

RUBIX

 INCLUDED

# HDP-HDO SERIES

Parallel shaft gear units HDP series  
Bevel helical gear units HDO series

 **Bonfiglioli**



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#### Revisions

Refer to page 392 for the catalogue revision index. Visit [www.bonfiglioli.com](http://www.bonfiglioli.com) to search for catalogues with up-to-date revisions.



## GENERAL INFORMATION

### 1 SYMBOLS AND UNITS OF MEASUREMENT

Symbols	Units of Measure	Description	Symbols	Units of Measure	Description
<b>An</b> <sub>1,2</sub>	[kN]	Permissible axial force	<b>P</b> <sub>TFAN...</sub>	[kW]	Thermal capacity with the contribution of forced ventilation
<b>f</b> <sub>s</sub>	–	Service factor	<b>P</b> <sub>TSR</sub>	[kW]	Thermal capacity inclusive of contribution from cooling coil
<b>i</b>	–	Gear ratio	<b>P</b> <sub>TMCRA...</sub>	[kW]	Thermal capacity inclusive of contribution from air/oil exchanger cooling unit
<b>l</b>	–	Cyclic duration factor	<b>P</b> <sub>TMCRW...</sub>	[kW]	Thermal capacity inclusive of contribution from water/oil exchanger cooling unit
<b>J</b>	[Kgm <sup>2</sup> ]	Mass moment of inertia	<b>Rc</b> <sub>1,2</sub>	[kN]	Calculated radial force
<b>M</b> <sub>1,2</sub>	[Nm]	Torque	<b>Rn</b> <sub>1,2</sub>	[kN]	Permissible overhung load
<b>Mc</b> <sub>1,2</sub>	[Nm]	Calculated torque	<b>t</b> <sub>a</sub>	[°C]	Ambient temperature
<b>Mn</b> <sub>1,2</sub>	[Nm]	Rated torque	<b>t</b> <sub>s</sub>	[°C]	Surface temperature
<b>Mr</b> <sub>1,2</sub>	[Nm]	Torque demand	<b>t</b> <sub>o</sub>	[°C]	Oil temperature
<b>n</b> <sub>1,2</sub>	[min <sup>-1</sup> ]	Speed	<b>η</b>	–	Efficiency
<b>P</b> <sub>1,2</sub>	[kW]	Power			<sub>1</sub> value applies to input shaft
<b>Pn</b> <sub>1,2</sub>	[kW]	Rated power			<sub>2</sub> value applies to output shaft
<b>Pr</b> <sub>1,2</sub>	[kW]	Power demand			
<b>P</b> <sub>T</sub>	[kW]	Overall thermal capacity			



## 2 GENERAL DESIGN FEATURES

Gear units of the HDP and HDO series make optimum use of advanced design features, to offer:

- Top torque density
- Superior performance
- Silent and vibration-free operation
- Total ruggedness and reliability
- Lifetime calculation in accordance with the applicable ISO and AGMA standards
- Extensive customisation through a wide range of options offered in the catalogue

## 3 ALLOWED TEMPERATURE LIMITS

Symbols	Description / Condition	Value (*)	
		Synthetic Oil	Mineral Oil
$t_a$	Ambient temperature		
$t_{au \text{ min}}$	Minimum operating ambient temperature	<b>-30°C</b>	<b>-10°C</b>
$t_{au \text{ Max}}$	Maximum operating ambient temperature	<b>+50°C</b>	<b>+40°C</b>
$t_{as \text{ min}}$	Minimum storage ambient temperature	<b>-40°C</b>	<b>-10°C</b>
$t_{as \text{ Max}}$	Maximum storage ambient temperature	<b>+50°C</b>	<b>+50°C</b>
$t_s$	Surface temperature		
$t_{s \text{ min}}$	Minimum gearbox surface temperature starting with partial load (#)	<b>-25°C</b>	<b>-10°C</b>
$t_{sc \text{ min}}$	Minimum gearbox surface temperature starting with full load	<b>-10°C</b>	<b>-5°C</b>
$t_{s \text{ Max}}$	Maximum casing surface temperature during continuous operation (measured next to the gearbox input)	<b>+100°C</b>	<b>+100°C (@)</b>
$t_o$	Oil temperature		
$t_{o \text{ Max}}$	Maximum oil temperature during continuous operation	<b>+95°C</b>	<b>+95°C (@)</b>

(\*) = Refer to the table “Selection of the optimal oil viscosity” for further information about minimum and maximum values of different oil viscosity and for using hydraulic circuits. For values of  $t_a < -20^\circ\text{C}$  and  $t_s, t_o > 80^\circ\text{C}$ , choose (as permitted in the product configuration stage) the sealing type of the most suitable material to the type of application. If needed contact Bonfiglioli Technical Service.

(@) = Continuous operation it is not advised if  $t_s$  and  $t_o$  range is  $80^\circ\text{C}$  to  $95^\circ\text{C}$ .

(#) = For full load start-up it is recommended to ramp-up and provide for greater absorption of the motor. If needed, contact Bonfiglioli Technical Service.





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## 4 INSTALLATION

The following installation instructions must be observed:

- Make sure that the gearbox is correctly secured to avoid vibrations. If shocks or overloads are expected, install hydraulic couplings, clutches, torque limiters, etc.
- Before the eventual painting, the machined surfaces and the outer face of the oilseals must be protected to prevent paint drying out the rubber and jeopardising the oil-seal function.
- Components to be keyed on to the gearbox output shafts should be machined to ISO H7 tolerances to prevent mating surfaces jamming and causing irreparable damage to the gearbox during installation. Suitable pullers and extractors should also be used to fit and remove such components. These should be properly secured to the threaded hole at the end of the shafts. The customer is required to verify the mating on the output shaft defining appropriate tolerances according to the torque to be transmitted.
- Mating surfaces must be cleaned and treated with suitable protective products before mounting to avoid oxidation and, as a result, seizure of parts.
- Prior to putting the gear unit into operation make sure that the equipment that incorporates the same complies with the current revision of the Machines Directive 2006/42/CE.
- Before starting up the machine, make sure that oil level conforms to the mounting position specified for the gear unit and viscosity is suitable for the specific application.
- For outdoor installation provide adequate guards in order to protect the drive from rainfalls as well as direct sun radiation.



## 5 LUBRICATION

Refer to the User's Manual available at [www.bonfiglioli.com](http://www.bonfiglioli.com) for indications about checking the oil level and its replacement.

Do not mix mineral oils with synthetic oils and/or different brands.

However, oil level should be checked at regular intervals and topped up as required.

Check monthly if unit operates under intermittent duty, more frequently if duty is continuous.

### 5.1 Selection of the optimal oil viscosity (data relating to Shell Oils)

		Operating ambient temperature [C°]																		
		-40	-35	-30	-25	-20	-15	-10	-5	0	+5	+10	+15	+20	+25	+30	+35	+40	+45	+50
		suitability seals check			standard seals provided in the catalog															
Splash lubrication	Mineral oil	150 VG							*											
		220 VG	⊘	ⓞ					*											ⓞ
		320 VG	⊘	ⓞ						*										
		460 VG									*									
	Synthetic oil (PAG)	150 VG			*															ⓞ
		220 VG	⊘	ⓞ		*														
320 VG					*															
Synthetic oil (PAO)	150 VG			*															ⓞ	
	220 VG	⊘	ⓞ		*															
	320 VG				*															
Forced lubrication	Mineral oil	150 VG								*										
		220 VG	⊘	ⓞ						*									ⓞ	
		320 VG									*									
		460 VG										*								
	Synthetic oil (PAG)	150 VG			*	*														ⓞ
		220 VG	⊘	ⓞ		*	*													
320 VG					*	*														
Synthetic oil (PAO)	150 VG			*	*														ⓞ	
	220 VG	⊘	ⓞ		*	*														
	320 VG				*	*														

Recommended operating limits

Allowed operating limits. ⓞ

Forbidden operating limits.

\* = It is recommended to ramp-up and to provide for greater absorption of the motor.

If needed and in the event of impulse loads, contact Bonfiglioli Technical Service. ⓞ



## 5.2 Lubrication for HDP-HDO series gearboxes

The internal parts of HDP gearboxes are lubricated with a mixed immersion and splash system. Should the output speed be lower than  $1 \text{ min}^{-1}$  or the input speed greater than  $1800 \text{ min}^{-1}$ , please contact Bonfiglioli Technical Service for advise.

In mounting position V5, the top bearings in gearbox sizes HDP 60 to HDP 90 are pre-lubricated with grease and fitted with Nilos seals, unless the order specifies a forced lubrication system with mechanical pump (optional variants OP1, OP2) or electric pump (option MOP).

If HDP 100 to 180 gearboxes have to be installed in mounting position V5, with the output shaft vertical, one of the above mentioned forced lubrication systems must be specified. The actual system should be selected on the basis of speed and/or operating conditions.

These gearboxes are supplied without lubricant. It is the customer's responsibility to fill them with the appropriate amount of oil before start-up.

The internal parts of HDO gearboxes are lubricated with a mixed immersion and splash system. Should the output speed be lower than  $1 \text{ min}^{-1}$  or the input speed greater than  $1800 \text{ min}^{-1}$ , please contact Bonfiglioli Technical Service for advise.

In mounting positions V5 and B6, the top bearings in gearbox sizes HDO 71 to HDO 95 are pre-lubricated with grease and fitted with Nilos seals.

If HDO 100 to 180 gearboxes have to be installed in mounting positions V5 and B6 it is required that the order specifies a forced lubrication system with mechanical pump (optional variants OP1, OP2) or electric pump (option MOP).

Depending on the configuration and mounting position, HDO gearboxes may require one of a number of forced lubrication systems described later in this catalogue.

The gearboxes are supplied without lubricant. It is the customer's responsibility to fill them with the appropriate amount of oil before start-up.



## 6 STORAGE

Observe the following instructions to ensure correct storage of the products:

- Do not store outdoors, in areas exposed to weather or with excessive humidity.
- Always place boards, wood or other material between the products and the floor. The gearboxes should not have direct contact with the floor.
- In case of long-term storage all machined surfaces such as flanges, shafts and couplings must be coated with a suitable rust inhibiting product (Tectile 506 EH or equivalent). Furthermore gear units must be placed with the fill plug in the highest position and filled up with oil. Before putting the units into operation the appropriate quantity, and type, of oil must be restored.

## 7 CONDITIONS OF SUPPLY

Gear units are supplied as follows:

- configured for installation in the mounting position specified when ordering;
- tested to manufacturer specifications;
- mating machined surfaces come unpainted;
- nuts and bolts for mounting motors are provided if a flanged motor input is specified.

## 8 PAINT COATING

HDP gearboxes in sizes 60 to 90 and HDO in sizes 71 to 95 are externally and internally painted in oven hardened epoxy resin and polyester powder paint. The painted (ferrous) surfaces of these gearboxes are protected to at least corrosivity class C2 (UNI EN ISO 12944-2). The colour is RAL 7042 grey. A synthetic top coat may be applied later.

HDP and HDO gearbox sizes 100 to 180 are internally and externally spray painted with an epoxy primer, and then externally painted on completion of assembly. These gearboxes are protected to at least corrosivity class C3 (UNI EN ISO 12944-2). The colour is RAL 7042 grey.



## 9 SERVICE FACTOR

Service factors listed here under are empirical values based on AGMA and ISO specifications as well as our experience for use in common applications. They apply for state of the art-designed driven machines and normal operating conditions.

Application	≤ 10 hours/day	> 10 hours/day
<b>AGITATORS, MIXERS</b>		
Pure liquids	1.25	1.50
Liquids and solids	1.25	1.50
Liquids - variable density	1.50	1.75
<b>BLOWERS</b>		
Centrifugal	1.00	1.25
Lobe	1.25	1.50
Vane	1.25	1.50
<b>CLARIFIERS</b>	1.00	1.25
<b>CLAY WORKING MACHINERY</b>		
Brick press	1.75	2.00
Briquette machine	1.75	2.00
Pug mill	1.25	1.50
<b>COMPACTORS</b>	2.00	2.00
<b>COMPRESSORS</b>		
Centrifugal	1.25	1.50
Lobe	1.25	1.50
Reciprocating, multi-cylinder	1.50	1.75
Reciprocating, single-cylinder	1.75	2.00
<b>CONVEYORS - GENERAL PURPOSE</b>		
Uniformly loaded or fed	1.15	1.25
- Heavy duty		
Not uniformly fed	1.25	1.50
- Reciprocating or shaker	1.75	2.00
<b>CRANES (*)</b>		
<b>Dry dock</b>		
Main hoist	2.50	2.50
Auxiliary hoist	2.50	3.00
Boom hoist	2.50	3.00
Slewing Drive	2.50	3.00
Traction Drive	3.00	3.00

Application	≤ 10 hours/day	> 10 hours/day
<b>Trolley Drive</b>		
Gantry Drive	3.00	3.00
Traction Drive	2.00	2.00
<b>Industrial duty</b>		
Main hoist	2.50	3.00
Auxiliary hoist	2.50	3.00
Bridge and	3.00	3.00
Trolley travel	3.00	3.00
<b>CRUSHER</b>		
Stone or ore	2.00	2.00
<b>DREDGES</b>		
Conveyors	1.25	1.50
Cutter head drives	2.00	2.00
Screen drives	1.75	2.00
Stackers	1.25	1.50
Winches	1.25	1.50
<b>ELEVATORS</b>		
Bucket	1.25	1.50
Centrifugal discharge	1.15	1.25
Escalators	1.15	1.25
Freight	1.25	1.50
Gravity discharge	1.15	1.25
<b>EXTRUDERS</b>		
General	1.50	1.50
<b>Plastics</b>		
Variable speed drive	1.50	1.50
Fixed speed drive	1.75	1.75
<b>Rubber</b>		
Continuous screw operation	1.75	1.75
Intermittent screw operation	1.75	1.75
<b>FANS</b>		
Centrifugal	1.00	1.25
Cooling towers	2.00	2.00

(\*) - Indication of service factor based on FEM 1.001 classification available upon request. Consult factory.

- Hoists for passengers lift: charted **values not applicable**. Consult factory.



Application	≤ 10 hours/day	> 10 hours/day
Forced draft	1.25	1.25
Induced draft	1.50	1.50
Industrial and mine	1.50	1.50
<b>FEEDERS</b>		
Apron	1.25	1.50
Belt	1.15	1.50
Disc	1.00	1.25
Reciprocating	1.75	2.00
Screw	1.25	1.50
<b>FOOD INDUSTRY</b>		
Dough mixer	1.25	1.50
Meat grinders	1.25	1.50
Slicers	1.25	1.50
<b>GENERATORS AND EXCITERS</b>	1.00	1.25
<b>HAMMER MILLS</b>	1.75	2.00
<b>HOISTS (*)</b>		
Heavy duty	1.75	2.00
Medium duty	1.25	1.50
Skip hoist	1.25	1.50
<b>LUMBER INDUSTRY</b>		
Barkers - spindle feed	1.25	1.50
Main drive	1.75	1.75
<b>Conveyors - burner</b>	1.25	1.50
Main or heavy duty	1.50	1.50
Main log	1.75	2.00
Re-saw, merry-go-round	1.25	1.50
<b>Conveyors</b>		
Slab	1.75	2.00
Transfer	1.25	1.50
<b>Chains</b>		
Floor	1.50	1.50
Green	1.50	1.75
<b>Cut-off saws</b>		
Chain	1.50	1.75
Drag	1.50	1.75
Debarking drums	1.75	2.00
<b>Feeds</b>		
Edger	1.25	1.50
Gang	1.75	1.75
Trimmer	1.25	1.50
Log deck	1.75	1.75

Application	≤ 10 hours/day	> 10 hours/day
Log hauls - incline - weel type	1.75	1.75
Log turning devices	1.75	1.75
Planer feed	1.25	1.50
Planer tilting hoists	1.50	1.50
Rolls - live-off brg. - roll cases	1.75	1.75
Sorting table	1.25	1.50
Tipple hoist	1.25	1.50
<b>Transfers</b>		
Chain	1.50	1.75
Craneways	1.50	1.75
Tray drives	1.25	1.50
Veneer lathe drives	1.25	1.50
<b>METAL MILLS</b>		
Slab pushers	1.50	1.50
Shears	2.00	2.00
Wire drawing	1.25	1.50
Wire winding machine	1.50	1.50
<b>MILLS, ROTARY TYPE</b>		
Ball and rod	2.00	2.00
Spur ring gear	2.00	2.00
Helical ring gear	1.50	1.50
Direct connected	2.00	2.00
Cement kilns	1.50	1.50
Dryers and coolers	1.50	1.50
<b>MIXERS</b>		
Concrete	1.50	1.75
<b>PAPER MILLS</b>		
Agitator (mixer)	1.50	1.50
Agitator for pure liquors	1.25	1.25
Barking drums	2.00	2.00
Barkers - mechanical	2.00	2.00
Beater	1.50	1.50
Breaker stack	1.25	1.25
Calendar	1.25	1.25
Chipper	2.00	2.00
Chip feeder	1.50	1.50
Coating rolls	1.25	1.25
<b>Conveyors</b>		
Chip, bark, chemical	1.25	1.25
Log (including slab)	2.00	2.00

(\*) - Indication of service factor based on FEM 1.001 classification available upon request. Consult factory.

- Hoists for passengers lift: charted **values not applicable**. Consult factory.



Application	≤ 10 hours/day	> 10 hours/day
Couch rolls	1.25	1.25
Cutter	2.00	2.00
Cylinder molds	1.25	1.25
<b>Dryers</b>		
Paper machine	1.25	1.25
Conveyors type	1.25	1.25
Embossers	1.25	1.25
Extruder	1.50	1.50
Jordan	1.50	1.50
Kiln drive	1.50	1.50
Paper rolls	1.25	1.25
Platter	1.50	1.50
Presses - felt and suction	1.25	1.25
Pulper	2.00	2.00
Pumps - vacuum	1.50	1.50
Reel (surface type)	1.25	1.25
<b>Screens</b>		
Chip	1.50	1.50
Rotary	1.50	1.50
Vibrating	2.00	2.00
Size press	1.25	1.25
Super calendar	1.25	1.25
Thickener (AC motor)	1.50	1.50
Thickener (DC motor)	1.25	1.25
Washer (AC motor)	1.50	1.50
Washer (DC motor)	1.25	1.25
Wind and unwind stand	1.25	1.50
Winders (surface type)	1.25	1.25
Yankee dryers	1.25	1.25
<b>PLASTICS INDUSTRY</b>		
Batch mixers	1.75	1.75
Continuous mixers	1.50	1.50
Compounding mill	1.25	1.25
Calendars	1.50	1.50
<b>Secondary processing</b>		
Blow molders	1.50	1.50
Coating	1.25	1.25
Film	1.25	1.25
Pre-plasticizers	1.50	1.50
Rods	1.25	1.25

Application	≤ 10 hours/day	> 10 hours/day
Sheet	1.25	1.25
Tubing	1.25	1.50
<b>PUMPS</b>		
Centrifugal	1.15	1.25
<b>Reciprocating</b>		
Single acting, three or more cylinders	1.25	1.50
Double acting, two or more cylinders	1.25	1.50
<b>Rotary</b>		
Gear type	1.15	1.25
Lobe	1.15	1.25
Vane	1.15	1.25
<b>RUBBER INDUSTRY</b>		
<b>Intensive internal mixer</b>		
Batch mixers	1.75	1.75
Continuous mixers	1.50	1.50
Refiner - two rolls	1.50	1.50
Calendars	1.50	1.50
<b>SAND MULLER</b>	1.25	1.50
<b>SEWAGE DISPOSAL EQUIPMENT</b>		
Aerators	2.00	2.00
Chemical feeders	1.25	1.25
Dewatering screens	1.50	1.50
Scum breakers	1.50	1.50
Slow or rapid mixers	1.50	1.50
Sludge collectors	1.25	1.25
Thickeners	1.50	1.50
Vacuum filters	1.50	1.50
<b>SCREENS</b>		
Air washing	1.00	1.25
Rotary - stone or gravel	1.25	1.50
Travelling water intake	1.00	1.25
<b>SUGAR INDUSTRY</b>		
Beet slicer	2.00	2.00
Cane knives	1.50	1.50
Crushers	1.50	1.50
Mills (low speed end)	1.75	1.75
<b>TEXTILE MACHINERY</b>	1.25	1.50



## SELECTING THE GEAR UNIT

Selection of the the Atex product must fit through the compilation of this selection form. For a safe selection it is strongly recommended to rely on the long time experience of the Bonfiglioli Technical Service Dept.

<b>Bonfiglioli</b> <small>Forever Forward</small>		<b>TECHNICAL DATA REQUIRED FOR THE SELECTION OF HDP - HDO</b>			Nr: _____		
					Date: _____		
					Rev_	Date: _____	
<b>A ) GENERAL DATA</b>							
#	1	Company / Customer					
#	2	Contact					
#	3	Branch / Distributor					
#	4	Order quantity					
#	5	Delivery time					
<b>B ) ELECTRIC MOTOR</b>							
#	6	Motor Type					
#	7	$P_{n1}$	Rated motor power	[kW]			
#	8	$P_{r1}$	Motor power demand	[kW]			
#	9	$n_1$	Input speed	[min <sup>-1</sup> ]			
#	10	Pole number					
#	11	Motor mounting: B3 - B5 - B14					
<b>C<sub>1</sub>) GEARBOX</b>				<b>C<sub>2</sub>) ATEX CONDITION [GROUPII] - 2014/34/EU</b>			
#	12	Gearbox configuration					
#	13	$i$	Gear ratio	Category: [2 = standard / 3 = special]			
#	14	$n_2$	Output speed	[min <sup>-1</sup> ]	Atmosphere: [G = gas / D = dust]		
#	15	$M_2$	Output torque demand	[Nm]	Zone: [1 - 21 / 2 - 22]		
#	17	$f_s$	Service factor required	Temperature class: [T4 / 135°C]			
#	18	Rotation of the output shaft [ front view ]:		<b>CW</b>	<b>CCW</b>		
#	19	$L_{10H}$	Bearings lifetime	[h]			
#	20	Gears lifetime		[h]			
#	21	$SF_{min}$	Safety for tooth root stress	standard reference (ISO preferred)			
#	22	$SH_{min}$	Safety for flank pressure	standard reference (ISO preferred)			
<b>D ) ADDITIONAL LOADS</b>							
#	23	$R_{e2}$	Radial load on output shaft	[N]			
#	24	$x_2$	Load application distance from shaft shoulder	[mm]			
#	25	$\alpha_{R_e2}$	Angle of application of the output Radial load	[° ' '']			
#	26	$R_{e1}$	Radial load on input shaft	[N]			
#	27	$x_1$	Load application distance from shaft shoulder	[mm]			
#	28	$\alpha_{R_e1}$	Angle of application of the input Radial load	[° ' '']			
#	29	$A_{n2}$	Thrust load on output shaft ( + / - )	[N]			
#	30	$A_{n1}$	Thrust load on input shaft ( + / - )	[N]			
<b>E ) APPLICATION</b>							
#	31	Type of application					
#	32			Time phase	Time phase	Gearbox output torque	Gearbox output speed
				%	hours	[Nm]	[min <sup>-1</sup> ]
				****	****		
				****	****		
				****	****		
#	33	Notes about Duty Cycle:					
		Duty type		<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4-S8</b>
#	34	$v_A$	Ambient air velocity	[m/s]	≤ 0.5	> 0.5 ≤ 1.4	> 1.4
#	35	$t_a$	Ambient temperature range	[°C]			
#	36	Altitude a.s.l.		[m]			
#	37	Rating according FEM class		T-	L-	M-	
<b>F ) OPTIONS OR ADDITIONAL REQUESTS</b>							
#	38	Lubrication					
#	39	Supplementary cooling systems					
#	40	Paint coating					
#	41	To specific requests for testing					
<b>G ) NOTES</b>							
#	42	Notes and additional Customer requirements:					
#	43	PLP number if present for Special Gearbox					
#	Mandatory for the selection						





The selection of the drive unit can only be optimized upon knowing both the engineering and the environmental conditions the gearbox will operate into.

