3		12,6	29000	40,6						
	700		10,3	9000	10,3		9,8	11000	12,0		9,9	16450	18,2		9,8	29000	31,6						
75	1750	73,9	23,7	9000	23,7	75,3				75,3	23,3	15500	40,1	73,3	23,9	24000	63,8	75,6	23,2	23900	61,7		
	1400		18,9	9000	19,0						18,6	15500	32,1		19,1	24000	51,1		18,5	23900	49,3		
	900		12,2	9000	12,2						12,0	15700	20,9		12,3	24000	32,8		11,9	24250	32,2		
	700		9,5	9000	9,5						9,3	15800	16,4		9,5	24000	25,5		9,3	24400	25,2		
81	1750	79,8	21,9	9000	22,0	84,7	20,7	11000	25,3	81,3	21,5	14600	35,0	79,4	22,0	23300	57,2	82,3	21,3	27200	64,4		
	1400		17,6	9000	17,6		16,5	11000	20,2		17,2	14600	28,0		17,6	23300	45,7		17,0	27200	51,5		
	900		11,3	9000	11,3		10,6	11000	13,0		11,1	14900	18,4		11,3	23700	29,9		10,9	27650	33,7		
	700		8,8	9000	8,8		8,3	11000	10,1		8,6	15000	14,4		8,8	23850	23,4		8,5	27900	26,4		
89	1750	86,2	20,3	8840	20,0	91,8	19,1	11000	23,4	89,4				89,4	19,6	20450	44,6	95,4					
	1400		16,2	8840	16,0		15,3	11000	18,7						15,7	20450	35,7						
	900		10,4	9000	10,5		9,8	11000	12,0						10,1	20700	23,2						
	700		8,1	9000	8,1		7,6	11000	9,3						7,8	20850	18,2						
96	1750	99,1				99,1	17,7	11000	21,6	95,4				95,4	18,3	19700	40,2	103					
	1400						14,1	11000	17,3						14,7	19700	32,2						
	900						9,1	11000	11,1						9,4	19950	21,0						
	700						7,1	11000	8,7						7,3	20050	16,4						
104	1750	107				107	16,3	10980	20,0	103				103	17,0	18500	35,0	103					
	1400						13,1	10980	16,0						13,6	18500	28,0						
	900						8,4	11000	10,3						8,7	18900	18,4						
	700						6,5	11000	8,0						6,8	19000	14,4						

Performance at input speeds higher than n₁=2000 rpm available on request.