## 10 ENGINEERING SELECTION

1. First determine the gear ratio:

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

2. Calculate the power  $P_{r1}$  required at the input shaft:

$$P_{r1} = \frac{M_{r2} \times n_2}{9550 \times \eta}$$

	$\eta$
2x	0.96
3x	0.94
4x	0.92

3. Determine the applicable service factor  $f_s$  and the adjusting factor  $f_m$  depending on prime mover:

	$f_m$
Electric motor Hydraulic motor Turbine	1.00
Multi-cylinder internal combustion engine	1.25
Single cylinder internal combustion engine	1.50

4. Use the rating charts to select the gear unit with the gear ratio nearest to that calculated, and with a rated power  $P_{n1}$ , so that:

$$P_{n1} \geq P_{r1} \times f_s \times f_m$$







## 11 VERIFICATIONS

### 11.1 SHOCK LOADING

For intermittent duty, impact/shock loading applications or start-ups under full load or with high inertial loads, make sure the following condition is satisfied for momentary peak torque  $M_p$  generated during the operating cycle:

$$M_p \leq M_{n2ref} \times f_p$$

Peaks/hour		$f_p$				
		1	2 ... 10	11 ... 50	51 ... 100	> 100
Drive	Constant direction	2.0 1.8 (HDO 71...95 3x  1.6 (HDO 71...95 4x 	1.6	1.3	1.1	1.0
	Reversals	1.4 1.3 (HDO 71...95 3x  1.1 (HDO 71...95 4x 	1.1	0.9	0.8	0.7

For configuration S (output shaft with shrink disc), use the following values to verify applicability.

Peaks/hour		$f_p$		
		1 ... 50	51 ... 100	> 100
Drive	Constant direction	1.3 1.1 (HDP 80) 1 (HDO 81) 1.2 (HDO 95)	1.1 1 (HDO 81)	1.0
	Reversals	0.9 0.8 (HDP 80 - HDO 95) 0.7 (HDO 81)	0.8 0.7 (HDO 81)	0.7

If the above condition is not satisfied, consider installing a torque limiter or selecting a gear unit of the next size up.

### 11.2 MOTOR MOUNTING

Verify that the appropriate motor adapter is available for the selected gear unit. See sections [15.5](#) and [26.6](#).

Because of standardisation, the rated power of the electric motor selected might be greater than power  $P_{r1}$  actually requested by the application. Make sure that the electric motor will never develop the extra power at any stage of the operating cycle. If you have any doubts about the validity of the application data, or uncertainty concerning the actual load pattern, install a torque limiting device or proportionally revise the applicable service factor.



### 11.3 BACKSTOP DEVICE

If the gear unit is specified with a backstop, verify the load capacity of the device at sections [15.6.3](#) and [26.7.3](#) of this catalogue and make sure the torque  $M_{1MAX}$  is never exceeded in operation.

### 11.4 CALCULATING THE RESULTING OVERHUNG LOAD

External transmissions keyed onto input and/or output shaft generate loads that act radially onto same shaft.




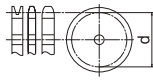
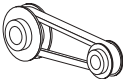
Resulting shaft loading must be compatible with both the bearing and the shaft capacity.

Namely shaft loading ( $R_{c1}$  for input shaft,  $R_{c2}$  for output shaft), must be equal or lower than admissible overhung load capacity for shaft under study ( $R_{x1}$  for input shaft,  $R_{x2}$  for output shaft). OHL capability listed in the rating chart section.

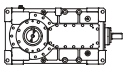
The procedure described above applies to both the input shaft and the output shaft, but care must be taken to apply factor  $K_1$  or factor  $K_2$  to suit the particular shaft.

The load generated by an external transmission can be calculated, to a good approximation, by the following equation:

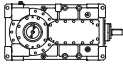
$$R_c = \frac{2000 \times M \times K_r}{d}$$

$K_r = 1$		$M$ [Nm]	
$K_r = 1.25$		$d$ [mm]	
$K_r = 1.5 - 2.0$			

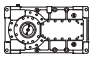
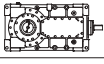


	i =	Rn <sub>1</sub> max [kN]	K <sub>1</sub>												
			x [mm] =												
			-100	-75	-50	-25	0	25	50	75	100	150	200	250	300
HDO 71 2	5.6 ... 14.6	11.3	—	—	2.35	1.41	1.00	0.78	0.64	0.54	0.46	—	—	—	—
HDO 71 3	21.8 ... 71.9	6.1	—	—	—	1.56	1.00	0.70	0.51	0.39	0.33	—	—	—	—
HDO 71 4	77.0 ... 475.4	4.8	—	—	—	1.88	1.00	0.54	0.38	0.29	0.23	—	—	—	—
HDO 81 2	5.5 ... 14.7	17.2	—	—	2.59	1.58	1.00	0.69	0.52	0.43	0.35	—	—	—	—
HDO 81 3	25.9 ... 71.9	11.7	—	—	2.61	1.56	1.00	0.69	0.52	0.43	0.36	—	—	—	—
HDO 81 4	78.3 ... 473.3	7.2	—	—	—	1.76	1.00	0.54	0.38	0.28	0.22	—	—	—	—
HDO 91 2	7.4 ... 15.9	17.9	—	—	2.37	1.41	1.00	0.78	0.64	0.54	0.46	—	—	—	—
HDO 91 3	18.6 ... 66.1	11.6	—	—	2.17	1.37	1.00	0.79	0.65	0.52	0.43	—	—	—	—
HDO 91 4	82.0 ... 489.3	5.9	—	—	—	1.54	1.00	0.75	0.53	0.42	0.34	—	—	—	—
HDO 95 3	21.2 ... 72.3	11.6	—	—	2.17	1.37	1.00	0.79	0.65	0.52	0.43	—	—	—	—
HDO 95 4	81.6 ... 489.7	5.8	—	—	—	1.55	1.00	0.74	0.53	0.41	0.34	—	—	—	—
HDO 100 2	5.8 ... 13.5	19.4	—	—	1.88	1.30	1.00	0.81	0.68	0.59	0.51	0.40	0.32	—	—
HDO 100 3	14 ... 17.3	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—
	20.2 ... 67.5	10.8	—	—	2.23	1.38	1.00	0.78	0.63	0.51	0.43	0.32	—	—	—
HDO 100 4	70.8 ... 139.8	7.2	—	—	—	1.56	1.00	0.72	0.52	0.40	0.33	—	—	—	—
	160 ... 344.2	4.8	—	—	—	1.56	1.00	0.74	0.58	0.46	0.38	—	—	—	—
HDO 110 2	6.4 ... 15.5	19.4	—	—	1.88	1.30	1.00	0.81	0.68	0.59	0.51	0.40	0.32	—	—
HDO 110 3	18.9 ... 20.9	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—
	22 ... 77.5	10.8	—	—	2.23	1.38	1.00	0.78	0.63	0.51	0.43	0.32	—	—	—
HDO 110 4	77.4 ... 121.7	7.2	—	—	—	1.56	1.00	0.72	0.52	0.40	0.33	—	—	—	—
	137.1 ... 395	4.8	—	—	—	1.56	1.00	0.74	0.58	0.46	0.38	—	—	—	—
HDO 120 2	6.6 ... 15.5	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—
HDO 120 3	17.3 ... 24.6	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—
	28.3 ... 78.6	10.8	—	—	2.23	1.38	1.00	0.78	0.63	0.51	0.43	0.32	—	—	—
HDO 120 4	87 ... 162.2	7.2	—	—	—	1.56	1.00	0.72	0.52	0.40	0.33	—	—	—	—
	179.7 ... 400.6	4.8	—	—	—	1.56	1.00	0.74	0.58	0.46	0.38	—	—	—	—
HDO 125 2	7.4 ... 16.9	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—
HDO 125 3	19.2 ... 35.8	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—
	38.8 ... 85.9	10.8	—	—	2.23	1.38	1.00	0.78	0.63	0.51	0.43	0.32	—	—	—
HDO 125 4	97.0 ... 178.0	7.2	—	—	—	1.56	1.00	0.72	0.52	0.40	0.33	—	—	—	—
	200.3 ... 438.0	4.8	—	—	—	1.56	1.00	0.74	0.58	0.46	0.38	—	—	—	—
HDO 130 2	5.7 ... 13.6	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—
HDO 130 3	15.2 ... 67.1	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—
HDO 130 4	71.5 ... 335.6	10.9	—	—	2.25	1.38	1.00	0.78	0.63	0.50	0.42	0.32	—	—	—
HDO 140 2	6.6 ... 15.7	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—
HDO 140 3	17.7 ... 77.3	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—
HDO 140 4	82.3 ... 386.6	10.9	—	—	2.25	1.38	1.00	0.78	0.63	0.50	0.42	0.32	—	—	—



	i =	Rn <sub>1</sub> max [kN]	K <sub>1</sub>													
			x [mm] =													
			-100	-75	-50	-25	0	25	50	75	100	150	200	250	300	
HDO 150 2	5.5 ... 7.0	54.0	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.67	0.59	0.47	0.40	0.34	0.30	
	8.1 ... 13.7	41.6	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.66	0.58	0.46	0.39	0.33	0.29	
HDO 150 3	15.6 ... 60.8	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—	
HDO 150 4	66.9 ... 92.9	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—	
	101.8 ... 238.8	10.9	—	—	2.25	1.38	1.00	0.78	0.63	0.50	0.42	0.32	—	—	—	
HDO 160 2	7.3 ... 7.9	54.0	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.67	0.59	0.47	0.40	0.34	0.30	
	8.9 ... 15.4	41.6	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.66	0.58	0.46	0.39	0.33	0.29	
HDO 160 3	17.7 ... 68.6	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—	
HDO 160 4	75.9 ... 96.3	18.7	—	—	2.23	1.38	1.00	0.78	0.64	0.54	0.45	0.34	—	—	—	
	115.2 ... 269.7	10.9	—	—	2.25	1.38	1.00	0.78	0.63	0.50	0.42	0.32	—	—	—	
HDO 170 3	15.9 ... 21.7	41.6	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.66	0.58	0.46	0.39	0.33	0.29	
	26.2 ... 59.9	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—	
HDO 170 4	72.9 ... 239.5	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—	
HDO 180 3	17.7 ... 27.9	41.6	2.75	1.91	1.47	1.19	1.00	0.86	0.76	0.66	0.58	0.46	0.39	0.33	0.29	
	31.4 ... 66.2	35.8	—	2.21	1.57	1.22	1.00	0.85	0.73	0.62	0.54	0.42	0.35	0.30	—	
HDO 180 4	81.0 ... 244.9	22.6	—	—	1.82	1.29	1.00	0.78	0.62	0.51	0.44	0.34	0.28	—	—	

The values for overhung and thrust loads are the maximum permissible values.

 	Rn <sub>2</sub> max [kN]	K <sub>2</sub>																An <sub>2</sub> max [kN]	
		x [mm] =																	
		-100	-75	-50	-25	0	25	50	75	100	150	200	250	300	350	400	450		500
HDP 60	35.0	—	—	1.20	1.09	1.00	0.74	0.58	0.48	0.41	0.32	—	—	—	—	—	—	17.5	
HDP 70 HDO 71	40.0	—	1.34	1.20	1.09	1.00	0.77	0.63	0.53	0.46	0.36	0.30	—	—	—	—	—	25.0	
HDP 80 HDO 81	46.0	1.38	1.26	1.16	1.07	1.00	0.82	0.69	0.59	0.52	0.42	0.35	0.30	—	—	—	—	32.5	
HDP 90 HDO 91	62.0	1.33	1.23	1.14	1.07	1.00	0.81	0.68	0.58	0.51	0.41	0.34	0.30	—	—	—	—	37.5	
HDO 95	69.0	1.28	1.20	1.12	1.06	1.00	0.81	0.68	0.58	0.51	0.41	0.34	0.30	0.26	—	—	—	38.5	
HDP 100 HDO 100	80.0	1.28	1.20	1.12	1.06	1.00	0.81	0.68	0.58	0.51	0.41	0.34	0.30	0.26	—	—	—	40.0	
HDP 110 HDO 110	86.0	1.27	1.19	1.12	1.06	1.00	0.83	0.71	0.63	0.56	0.45	0.38	0.33	0.29	0.26	0.24	—	43.0	
HDP 120 HDO 120	107.0	1.25	1.18	1.11	1.05	1.00	0.83	0.71	0.63	0.56	0.45	0.38	0.33	0.29	0.26	0.24	—	53.5	
HDP 125 HDO 125	130.0	1.20	1.14	1.09	1.04	1.00	0.86	0.75	0.67	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	—	65.0
HDP 130 HDO 130	160.0	1.20	1.14	1.09	1.04	1.00	0.86	0.75	0.67	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	—	80.0
HDP 140 HDO 140	190.0	1.20	1.14	1.09	1.04	1.00	0.86	0.75	0.67	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	—	95.0
HDP 150 HDO 150	200.0	1.15	1.11	1.07	1.03	1.00	0.92	0.85	0.80	0.75	0.66	0.60	0.54	0.49	0.45	0.41	0.38	0.35	100.0
HDP 160 HDO 160	220.0	1.15	1.11	1.07	1.03	1.00	0.92	0.85	0.80	0.75	0.66	0.60	0.54	0.49	0.45	0.41	0.38	0.35	110.0
HDP 170 HDO 170	250.0	1.15	1.11	1.07	1.03	1.00	0.92	0.85	0.80	0.75	0.66	0.60	0.54	0.49	0.45	0.41	0.38	0.35	125.0
HDP 180 HDO 180	260.0	1.15	1.11	1.07	1.03	1.00	0.92	0.85	0.80	0.75	0.66	0.60	0.54	0.49	0.45	0.41	0.38	0.35	130.0



## 11.7 THERMAL CAPACITY

Thermal power  $P_T$  is the maximum power that the gearbox can transmit mechanically, under continuous operation, without the internal temperature rising to a value that could damage the gearbox components.

Under the following operating conditions:

- mounting position B3, gearbox connected through a metallic support
- continuous functioning
- installation in large areas (air speed > 1.4 m/s)
- max. installation altitude 1000 m

total thermal capacity values and thermal capacity values inclusive of contributions from auxiliary cooling units are listed in sections [17](#) and [28](#).

For other conditions contact Bonfiglioli's Technical Service.

The figure determined must be greater than the  $Pr_1$  power value for the gearbox input shaft. It is therefore important to verify the following formula:

$$P_{T...} \geq Pr_1$$



	Application data	
	$n_1 = 1500 \text{ min}^{-1}$	$f_s = 1.5$
	$n_2 = 120 \text{ min}^{-1}$	$Mr_2 = 13500 \text{ Nm}$
	Mounting position: <b>B3</b>	
	Environmental conditions	
Ambient temperature = 40°C		
Installation in large areas		

### Product selection:

a)  $i = \frac{n_1}{n_2} = \frac{1500}{120} = 12.5$     b)  $Pr_1 = \frac{Mr_2 \times n_2}{9550 \times \eta} = \frac{13500 \times 120}{9550 \times 0.96} \approx 176.7 \text{ kW}$     c)  $Pn_1 \geq Pr_1 \cdot f_s \approx 265.1 \text{ kW}$



**HDO 110 2 12.5 LP L 1 VP B3**

[ $Pn_1 = 329.4 \text{ kW @ } n_1 = 1500 \text{ min}^{-1}$ ]

### Thermal capacity check:

$P_T = 52 \text{ kW} < Pr_1 = 176.7 \text{ kW}$



### Option 1

- Cooling units with air/oil heat exchanger

$P_{TMCR A9} = 184 \text{ kW @ } n_1 = 1500 \text{ min}^{-1}$

$P_{TMCR A9} > Pr_1$

✓ OK

### Option 2

- Cooling units with water/oil heat exchanger

$P_{TMCR W5} = 250 \text{ kW @ } n_1 = 1500 \text{ min}^{-1}$

$P_{TMCR W5} > Pr_1$

✓ OK



## GEAR UNITS ATEX CONFIGURATION

### 13 INTRODUCTION TO THE ATEX DIRECTIVES

#### 13.1 Explosive atmosphere

An **explosive atmosphere** for the purposes of Directive 2014/34/EU is defined as a mixture:

- a. of **flammable substances**, in the form of gases, vapours, mists or dusts;
- b. with **air**;
- c. under atmospheric conditions;
- d. in which, after ignition, the combustion spreads to the entire unburned mixture (it has to be noted that sometimes, mainly with dust, not always the whole quantity of the combustible material is consumed by the combustion).

An atmosphere, which could become explosive due to local and/or operational conditions is called a **potentially explosive atmosphere**.

It is only in this kind of potentially explosive atmosphere which products falling under the Directive 2014/34/EU are designed for.

#### 13.2 European harmonised atex standards

Directive 2014/34/EU stipulates the minimum safety requirements for products intended for use in explosion risk areas within the member countries of the European Union. The directive also assigns such equipment to **categories**, which are defined by the directive itself.

The following table describes the **zones** into which the user of a plant, in which an explosive atmosphere may occur, is required to divide the equipment application areas.

Zones		Formation frequency of a potentially explosive atmosphere	Type of danger
Gaseous atmosphere G	Dusty atmosphere D		
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but if it does occur will persist for short period only	Minimal



**BONFIGLIOLI RIDUTTORI gear units selected in this catalogue are marked and suitable for installation in zones 1, 21, as highlighted in light gray in the above diagram and they may of course also be installed in areas (minor risk) 2 and 22.**

As from 20 April 2016 the ATEX directive 2014/34/EU come into force throughout the entire European Union, and replace existing conflicting national and European laws on explosive atmospheres and the previous directive 94/9/EC.

The directives apply to mechanical, hydraulic and pneumatic equipment.

### 13.3 Levels of protection for the various categories of equipment

The various categories of equipment must be able to operate in conformity with the Manufacturer's operational specifications, at certain defined levels of protection.

The availability of BONFIGLIOLI RIDUTTORI products is highlighted in grey.

Protection level	Category		Type of protection	Operating conditions
	Group I	Group II		
Very high	M1		Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational even in the presence of an explosive atmosphere
Very high		1	Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational in zones 0, 1, 2 (G) and/or zones 20, 21, 22 (D)
High	M2		Protection suitable for normal operation and heavy duty conditions	Power to the equipment is shut off in the presence of a potentially explosive atmosphere
High		2	Protection suitable for normal operation and frequent faults or equipment in which malfunction is normal.	The equipment remains powered and operational in zones 1, 2 (G) and/or zones 21, 22 (D)
Normal		3	Protection suitable for normal operation	The equipment remains powered and operational in zones 2 (G) and/or 22 (D)

### 13.4 Definition of groups

**Group I** Applies to equipment intended for use underground in parts of mines and those parts of surface installations of such mines, liable to be endangered by fire damp and/or combustible dust.

**Group II** Applies to equipment intended for use in other places liable to be endangered by explosive atmospheres.

BONFIGLIOLI RIDUTTORI products may not therefore be installed in mines, classified in **Group I** and in **Group II**, category 1.

To summarise, the classification of equipment in to groups, categories and zones is illustrated in the table below, where by the availability of BONFIGLIOLI RIDUTTORI products is highlighted in grey.



Group	I mines, firedamp		II other potentially explosive areas (gas, dust)					
	M1	M2	1		2		3	
Category			G	D	G	D	G	D
Atmosphere <sup>(1)</sup>								
Zone			0	20	1	21	2	22
Type of protection gear unit <sup>(2)</sup>					Ex h Gb	Ex h Db	Ex h Gc	Ex h Dc

<sup>(1)</sup> G = gas D = dust

<sup>(2)</sup> as per 80079-36 and EN 80079-37

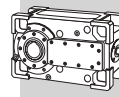
### 13.5 Declaration of conformity


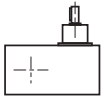
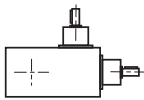


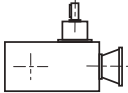

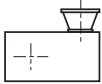

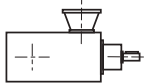



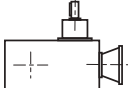
The Declaration of Conformity, is the document which attests to the conformity of the product to Directive 2014/34/EU.

The validity of the Declaration is bound to observance of the instructions given in the User, Installation and Service Manual for safe use of the product throughout its service life.

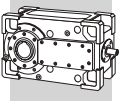
This can be downloaded from [www.bonfiglioli.com](http://www.bonfiglioli.com) where the manual is available in PDF format in a number of languages.

The instructions regarding ambient conditions are of particular importance inasmuch as failure to observe them during operation of the product renders the certificate null and void. In case of doubt regarding the validity of the certificate of conformity, contact the BONFIGLIOLI RIDUTTORI technical department.



VP			
G NG			
GJ NGJ		  HDO 71 ... 95	  HDO 71 ... 95
AD	 HDO 71 ... 95	 HDO 71 ... 95	 HDO 71 ... 95

HDO

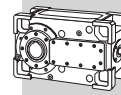


26.4.3 SHAFT ARRANGEMENT

HDO

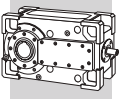
		VP						
B3	LP		L		LJ (*)		LD (*)	
			R		RJ (*)		RD (*)	
			D		DJ (*)		DD (*)	
	S	H		L		LJ (*)		LD (*)
		S		L		LJ (*)		LD (*)
				R		RJ (*)		RD (*)

		G - NG / AD AD: HDO 71 ... 95		GJ - NGJ HDO 71 ... 95		
B3	LP		L		LD (*)	
			R		RD (*)	
			D		DD (*)	
	S	H		L		LD (*)
		S		L		LD (*)
				R		RD (*)



		VP					
B6	LP		L		R		LD (*)
			RJ (*)		RD (*)		DD (*)
			DJ (*)		DD (*)		DD (*)
	H		L		LJ (*)		LD (*)
			RJ (*)		RD (*)		DD (*)
	S		L		LJ (*)		LD (*)
		RJ (*)		RD (*)		DD (*)	

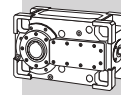
		G - NG / AD AD: HDO 71 ... 95		GJ - NGJ HDO 71 ... 95	
B6	LP		L		LD (*)
			RJ (*)		RD (*)
			DJ (*)		DD (*)
	H		L		LD (*)
			RJ (*)		RD (*)
	S		L		LD (*)
		RJ (*)		RD (*)	



HDO

		VP					
B7	LP	L	LJ (*)	LD (*)	R	RJ (*)	RD (*)
		D	DJ (*)	DD (*)			
		L	LJ (*)	LD (*)			
	S	L	LJ (*)	LD (*)	R	RJ (*)	RD (*)
		R					
	(*) 214						

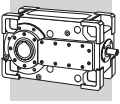
		G - NG / AD AD: HDO 71 ... 95		GJ - NGJ  HDO 71 ... 95		
B7	LP	L	LD (*)	LJ (*)	LD (*)	
		R	RD (*)	RJ (*)	RD (*)	
		D	DD (*)	DJ (*)	DD (*)	
	S	L	LD (*)	LJ (*)	LD (*)	
		R	RD (*)	RJ (*)	RD (*)	
	(*) 214					



		VP					
V5	LP	L		LJ (*)		LD (*)	
		R		RJ (*)		RD (*)	
		D		DJ (*)		DD (*)	
	H	L		LJ (*)		LD (*)	
		R		RJ (*)		RD (*)	
	S	L		LJ (*)		LD (*)	
R			RJ (*)		RD (*)		

HDO

		G - NG / AD	AD: HDO 71 ... 95	GJ - NGJ	HDO 71 ... 95
V5	LP	L		LJ (*)	
		R		RJ (*)	
		D		DJ (*)	
	H	L		LJ (*)	
		R		RJ (*)	
	S	L		LJ (*)	
R			RJ (*)		

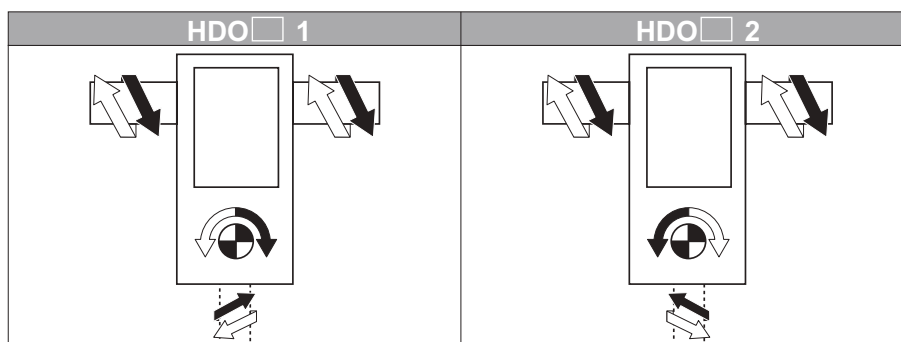


The gear ratios listed below are those that are not available for the configurations marked with (\*) in the charts here before.