		P3Z 279				P3Z 319				P3Z 349				P3Z 399				P3Z 409												
in	n ₁ [rpm]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]	i	n ₂ [rpm]	Mn ₂ [Nm]	Pn ₁ [kW]									
52	1750	50,9	34,4	36000	137,9	49,1	35,6	55000	218,4	49,9	35,1	70000	273,5	54,9	31,9	90000	319,8	52,2	33,5	110000	410,5									
	1400		27,5	36000	110,3		28,5	55000	174,7		28,1	70000	218,8		25,5	90000	255,8		26,8	110000	328,4									
	900		17,7	36000	70,9		18,3	55000	112,3		18,0	70000	140,7		16,4	90000	164,4		17,2	110000	211,1									
	700		13,8	36000	55,2		14,3	55000	87,4		14,0	70000	109,4		12,8	90000	127,9		13,4	110000	164,2									
57	1750	55,3	31,6	36000	126,9	56,8	30,8	55000	188,8	54,5	32,1	70000	250,6						56,4	31,0	110000	380,2								
	1400		25,3	36000	101,5		24,7	55000	151,0		25,7	70000	200,5							24,8	110000	304,2								
	900		16,3	36000	65,2		15,8	55000	97,1		16,5	70000	128,9							16,0	110000	195,5								
	700		12,7	36000	50,7		12,3	55000	75,5		12,9	70000	100,2							12,4	110000	152,1								
64	1750	66,6	26,3	36000	105,3	62,3	28,1	55000	172,2	63,1	27,7	70000	216,2	63,0	27,8	90000	278,5													
	1400		21,0	36000	84,3		22,5	55000	137,8		22,2	70000	173,0		22,2	90000	222,8													
	900		13,5	36000	54,2		14,5	55000	88,6		14,3	70000	111,2		14,3	90000	143,2													
	700		10,5	36000	42,1		11,2	55000	68,9		11,1	70000	86,5		11,1	90000	111,4													
69	1750					67,4	26,0	54100	156,5	73,0	24,0	70000	186,9	67,6	25,9	90000	259,4	66,4	26,4	110000	323,0									
	1400						20,8	54100	125,2		19,2	70000	149,5		20,7	90000	207,5		21,1	110000	258,4									
	900						13,4	54800	81,5		12,3	70000	96,1		13,3	90000	133,4		13,6	110000	166,1									
	700						10,4	55000	63,7		9,6	70000	74,8		10,4	90000	103,8		10,5	110000	129,2									
75	1750	75,7	23,1	36000	92,7	73,2	23,9	50700	135,0					73,2	23,9	90000	239,8	76,2	23,0	110000	281,4									
	1400		18,5	36000	74,1		19,1	50700	108,0						19,1	90000	191,9		18,4	110000	225,1									
	900		11,9	36000	47,7		12,3	51400	70,4						12,3	90000	123,3		11,8	110000	144,7									
	700		9,2	36000	37,1		9,6	51700	55,1						9,6	90000	95,9		9,2	110000	112,6									
81	1750	81,7	21,4	36000	85,9					80,1	21,9	70000	170,5	80,0	21,9	81300	198,1	81,8	21,4	110000	262,1									
	1400		17,1	36000	68,7						17,5	70000	136,4		17,5	81300	158,4		17,1	110000	209,7									
	900		11,0	36000	44,2						11,2	70000	87,7		11,2	82500	103,4		11,0	110000	134,8									
	700		8,6	36000	34,4						8,7	70000	68,2		8,7	83000	80,9		8,6	110000	104,8									
89	1750	88,5	19,8	36000	79,3					86,6	20,2	69550	156,5					88,5	19,8	110000	242,3									
	1400		15,8	36000	63,4						16,2	69550	125,2						16,2	69550	125,2	15,8	110000	193,8						
	900		10,2	36000	40,8						10,4	70000	81,0						10,4	70000	81,0	10,2	110000	124,6						
	700		7,9	36000	31,7						8,1	70000	63,0						8,1	70000	63,0	7,9	110000	96,9						
96	1750	93,5	18,7	29550	61,6					94,1	18,6	65200	135,0					96,8	18,1	98300	198,0									
	1400		15,0	29550	49,3						14,9	65200	108,0						14,9	65200	108,0	14,5	98300	158,4						
	900		9,6	30000	32,2						9,6	66100	70,4						9,6	66100	70,4	9,3	99750	103,3						
	700		7,5	30150	25,1						7,4	66550	55,1						7,4	66550	55,1	7,2	100400	80,9						
104	1750	102	17,2	33650	64,4																									
	1400		13,7	33650	51,5																	13,7	33650	51,5	13,7	33650	51,5	13,7	33650	51,5
	900		8,8	34200	33,7																	8,8	34200	33,7	8,8	34200	33,7	8,8	34200	33,7
	700		6,9	34500	26,4																	6,9	34500	26,4	6,9	34500	26,4	6,9	34500	26,4

INSTALLATION

Pay special attention to the installation conditions as these are the principal cause of damage and downtime. When choosing the motor, consider the mounting position and presence, below the motor itself, of parts, things or materials which may be damaged by oil leaks, however limited in amount. The unit can only be mounted in the mounting position indicated on the nameplate: a different mounting position must be authorized by MOTOVARIO.

Unless expressly requested, gear reducers are supplied dry, and it is the customer's responsibility to top up with oil up to the correct level, this should be done with the unit in the selected mounting position (using a filter with 25 µm grain) paying attention not to damage the seal when refitting it (or when smearing it with fresh sealing compound); if necessary, top up with oil of the same type up to correct level (see table LUBRICANTS RECOMMENDED BY MOTOVARIO).

For possible use of different oil (after checking with the MOTOVARIO TECHNICAL SALES SUPPORT), replace completely and, in case of synthetic oil, only after washing the inside of the gear reducer. If you are using pressure-fed lubrication, fill the oil circuit and check oil level after gear reducer has been running for a short period. If there is an oil leak, find the cause before restoring the lubricant level. Do not dump the lubricant in the environment, adopt all the necessary environmental safety measures, dispose of the lubricant in compliance with the current regulations.

Before the commissioning of the unit, carry out the following operations:

- Check the nameplate data of the unit and/or electric motor;
- Make sure the equipment supplied corresponds to the equipment ordered;
- Fixing to the structure of the machine must be stable, vibration-free. The structure shall not be subject to torsional movements, must ensure a continuity of transmission of any electrical and electrostatic discharges, otherwise provide a grounding system, via a cable securely attached to the mounting areas, making sure to remove any paint in the contact area and using conductors of adequate cross section;
- For fixing use the fixing screws of minimum 8.8 quality and be careful not to buckle the casings due to improper fixing, making sure that the support surface is coplanar to the fixing surface;
- Do not install the unit in mounting positions other than those stated in the order, since different positions provide different positions of the loading, unloading and oil level plugs, in addition to a different amount of lubricant;
- Check the position of the level plug. If the casing is provided with a hole with closed plug symmetric with respect to the level plug itself, if necessary, for level visibility, reverse their positions. Check the accessibility to oil loading/unloading plugs.
- Check the correct quantity of oil, according to the mounting position required. If the oil level of the unit is restored, do it according to the plug diagram and use oil of the same type indicated on the label.
- Replace the cap, if present, with the vent cap in the kit provided with the gear reducer;
- Check for any leakage of lubricant;
- Eliminate, if possible, any traces of dirt from the shafts and from the areas around the sealing rings;
- Lubricate the contact surfaces to prevent oxidation or seizure;
- Check the static seals and the bolted joints;
- Do not install the unit in an environment with fumes or abrasive and/or corrosive dust;
- Install all the protections designed for the rotary organs so as to ensure the system safety according to the current rules;
- Check the correct rotation direction of the output shaft of the unit;