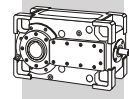
HDO

(*)	Configurations not possible
	i
HDO 71 2	⊖
HDO 71 4	⊖
HDO 81 2	⊖
HDO 81 4	⊖
HDO 91 2	⊖
HDO 91 3	$i = 30.6$
HDO 91 4	⊖
HDO 95 2	⊖
HDO 95 3	$34.9 \leq i \leq 40.5$
HDO 95 4	⊖
HDO 100 2	⊖
HDO 100 4	⊖
HDO 110 2	⊖
HDO 110 4	⊖
HDO 120 2	⊖
HDO 120 3	$i = 24.6$
HDO 120 4	⊖
HDO 125 2	⊖
HDO 125 3	$27.7 \leq i \leq 35.8$
HDO 125 4	⊖
HDO 130 2	⊖
HDO 130 4	⊖
HDO 140 2	⊖
HDO 140 4	⊖
HDO 150 2	⊖
HDO 150 3	$15.6 \leq i \leq 25.4$
HDO 150 4	⊖
HDO 160 2	⊖
HDO 160 3	$17.7 \leq i \leq 31.3$
HDO 160 4	⊖
HDO 170	⊖
HDO 180	⊖

## 26.5 EXECUTION







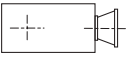
## 26.6 MOTOR AVAILABILITY

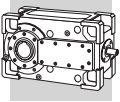
The following charts list the motor/gearbox combinations that are geometrically feasible. Variants are only applicable if either an AD (direct motor mounting) or a G/NG - GJ/NGJ input configuration (coupling through bell housing IEC or NEMA and flexible coupling) were previously specified within the ordering code.





**Because of standardisation, the rated power of the electric motor selected might be greater than nominal power  $P_{n1}$  of chosen gearbox. Make sure that the electric motor will never develop the extra power at any stage of the operating cycle. If you have any doubts about the validity of the application data, or uncertainty concerning the actual load pattern, install a torque limiting device or proportionally revise the applicable service factor.**

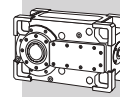
	Input configuration				
	AD				
	112	132	160	180	200
HDO 71 3	—	X	X	X	X
HDO 81 3	—	—	X	X	X
HDO 91 3	—	—	—	X	X
HDO 91 4	—	—	X	X	X
HDO 95 3	—	—	—	X	X
HDO 95 4	—	—	X	X	X

	Input configuration							
	G							
	112	132	160	180	200	225	250	280
HDO 71 2	—	—	—	—	5.6_14.6	5.6_14.6	—	—
HDO 71 3	—	15.9_69.2	15.9_69.2	15.9_69.2	15.9_69.2	15.9_69.2	—	—
HDO 81 2	—	—	—	—	5.5_14.7	5.5_14.7	5.5_14.7	5.5_14.7
HDO 81 3	—	—	15.5_69.2	15.5_69.2	15.5_69.2	15.5_69.2	15.5_69.2	15.5_69.2
HDO 91 2	i =	—	—	—	7.4_15.9	7.4_15.9	7.4_15.9	7.4_15.9
HDO 91 3	—	—	18.6_66.1	18.6_66.1	18.6_66.1	18.6_66.1	18.6_66.1	18.6_66.1
HDO 91 4	—	82.0_489.3	82.0_489.3	82.0_489.3	82.0_489.3	82.0_489.3	—	—
HDO 95 3	—	—	21.2_72.3	21.2_72.3	21.2_72.3	21.2_72.3	21.2_72.3	21.2_72.3
HDO 95 4	—	81.6_489.7	81.6_489.7	81.6_489.7	81.6_489.7	81.6_489.7	—	—



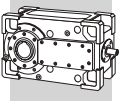
HDO

	Input configuration								
	G								
	112	132	160	180	200	225	250	280	315
HDO 100_2	—	—	—	—	—	—	5.8_13.5	5.8_13.5	5.8_13.5
HDO 100_3	—	—	20.2_67.5	20.2_67.5	20.2_67.5	20.2_67.5	14.0_67.5	14.0_67.5	14.0_67.5
HDO 100_4	160.0_344.2	70.8_344.2	70.8_344.2	70.8_344.2	70.8_139.8	70.8_139.8	—	—	—
HDO 110_2	—	—	—	—	—	—	—	6.4_15.5	6.4_15.5
HDO 110_3	—	—	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	18.9_77.5	18.9_77.5
HDO 110_4	137.1_395.0	137.1_395.0	77.4_395.0	77.4_395.0	77.4_121.7	77.4_121.7	—	—	—
HDO 120_2	—	—	—	—	—	—	—	—	6.6_15.5
HDO 120_3	—	—	—	—	28.3_78.6	28.3_78.6	28.3_78.6	17.3_78.6	17.3_78.6
HDO 120_4	—	87.0_400.6	87.0_400.6	87.0_400.6	87.0_162.2	87.0_162.2	—	—	—
HDO 125_2	—	—	—	—	—	—	—	—	7.4_16.9
HDO 125_3	—	—	—	—	38.8_85.9	38.8_85.9	38.8_85.9	19.2_85.9	19.2_85.9
HDO 125_4	—	97.0_438.0	97.0_438.0	97.0_438.0	97.0_178.0	97.0_178.0	—	—	—
HDO 130_2	—	—	—	—	—	—	—	—	5.7_13.6
HDO 130_3	—	—	—	—	—	—	15.2_67.1	15.2_67.1	15.2_67.1
HDO 130_4	—	—	71.5_335.6	71.5_335.6	71.5_335.6	71.5_335.6	71.5_335.6	71.5_335.6	—
HDO 140_2	—	—	—	—	—	—	—	—	6.6_15.7
HDO 140_3	—	—	—	—	—	—	17.7_77.3	17.7_77.3	17.7_77.3
HDO 140_4	—	—	82.3_386.6	82.3_386.6	82.3_386.6	82.3_386.6	82.3_386.6	82.3_386.6	—
HDO 150_2	—	—	—	—	—	—	—	—	—
HDO 150_3	—	—	—	—	—	—	—	15.6_60.8	15.6_60.8
HDO 150_4	—	—	—	101.8_238.8	101.8_238.8	101.8_238.8	66.9_238.8	66.9_238.8	66.9_238.8
HDO 160_2	—	—	—	—	—	—	—	—	—
HDO 160_3	—	—	—	—	—	—	—	17.7_68.6	17.7_68.6
HDO 160_4	—	—	—	115.2_269.7	115.2_269.7	115.2_269.7	75.9_269.7	75.9_269.7	75.9_269.7
HDO 170	 <b>BONFIGLIOLI TECHNICAL SERVICE</b>								
HDO 180									





		Input configuration							
		NG							
		N180TC	N210TC	N250TC	N280TC	N320TC	N360TC	N400TC	
HDO 71 2	i =	—	—	—	—	5.6_14.6	5.6_14.6	—	
HDO 71 3		—	15.9_69.2	15.9_69.2	15.9_69.2	15.9_69.2	15.9_69.2	—	
HDO 81 2		—	—	—	—	5.5_14.7	5.5_14.7	5.5_14.7	
HDO 81 3		—	—	15.5_69.2	15.5_69.2	15.5_69.2	15.5_69.2	15.5_69.2	
HDO 91 2		—	—	—	—	7.4_15.9	7.4_15.9	7.4_15.9	
HDO 91 3		—	—	18.6_66.1	18.6_66.1	18.6_66.1	18.6_66.1	18.6_66.1	
HDO 91 4		82.0_489.3	82.0_489.3	82.0_489.3	82.0_489.3	82.0_489.3	82.0_489.3	—	
HDO 95 3		—	—	21.2_72.3	21.2_72.3	21.2_72.3	21.2_72.3	21.2_72.3	
HDO 95 4		81.6_489.7	81.6_489.7	81.6_489.7	81.6_489.7	81.6_489.7	81.6_489.7	—	

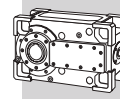
		Input configuration							
		NG							
		N180TC	N210TC	N250TC	N280TC	N320TC	N360TC	N400TC	N440TC
HDO 100_2	i =	—	—	—	—	—	5.8_13.5	5.8_13.5	—
HDO 100_3		—	—	20.2_67.5	20.2_67.5	20.2_67.5	14.0_67.5	14.0_67.5	—
HDO 100_4		160.0_344.2	70.8_344.2	70.8_344.2	70.8_344.2	70.8_139.8	70.8_139.8	—	—
HDO 110_2		—	—	—	—	—	—	6.4_15.5	—
HDO 110_3		—	—	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	18.9_77.5	—
HDO 110_4		137.1_395.0	77.4_395.0	77.4_395.0	77.4_395.0	77.4_121.7	77.4_121.7	—	—
HDO 120_2		—	—	—	—	—	—	—	6.6_15.5
HDO 120_3		—	—	—	—	28.3_78.6	28.3_78.6	17.3_78.6	17.3_78.6
HDO 120_4		—	87.0_400.6	87.0_400.6	87.0_400.6	87.0_162.2	87.0_162.2	—	—
HDO 125_2		—	—	—	—	—	—	—	7.4_16.9
HDO 125_3		—	—	—	—	38.8_85.9	38.8_85.9	19.2_85.9	19.2_85.9
HDO 125_4		—	97.0_438.0	97.0_438.0	97.0_438.0	97.0_178.0	97.0_178.0	—	—
HDO 130_2		—	—	—	—	—	—	—	5.7_13.6
HDO 130_3		—	—	—	—	—	15.2_67.1	15.2_67.1	15.2_67.1
HDO 130_4		—	—	71.5_335.6	71.5_335.6	71.5_335.6	71.5_335.6	71.5_335.6	—
HDO 140_2		—	—	—	—	—	—	—	6.6_15.7
HDO 140_3		—	—	—	—	—	17.7_77.3	17.7_77.3	17.7_77.3
HDO 140_4		—	—	82.3_386.6	82.3_386.6	82.3_386.6	82.3_386.6	82.3_386.6	—



**HDO**

	Input configuration							
	GJ							
	160	180	200	225	250	280	315	
HDO 100_2	⊖							
HDO 100_3	20.2_67.5	20.2_67.5	20.2_67.5	20.2_67.5	14.0_67.5	14.0_67.5	14.0_67.5	
HDO 100_4	⊖							
HDO 110_2	⊖							
HDO 110_3	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	18.9_77.5	18.9_77.5	
HDO 110_4	⊖							
HDO 120_2	⊖							
HDO 120_3	—	—	28.3_78.6	28.3_78.6	28.3_78.6	17.3_78.6 ⊖ (24.6)	17.3_78.6 ⊖ (24.6)	
HDO 120_4	⊖							
HDO 125_2	⊖							
HDO 125_3	—	—	38.8_85.9	38.8_85.9	38.8_85.9	19.2_85.9 ⊖ (27.7_33.0_35.8)	19.2_85.9 ⊖ (27.7_33.0_35.8)	
HDO 125_4	⊖							
HDO 130_2	i =	⊖						
HDO 130_3		—	—	—	—	15.2_67.1	15.2_67.1	15.2_67.1
HDO 130_4	⊖							
HDO 140_2	⊖							
HDO 140_3	—	—	—	—	17.7_77.3	17.7_77.3	17.7_77.3	
HDO 140_4	⊖							
HDO 150_2	⊖							
HDO 150_3	—	—	—	—	—	28.2_60.8	28.2_60.8	
HDO 150_4	⊖							
HDO 160_2	⊖							
HDO 160_3	—	—	—	—	—	34.9_68.6	34.9_68.6	
HDO 160_4	⊖							
HDO 170	⊖							
HDO 180	⊖							

	Input configuration								
	NGJ								
	N180TC	N210TC	N250TC	N280TC	N320TC	N360TC	N400TC	N440TC	
HDO 100_3	—	—	20.2_67.5	20.2_67.5	20.2_67.5	14.0_67.5	14.0_67.5	—	
HDO 110_3	—	—	22.0_77.5	22.0_77.5	22.0_77.5	22.0_77.5	18.9_77.5	—	
HDO 120_3	i =	—	—	—	—	28.3_78.6	28.3_78.6	17.3_78.6 ⊖ (24.6)	17.3_78.6 ⊖ (24.6)
HDO 125_3		—	—	—	—	38.8_85.9	38.8_85.9	19.2_85.9 ⊖ (27.7_33.0_35.8)	19.2_85.9 ⊖ (27.7_33.0_35.8)
HDO 130_3		—	—	—	—	—	15.2_67.1	15.2_67.1	15.2_67.1
HDO 140_3		—	—	—	—	—	17.7_77.3	17.7_77.3	17.7_77.3



## 26.7 OPTIONAL VARIANTS

### 26.7.1 AUXILIARY THERMAL DEVICES

#### 26.7.1.1 FORCED VENTILATION

Improved heat dissipation can be achieved on HDO gearboxes by keying a cooling fan on to the gearbox input shaft.

Specify the **FAN** option to have the fan installed on the shaft in the same plane. The alternative option, **FANJ**, with an orthogonally mounted fan, is only available with three stage gearboxes.

In combination with some configuration or mounting position forced ventilation may not be available along with forced lubrication devices - option OP... or MOP.

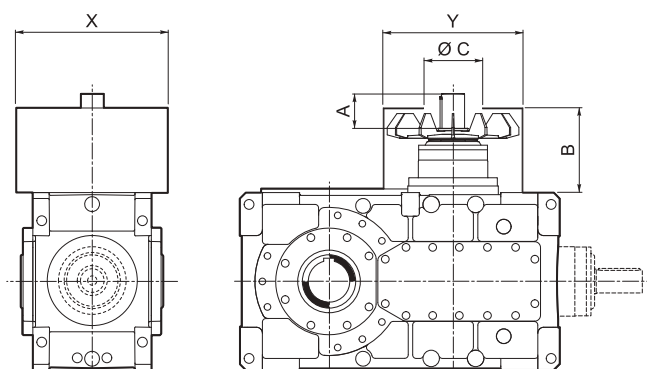
The increased cooling effect is shown by the thermal capacity value  $P_{TFAN}$  listed in section 28.

This value is only significant with continuous duty applications.

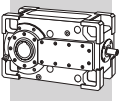
The effectiveness of forced ventilation is drastically reduced in intermittent duty applications and also below drive speeds of  $n_1 = 900 \text{ min}^{-1}$ .

In such cases, other auxiliary cooling devices should be used to increase the thermal capacity of the gearbox.

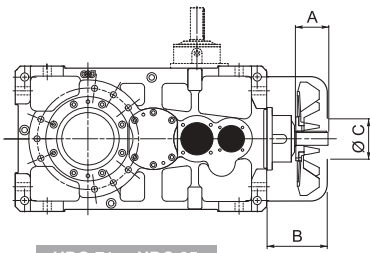
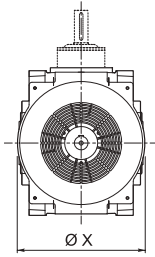
#### FANJ



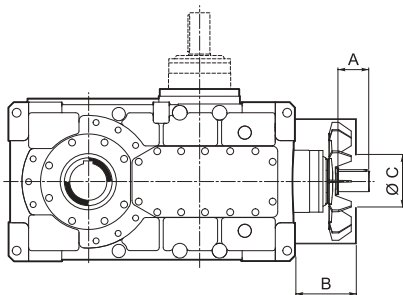
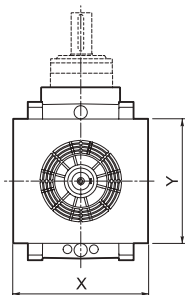
	A [mm]	B [mm]	C [mm]	X [mm]	Y [mm]
HDO 100 3	82	207	180	460	440
HDO 110 3	82	207	180	460	440
HDO 120 3	82	172	180	480	480
HDO 125 3	82	172	180	480	480
HDO 130 3	105	222	230	600	600
HDO 140 3	105	222	230	600	600
HDO 150 3	⊘				
HDO 160 3					
HDO 170					
HDO 180					



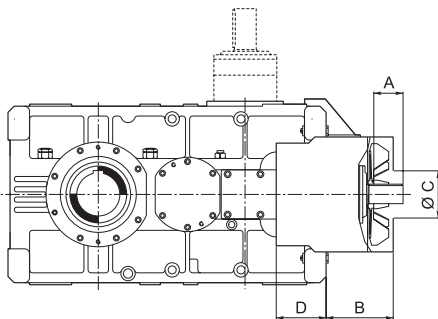
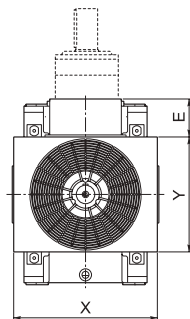
# FAN




HDO 71 ... HDO 95



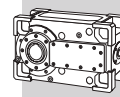
HDO 100 ... HDO 140



HDO 150 - HDO 160

	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	X [mm]	Y [mm]
HDO 71_2	82	151.5	140	—	—	345	—
HDO 71_3	58	152	140	—	—	345	—
HDO 81_2	82	161.5	140	—	—	345	—
HDO 81_3	82	162	140	—	—	345	—
HDO 91_2	82	208.5	140	—	—	440	—
HDO 91_3	82	209	140	—	—	440	—
HDO 91_4	58	209	140	—	—	440	—
HDO 95_3	82	209	140	—	—	440	—
HDO 95_4	58	209	140	—	—	440	—
HDO 100_2	105	207	180	—	—	460	424
HDO 100_3	82	207	180	—	—	460	424
HDO 100_4	58	207	180	—	—	460	424
HDO 110_2	105	207	180	—	—	460	424
HDO 110_3	82	207	180	—	—	460	424
HDO 110_4	58	207	180	—	—	460	424
HDO 120_2	105	232	180	—	—	480	460
HDO 120_3	82	172	180	—	—	480	460
HDO 120_4	58	172	180	—	—	480	460
HDO 125_2	105	232	180	—	—	480	460
HDO 125_3	82	172	180	—	—	480	460
HDO 125_4	58	172	180	—	—	480	460
HDO 130_2	140	327	230	—	—	600	600
HDO 130_3	105	222	230	—	—	600	600
HDO 130_4	82	287	230	—	—	600	600
HDO 140_2	140	327	230	—	—	600	600
HDO 140_3	105	222	230	—	—	600	600
HDO 140_4	82	287	230	—	—	600	600
HDO 150_2	165	387	230	243	185	700	560
HDO 150_3	130	327	230	243	185	700	560
HDO 150_4	82	297	230	243	185	700	560
HDO 160_2	165	387	230	243	185	700	560
HDO 160_3	130	327	230	243	185	700	560
HDO 160_4	82	297	230	243	185	700	560
HDO 170	 <b>BONFIGLIOLI TECHNICAL SERVICE</b>						
HDO 180							

HDO



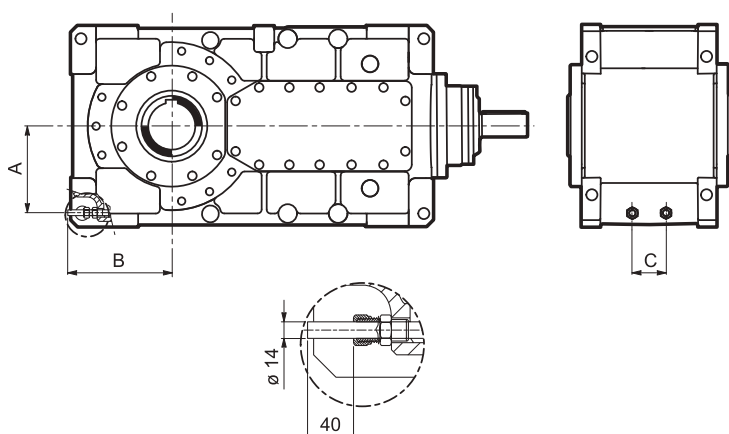
### 26.7.1.2 HEAT DISSIPATION THROUGH COOLING COIL

The cooling coil option **SR** is designed for integration in a cooling circuit to be provided by the installer.

For optimal efficiency the cooling circuit supply must comply with the following specifications:

- max. pressure 8 bar
- min flow rate 5 l/min for HDO 71 ... HDO 95
- min flow rate 10 l/min for HDO 100 ... HDO 140
- max. water temperature 20°C

The increased cooling effect obtained in these conditions is shown by the thermal capacity value  $P_{TSR}$ . See the section [28](#)



	A [mm]	B [mm]	C [mm]
HDO 71_SR	147	170	60
HDO 81_SR	173	190	60
HDO 91_SR	190	210	60
HDO 95_SR	215	259	60
HDO 100_SR	230	285	100
HDO 110_SR	230	270	100
HDO 120_SR	258	305	100
HDO 125_SR	258	305	100
HDO 130_SR	325	340	100
HDO 140_SR	325	365	100
HDO 150			
HDO 160			
HDO 170			
HDO 180			
HDO 180			

### 26.7.1.3 AUXILIARY COOLING WITH AUTONOMOUS COOLING UNIT

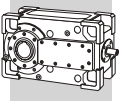
Two types of cooling unit are available, each in a range of sizes providing different cooling capacities. The two types use different cooling media for the oil: MCRW... – water/oil heat exchanger and MCRA... – air/oil heat exchanger.

If an autonomous cooling unit is installed on the advice of the Bonfiglioli Technical Service, no additional forced lubrication devices are required. See section [26.7.2](#). The following chart shows device availability according to gearbox size. Your selection must take into account the deficit in thermal power that must be made up by contribution  $P_{TMCRW}$  or  $P_{TMCRA}$  as shown in the chart in section [28](#).

	MCRW5 MCRA5	MCRW9 MCRA9	MCRW21 MCRA21	MCRW34 MCRA34	MCRW51 MCRA51	MCRW70 MCRA70
HDO 100	X	X				
HDO 110	X	X				
HDO 120	X	X	X (*)			
HDO 125	X	X	X (**)			
HDO 130	X	X	X	X (**)		
HDO 140	X	X	X	X (**)		
HDO 150	X	X	X	X	X (**)	
HDO 160	X	X	X	X	X (**)	
HDO 170						
HDO 180						

(\*) not available for mounting position B3.

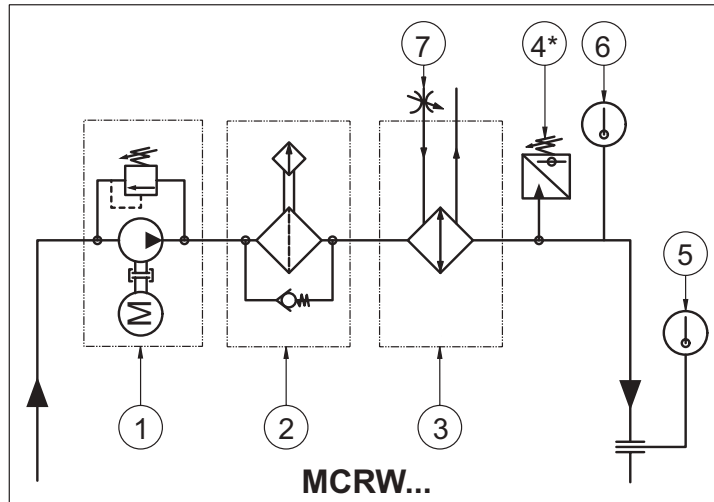
(\*\*) not available for double reduction units in the mounting position B3.



The main components of the cooling units are as follows:

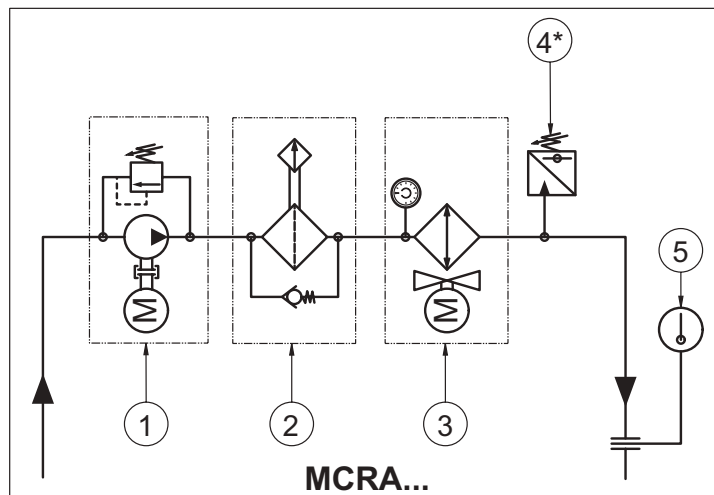
**MCRW...**

- 1) motorpump complete with by-pass circuit
- 2) filter with clogging visual indicator
- 3) water/oil heat exchanger
- 4) minimum pressure switch (only available in combination with forced lubrication)
- 5) maximum temperature thermostat
- 6) minimum temperature switch
- 7) electro-valve

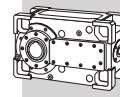


**MCRA...**

- 1) motorpump complete with by-pass circuit
- 2) filter with clogging visual indicator
- 3) air/oil heat exchanger with thermostat
- 4) minimum pressure switch (only available in combination with forced lubrication)
- 5) maximum temperature thermostat







**General warnings:**

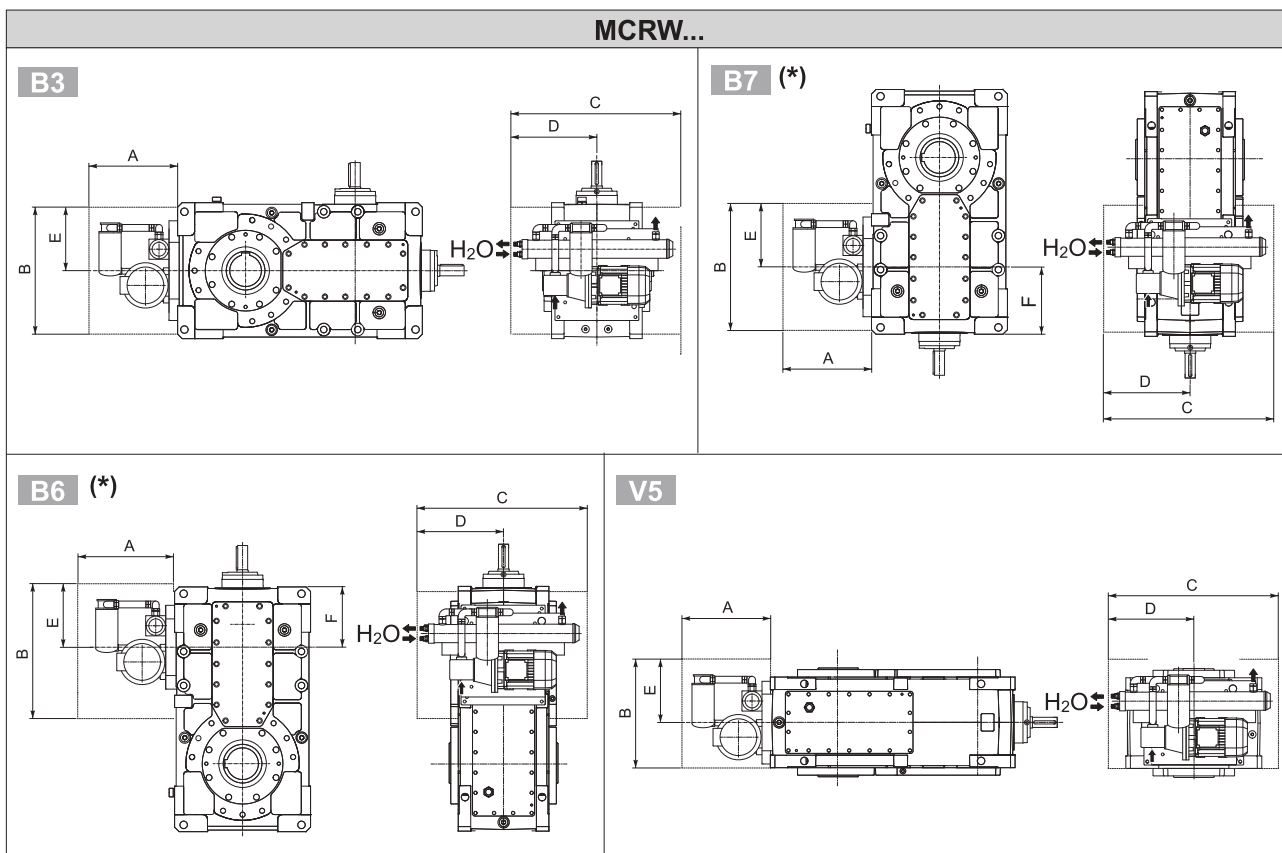
**MCRW...** : provide a water supply system that corresponds to the following specifications:

- max. pressure, 10 bar
- maximum delivery temperature, 20°C
- minimum flow rate  $Q_{H_2O}$  as per the chart:

	MCRW5	MCRW9	MCRW21	MCRW34	MCRW51	MCRW70
$Q_{H_2O}$ [l/min]	10	18	31	56	81	<b>BONFIGLIOLI TECHNICAL SERVICE</b>

**MCRA...** : leave sufficient space around the heat exchanger to ensure an unrestricted air flow.

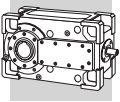
The cooling units are installed on the gearboxes as shown in the figure below.



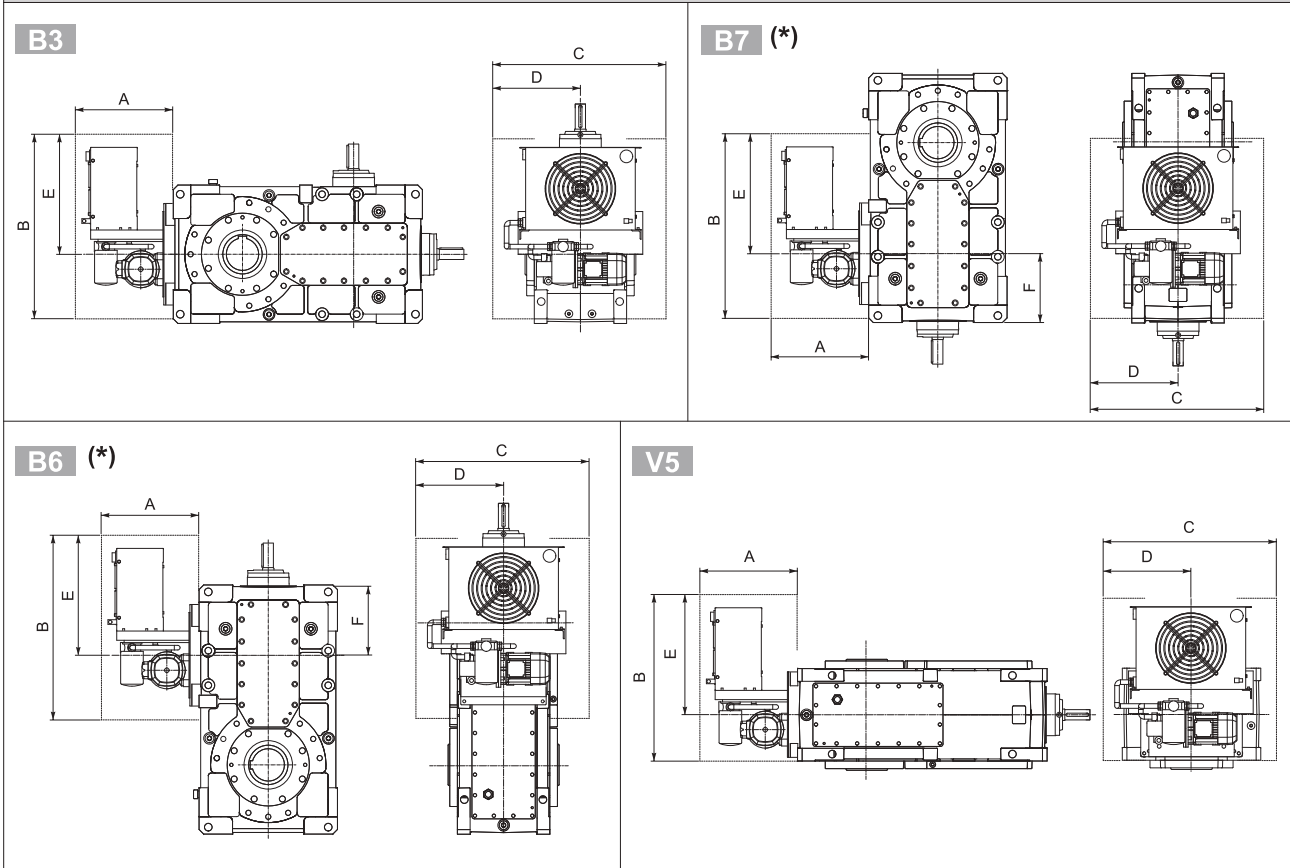
	A	B	C	D	E	F [mm]														
						HDO 100 - HDO 110		HDO 120		HDO 125		HDO 130 - HDO 140		HDO 150 - HDO 160						
						2x	3x/4x	2x	3x/4x	2x	3x/4x	2x	3x/4x	2x	3x/4x					
MCRW5	360	415	730	365	230															
MCRW9	360	380	870	435	195															
MCRW21	400	425	780	390	240	325	270	350	300	<b>BONFIGLIOLI TECHNICAL SERVICE</b>	420	380	475	395						
MCRW34	430	650	1000	500	465															
MCRW51	520	650	1250	625	465															
MCRW70											<b>BONFIGLIOLI TECHNICAL SERVICE</b>									

(\*) Units featuring the "J" input configuration have the cooling unit fitted on opposite side as shown.

Overall dimensions A, B, C, D and E are indicative only



MCRA...



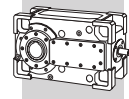
	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]													
						HDO 100 - HDO 110		HDO 120		HDO 125		HDO 130 - HDO 140		HDO 150 - HDO 160					
						2x	3x/4x	2x	3x/4x	2x	3x/4x	2x	3x/4x	2x	3x/4x				
MCRA5	400	560	500	250	375														
MCRA9	435	650	640	320	465														
MCRA21	440	815	700	350	630	325	270	350	300	BONFIGLIOLI TECHNICAL SERVICE	420	380	475	395					
MCRA34	500	920	840	420	735														
MCRA51	560	1075	1000	500	890														
MCRA70	BONFIGLIOLI TECHNICAL SERVICE																		

(\*) Units featuring the "J" input configuration have the cooling unit fitted on opposite side as shown.

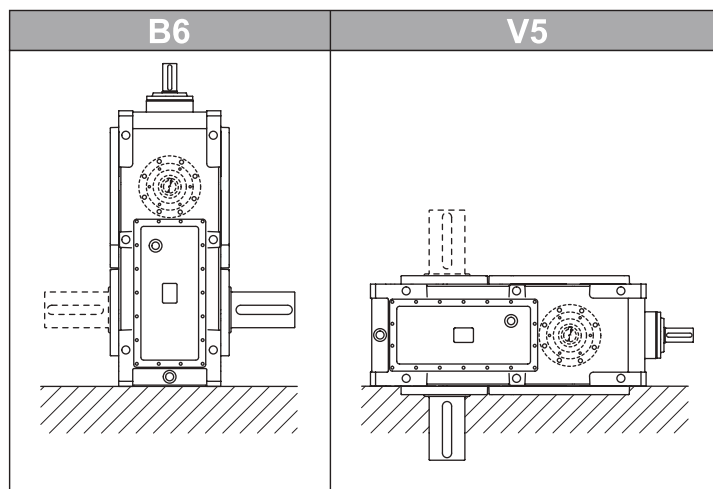
Overall dimensions A, B, C, D and E are indicative only

26.7.1.4 HEATERS

In very low ambient temperatures it may prove necessary to pre-heat the lubricant in the sump before start-up and/or during operation. The **HE** option envisages the installation of an electrical heating element, supplied with a thermostat to detect when the minimum temperature needed for correct operation has been reached. The wiring necessary for the thermostat must be provided by the installer.



## 26.7.2 GREASE LUBRICATION



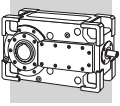
Gearboxes of sizes HDO 71... HDO 95 in mounting position V5 are supplied with upper bearings (not immersed in oil) lubricated with grease and do not require periodic maintenance. Gearboxes of sizes HDO 71... HDO 95 in mounting position B6 (or B3 with input J) are supplied with the upper bearings (not immersed in oil) lubricated with grease and require periodic maintenance. For lubrication, methodology, quantity and type of grease, refer to the Use and Maintenance Manual.

### 26.7.2.1 FORCED LUBRICATION

Gearboxes of sizes HDO 71... HDO 95 in mounting position V5 and B6 (or B3 with input J) normally supplied with the upper bearings (not immersed in the oil) lubricated with grease can be supplied, on request, with a forced lubrication circuit for the lubrication of the same.

Application conditions of the OPTIONAL forced lubrication devices.

HDO 71 ... HDO 95					
		B3	B6	B7	V5
	L R D	●	OP MOP	●	●
	LJ RJ DJ	OP MOP	●	●	●
	LD RD DD	OP MOP	OP MOP	●	●



Gearboxes of sizes HDO 100 ... HDO 180 in mounting position V5 and B6 (or B3 with input J) are supplied with upper bearings not immersed in oil and lubricated through a forced lubrication circuit the lubrication of the same.

Application conditions of the MANDATORY forced lubrication devices.

HDO 100 ... HDO 180					
		B3	B6	B7	V5
	L R D	⊖	OP MOP	⊖	OP... MOP
	LJ RJ DJ	OP MOP	⊖	⊖	OP... MOP
	LD RD DD	OP MOP	OP MOP	⊖	OP... MOP

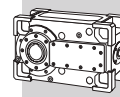
Remark: Forced lubrication devices for gearboxes size HDO 100 ... HDO 180 may be replaced, upon approval from Bonfiglioli Technical Service, by independent cooling systems, type MCR...

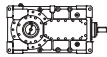
### 26.7.2.2 PUMP FOR MOUNTING POSITIONS B3 and B6

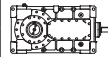
In continuous duty applications and, when required, for B3 or B6 mounting positions (see section [26.7.2.1](#)), an optional forced lubrication circuit is available with a mechanically driven pump keyed on to the intermediate shaft.

This circuit only guarantees lubrication of the top bearings that are not immersed in oil.

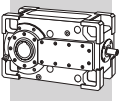
Before specifying the OP option in your order, check the chart to make sure that the device is fully compatible with the drive speed  $n_1$  and reduction ratio. See the following diagram.



	i	n <sub>1</sub>		
		1000 min <sup>-1</sup>	1200 min <sup>-1</sup>	1500 min <sup>-1</sup>
HDO 71 2	5.6 ≤ i ≤ 9.5	OP	OP	OP
	i = 11.1	⊖	OP	OP
	12.1 ≤ i ≤ 14.6	⊖	⊖	OP
HDO 71 3	15.9 ≤ i ≤ 35.6	OP	OP	OP
	38.5 ≤ i ≤ 69.2	⊖	⊖	OP
HDO 71 4	77.0 ≤ i ≤ 197.0 i=237.7	OP	OP	OP
	i=228.2 308.9 ≤ i ≤ 475.4	⊖	⊖	⊖
HDO 81 2	5.5 ≤ i ≤ 9.1	OP	OP	OP
	9.6 ≤ i ≤ 11.1	⊖	OP	OP
	12.2 ≤ i ≤ 14.7	⊖	⊖	OP
HDO 81 3	15.5 ≤ i ≤ 35.6	OP	OP	OP
	38.6 ≤ i ≤ 69.2	⊖	⊖	OP
HDO 81 4	78.3 ≤ i ≤ 181.4 i=227.8	OP	OP	OP
	i=196.5 254.8 ≤ i ≤ 473.3	⊖	⊖	⊖
HDO 91 2	7.4 ≤ i ≤ 9.0	OP	OP	OP
	10.3 ≤ i ≤ 12.5	⊖	OP	OP
	14.6 ≤ i ≤ 15.9	⊖	⊖	OP
HDO 91 3	18.6 ≤ i ≤ 30.6	OP	OP	OP
	36.9 ≤ i ≤ 66.1	⊖	⊖	OP
HDO 91 4	82.0 ≤ i ≤ 225.4	OP	OP	OP
	256.3 ≤ i ≤ 489.3	⊖	⊖	⊖
HDO 95 3	21.2 ≤ i ≤ 40.5	OP	OP	OP
	44.0 ≤ i ≤ 72.3	⊖	⊖	OP
HDO 95 4	81.6 ≤ i ≤ 231.1	OP	OP	OP
	256.6 ≤ i ≤ 489.7	⊖	⊖	⊖
HDO 100 2	5.8 ≤ i ≤ 8.7	OP	OP	OP
	i = 10.0; 10.9	⊖	OP	OP
	i = 12.4; 13.5	⊖	⊖	OP
HDO 100 3	14.0 ≤ i ≤ 40.0	OP	OP	OP
	43.9 ≤ i ≤ 67.5	⊖	⊖	OP
HDO 100 4	70.8 ≤ i ≤ 139.8	OP	OP	OP
	160.0 ≤ i ≤ 344.2	⊖	⊖	OP
HDO 110 2	6.4 ≤ i ≤ 10.0	OP	OP	OP
	i = 10.9; 12.5	⊖	OP	OP
	i = 13.5; 15.5	⊖	⊖	OP
HDO 110 3	18.9 ≤ i ≤ 43.6	OP	OP	OP
	48.0 ≤ i ≤ 77.5	⊖	⊖	OP
HDO 110 4	77.4 ≤ i ≤ 121.7	OP	OP	OP
	137.1 ≤ i ≤ 395.0	⊖	⊖	OP
HDO 120 2	6.6 ≤ i ≤ 10.0	OP	OP	OP
	i = 11.1; 12.5	⊖	OP	OP
	i = 13.7; 15.5	⊖	⊖	OP
HDO 120 3	17.3 ≤ i ≤ 44.9	OP	OP	OP
	49.5 ≤ i ≤ 78.6	⊖	⊖	OP
HDO 120 4	87.0 ≤ i ≤ 162.2	OP	OP	OP
	179.7 ≤ i ≤ 400.6	⊖	⊖	OP

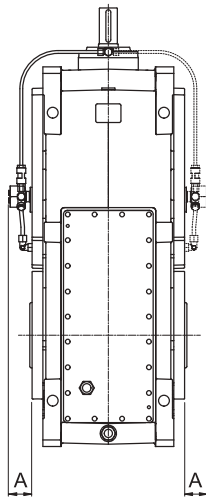
	i	n <sub>1</sub>		
		1000 min <sup>-1</sup>	1200 min <sup>-1</sup>	1500 min <sup>-1</sup>
HDO 125 2	7.4 ≤ i ≤ 9.9	OP	OP	OP
	i = 11.5; 12.3	⊖	OP	OP
	i = 14.2; 15.3; 16.9	⊖	⊖	OP
HDO 125 3	19.2 ≤ i ≤ 55.5	OP	OP	OP
	60.1 ≤ i ≤ 85.9	⊖	⊖	OP
HDO 125 4	90.1 ≤ i ≤ 178.0	OP	OP	OP
	200.3 ≤ i ≤ 438.0	⊖	⊖	OP
HDO 130 2	5.7 ≤ i ≤ 7.1	⊖	OP	OP
	i = 7.7; 8.8	⊖	⊖	OP
	9.6 ≤ i ≤ 13.6	⊖	⊖	⊖
HDO 130 3	15.2 ≤ i ≤ 34.9	OP	OP	OP
	38.3 ≤ i ≤ 67.1	⊖	⊖	OP
HDO 130 4	71.5 ≤ i ≤ 190.3	OP	OP	OP
	219.1 ≤ i ≤ 335.6	⊖	⊖	OP
HDO 140 2	6.6 ≤ i ≤ 8.2	⊖	OP	OP
	i = 9.0; 10.1	⊖	⊖	OP
	11.3 ≤ i ≤ 15.7	⊖	⊖	⊖
HDO 140 3	17.7 ≤ i ≤ 44.4	OP	OP	OP
	50.4 ≤ i ≤ 77.3	⊖	⊖	OP
HDO 140 4	82.3 ≤ i ≤ 180.0	OP	OP	OP
	198.3 ≤ i ≤ 386.6	⊖	⊖	OP
HDO 150 2	5.5 ≤ i ≤ 7.0	⊖	OP	OP
	i = 8.1; 8.9	⊖	⊖	OP
	10.0 ≤ i ≤ 13.7	⊖	⊖	⊖
HDO 150 3	15.6 ≤ i ≤ 25.4	⊖	OP	OP
	28.2 ≤ i ≤ 36.0	⊖	⊖	OP
HDO 150 4	40.2 ≤ i ≤ 60.8	⊖	⊖	⊖
	66.9 ≤ i ≤ 92.9	OP	OP	OP
	101.8 ≤ i ≤ 141.5	⊖	OP	OP
HDO 160 2	157.9 ≤ i ≤ 238.8	⊖	⊖	⊖
	i = 7.3; 7.9	⊖	OP	OP
	8.9 ≤ i ≤ 11.3	⊖	⊖	OP
HDO 160 3	12.2 ≤ i ≤ 15.4	⊖	⊖	⊖
	17.7 ≤ i ≤ 31.3	⊖	OP	OP
	34.9 ≤ i ≤ 44.3	⊖	⊖	OP
HDO 160 4	49.4 ≤ i ≤ 68.6	⊖	⊖	⊖
	75.9 ≤ i ≤ 96.3	OP	OP	OP
	115.2 ≤ i ≤ 174.0	⊖	OP	OP
HDO 170	194.1 ≤ i ≤ 269.7	⊖	⊖	⊖
	⊖			
HDO 180				

This option is not available with other configurations that use the same shaft end.



HDO ... G-NG ... B6  
HDO ... VP ... B6

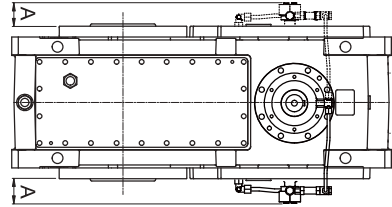
<b>HDO 71 ... 91</b>
2x  ... 2
3x  ... 2
4x  ... 2
<b>HDO 95</b>
3x  ... 2
4x  ... 2
<b>HDO 100 ... 140</b>
2x  ... 2
3x  ... 2
4x  ... 2
<b>HDO 150 - 160</b>
2x  ... 2
3x  ... 2
4x  ... 1



<b>HDO 71 ... 91</b>
2x  ... 1
3x  ... 1
4x  ... 1
<b>HDO 95</b>
3x  ... 1
4x  ... 1
<b>HDO 100 ... 140</b>
2x  ... 1
3x  ... 1
4x  ... 1
<b>HDO 150 - 160</b>
2x  ... 1
3x  ... 1
4x  ... 2

HDO ... VP ... B3

<b>HDO 71 ... 95</b>
3x  ... 2

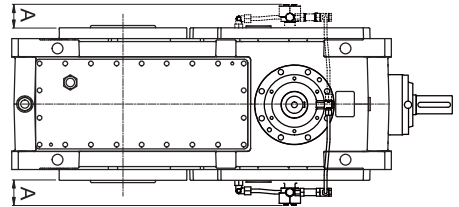


<b>HDO 71 ... 95</b>
3x  ... 1

HDO ... GJ-NGJ ... B3  
HDO ... VP ... B3

<b>HDO 100 ... 140</b>
2x  ... 2
3x  ... 2
4x  ... 2

<b>HDO 150 - 160</b>
2x  ... 2
3x  ... 2
4x  ... 1

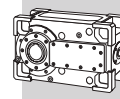


<b>HDO 100 ... 140</b>
2x  ... 1
3x  ... 1
4x  ... 1

<b>HDO 150 - 160</b>
2x  ... 1
3x  ... 1
4x  ... 2

HDO

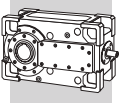
	A (min) [mm]		A (min) [mm]		A (min) [mm]		A (min) [mm]
HDO 71 2_OP	85	HDO 95 3_OP	53	HDO 120 2_OP	125	HDO 140 2_OP	125
HDO 71 3_OP	78	HDO 95 4_OP	50	HDO 120 3_OP	105	HDO 140 3_OP	110
HDO 71 4_OP	85			HDO 120 4_OP	100	HDO 140 4_OP	110
HDO 81 2_OP	78	HDO 100 2_OP	100	HDO 125 2_OP	125	HDO 150 2_OP	125
HDO 81 3_OP	78	HDO 100 3_OP	95	HDO 125 3_OP	105	HDO 150 3_OP	110
HDO 81 4_OP	78	HDO 100 4_OP	95	HDO 125 4_OP	100	HDO 150 4_OP	110
HDO 91 2_OP	78	HDO 110 2_OP	130	HDO 130 2_OP	120	HDO 160 2_OP	125
HDO 91 3_OP	78	HDO 110 3_OP	95	HDO 130 3_OP	110	HDO 160 3_OP	110
HDO 91 4_OP	75	HDO 110 4_OP	95	HDO 130 4_OP	110	HDO 160 4_OP	110



The following chart specifies the availability of the pump on the basis of mounting position, shaft arrangement and input configuration.