- In case of shaft mounting configuration it is recommended to use the torque arms that can be supplied by MOTOVARIO, specially designed;
- Ensure proper cooling of the motor through a good flow of air from the fan side;
- Avoid solar radiation or other heat sources, the cooling air temperature must never exceed 40 °C;
- Check that the assembly of the various parts (pulleys, sprockets, couplings, etc.) on shafts is performed by using the proper threaded holes or any other systems able to ensure a correct operation without risking damage to the bearings or the outer parts of the units;

For the operating fields with temperatures below 0 °C, please consider the following:

- Be sure to avoid shock loading as cast-iron may become brittle at temperatures below -15 °C.
- During the initial service stages, lubrication problems can occur due to the high viscosity of the oil, therefore it is advisable to operate with “no load” for a few minutes.

If the temperature is lower than -30 °C or higher than 60 °C use special mixture seal rings.

Change the oil as specified in table OIL CHANGE INTERVAL; first bring gear reducer to a surface temperature lower than 40 °C (this will make it easier to drain oil, when you take all necessary precautions to avoid scalding).

- Locate the loading and unloading caps (the loading cap can match the vent cap or the dipstick); place a container of suitable capacity under the gear reducer at the unloading cap;
- Unscrew the loading and unloading caps paying attention to progressively reduce any internal overpressure;
- Completely drain the oil and collect it in the underlying container;
- Replace the seal of the unloading cap and tighten it again by applying the appropriate tightening torque (see table “OIL CAPS TIGHTENING TORQUE”);
- Fill the gear reducer with new oil until the level reaches the centre line of the indicator cap or the top notch on the dipstick;
- Replace the seal of the loading cap and tighten it again by applying the appropriate tightening torque (see table “OIL CAPS TIGHTENING TORQUE”);
- After about 30 minutes check the correctness of the level (if necessary, provide to its restoration) and any oil leaks. Clean the surface of the gear reducer with materials that do not generate electrostatic discharges;
- Dispose of used oil in accordance with current regulations.

Table OIL CHANGE INTERVAL

Oil type	Oil temperature [°C]		
	< 65	80	95
Mineral oil	8000 h	4000 h	2000 h
Synthetic oil	25000 h	18000 h	12500 h

OIL PLUGS TIGHTENING TORQUE with aluminium gasket and Allen key

Cap	Tightening torque [Nm]
GAS 3/8"	30
GAS 1/2"	60
GAS 3/4"	70
GAS 1"	70

OIL PLUGS TIGHTENING TORQUE with aluminium gasket and Allen key

Cap	Tightening torque [Nm]
GAS 3/8"	20
GAS 1/2"	30
GAS 3/4"	40
GAS 1"	50

Cap	PZ
GAS 3/8"	179 - 199
GAS 3/4"	219 - 249 - 269 279
GAS 1" - GAS 3/4"	319 - 349 - 399 409

Assembling motor on PAM flange

If the unit is supplied without motor, it is necessary to follow these recommendation to ensure the correct assembly of the electric motor. Check that the tolerances for the motor shaft and flange correspond to the “standard”. Carefully clean the shaft, spigot and surfaces of the flange removing traces of paint and dirt, and confirm the key is fitted correctly.

Mount the half coupling onto the electric motor without forcing it, otherwise check the tolerance of the motor key and ensure that it is in the correct position; in any case, use appropriate systems that ensure it is mounted properly without damaging the motor bearings.

Mount the motor, with half coupling, placing the couplings elastic element onto the motor half coupling and position the motor up to the gear reducer ensuring the coupling element is aligned with the driven half coupling. The motor key does not need adjusting.

SALES CONDITIONS

All supplies effected by MOTOVARIO are governed exclusively by the general terms of sale that you can find on our website:

<https://www.motovario.com/eng/corporate/sales-conditions>

The revised data and information, shown in this technical catalogue, replaces the data of the previous editions, old data is now obsolete. All technical data, dimensions, weights in this catalogue are subject to changes without warning. Illustrations are not binding.

You can find the above mentioned data and information on our website www.motovario.com; please periodically consult the technical documentation on the web site to be always updated about possible modifications of performances and characteristics of the product.

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