Mounting position	Shaft arrangement	Input configuration
<b>B3</b>	LJ - RJ - DJ - LD - RD - DD	VP - GJ* - NGJ*
<b>B6</b>	L - R - D - LD - RD - DD	VP - G - NG

(\*) HDO 71 ... HDO 95 excluded



### 26.7.2.3 PUMP FOR MOUNTING POSITION V5


In continuous duty applications and with V5 mounting positions version 1 (version 2 for 4-stage HDO 150 ... HDO 180), an optional forced lubrication circuit is available with a mechanically driven pump keyed on to the intermediate shaft.

This circuit only guarantees lubrication of the top bearings that are not immersed in oil. If this device is required in conjunction with the Drywell device, consult the Bonfiglioli Technical Service.

When ordering, specify the OP1 or OP2 option in your order after first checking the chart to make sure that the device is fully compatible with drive speed  $n_1$  and the reduction ratio. See the following diagram.

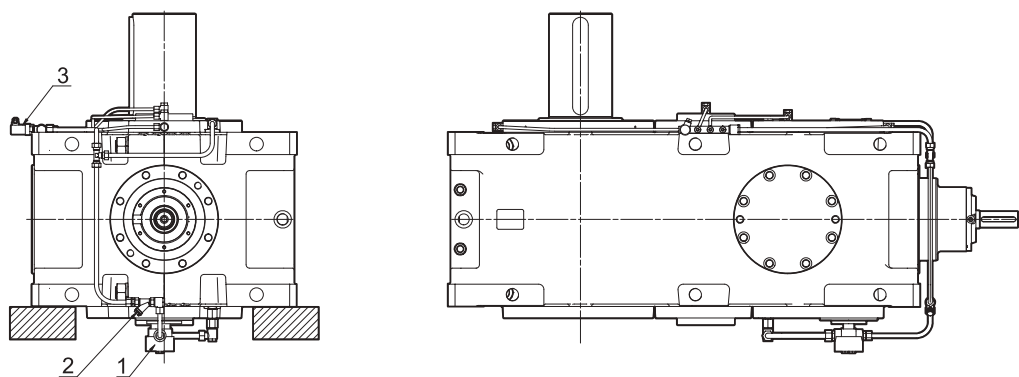
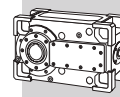
HDO

	i	n <sub>1</sub>		
		1000 min <sup>-1</sup>	1200 min <sup>-1</sup>	1500 min <sup>-1</sup>
HDO 100 2	5.8 ≤ i ≤ 7.0	OP1	OP1	OP1
	i = 8.0; 8.7	⊖	OP1	OP1
	i = 10.0; 10.9	⊖	⊖	OP1
	i = 12.4; 13.5	⊖	⊖	⊖
HDO 100 3	14.0 ≤ i ≤ 17.3	OP2	OP1	OP1
	20.2 ≤ i ≤ 40.0	⊖	OP2	OP1
	43.9 ≤ i ≤ 67.5	⊖	⊖	⊖
HDO 100 4	70.8 ≤ i ≤ 139.8	⊖	OP2	OP1
	160.0 ≤ i ≤ 344.2	⊖	⊖	⊖
HDO 110 2	6.4 ≤ i ≤ 8.1	OP2	OP2	OP1
	i = 8.7; 10.0	⊖	OP2	OP2
	i = 10.9; 12.5	⊖	⊖	OP2
	i = 13.5; 15.5	⊖	⊖	⊖
HDO 110 3	i = 18.9; 20.9	OP2	OP1	OP1
	22.0 ≤ i ≤ 43.6	⊖	OP2	OP1
	48.0 ≤ i ≤ 77.5	⊖	⊖	⊖
HDO 110 4	77.4 ≤ i ≤ 121.7	⊖	OP2	OP2
	137.1 ≤ i ≤ 395.0	⊖	⊖	⊖
HDO 120 2	6.6 ≤ i ≤ 8.1	OP2	OP2	OP1
	i = 8.9; 10.0	⊖	OP2	OP2
	i = 11.1; 12.5	⊖	⊖	OP2
	i = 13.7; 15.5	⊖	⊖	⊖
HDO 120 3	17.3 ≤ i ≤ 28.3	OP2	OP2	OP1
	32.0 ≤ i ≤ 44.9	⊖	OP2	OP2
	49.5 ≤ i ≤ 78.6	⊖	⊖	⊖
HDO 120 4	87.0 ≤ i ≤ 162.2	⊖	OP2	OP2
	179.0 ≤ i ≤ 400.6	⊖	⊖	⊖
HDO 125 2	7.4 ≤ i ≤ 8.8	OP2	OP2	OP1
	i = 9.9	⊖	OP2	OP2
	i = 11.5; 12.3	⊖	⊖	OP2
	14.2 ≤ i ≤ 16.9	⊖	⊖	⊖
HDO 125 3	19.2 ≤ i ≤ 35.8	OP2	OP2	OP1
	38.8 ≤ i ≤ 55.4	⊖	OP2	OP2
	60.1 ≤ i ≤ 85.9	⊖	⊖	⊖
HDO 125 4	97.0 ≤ i ≤ 178.0	⊖	OP2	OP2
	200.3 ≤ i ≤ 438.0	⊖	⊖	⊖
HDO 130 2	5.7 ≤ i ≤ 7.1	OP2	OP1	OP1
	i = 7.7; 8.8	⊖	OP2	OP1
	i = 9.6; 11.0	⊖	⊖	OP2
	i = 12.0; 13.6	⊖	⊖	⊖
HDO 130 3	15.2 ≤ i ≤ 19.9	OP2	OP2	OP1
	22.6 ≤ i ≤ 34.9	⊖	OP2	OP2
	38.3 ≤ i ≤ 67.1	⊖	⊖	⊖
HDO 130 4	71.5 ≤ i ≤ 190.3	⊖	OP2	OP1
	219.1 ≤ i ≤ 335.6	⊖	⊖	⊖

	i	n <sub>1</sub>		
		1000 min <sup>-1</sup>	1200 min <sup>-1</sup>	1500 min <sup>-1</sup>
HDO 140 2	6.6 ≤ i ≤ 8.2	OP2	OP2	OP1
	i = 9.0; 10.1	⊖	OP2	OP2
	i = 11.3; 12.6	⊖	⊖	OP2
	i = 14.0; 15.7	⊖	⊖	⊖
HDO 140 3	17.7 ≤ i ≤ 23.3	OP2	OP2	OP1
	26.0 ≤ i ≤ 44.4	⊖	OP2	OP2
	50.4 ≤ i ≤ 77.3	⊖	⊖	⊖
HDO 140 4	82.3 ≤ i ≤ 180.0	⊖	OP2	OP1
	198.3 ≤ i ≤ 386.6	⊖	⊖	⊖
HDO 150 2	5.5 ≤ i ≤ 7.0	OP2	OP2	OP1
	i = 8.1; 8.9	⊖	OP2	OP2
	10.0 ≤ i ≤ 10.9	⊖	⊖	OP2
	12.6 ≤ i ≤ 13.7	⊖	⊖	⊖
HDO 150 3	15.6 ≤ i ≤ 25.4	OP2	OP2	OP1
	28.2 ≤ i ≤ 36.0	⊖	OP2	OP2
	40.2 ≤ i ≤ 60.8	⊖	⊖	⊖
HDO 150 4	66.9 ≤ i ≤ 92.9	OP2	OP2	OP1
	101.8 ≤ i ≤ 141.5	⊖	OP2	OP2
HDO 160 2	157.9 ≤ i ≤ 238.8	⊖	⊖	⊖
	i = 7.3; 7.9	OP2	OP2	OP1
	8.9 ≤ i ≤ 11.3	⊖	⊖	OP2
	12.2 ≤ i ≤ 15.4	⊖	⊖	⊖
HDO 160 3	17.7 ≤ i ≤ 31.3	OP2	OP2	OP1
	34.9 ≤ i ≤ 44.3	⊖	OP2	OP2
	49.4 ≤ i ≤ 68.6	⊖	⊖	⊖
HDO 160 4	75.9 ≤ i ≤ 96.3	OP2	OP2	OP1
	115.2 ≤ i ≤ 174.0	⊖	OP2	OP2
	194.1 ≤ i ≤ 269.7	⊖	⊖	⊖
HDO 170	 <b>BONFIGLIOLI TECHNICAL SERVICE</b>			
HDO 180				

This option is not available with other configurations that use the same shaft end.



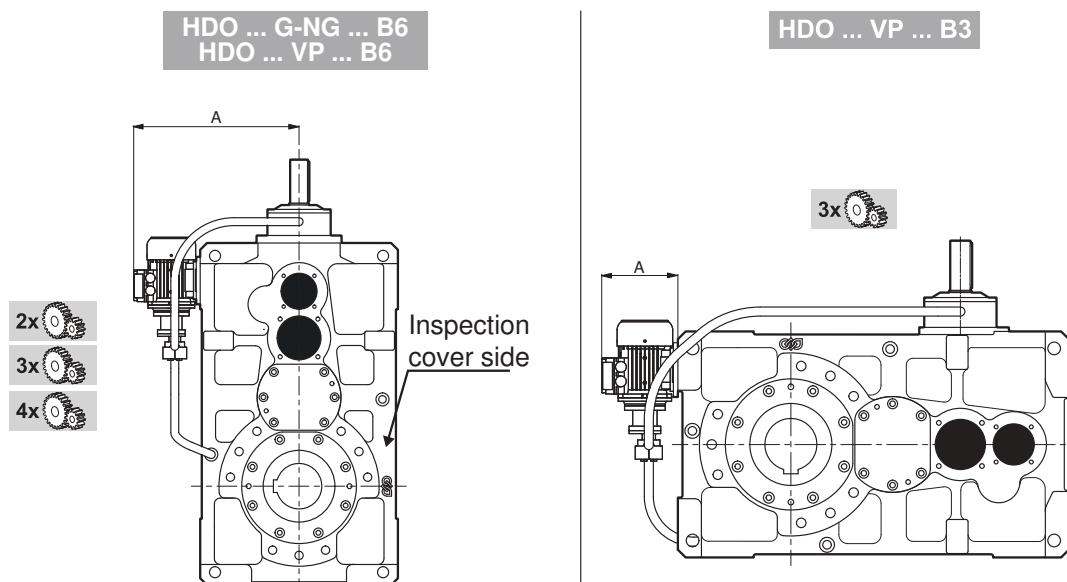


- 1 - Pump
- 2 - Filter
- 3 - Minimum pressure switch

Contact the Bonfiglioli Technical Service for overall dimensions.

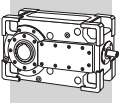
### 26.7.2.4 ELECTRIC PUMP FOR MOUNTING POSITIONS B3 and B6

In intermittent duty applications, if speeds are incompatible with the use of the OP pump option, and when required for B3 and B6 mounting positions (see section 26.7.2.1), the MOP optional forced lubrication circuit is available with an independently powered electric pump. This system ensures a constant flow of oil to the top bearings.

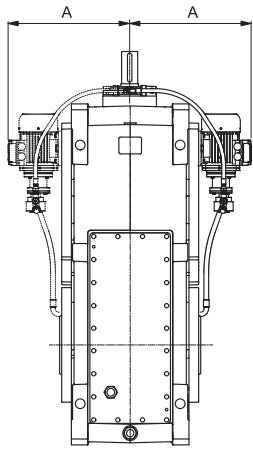


	A (min) [mm]
HDO 71	345
HDO 81	370
HDO 91	395
HDO 95	420

	A (min) [mm]
HDO 71	170
HDO 81	170
HDO 91	170
HDO 95	170



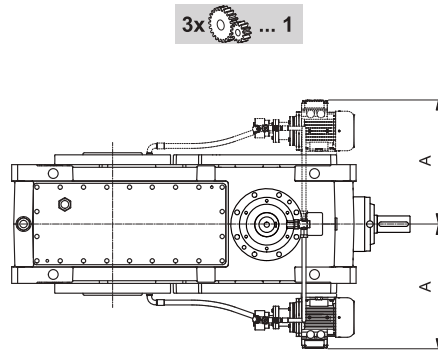
HDO ... G-NG ... B6  
HDO ... VP ... B6



- 2x ... 2
- 3x ... 1
- 4x ... 2

- 2x ... 1
- 3x ... 2
- 4x ... 1

HDO ... GJ-NGJ ... B3  
HDO ... VP ... B3



- 3x ... 1

- 3x ... 2

	A (min) [mm]
HDO 100	410
HDO 110	410
HDO 120	430
HDO 125	430
HDO 130	480
HDO 140	480
HDO 150	☎ BONFIGLIOLI TECHNICAL SERVICE
HDO 160	
HDO 170	●
HDO 180	

The electric pump arrangements shown above are purely indicative. Pump positions may vary depending on the presence of other options

The chart specifies electric pump availability on the basis of mounting position and shaft arrangement.

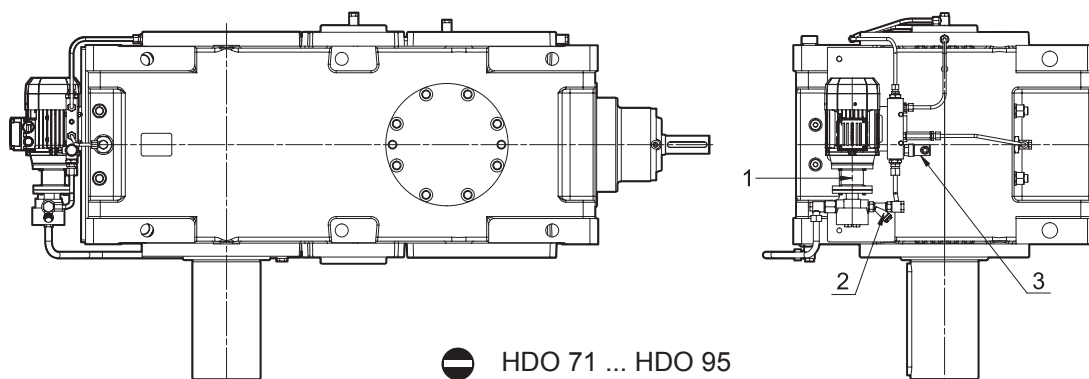
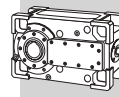
Mounting position	Shaft arrangement	Input configuration
<b>B3</b>	LJ - RJ - DJ - LD - RD - DD	VP - GJ* - NGJ*
<b>B6</b>	L - R - D - LD - RD - DD	VP - G - NG

(\*) HDO 71 ... HDO 95 excluded

### 26.7.2.5 ELECTRIC PUMP FOR MOUNTING POSITION V5

In intermittent duty applications or when speeds are incompatible with the use of the OP pump option, and when required for mounting position V5, the MOP optional forced lubrication circuit is available with an independently powered electric pump.

If this device is required in conjunction with the Drywell device, consult the Bonfiglioli Technical Service. This system ensures a constant flow of oil to the top bearings.



- 1 - Motorpump
- 2 - Filter
- 3 - Minimum pressure switch

The electric pump arrangements shown above are purely indicative. Pump positions may vary depending on the presence of other options at the same time.

Contact the Bonfiglioli Technical Service for overall dimensions.

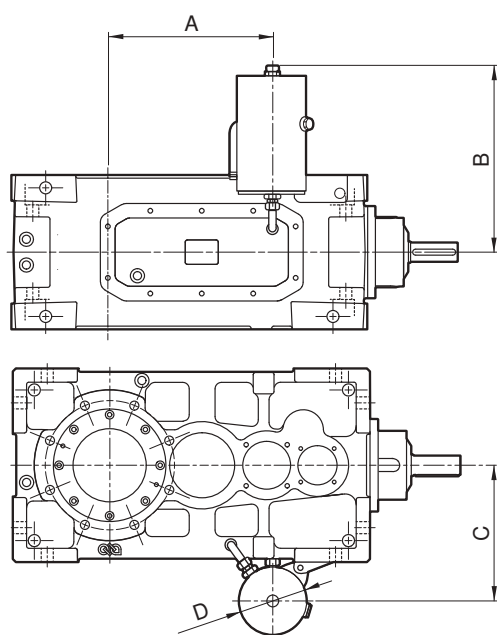
### 26.7.2.6 OIL BATH LUBRICATION SYSTEM (SPECIAL VARIANT)

As a variant of the forced lubrication systems (OP or MOP) and oil splash and grease lubrication systems (where provided), the option “oil bath lubrication” system is available.

The “oil bath lubrication” option may be supplied only for gearboxes in mounting positions B6 and V5. With this variant, gears and bearings will be completely immersed in oil and the gearbox will be equipped with an expansion tank in order to compensate any variations in the volume of lubricant that will occur in the gearbox due to temperature variations.

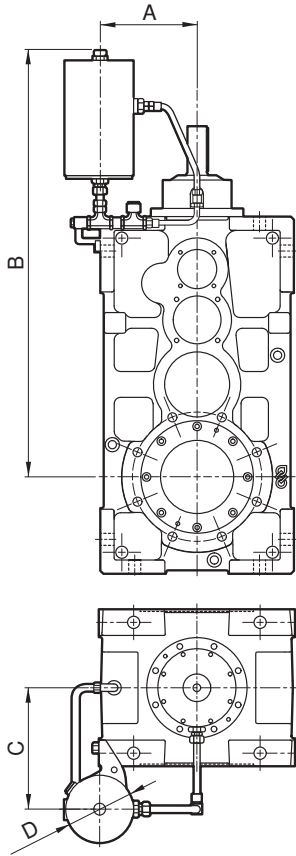
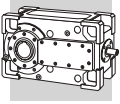
Using the gearbox outside of the “Allowed temperature limits” may compromise the correct lubrication, it will therefore be appropriate to thermally check the gearbox according to the work cycle and the application.

The HDO 71, HDO 81, HDO 91, HDO 95 gearboxes, in mounting positions V5 and B6 can be supplied with the “oil bath lubrication” system by consulting the Bonfiglioli Technical Service in advance (type of lubrication not configurable as standard).



HDO 71 ... HDO 91 - V5

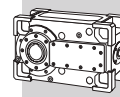
	A [mm]	B [mm]	C [mm]	D [mm]
HDO 71 2 - 3 - 4	330	366	235	99
HDO 81 2 - 3 - 4	405	393	262	99
HDO 91 2	281	483	340	159
HDO 91 3 - 4	369	483	340	159



HDO 71 ... HDO 95 - B6

	A [mm]	B [mm]	C [mm]	D [mm]
HDO 71 2	185	644	200	99
HDO 71 3	175	694	200	99
HDO 71 4	175	730	165	99
HDO 81 2	201	715	220	99
HDO 81 3	201	757	220	99
HDO 81 4	190	833	185	99
HDO 91 2	225	929	295	159
HDO 91 3 - 4	225	1050	295	159
HDO 95 3 - 4	225	1044	295	159

HDO



### 26.7.3 BACKSTOP DEVICE

The backstop device ensures that only one direction of rotation is allowed, and prevents the gearbox to be backdriven by the load connected to the output shaft.

In addition to verifying the shock loads shown in section 11.1, also make sure that the torque transmitted to the backstop  $M_1 = M_2 / (i \times \eta)$  is less than the admissible torque  $M_{1max}$  listed in the chart below.

Along with the specification of the backstop device, option **A**, the direction of free rotation for the output shaft (**CW** or **CCW**) must also be specified in the order.

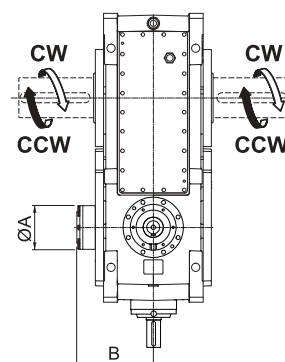
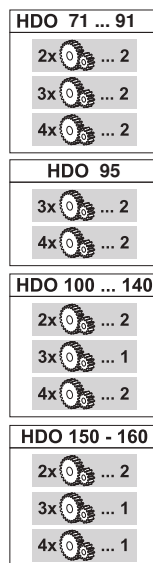
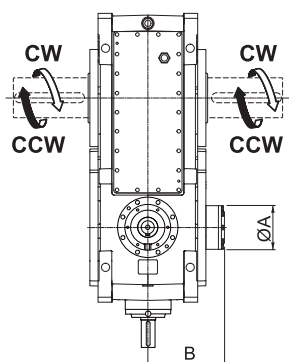
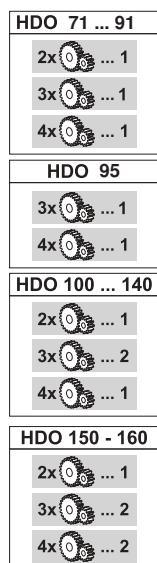
If special operating conditions require it, the user can reverse the direction of rotation of the backstop device by opening the backstop compartment and reversing the direction of the freewheel. If you need to perform this operation, contact Bonfiglioli's Technical Service for the necessary instructions.

The type of backstop device used, based on centrifugally released shoes, does not require any regular maintenance.

This option is not available with other configurations that use the same shaft end.



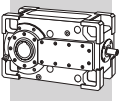
**Under continuous operating conditions, it is advisable to maintain a neutral rotation speed  $n_{1min}$  greater than that specified in the chart in order to ensure the effective centrifugal release of all the shoes and avoid unnecessary wear. For further details, contact the Bonfiglioli Technical Service.**

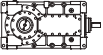


	i	A [mm]	B [mm]	$M_{1max}$ [Nm]	$n_{1min}$ [min <sup>-1</sup> ]
HDO 71 2_A	$5.6 \leq i \leq 6.8$	130	212	650	870
	$7.9 \leq i \leq 9.5$			460	1220
	$i=11.1$			380	1490
HDO 71 3_A	$12.1 \leq i \leq 14.6$	110	204	300	(*)
	$15.9 \leq i \leq 35.6$			350	1060
	$38.5 \leq i \leq 69.2$			180	(*)
HDO 71 4_A	$77.0 \leq i \leq 197.0$ $i=237.7$	91	199	100	1500
	$i=228.2$ $308.9 \leq i \leq 475.4$			50	(*)
HDO 81 2_A	$5.5 \leq i \leq 6.7$	151	242	1010	790
	$i=7.9$ ; 9.1			710	1120
	$i=9.6$ ; 11.1			580	1365
	$12.2 \leq i \leq 14.7$			460	1740
HDO 81 3_A	$15.5 \leq i \leq 35.8$	110	231	350	1060
	$38.6 \leq i \leq 69.2$			180	(*)
HDO 81 4_A	$78.3 \leq i \leq 181.4$ $i=227.8$	95	231	150	1485
	$i=196.5$ $254.8 \leq i \leq 473.3$			80	(*)

	i	A [mm]	B [mm]	$M_{1max}$ [Nm]	$n_{1min}$ [min <sup>-1</sup> ]
HDO 91 2_A	$7.4 \leq i \leq 9.0$	175	279	1310	935
	$i=10.3$ ; 12.5			940	1290
	$i=14.6$ ; 15.9			740	1640
HDO 91 3_A	$18.6 \leq i \leq 30.6$	130	259	610	930
	$36.9 \leq i \leq 66.1$			340	1660
HDO 91 4_A	$82.0 \leq i \leq 225.4$	110	250	270	1455
	$256.3 \leq i \leq 489.3$			130	(*)
HDO 95 3_A	$21.2 \leq i \leq 40.5$	130	259	610	930
	$44.0 \leq i \leq 72.3$			340	1660
HDO 95 4_A	$81.6 \leq i \leq 231.1$	110	250	270	1455
	$256.6 \leq i \leq 489.7$			130	(*)

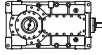

(\*) Contact the Bonfiglioli Technical Service.

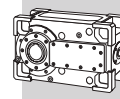


	i	A [mm]	B [mm]	M <sub>1max</sub> [Nm]	n <sub>1min</sub> [min <sup>-1</sup> ]
<b>HDO 100 2_A</b>	5.8 ≤ i ≤ 7.0	210	335	2840	715
	i = 8.0 ; 8.7			2290	880
	i = 10.0 ; 10.9			1830	1100
	i = 12.4 ; 13.5			1480	1365
<b>HDO 100 3_A</b>	14.0 ≤ i ≤ 17.3	175	285	1550	785
	20.2 ≤ i ≤ 40.0			1190	1020
	43.9 ≤ i ≤ 67.5			770	1585
<b>HDO 100 4_A</b>	70.8 ≤ i ≤ 139.8	125	278	400	1260
	160.0 ≤ i ≤ 344.2			250	(*)
<b>HDO 110 2_A</b>	6.4 ≤ i ≤ 8.1	210	335	2840	715
	i = 8.7 ; 10.0			2290	880
	i = 10.9 ; 12.5			1830	1100
	i = 13.5 ; 15.5			1480	1365
<b>HDO 110 3_A</b>	i = 18.9 ; 20.9	175	285	1550	785
	22.0 ≤ i ≤ 43.6			1190	1020
	48.0 ≤ i ≤ 77.5			770	1585
<b>HDO 110 4_A</b>	77.4 ≤ i ≤ 121.7	125	278	400	1260
	137.1 ≤ i ≤ 395.0			250	(*)
<b>HDO 120 2_A</b>	6.6 ≤ i ≤ 8.1	230	336	3530	665
	i = 8.9 ; 10.0			2850	820
	i = 11.1 ; 12.5			2280	1025
	i = 13.7 ; 15.5			1840	1275
<b>HDO 120 3_A</b>	17.3 ≤ i ≤ 24.6	175	305	1550	785
	28.3 ≤ i ≤ 44.9			1190	1020
	49.5 ≤ i ≤ 78.6			770	1585
<b>HDO 120 4_A</b>	87.0 ≤ i ≤ 162.2	125	279	400	1260
	179.7 ≤ i ≤ 400.6			250	(*)
<b>HDO 125 2_A</b>	7.4 ≤ i ≤ 8.8	230	336	3530	665
	i = 9.9			2850	820
	i = 11.5 ; 12.3			2280	1025
	14.2 ≤ i ≤ 16.9			1840	1275
<b>HDO 125 3_A</b>	19.2 ≤ i ≤ 35.8	175	305	1550	785
	38.8 ≤ i ≤ 55.4			1190	1020
	60.1 ≤ i ≤ 85.9			770	1585
<b>HDO 125 4_A</b>	97.0 ≤ i ≤ 178.0	125	279	400	1260
	200.3 ≤ i ≤ 438.0			250	(*)

(\*) Contact the Bonfiglioli Technical Service.

(\*\*) Option not available in configuration  
...S-L-1... e ...S-R-2...

	i	A [mm]	B [mm]	M <sub>1max</sub> [Nm]	n <sub>1min</sub> [min <sup>-1</sup> ]
<b>HDO 130 2_A</b> (**)	5.7 ≤ i ≤ 7.1	290	437	6630	575
	i = 7.7 ; 8.8			5350	710
	i = 9.6 ; 11.0			4280	890
	i = 12.0 ; 13.6			3450	1105
<b>HDO 130 3_A</b>	15.2 ≤ i ≤ 19.9	210	402	2840	715
	22.6 ≤ i ≤ 34.9			2290	880
	38.3 ≤ i ≤ 67.1			1480	1365
<b>HDO 130 4_A</b>	71.5 ≤ i ≤ 190.3	175	366	1190	1020
	219.1 ≤ i ≤ 335.6			770	1585
<b>HDO 140 2_A</b> (**)	6.6 ≤ i ≤ 8.2	290	437	6630	575
	i = 9.0 ; 10.1			5350	710
	i = 11.3 ; 12.6			4280	890
	i = 14.0 ; 15.7			3450	1105
<b>HDO 140 3_A</b>	17.7 ≤ i ≤ 23.3	210	402	2840	715
	26.0 ≤ i ≤ 44.4			2290	880
	50.4 ≤ i ≤ 77.3			1480	1365
<b>HDO 140 4_A</b>	82.3 ≤ i ≤ 180.0	175	366	1190	1020
	198.3 ≤ i ≤ 386.6			770	1585
<b>HDO 150 2_A</b>	5.5 ≤ i ≤ 7.0	322	447	10110	525
	i = 8.1 ; 8.9			8030	660
	i = 10.0 ; 10.9			6520	815
	i = 12.6 ; 13.7			5180	1025
<b>HDO 150 3_A</b>	15.6 ≤ i ≤ 25.4	230	440	4040	580
	28.2 ≤ i ≤ 36.0			2850	820
	40.2 ≤ i ≤ 60.8			1840	1275
<b>HDO 150 4_A</b>	66.9 ≤ i ≤ 92.9	—	333	1550	785
	101.8 ≤ i ≤ 141.5			1190	1020
	157.9 ≤ i ≤ 238.8			770	1585
<b>HDO 160 2_A</b>	i = 7.3 ; 7.9	322	447	10110	525
	8.9 ≤ i ≤ 11.3			7090	750
	12.2 ≤ i ≤ 15.4			5210	1020
<b>HDO 160 3_A</b>	17.7 ≤ i ≤ 31.3	230	440	4040	580
	34.9 ≤ i ≤ 44.3			2850	820
	49.4 ≤ i ≤ 68.6			1840	1275
<b>HDO 160 4_A</b>	75.9 ≤ i ≤ 96.3	—	333	1550	785
	115.2 ≤ i ≤ 174.0			1190	1020
	194.1 ≤ i ≤ 269.7			770	1585
<b>HDO 170</b>	 <b>BONFIGLIOLI TECHNICAL SERVICE</b>				
<b>HDO 180</b>					



#### 26.7.4 REINFORCED BEARINGS

Optional heavy-duty bearings are also available, with increased overhung load capacity. The HDB option can only be applied to HDO 71, 81, 91 units with the LP shaft arrangement (solid shaft).

#### 26.7.5 SEALS AND GASKETS

On request, gearboxes can be equipped with different oil sealing systems. These are:

**TK** – Taconite seals are recommended for environments characterised by the presence of abrasive dust or powders. Taconite seals incorporate a combination of sealing rings, labyrinths and a grease chamber. Greasing must be ensured as part of the scheduled maintenance programme.

Gearboxes of size HDO 71 ... HDO 95 with AD-G-NG inputs are provided with the taconite seal on the output axis only. This option is not available if combined with the optional variant “Mounting flanges” (FM excluded).

**VS** – Fluoro elastomer compound seal rings.

**DS** – Dual set of seal rings at each shaft end.

**DVS** – Dual set of Fluoro elastomer compound seal rings at each shaft end.

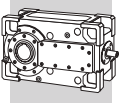
#### 26.7.6 SENSORS

**Bimetal thermostat** – If the **TG** option is specified, a bimetallic thermostat detects when the oil temperature exceeds  $90^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

The device is supplied with the gear unit, but installation and wiring are the responsibility of the installer.

**Oil level indicator** – If the **OLG** option is specified in the order, the gearbox is supplied with a device permitting the remote checking of the oil level. The device best operates when the gearbox is idle and should be bypassed when the gearbox is operating. Wiring is the responsibility of the installer.

The device may not be available in combination with other accessories and/or particular product configurations. Please contact Bonfiglioli Technical Service for advise.



### 26.7.7 DRYWELL

The “drywell” - option **DW** - is a device providing output shaft sealing for units with output shaft laying vertically in the V5 position.

For gearboxes from HDO 71 to HDO 95 with “drywell” sealing system consult the Bonfiglioli Technical Service.

When specified, for HDO 100 to 180 gearboxes, it necessarily requires the installation of a forced lubrication system, selected from those available for the gearbox, as illustrated in the relevant section of this catalogue.

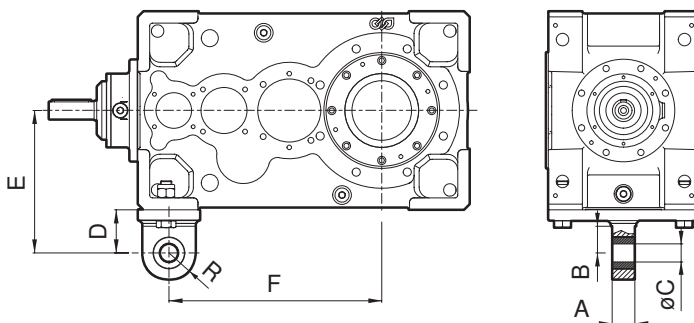
At scheduled intervals, check and refill the grease in the vane underneath the output shaft’s bottom bearing.

Availability of the Drywell may be subject to limitations, depending on the contemporary specification of other devices. Please consult with Bonfiglioli Technical Service.

HDO

### 26.7.8 FIXING ELEMENTS

For shaft-mounted installations, **HDO 71 ... HDO 95** gearboxes can be fitted with an electro-welded steel torque arm, complete with anti-vibration bushing.



	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	R [mm]
<b>HDO 71_TA</b>	40	47	32	76	251	375	47
<b>HDO 81_TA</b>	60	60	42	97	297	413	60
<b>HDO 91_TA</b>	60	68	42	113	338	525	68
<b>HDO 95_TA</b>	60	68	42	113	363	520	68

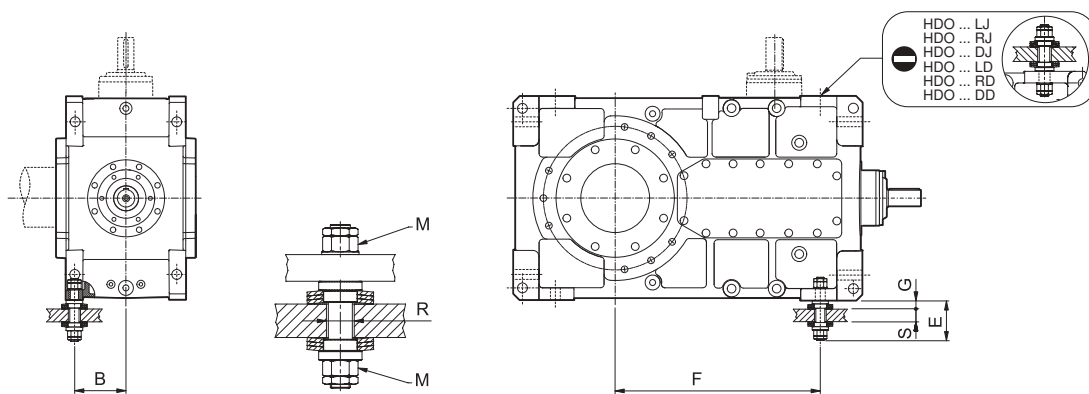
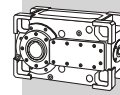
For shaft mounted HDO gearboxes, a specially shaped hardened steel bolt is available to secure the unit to the supporting structure.


Vibration damping cup springs are also supplied in the kit. The customer must adjust the preload of these springs during installation, respecting the value G given in the following chart.

The reaction bolt must be fitted on the side of the gearbox next to the driven machine and in the farthest hole from output shaft centre (see dimension F in the following figure).

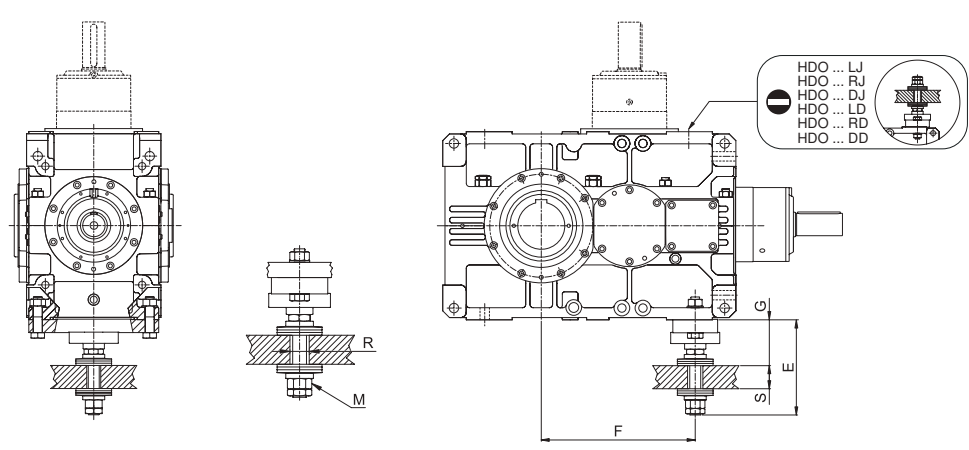
Fitting the bolt on same side as the inspection cover is not possible. In this case please contact Bonfiglioli Technical Service for advise.





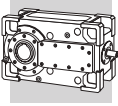


	F [mm]	B [mm]	E [mm]	G [mm] Rated value	M	R [mm]	S [mm]	 DIN2093
HDO 100 2_TA	420	160	153	33.4	M27	35	30 - 40	A100
HDO 100 3_TA	540							
HDO 100 4_TA								
HDO 110 2_TA	435	160	153	33.4	M27	35	30 - 40	A100
HDO 110 3_TA	555							
HDO 110 4_TA								
HDO 120 2_TA	480	170	166	33.4	M30	40	40 - 50	A125
HDO 120 3_TA	630							
HDO 120 4_TA								
HDO 125 2_TA	530	170	166	33.4	M30	40	40 - 50	A125
HDO 125 3_TA	680							
HDO 125 4_TA								
HDO 130 2_TA	585	216	205	42.7	M36	45	50 - 60	A125
HDO 130 3_TA	780							
HDO 130 4_TA								
HDO 140 2_TA	625	216	205	42.7	M36	45	50 - 60	A125
HDO 140 3_TA	790							
HDO 140 4_TA								

**HDO**



	F [mm]	E [mm]	G [mm] Rated value	M	R [mm]	S [mm]	 DIN2093
HDO 150 2_TA	687.5	405	204.3	M48x2	52	70 - 80	A160
HDO 150 3_TA	877.5						
HDO 150 4_TA							
HDO 160 2_TA	727.5	405	204.3	M48x2	52	70 - 80	A160
HDO 160 3_TA	927.5						
HDO 160 4_TA							
HDO 170	 BONFIGLIOLI TECHNICAL SERVICE						
HDO 180							



## 26.7.9 SURFACE PROTECTION

### HDO 71 ... 95

When no specific protection class is requested, the painted (ferrous) surfaces of gearboxes are protected to at least corrosivity class C2 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, gearboxes can be delivered with C3 and C4 surface protection, obtained by painting the complete gearbox.

<b>SURFACE PROTECTION</b>	Typical environments	Maximum surface temperature	Corrosivity class according to UNI EN ISO 12944-2
<b>C3</b>	Urban and industrial environments with up to 100% relative humidity (medium air pollution)	120°C	C3
<b>C4</b>	Industrial areas, coastal areas, chemical plant, with up to 100% relative humidity (high air pollution)	120°C	C4

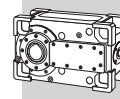
Gearboxes with optional protection to class C3 or C4 are available in a choice of colours. If no specific colour is requested (see the "PAINTING" option) gearboxes are finished in RAL 7042. Gearboxes can also be supplied with surface protection for corrosivity class C5 according to UNI EN ISO 12944-2. Contact our Technical Service for further details.

### HDO 100 ... 180

When no specific protection class is requested, the painted surfaces of gearboxes are protected to at least corrosivity class C3 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, gearboxes can be delivered with C4 surface protection, obtained by painting the complete gearbox.

<b>SURFACE PROTECTION</b>	Typical environments	Maximum surface temperature	Corrosivity class according to UNI EN ISO 12944-2
<b>C4</b>	Industrial areas, coastal areas, chemical plant, with up to 100% relative humidity (high air pollution)	120°C	C4

Gearboxes with optional protection to class C4 are available in a choice of colours. If no specific colour is requested (see the "PAINTING" option) gearboxes are finished in RAL 7042. Gearboxes can also be supplied with surface protection for corrosivity class C5 according to UNI EN ISO 12944-2. Contact our Technical Service for further details.



## 26.7.10 PAINTING

Gearboxes with optional protection to class C3 or C4 are available in the colours listed in the following table.

PAINTING	Colour	RAL number
<b>RAL7042*</b>	Traffik Grey A	7042
<b>RAL5010</b>	Gentian Blue	5010
<b>RAL9005</b>	Jet Black	9005
<b>RAL9006</b>	White Aluminium	9006
<b>RAL9010</b>	Pure White	9010
<b>RAL7035</b>	Light Grey	7035
<b>RAL7001</b>	Silver Grey	7001
<b>RAL5015</b>	Sky Blue	5015
<b>RAL7037</b>	Dusty Grey	7037
<b>RAL5024</b>	Pastel Blue	5024

\* Gearboxes are supplied in this standard colour if no other colour is specified.

NOTE - "PAINTING" options can only be specified in conjunction with "SURFACE PROTECTION" options.

## 26.7.11 CERTIFICATES

### AC - Certificate of compliance

The document certifies the compliance of the product with the purchase order and the construction in conformity with the applicable procedures of the Bonfiglioli Quality System.

### CC - Inspection certificate

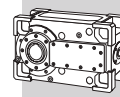
The document entails checking on order compliance, the visual inspection of external conditions and of mating dimensions. Checking on main functional parameters in unloaded conditions is also performed along with oil seal proofing, both in static and in running conditions. Units inspected are sampled within the shipping batch and marked individually.

### CT - Type certificate

Further to the activities relevant to the Inspection certificate the following checks are also conducted:

- noise
- surface temperature
- tightness of external hardware
- functionality of ancillary devices, if fitted

All checks are conducted with the gear unit running unloaded. Units inspected are sampled within the shipping batch and marked individually.

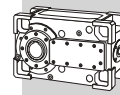


## 27 REFERENCE TORQUE

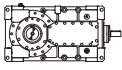
The torque values given in the table are influenced by the following elements: gear teeth, shafts and couplings. Performance may therefore vary with application conditions (see the “Thermal Capacity and Rating Charts”).

		HDO													
		Mn <sub>2ref</sub> [Nm]													
	i <sub>N</sub>	HDO 71	HDO 81	HDO 91	HDO 95	HDO 100	HDO 110	HDO 120	HDO 125	HDO 130	HDO 140	HDO 150	HDO 160	HDO 170	HDO 180
2x	5.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	5.6	6560	11680	—	—	20910	—	—	—	60700	—	89750	—	—	—
	6.3	7530	13060	—	—	22620	22220	31520	—	66260	69850	105160	—	—	—
	7.1	7030	11950	18910	—	23610	23580	32970	35500	65220	77290	114290	118960	—	—
	8.0	6390	11510	18230	—	22820	25740	35120	36890	65900	81460	113280	129300	—	—
	9.0	7420	12670	17150	—	23430	23790	34440	39420	65400	80240	113290	121910	—	—
	10.0	6950	11060	17810	—	22070	25960	36600	38520	62660	81680	104620	131940	—	—
	11.2	7400	12200	18040	—	23110	23040	33350	35910	65440	73090	112410	137750	—	—
	12.5	6030	10220	16970	—	21490	25180	35500	37300	59310	80740	105820	116840	—	—
	14.0	7000	11820	17920	—	22530	22480	32500	34960	64980	69190	111480	126850	—	—
16.0	6870	11890	16850	—	—	24600	34640	36350	—	77730	—	132600	—	—	
18.0	—	—	—	—	—	—	—	38880	—	—	—	—	—	—	
3x	14.0	—	—	—	—	26470	—	—	—	—	—	—	—	—	—
	16.0	7630	9930	—	—	—	—	—	—	—	—	99460	—	179960	—
	18.0	7310	11520	16760	—	26310	30740	32720	—	65750	68660	114150	111830	190190	199920
	20.0	7590	10760	17750	20040	24400	29890	35300	36480	63770	77140	110100	131830	182320	202450
	22.4	7270	12490	16690	21290	26130	29850	38530	39920	65610	82910	117200	141170	188900	202480
	25.0	7560	12280	18260	19320	24270	30740	40340	43390	63380	75510	113000	136270	190190	209900
	28.0	7240	12520	16590	20680	25990	29690	36250	45510	65810	82850	108950	146300	182320	202450
	31.5	7530	12920	18160	19200	24140	31130	38110	46950	63010	84810	116920	139750	188900	200290
	35.5	7210	12460	17520	20940	25860	29540	39350	47750	65470	82360	111930	132770	190190	209900
	40.0	7500	12870	16480	19110	24020	31240	40590	46730	62680	82170	107250	146300	190190	202450
	45.0	7180	12410	18030	19070	25750	29390	39130	46650	65130	81940	107700	138440	181730	198560
	50.0	7470	12820	16400	20680	23930	31120	37620	49240	62370	82500	114010	131890	188900	197890
	56.0	7160	12370	17960	18980	25640	29280	38990	46390	64840	81520	110770	129470	189370	209900
	63.0	7450	12770	17360	20940	23830	30990	40250	48720	62100	82170	106900	144850	180390	202450
	71.0	7140	12330	16330	18910	22260	29160	38800	47750	62420	81170	—	137030	—	196430
80.0	—	—	—	—	—	26350	35760	49240	—	78870	—	—	—	—	
90.0	—	—	—	—	—	—	—	46010	—	—	—	—	—	—	
4x	71.0	—	—	—	—	25930	—	—	—	65760	—	109890	—	180330	—
	80.0	7530	11500	18190	21220	24100	31130	—	—	63000	84810	111250	124790	190190	200360
	90.0	7220	12570	17590	20330	26910	29490	39240	—	67870	82350	117200	135850	182320	202450
	100.0	7830	11750	17710	21370	24880	30740	41250	48720	65030	82170	112750	137650	188900	199380
	112.0	7510	11790	18340	19300	27820	30610	40820	47750	69570	85000	111670	127540	190190	209900
	125.0	7010	12060	17260	21370	24880	31130	41250	49240	66770	84810	117200	137260	182320	202450
	140.0	—	13000	16540	19980	28210	31750	40920	47230	69570	87060	117090	142460	183700	207020
	160.0	8260	12070	19230	21370	24880	31350	41250	48720	66770	84810	116600	146300	190190	204100
	180.0	8100	13910	19250	20680	28210	31790	40920	47700	69570	87060	114780	147070	182320	202450
	200.0	8010	12070	20310	21370	24880	31570	41250	49240	66770	84810	117200	143330	188900	205480
	224.0	8430	14530	19250	20940	28210	31790	40920	47700	69570	87060	117090	141140	190190	209900
	250.0	7890	12070	19360	21370	24880	31570	41250	48720	66770	84810	114780	146300	182320	202450
	280.0	—	13000	20210	22400	28210	31790	40920	47230	69570	87060	—	147070	—	—
	315.0	8260	11980	18950	19420	25080	31570	41250	49240	66770	80940	—	—	—	—
	355.0	—	13910	19740	20680	23870	31790	40920	47750	63140	87060	—	—	—	—
	400.0	8150	13190	20550	23200	—	28490	37730	49240	—	78870	—	—	—	—
	450.0	8990	14740	20460	20940	—	—	—	49240	—	—	—	—	—	—
500.0	8890	12990	21610	21940	—	—	—	—	—	—	—	—	—	—	

HDO

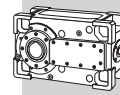


HDO

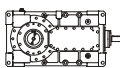
HDO 71					n <sub>1</sub> = 1500 min <sup>-1</sup>		
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 40°C		
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>TSR</sub> [kW]
HDO 71 2	5.6	268	4150	121	*	55	52
HDO 71 2	6.5	231	4820	121	*	52	50
HDO 71 2	6.8	222	5010	121	*	53	50
HDO 71 2	7.9	190	4630	96	*	56	54
HDO 71 2	9.1	164	5380	96	*	53	51
HDO 71 2	9.5	158	5590	96	*	54	51
HDO 71 2	11.1	135	5400	79	*	49	47
HDO 71 2	12.1	124	5370	73	*	49	47
HDO 71 2	14.0	107	6200	72	*	46	45
HDO 71 2	14.6	103	6410	72	*	47	45
HDO 71 3	15.9	94	5960	62	*	41	40
HDO 71 3	18.5	81	6910	62	*	40	38
HDO 71 3	19.8	76	6620	56	*	39	38
HDO 71 3	23.0	65	7270	53	*	38	36
HDO 71 3	24.0	62	7130	50	*	37	36
HDO 71 3	27.9	54	7240	43	18	36	35
HDO 71 3	30.7	49	7530	41	17	35	34
HDO 71 3	35.6	42	7210	34	17	33	32
HDO 71 3	38.5	39	7500	33	16	—	32
HDO 71 3	44.7	34	7180	27	16	—	—
HDO 71 3	46.7	32	7470	27	16	—	—
HDO 71 3	54.2	27.7	7160	22	15	—	—
HDO 71 3	59.6	25.2	7450	21	15	—	—
HDO 71 3	69.2	21.7	7140	17	14	—	—
HDO 71 4	77.0	19.5	7530	17	16	⊖	—
HDO 71 4	89.4	16.8	7220	14	—		—
HDO 71 4	98.3	15.3	7830	14	—		—
HDO 71 4	114.1	13.1	7510	11	—		—
HDO 71 4	118.5	12.7	7010	10	—		—
HDO 71 4	154.4	9.7	8260	9	—		—
HDO 71 4	179.3	8.4	8100	8	—		—
HDO 71 4	197.0	7.6	8010	7	—		—
HDO 71 4	228.2	6.6	8430	6	—		—
HDO 71 4	237.7	6.3	7890	6	—		—
HDO 71 4	308.9	4.9	8260	5	—		—
HDO 71 4	394.1	3.8	8150	4	—		—
HDO 71 4	457.5	3.3	8990	3	—		—
HDO 71 4	475.4	3.2	8890	3	—		—

\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary

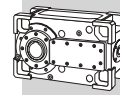


**HDO**

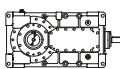
HDO 81					n <sub>1</sub> = 1500 min <sup>-1</sup>		
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 40°C		
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>TSR</sub> [kW]
HDO 81 2	5.5	270	9090	268	*	*	*
HDO 81 2	6.4	233	9440	240	*	*	*
HDO 81 2	6.7	224	9490	232	*	*	*
HDO 81 2	7.9	190	9800	204	*	*	*
HDO 81 2	9.1	164	10210	183	*	*	*
HDO 81 2	9.6	156	10170	173	*	*	*
HDO 81 2	11.1	135	10630	156	*	*	63
HDO 81 2	12.2	123	10220	137	*	*	57
HDO 81 2	14.2	106	11240	130	*	*	54
HDO 81 2	14.7	102	11310	126	*	*	55
HDO 81 3	15.5	97	6570	71	*	45	52
HDO 81 3	18.0	83	7630	71	*	43	49
HDO 81 3	19.9	75	7850	66	*	43	49
HDO 81 3	23.1	65	9120	66	*	41	46
HDO 81 3	24.5	61	9270	63	*	42	47
HDO 81 3	28.4	53	10760	63	*	40	45
HDO 81 3	30.7	49	10590	58	*	40	45
HDO 81 3	35.6	42	12300	58	*	38	43
HDO 81 3	38.6	39	8750	38	19	36	—
HDO 81 3	44.9	33	10160	38	19	—	—
HDO 81 3	47.5	32	10360	36	19	34	—
HDO 81 3	55.1	27.2	12030	36	18	—	—
HDO 81 3	59.6	25.2	11940	33	19	33	—
HDO 81 3	69.2	21.7	12330	30	18	—	—
HDO 81 4	78.3	19.2	11500	25	23	●	—
HDO 81 4	94.5	15.9	12570	23	22		—
HDO 81 4	98.2	15.3	11750	20	—		—
HDO 81 4	105.6	14.2	11790	19	—		—
HDO 81 4	127.4	11.8	12060	16	—		—
HDO 81 4	132.6	11.3	13000	17	—		—
HDO 81 4	159.9	9.4	12070	13	—		—
HDO 81 4	181.4	8.3	13910	13	—		—
HDO 81 4	196.5	7.6	12070	10	—		—
HDO 81 4	227.8	6.6	14530	11	—		—
HDO 81 4	254.8	5.9	12070	8	—		—
HDO 81 4	265.1	5.7	13000	8	—		—
HDO 81 4	312.6	4.8	11980	7	—		—
HDO 81 4	362.9	4.1	13910	7	—		—
HDO 81 4	392.4	3.8	13190	6	—		—
HDO 81 4	455.5	3.3	14740	6	—		—
HDO 81 4	473.3	3.2	12990	5	—	—	

\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary

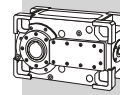


**HDO**

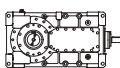
<b>HDO 91</b>					<b><math>n_1 = 1500 \text{ min}^{-1}</math></b>		
	<b>i</b>	<b><math>n_2</math></b> [min <sup>-1</sup> ]	<b>Mn<sub>2</sub></b> [Nm]	<b>Pn<sub>1</sub></b> [kW]	<b>t<sub>a</sub> = 40°C</b>		
					<b>P<sub>T</sub></b> [kW]	<b>P<sub>TFAN</sub></b> [kW]	<b>P<sub>TSR</sub></b> [kW]
HDO 91 2	7.4	202	12380	272	*	*	*
HDO 91 2	8.3	181	13470	266	*	*	*
HDO 91 2	9.0	167	14150	257	*	*	*
HDO 91 2	10.3	146	13070	208	*	91	85
HDO 91 2	11.5	131	14370	205	*	91	85
HDO 91 2	12.5	120	15100	198	*	82	76
HDO 91 2	14.6	103	15280	172	*	83	78
HDO 91 2	15.9	95	16060	166	*	75	70
HDO 91 3	18.6	81	15920	143	*	71	67
HDO 91 3	20.7	72	17720	143	*	71	67
HDO 91 3	22.5	67	16690	124	*	65	61
HDO 91 3	24.1	62	17600	122	*	68	64
HDO 91 3	29.1	51	16590	95	*	62	58
HDO 91 3	30.6	49	18160	99	*	63	60
HDO 91 3	36.9	41	17520	79	*	60	56
HDO 91 3	40.2	37	16480	68	29	55	52
HDO 91 3	42.9	35	18030	70	29	56	53
HDO 91 3	52.0	28.9	16400	53	29	—	51
HDO 91 3	54.5	27.5	17960	55	29	—	51
HDO 91 3	60.7	24.7	17360	48	29	—	—
HDO 91 3	66.1	22.7	16330	41	27	—	—
HDO 91 4	82.0	18.3	16840	35	31	—	—
HDO 91 4	91.3	16.4	17590	33	31	—	—
HDO 91 4	95.3	15.7	17710	32	—	—	—
HDO 91 4	118.1	12.7	18340	26	—	—	—
HDO 91 4	128.5	11.7	17260	23	—	—	—
HDO 91 4	137.1	10.9	16540	21	—	—	—
HDO 91 4	159.3	9.4	19230	21	—	—	—
HDO 91 4	177.4	8.5	19250	18	—	—	—
HDO 91 4	202.5	7.4	20310	17	—	—	—
HDO 91 4	225.4	6.7	19250	15	—	—	—
HDO 91 4	256.3	5.9	19360	13	—	—	—
HDO 91 4	268.8	5.6	20210	13	—	—	—
HDO 91 4	317.8	4.7	18950	10	—	—	—
HDO 91 4	353.8	4.2	19740	10	—	—	—
HDO 91 4	403.8	3.7	20550	9	—	—	—
HDO 91 4	449.6	3.3	20460	8	—	—	—
HDO 91 4	489.3	3.1	21610	8	—	—	—

\* 

— Thermal verification not necessary



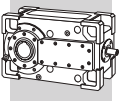
**HDO**

<b>HDO 95</b>					<b><math>n_1 = 1500 \text{ min}^{-1}</math></b>		
	<b>i</b>	<b><math>n_2</math></b> [ $\text{min}^{-1}$ ]	<b><math>Mn_2</math></b> [Nm]	<b><math>Pn_1</math></b> [kW]	<b><math>t_a = 40^\circ\text{C}</math></b>		
					<b><math>P_T</math></b> [kW]	<b><math>P_{TFAN}</math></b> [kW]	<b><math>P_{TSR}</math></b> [kW]
HDO 95 3	21.2	71	18710	147	*	82	75
HDO 95 3	22.5	67	19320	143	*	83	76
HDO 95 3	24.7	61	19320	131	*	78	72
HDO 95 3	27.5	55	20680	126	*	77	71
HDO 95 3	31.9	47	19200	100	*	75	69
HDO 95 3	34.9	43	20940	100	*	72	66
HDO 95 3	40.5	37	19110	79	37	69	64
HDO 95 3	44.0	34	19070	72	35	65	60
HDO 95 3	49.0	31	20680	70	37	66	61
HDO 95 3	56.9	26.4	18980	56	36	—	—
HDO 95 3	62.2	24.1	20940	56	35	—	—
HDO 95 3	72.3	20.7	18910	44	33	—	—
HDO 95 4	81.6	18.4	21220	44	40	—	—
HDO 95 4	93.6	16.0	19220	35	—	—	—
HDO 95 4	103.7	14.5	21370	35	—	—	—
HDO 95 4	113.5	13.2	19300	29	—	—	—
HDO 95 4	128.7	11.7	21370	28	—	—	—
HDO 95 4	140.7	10.7	19980	24	—	—	—
HDO 95 4	163.5	9.2	21370	22	—	—	—
HDO 95 4	181.9	8.2	20680	19	—	—	—
HDO 95 4	211.3	7.1	21370	17	—	—	—
HDO 95 4	231.1	6.5	20940	15	—	—	—
HDO 95 4	256.6	5.8	21370	14	—	—	—
HDO 95 4	280.6	5.3	22400	14	—	—	—
HDO 95 4	325.7	4.6	19420	10	—	—	—
HDO 95 4	362.7	4.1	20680	10	—	—	—
HDO 95 4	421.4	3.6	23200	9	—	—	—
HDO 95 4	460.9	3.3	20940	8	—	—	—
HDO 95 4	489.7	3.1	21940	8	—	—	—

\* 

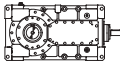
— Thermal verification not necessary





# HDO 100

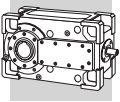
$n_1 = 1500 \text{ min}^{-1}$

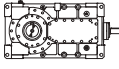
	i	$n_2$ [ $\text{min}^{-1}$ ]	$Mn_2$ [Nm]	$Pn_1$ [kW]	$t_a = 20^\circ\text{C}$						
					$P_T$ [kW]	$P_{TFAN}$ [kW]	$P_{TMCRAS}$ [kW]	$P_{TMCRAS9}$ [kW]	$P_{TSR}$ [kW]	$P_{TMCRW5}$ [kW]	$P_{TMCRW9}$ [kW]
HDO 100 2	5.8	258	14990	422	*	244	295	373	208	236	330
HDO 100 2	6.5	232	17080	432	*	247	298	376	211	239	333
HDO 100 2	7.0	213	17740	412	*	249	300	378	213	241	335
HDO 100 2	8.0	188	17370	355	*	253	304	382	217	245	339
HDO 100 2	8.7	172	17950	337	*	255	306	384	219	247	341
HDO 100 2	10.0	150	17580	288	138	262	313	—	226	254	348
HDO 100 2	10.9	138	18220	274	139	263	314	—	227	255	349
HDO 100 2	12.4	121	17980	237	144	268	319	—	232	260	—
HDO 100 2	13.5	111	18670	226	145	269	320	—	233	261	—
HDO 100 3	14.0	107	20240	241	98	183	225	282	161	182	250
HDO 100 3	15.6	96	22210	238	98	183	225	282	161	182	250
HDO 100 3	17.3	87	21300	205	102	187	229	—	165	186	254
HDO 100 3	20.2	74	23650	195	107	192	234	—	170	191	259
HDO 100 3	22.5	67	23040	171	109	194	236	—	172	193	—
HDO 100 3	25.0	60	24270	162	109	194	236	—	172	193	—
HDO 100 3	28.3	53	24080	142	111	196	238	—	174	195	—
HDO 100 3	31.5	48	24140	128	112	197	239	—	175	196	—
HDO 100 3	36.0	42	25230	117	113	198	240	—	176	197	—
HDO 100 3	40.0	38	24020	100	—	—	—	—	—	—	—
HDO 100 3	43.9	34	25580	97	—	—	—	—	—	—	—
HDO 100 3	48.8	31	23930	82	—	—	—	—	—	—	—
HDO 100 3	55.8	26.9	25640	77	—	—	—	—	—	—	—
HDO 100 3	62.0	24.2	23830	64	—	—	—	—	—	—	—
HDO 100 3	67.5	22.2	22260	55	—	—	—	—	—	—	—
HDO 100 4	70.8	21.2	25930	62	—	—	—	—	—	—	—
HDO 100 4	78.7	19.1	24100	52	—	—	—	—	—	—	—
HDO 100 4	90.0	16.7	26910	51	—	—	—	—	—	—	—
HDO 100 4	100.0	15.0	24880	42	—	—	—	—	—	—	—
HDO 100 4	111.4	13.5	27820	43	—	—	—	—	—	—	—
HDO 100 4	123.8	12.1	24880	34	—	—	—	—	—	—	—
HDO 100 4	139.8	10.7	28210	34	—	—	—	—	—	—	—
HDO 100 4	160.0	9.4	24880	26	—	—	—	—	—	—	—
HDO 100 4	178.2	8.4	28210	27	—	—	—	—	—	—	—
HDO 100 4	198.0	7.6	24880	21	—	—	—	—	—	—	—
HDO 100 4	223.7	6.7	28210	21	—	—	—	—	—	—	—
HDO 100 4	248.6	6.0	24880	17.0	—	—	—	—	—	—	—
HDO 100 4	284.4	5.3	28210	16.9	—	—	—	—	—	—	—
HDO 100 4	316.0	4.7	25080	13.5	—	—	—	—	—	—	—
HDO 100 4	344.2	4.4	23870	11.8	—	—	—	—	—	—	—

HDO

\*  BONFIGLIOLI TECHNICAL SERVICE

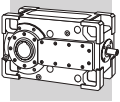
— Thermal verification not necessary

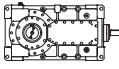


HDO 110					n <sub>1</sub> = 1500 min <sup>-1</sup>						
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 20°C						
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>TMCR45</sub> [kW]	P <sub>TMCR49</sub> [kW]	P <sub>TSR</sub> [kW]	P <sub>TMCRW5</sub> [kW]	P <sub>TMCRW9</sub> [kW]
HDO 110 2	6.4	236	21050	542	*	222	273	351	*	*	308
HDO 110 2	7.0	213	22150	515	*	226	277	355	*	218	312
HDO 110 2	8.1	186	23880	484	*	230	281	359	194	222	316
HDO 110 2	8.7	172	23730	445	*	232	283	361	196	224	318
HDO 110 2	10.0	150	25580	418	*	235	286	364	199	227	321
HDO 110 2	10.9	138	23040	346	*	245	296	374	209	237	331
HDO 110 2	12.5	120	25180	329	*	247	298	376	211	239	333
HDO 110 2	13.5	111	22480	272	130	254	305	—	218	246	340
HDO 110 2	15.5	97	24600	260	132	256	307	—	220	248	342
HDO 110 3	18.9	79	24850	219	101	186	228	—	164	185	253
HDO 110 3	20.9	72	25980	207	101	186	228	—	164	185	253
HDO 110 3	22.0	68	25740	195	106	191	233	—	169	190	258
HDO 110 3	24.6	61	26070	177	108	193	235	—	171	192	—
HDO 110 3	27.2	55	28100	172	109	194	236	—	172	193	—
HDO 110 3	30.9	48	28060	151	111	196	238	—	174	195	—
HDO 110 3	34.3	44	29540	144	111	196	238	—	174	195	—
HDO 110 3	39.3	38	29350	125	113	198	240	—	176	197	—
HDO 110 3	43.6	34	29390	113	—	—	—	—	—	—	—
HDO 110 3	48.0	31	31120	108	—	—	—	—	—	—	—
HDO 110 3	53.1	28.2	29280	92	—	—	—	—	—	—	—
HDO 110 3	61.0	24.6	30990	85	—	—	—	—	—	—	—
HDO 110 3	67.5	22.2	29160	72	—	—	—	—	—	—	—
HDO 110 3	77.5	19.4	26350	57	—	—	—	—	—	—	—
HDO 110 4	77.4	19.4	31130	69	—	—	—	—	—	—	—
HDO 110 4	85.7	17.5	29490	59	—	—	—	—	—	—	—
HDO 110 4	96.7	15.5	30690	54	—	—	—	—	—	—	—
HDO 110 4	108.9	13.8	30610	48	—	—	—	—	—	—	—
HDO 110 4	121.7	12.3	31130	44	—	—	—	—	—	—	—
HDO 110 4	137.1	10.9	30410	38	—	—	—	—	—	—	—
HDO 110 4	154.7	9.7	31350	35	—	—	—	—	—	—	—
HDO 110 4	174.3	8.6	31790	31	—	—	—	—	—	—	—
HDO 110 4	194.7	7.7	31570	28	—	—	—	—	—	—	—
HDO 110 4	215.7	7.0	31790	25	—	—	—	—	—	—	—
HDO 110 4	244.4	6.1	31570	22	—	—	—	—	—	—	—
HDO 110 4	274.2	5.5	31790	19.7	—	—	—	—	—	—	—
HDO 110 4	310.7	4.8	31570	17.3	—	—	—	—	—	—	—
HDO 110 4	344.2	4.4	31790	15.7	—	—	—	—	—	—	—
HDO 110 4	395.0	3.8	28490	12.3	—	—	—	—	—	—	—

\*  BONFIGLIOLI TECHNICAL SERVICE

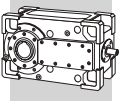
— Thermal verification not necessary

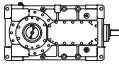


HDO 120					$n_1 = 1500 \text{ min}^{-1}$						
	i	$n_2$ [min <sup>-1</sup> ]	$Mn_2$ [Nm]	$Pn_1$ [kW]	$t_a = 20^\circ\text{C}$						
					$P_T$ [kW]	$P_{TFAN}$ [kW]	$P_{TMCR45}$ [kW]	$P_{TMCR49}$ [kW]	$P_{TSR}$ [kW]	$P_{TMCRW5}$ [kW]	$P_{TMCRW9}$ [kW]
HDO 120 2	6.6	228	27460	684	*	*	294	372	*	*	329
HDO 120 2	7.2	210	29900	684	*	*	298	376	*	*	333
HDO 120 2	8.1	186	32870	666	*	274	302	380	*	*	337
HDO 120 2	8.9	169	33980	627	*	263	291	369	*	*	326
HDO 120 2	10.0	150	35860	586	*	266	294	372	*	235	329
HDO 120 2	11.1	135	33350	493	*	284	312	390	225	253	347
HDO 120 2	12.5	120	35500	464	*	287	315	393	228	256	350
HDO 120 2	13.7	109	32500	387	*	298	326	404	239	267	361
HDO 120 2	15.5	97	34640	365	153	300	328	406	241	269	363
HDO 120 3	17.3	87	31620	306	*	221	247	304	183	204	272
HDO 120 3	19.5	77	34750	298	121	222	248	305	184	205	273
HDO 120 3	21.8	69	33390	256	126	227	253	310	189	210	278
HDO 120 3	24.6	61	34510	234	129	230	256	—	192	213	281
HDO 120 3	28.3	53	33780	199	134	235	261	—	197	218	—
HDO 120 3	32.0	47	37340	195	137	238	264	—	200	221	—
HDO 120 3	34.8	43	37920	182	137	238	264	—	200	221	—
HDO 120 3	41.2	36	39780	161	140	241	267	—	203	224	—
HDO 120 3	44.9	33	39130	145	140	241	267	—	203	224	—
HDO 120 3	49.5	30	36900	124	—	—	—	—	—	—	—
HDO 120 3	53.9	27.8	38990	121	—	—	—	—	—	—	—
HDO 120 3	63.9	23.5	40250	105	—	—	—	—	—	—	—
HDO 120 3	69.6	21.5	38800	93	—	—	—	—	—	—	—
HDO 120 3	78.6	19.1	35760	76	—	—	—	—	—	—	—
HDO 120 4	87.0	17.2	35210	69	—	—	—	—	—	—	—
HDO 120 4	103.1	14.5	38150	63	—	—	—	—	—	—	—
HDO 120 4	112.3	13.4	40820	62	—	—	—	—	—	—	—
HDO 120 4	125.7	11.9	38460	52	—	—	—	—	—	—	—
HDO 120 4	136.9	11.0	40920	51	—	—	—	—	—	—	—
HDO 120 4	162.2	9.2	41250	43	—	—	—	—	—	—	—
HDO 120 4	179.7	8.3	39850	38	—	—	—	—	—	—	—
HDO 120 4	201.1	7.5	41250	35	—	—	—	—	—	—	—
HDO 120 4	219.0	6.8	40920	32	—	—	—	—	—	—	—
HDO 120 4	252.4	5.9	41250	28	—	—	—	—	—	—	—
HDO 120 4	282.7	5.3	40920	25	—	—	—	—	—	—	—
HDO 120 4	325.9	4.6	41250	22	—	—	—	—	—	—	—
HDO 120 4	354.9	4.2	40920	19.6	—	—	—	—	—	—	—
HDO 120 4	400.6	3.7	37730	16.0	—	—	—	—	—	—	—

\*  BONFIGLIOLI TECHNICAL SERVICE

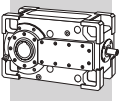
— Thermal verification not necessary



HDO 125					$n_1 = 1500 \text{ min}^{-1}$							
	i	$n_2$ [ $\text{min}^{-1}$ ]	$Mn_2$ [Nm]	$Pn_1$ [kW]	$t_a = 20^\circ\text{C}$							
					$P_T$ [kW]	$P_{TFAN}$ [kW]	$P_{TMCR45}$ [kW]	$P_{TMCR49}$ [kW]	$P_{TSR}$ [kW]	$P_{TMCRW5}$ [kW]	$P_{TMCRW9}$ [kW]	
HDO 125 2	7.4	202	30980	684	*	326	354	432	*	295	389	
HDO 125 2	8.0	188	33330	683	*	329	357	435	*	298	392	
HDO 125 2	8.8	170	36910	684	*	332	360	438	*	301	395	
HDO 125 2	9.9	152	38280	634	*	333	361	439	274	302	396	
HDO 125 2	11.5	131	35910	512	*	344	372	450	285	313	407	
HDO 125 2	12.3	122	37300	494	199	346	374	452	287	315	409	
HDO 125 2	14.2	105	34970	402	188	335	363	441	276	304	398	
HDO 125 2	15.3	98	36350	388	189	336	364	442	277	305	399	
HDO 125 2	16.9	89	38880	375	201	348	376	—	289	317	411	
HDO 125 3	19.2	78	35530	308	148	249	275	332	211	232	300	
HDO 125 3	22.6	66	37160	275	153	254	280	—	216	237	305	
HDO 125 3	24.3	62	39990	275	156	257	283	—	219	240	308	
HDO 125 3	27.7	54	40300	243	161	262	288	—	224	245	—	
HDO 125 3	33.0	45	43560	220	164	265	291	—	227	248	—	
HDO 125 3	35.8	42	44100	206	164	265	291	—	227	248	—	
HDO 125 3	38.8	39	45680	197	165	266	292	—	228	249	—	
HDO 125 3	43.0	35	46650	181	165	266	292	—	228	249	—	
HDO 125 3	50.1	30	48640	162	—	—	—	—	—	—	—	
HDO 125 3	55.4	27.1	46390	140	—	—	—	—	—	—	—	
HDO 125 3	60.1	24.9	44800	124	—	—	—	—	—	—	—	
HDO 125 3	72.1	20.8	47750	110	—	—	—	—	—	—	—	
HDO 125 3	77.6	19.3	49240	106	—	—	—	—	—	—	—	
HDO 125 3	85.9	17.5	46010	89	—	—	—	—	—	—	—	
HDO 125 4	97.0	15.5	39260	69	—	—	—	—	—	—	—	
HDO 125 4	116.3	12.9	47090	69	—	—	—	—	—	—	—	
HDO 125 4	125.2	12.0	49240	67	—	—	—	—	—	—	—	
HDO 125 4	141.8	10.6	45000	54	—	—	—	—	—	—	—	
HDO 125 4	152.6	9.8	48420	54	—	—	—	—	—	—	—	
HDO 125 4	178.0	8.4	47230	45	—	—	—	—	—	—	—	
HDO 125 4	200.3	7.5	44430	38	—	—	—	—	—	—	—	
HDO 125 4	226.9	6.6	47230	35	—	—	—	—	—	—	—	
HDO 125 4	244.1	6.1	48720	34	—	—	—	—	—	—	—	
HDO 125 4	284.8	5.3	47230	28	—	—	—	—	—	—	—	
HDO 125 4	315.2	4.8	49240	27	—	—	—	—	—	—	—	
HDO 125 4	367.6	4.1	47750	22	—	—	—	—	—	—	—	
HDO 125 4	395.6	3.8	49240	21	—	—	—	—	—	—	—	
HDO 125 4	438.0	3.4	49240	19.1	—	—	—	—	—	—	—	

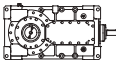
\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary



# HDO 130

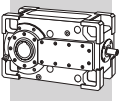
$n_1 = 1500 \text{ min}^{-1}$

	i	$n_2$ [min <sup>-1</sup> ]	$Mn_2$ [Nm]	$Pn_1$ [kW]	$t_a = 20^\circ\text{C}$										
					$P_T$ [kW]	$P_{TFAN}$ [kW]	$P_{TMCR A5}$ [kW]	$P_{TMCR A9}$ [kW]	$P_{TMCR A21}$ [kW]	$P_{TMCR A34}$ [kW]	$P_{TSR}$ [kW]	$P_{TMCR W5}$ [kW]	$P_{TMCR W9}$ [kW]	$P_{TMCR W21}$ [kW]	$P_{TMCR W34}$ [kW]
HDO 130 2	5.7	263	43810	1255	*	*	*	*	640	●	*	*	*	514	●
HDO 130 2	6.2	241	45370	1191	*	*	*	*	647		*	*	*	521	
HDO 130 2	7.1	212	47000	1084	*	*	*	*	656		*	*	*	530	
HDO 130 2	7.7	194	48650	1031	*	*	*	416	659		*	*	*	533	
HDO 130 2	8.8	171	50380	939	*	413	*	423	666		*	*	380	540	
HDO 130 2	9.6	156	51050	866	*	443	375	453	696		*	*	410	570	
HDO 130 2	11.0	137	52950	789	*	448	380	458	701		*	321	415	575	
HDO 130 2	12.0	125	53660	734	*	467	399	477	720		331	340	434	594	
HDO 130 2	13.6	110	55730	670	*	471	403	481	724		335	344	438	598	
HDO 130 3	15.2	99	58470	642	*	260	*	278	454	580	*	*	*	362	584
HDO 130 3	18.3	82	60430	552	*	313	274	331	507	633	249	231	299	415	637
HDO 130 3	19.9	75	63770	534	*	314	275	332	508	634	250	232	300	416	638
HDO 130 3	22.6	66	63570	469	*	335	296	353	529	—	271	253	321	437	659
HDO 130 3	24.7	61	63380	428	*	336	297	354	530	—	272	254	322	438	—
HDO 130 3	28.3	53	65810	389	179	345	306	363	539	—	281	263	331	447	—
HDO 130 3	30.9	49	63010	341	179	345	306	363	—	—	281	263	331	447	—
HDO 130 3	34.9	43	65470	313	186	352	313	370	—	—	288	270	338	—	—
HDO 130 3	38.3	39	62680	273	203	369	330	—	—	—	305	287	—	—	—
HDO 130 3	43.8	34	65130	248	208	374	335	—	—	—	310	292	—	—	—
HDO 130 3	47.8	31	62370	218	209	375	336	—	—	—	311	293	—	—	—
HDO 130 3	54.0	27.8	64840	200	—	—	—	—	—	—	—	—	—	—	—
HDO 130 3	59.0	25.4	62100	176	—	—	—	—	—	—	—	—	—	—	—
HDO 130 3	67.1	22.3	62420	155	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	71.5	21.0	65760	157	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	78.1	19.2	63000	137	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	88.2	17.0	67870	131	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	96.3	15.6	65030	115	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	111.2	13.5	69570	107	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	121.4	12.4	66770	94	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	141.3	10.6	69570	84	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	154.3	9.7	66770	74	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	174.3	8.6	69570	68	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	190.3	7.9	66770	60	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	219.1	6.8	69570	54	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	239.1	6.3	66770	48	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	270.2	5.6	69570	44	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	294.9	5.1	66770	39	—	—	—	—	—	—	—	—	—	—	—
HDO 130 4	335.6	4.5	63140	32	—	—	—	—	—	—	—	—	—	—	—

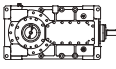
HDO

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— Thermal verification not necessary

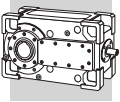


HDO

HDO 140					$n_1 = 1500 \text{ min}^{-1}$										
	i	$n_2$ [min <sup>-1</sup> ]	$Mn_2$ [Nm]	$Pn_1$ [kW]	$t_a = 20^\circ\text{C}$										
					$P_T$ [kW]	$P_{TFAN}$ [kW]	$P_{TMCR A5}$ [kW]	$P_{TMCR A9}$ [kW]	$P_{TMCR A21}$ [kW]	$P_{TMCR A34}$ [kW]	$P_{TSR}$ [kW]	$P_{TMCR W5}$ [kW]	$P_{TMCR W9}$ [kW]	$P_{TMCR W21}$ [kW]	$P_{TMCR W34}$ [kW]
HDO 140 2	6.6	228	52260	1301	*	*	*	*	640	●	*	*	*	*	●
HDO 140 2	7.3	206	57840	1301	*	*	*	*	650		*	*	*	524	
HDO 140 2	8.2	184	64740	1296	*	*	*	*	659		*	*	*	533	
HDO 140 2	9.0	167	67890	1234	*	*	*	*	665		*	*	*	539	
HDO 140 2	10.1	148	69410	1123	*	*	*	*	672		*	*	*	546	
HDO 140 2	11.3	133	71210	1035	*	450	*	460	703		*	*	417	577	
HDO 140 2	12.6	119	72940	944	*	456	388	466	709		*	*	423	583	
HDO 140 2	14.0	108	69190	811	*	476	408	486	729		340	349	443	603	
HDO 140 2	15.7	96	76770	801	*	480	412	490	733		344	353	447	607	
HDO 140 3	17.7	85	68210	642	*	*	*	275	451	577	*	*	*	359	581
HDO 140 3	19.9	75	76630	642	*	259	*	277	453	579	*	*	*	361	583
HDO 140 3	23.3	64	76960	552	*	314	275	332	508	634	250	232	300	416	638
HDO 140 3	26.0	58	73170	469	*	336	297	354	530	—	272	254	322	438	660
HDO 140 3	28.8	52	80970	469	*	337	298	355	531	—	273	255	323	439	661
HDO 140 3	32.5	46	80860	415	181	347	308	365	541	—	283	265	333	449	—
HDO 140 3	36.0	42	82360	382	182	348	309	366	542	—	284	266	334	450	—
HDO 140 3	40.1	37	79400	330	190	356	317	374	—	—	292	274	342	—	—
HDO 140 3	44.4	34	81940	308	190	356	317	—	—	—	292	274	342	—	—
HDO 140 3	50.4	29.7	82500	273	213	379	340	—	—	—	315	297	—	—	—
HDO 140 3	55.8	26.9	81520	244	214	380	341	—	—	—	316	298	—	—	—
HDO 140 3	62.2	24.1	82170	220	219	385	346	—	—	—	321	303	—	—	—
HDO 140 3	68.8	21.8	81170	197	—	—	—	—	—	—	—	—	—	—	—
HDO 140 3	77.3	19.4	78870	170	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	82.3	18.2	80550	167	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	91.1	16.5	82350	154	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	101.5	14.8	82170	138	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	112.3	13.4	85000	129	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	128.0	11.7	84810	113	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	141.6	10.6	87060	105	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	162.7	9.2	84810	89	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	180.0	8.3	87060	82	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	198.3	7.6	84810	73	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	219.5	6.8	87060	68	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	252.1	5.9	84810	57	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	279.0	5.4	87060	53	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	311.0	4.8	80940	44	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	344.1	4.4	87060	43	—	—	—	—	—	—	—	—	—	—	—
HDO 140 4	386.6	3.9	78870	35	—	—	—	—	—	—	—	—	—	—	—

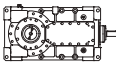
\* 

— Thermal verification not necessary



# HDO 150

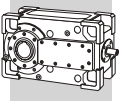
$n_1 = 1500 \text{ min}^{-1}$

	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 20°C											
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>TMCRA5</sub> [kW]	P <sub>TMCRA9</sub> [kW]	P <sub>TMCRA21</sub> [kW]	P <sub>TMCRA34</sub> [kW]	P <sub>TMCRA51</sub> [kW]	P <sub>TMCRW5</sub> [kW]	P <sub>TMCRW9</sub> [kW]	P <sub>TMCRW21</sub> [kW]	P <sub>TMCRW34</sub> [kW]	P <sub>TMCRW51</sub> [kW]
HDO 150 2	5.5	272	67710	2009	*	*	*	*	*	*		*	*	*	*	
HDO 150 2	6.5	232	79310	2008	*	*	*	*	*	*		*	*	*	*	
HDO 150 2	7.0	213	81770	1901	*	*	*	*	*	*		*	*	*	*	
HDO 150 2	8.1	184	84250	1694	*	*	*	*	*	817		*	*	*	822	
HDO 150 2	8.9	169	86910	1605	*	*	*	*	650	825	⊖	*	*	*	830	⊖
HDO 150 2	10.0	150	88070	1439	*	*	*	*	710	885		*	*	584	890	
HDO 150 2	10.9	138	90930	1364	*	568	*	*	717	892		*	*	591	897	
HDO 150 2	12.6	119	92930	1206	*	613	*	519	762	937		*	*	636	942	
HDO 150 2	13.7	109	96020	1144	*	618	*	524	767	942		*	481	641	947	
HDO 150 3	15.6	96	90530	967	*	419	*	*	541	667	731	*	*	449	671	881
HDO 150 3	18.3	82	102670	936	*	423	*	*	545	671	735	*	*	453	675	885
HDO 150 3	19.9	75	105070	880	*	425	*	371	547	673	737	*	*	455	677	887
HDO 150 3	21.7	69	104840	806	*	439	328	385	561	687	751	*	353	469	691	901
HDO 150 3	25.4	59	113000	742	*	442	331	388	564	690	754	*	356	472	694	904
HDO 150 3	28.2	53	105090	621	254	492	381	438	614	740	—	338	406	522	744	—
HDO 150 3	30.7	49	99350	539	263	501	390	447	623	—	—	347	415	531	753	—
HDO 150 3	36.0	42	111930	519	265	503	392	449	625	—	—	349	417	533	—	—
HDO 150 3	40.2	37	100660	418	279	517	406	463	—	—	—	363	431	—	—	—
HDO 150 3	43.8	34	107700	411	280	518	407	464	—	—	—	364	432	—	—	—
HDO 150 3	47.6	31	110750	388	285	523	412	—	—	—	—	369	437	—	—	—
HDO 150 3	55.8	26.9	110770	331	286	524	413	—	—	—	—	370	—	—	—	—
HDO 150 3	60.8	24.7	106900	293	287	525	414	—	—	—	—	371	—	—	—	—
HDO 150 4	66.9	22.4	94970	242	202	383	302	—	—	—	—	268	—	—	—	—
HDO 150 4	78.3	19.1	111250	242	202	383	302	—	—	—	—	268	—	—	—	—
HDO 150 4	92.9	16.1	117200	215	208	389	308	—	—	—	—	274	—	—	—	—
HDO 150 4	101.8	14.7	111630	187	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	110.9	13.5	111670	171	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	120.8	12.4	117200	165	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	141.5	10.6	117090	141	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	157.9	9.5	113780	123	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	171.9	8.7	114780	114	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	187.2	8.0	117200	107	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	219.3	6.8	117090	91	—	—	—	—	—	—	—	—	—	—	—	—
HDO 150 4	238.8	6.3	114780	82	—	—	—	—	—	—	—	—	—	—	—	—

HDO

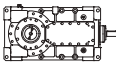
\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary



# HDO 160

$n_1 = 1500 \text{ min}^{-1}$

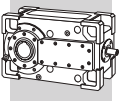
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 20°C											
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>TMCRA5</sub> [kW]	P <sub>TMCRA9</sub> [kW]	P <sub>TMCRA21</sub> [kW]	P <sub>TMCRA34</sub> [kW]	P <sub>TMCRA51</sub> [kW]	P <sub>TMCRW5</sub> [kW]	P <sub>TMCRW9</sub> [kW]	P <sub>TMCRW21</sub> [kW]	P <sub>TMCRW34</sub> [kW]	P <sub>TMCRW51</sub> [kW]
HDO 160 2	7.3	205	89730	2009	*	*	*	*	*	*		*	*	*	*	
HDO 160 2	7.9	189	94750	1951	*	*	*	*	*	*		*	*	*	*	
HDO 160 2	8.9	168	95690	1752	*	*	*	*	*	755		*	*	*	760	
HDO 160 2	10.4	144	103430	1622	*	*	*	*	*	773		*	*	*	778	
HDO 160 2	11.3	132	106410	1536	*	*	*	*	*	781	●	*	*	*	786	●
HDO 160 2	12.2	123	98150	1321	*	557	*	*	706	881		*	*	580	886	
HDO 160 2	14.2	106	110890	1279	*	569	*	*	718	893		*	*	592	898	
HDO 160 2	15.4	97	114230	1212	*	574	*	*	723	898		*	*	597	903	
HDO 160 3	17.7	85	102810	967	*	431	*	*	553	679	743	*	*	461	683	893
HDO 160 3	20.7	72	119990	967	*	436	*	*	558	684	748	*	*	466	688	898
HDO 160 3	22.5	67	130430	967	*	438	*	*	560	686	750	*	*	468	690	900
HDO 160 3	24.6	61	119050	806	*	454	343	400	576	702	766	*	368	484	706	916
HDO 160 3	28.8	52	138950	806	*	457	346	403	579	705	769	*	371	487	709	919
HDO 160 3	31.3	48	139750	746	*	458	347	404	580	706	770	304	372	488	710	920
HDO 160 3	34.9	43	118520	567	278	516	405	462	638	—	—	362	430	546	768	—
HDO 160 3	40.7	37	138380	567	281	519	408	465	641	—	—	365	433	549	771	—
HDO 160 3	44.3	34	138440	522	282	520	409	466	642	—	—	366	434	550	—	—
HDO 160 3	49.4	30	123770	418	296	534	423	—	—	—	—	380	448	—	—	—
HDO 160 3	54.1	27.7	125770	388	301	539	428	—	—	—	—	385	453	—	—	—
HDO 160 3	63.2	23.8	144850	383	303	541	430	—	—	—	—	387	—	—	—	—
HDO 160 3	68.6	21.9	137030	333	303	541	430	—	—	—	—	387	—	—	—	—
HDO 160 4	75.9	19.8	107850	242	215	396	315	—	—	—	—	281	—	—	—	—
HDO 160 4	88.6	16.9	125870	242	216	397	316	—	—	—	—	282	—	—	—	—
HDO 160 4	96.3	15.6	136820	242	216	397	316	—	—	—	—	282	—	—	—	—
HDO 160 4	115.2	13.0	126280	187	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	125.2	12.0	138630	189	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	137.1	10.9	142460	177	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	160.1	9.4	146300	156	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	174.0	8.6	147070	144	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	194.1	7.7	139890	123	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	212.6	7.1	141140	113	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	248.1	6.0	146300	100	—	—	—	—	—	—	—	—	—	—	—	—
HDO 160 4	269.7	5.6	147070	93	—	—	—	—	—	—	—	—	—	—	—	—

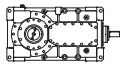
HDO

\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary

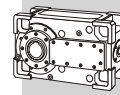


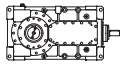


HDO 170					n <sub>1</sub> = 1500 min <sup>-1</sup>			
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 20°C		t <sub>a</sub> = 40°C	
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]
HDO 170 3	15.9	94	130010	1364	*	*	*	*
HDO 170 3	18.5	81	150910	1364	*	*	*	*
HDO 170 3	20.0	75	163440	1364	*	*	*	*
HDO 170 3	21.7	69	146900	1132	*	469	*	*
HDO 170 3	26.2	57	165080	1052	*	554	*	*
HDO 170 3	28.4	53	178800	1052	*	556	*	*
HDO 170 3	30.7	49	158700	862	*	570	*	396
HDO 170 3	35.7	42	184210	862	*	572	*	398
HDO 170 3	38.6	37	183140	753	322	596	*	422
HDO 170 3	44.0	34	181730	690	323	597	*	423
HDO 170 3	47.6	31	176740	619	331	605	*	431
HDO 170 3	55.3	27.1	189370	572	333	607	232	433
HDO 170 3	59.9	25.1	180390	503	334	608	232	433
HDO 170 4	72.9	20.6	172210	402	251	450	171	317
HDO 170 4	84.6	17.7	190190	383	264	463	184	330
HDO 170 4	91.6	16.4	182320	339	265	464	184	330
HDO 170 4	99.3	15.1	188900	324	258	457	178	324
HDO 170 4	115.2	13.0	190190	281	268	467	187	333
HDO 170 4	124.8	12.0	182320	249	—	—	187	333
HDO 170 4	139.8	10.7	183700	224	—	—	195	341
HDO 170 4	162.3	9.2	190190	200	—	—	—	—
HDO 170 4	175.8	8.5	182320	177	—	—	—	—
HDO 170 4	190.5	7.9	188900	169	—	—	—	—
HDO 170 4	221.1	6.8	190190	146	—	—	—	—
HDO 170 4	239.5	6.3	182320	130	—	—	—	—

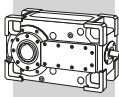
\*  BONFIGLIOLI TECHNICAL SERVICE

— Thermal verification not necessary



HDO 180					n <sub>1</sub> = 1500 min <sup>-1</sup>			
	i	n <sub>2</sub> [min <sup>-1</sup> ]	Mn <sub>2</sub> [Nm]	Pn <sub>1</sub> [kW]	t <sub>a</sub> = 20°C		t <sub>a</sub> = 40°C	
					P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]	P <sub>T</sub> [kW]	P <sub>TFAN</sub> [kW]
HDO 180 3	17.7	85	144460	1363	*	*	*	*
HDO 180 3	20.5	73	167160	1363	*	*	*	*
HDO 180 3	22.1	68	180780	1363	*	*	*	*
HDO 180 3	24.1	62	163220	1130	*	498	*	*
HDO 180 3	27.9	54	188870	1130	*	502	*	*
HDO 180 3	31.4	48	197760	1052	*	585	*	*
HDO 180 3	34.1	44	176340	862	*	598	*	417
HDO 180 3	39.5	38	202450	855	*	601	*	419
HDO 180 3	42.7	35	198560	776	324	602	*	420
HDO 180 3	48.6	31	197890	679	348	626	*	444
HDO 180 3	52.9	28.3	196380	619	355	633	248	452
HDO 180 3	61.2	24.5	202450	552	357	635	249	453
HDO 180 3	66.2	22.7	196430	495	358	636	250	454
HDO 180 4	81.0	18.5	191340	402	270	472	184	332
HDO 180 4	93.7	16.0	202450	368	283	485	197	345
HDO 180 4	101.3	14.8	199380	335	283	485	197	345
HDO 180 4	110.3	13.6	209900	324	277	479	191	339
HDO 180 4	127.6	11.8	202450	270	—	—	201	349
HDO 180 4	138.0	10.9	207020	255	—	—	201	349
HDO 180 4	155.4	9.7	204100	224	—	—	208	356
HDO 180 4	179.8	8.3	202450	192	—	—	—	—
HDO 180 4	194.5	7.7	205480	180	—	—	—	—
HDO 180 4	211.6	7.1	209900	169	—	—	—	—
HDO 180 4	244.9	6.1	202450	141	—	—	—	—

HDO



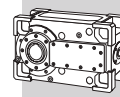
## 29 MASS MOMENT OF INERTIA

Moments of inertia listed refer to gearbox input shaft and apply exclusively for configurations with a single extension input and output shaft.




	$i_N$	$J \cdot 10^{-4} \text{ [kg m}^2\text{]}$													
		HDO 71	HDO 81	HDO 91	HDO 95	HDO 100	HDO 110	HDO 120	HDO 125	HDO 130	HDO 140	HDO 150	HDO 160	HDO 170	HDO 180
<b>2x</b> 	5.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	5.6	263	628	—	—	1862	—	—	—	8268	—	23425	—	—	—
	6.3	244	583	—	—	1780	1893	2869	—	7943	9161	21737	—	—	—
	7.1	238	566	970	—	1725	1803	2757	3116	10164	8677	20949	23848	—	—
	8.0	183	457	935	—	1578	1692	2592	2991	6959	8104	16297	22841	—	—
	9.0	174	434	913	—	1543	1566	2774	2922	8408	7438	15670	19669	—	—
	10.0	171	350	625	—	1204	1494	2666	2920	5207	7065	12076	18609	—	—
	11.2	142	335	607	—	1182	1168	2056	2206	6135	5514	12006	18114	—	—
	12.5	116	276	596	—	967	1121	1987	2154	4070	5275	9091	12785	—	—
	14.0	112	266	431	—	952	996	1572	1670	4673	4269	8884	12212	—	—
	16.0	111	263	424	—	—	966	1528	1636	—	4114	—	11945	—	—
18.0	—	—	—	—	—	—	—	1617	—	—	—	—	—	—	
<b>3x</b> 	14.0	—	—	—	—	940	—	—	—	—	—	—	—	—	
	16.0	112	248	—	—	926	—	—	—	3156	—	9690	—	—	
	18.0	109	242	414	—	836	849	1233	—	2675	3280	9480	10012	—	
	20.0	99	216	408	419	540	839	1205	1273	2643	3184	9382	9743	—	
	22.4	97	212	405	416	487	550	1013	1052	1913	2716	8401	9618	—	
	25.0	92	197	374	411	481	494	917	1038	1893	1970	8292	8568	—	
	28.0	91	195	368	377	443	488	592	934	1728	1940	5067	8428	—	
	31.5	85	185	350	373	440	448	534	920	1714	1764	4578	8363	—	
	35.5	84	184	179	353	415	444	530	808	1612	1744	4524	4661	—	
	40.0	46	99	178	350	413	418	464	540	1137	1636	3114	4592	—	
	45.0	45	98	169	180	240	415	461	537	1069	1623	3093	4559	—	
	50.0	44	94	167	170	239	242	278	467	1063	1084	2890	3142	—	
	56.0	44	94	161	168	228	241	276	465	1021	1076	2867	2924	—	
	63.0	42	91	161	162	227	230	249	280	1017	1031	2857	2895	—	
71.0	42	91	160	161	227	229	248	251	1042	1025	—	2882	—		
80.0	—	—	—	—	—	227	246	250	—	1019	—	—	—		
90.0	—	—	—	—	—	—	—	249	—	—	—	—	—		
<b>4x</b> 	71.0	—	—	—	—	168	—	—	—	553	—	1023	—	—	
	80.0	17	44	66	76	167	169	—	—	551	558	1011	1040	—	
	90.0	17	43	66	66	163	168	182	—	535	555	952	1025	—	
	100.0	17	43	74	74	163	143	171	183	533	538	589	1019	—	
	112.0	17	38	65	74	139	163	171	172	447	536	586	597	—	
	125.0	17	38	64	65	139	140	145	172	446	449	554	593	—	
	140.0	—	38	61	65	132	70	145	146	410	448	550	559	—	
	160.0	14	38	60	64	68	60	141	146	410	412	301	555	—	
	180.0	14	36	60	60	59	68	71	136	406	411	300	553	—	
	200.0	14	20	60	60	59	59	61	72	405	243	287	303	—	
	224.0	8	36	60	60	56	59	61	62	227	242	285	289	—	
	250.0	14	19	30	30	56	56	58	62	226	227	284	287	—	
	280.0	—	19	30	30	56	58	60	58	225	227	—	286	—	
	315.0	7	18	29	29	56	56	57	58	225	225	—	—	—	
	355.0	—	18	29	29	56	56	57	57	226	225	—	—	—	
	400.0	7	18	29	29	—	56	56	57	—	225	—	—	—	
	450.0	7	18	29	29	—	—	—	57	—	—	—	—	—	
500.0	7	18	29	29	—	—	—	—	—	—	—	—	—		

BONFIGLIOLI TECHNICAL SERVICE

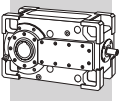
HDO



30 EXACT RATIOS

	i <sub>N</sub>	i													
		HDO 71	HDO 81	HDO 91	HDO 95	HDO 100	HDO 110	HDO 120	HDO 125	HDO 130	HDO 140	HDO 150	HDO 160	HDO 170	HDO 180
<b>2x</b> 	5.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	5.6	5.603	5.548	—	—	5.815	—	—	—	5.708	—	5.512	—	—	—
	6.3	6.505	6.442	—	—	6.462	6.354	6.569	—	6.231	6.569	6.459	—	—	—
	7.1	6.760	6.693	7.435	—	7.038	7.038	7.154	7.412	7.090	7.269	7.034	7.306	—	—
	8.0	7.875	7.875	8.278	—	8.000	8.077	8.077	7.976	7.714	8.167	8.133	7.941	—	—
	9.0	9.143	9.143	9.009	—	8.714	8.714	8.857	8.831	8.778	9.000	8.857	8.933	—	—
	10.0	9.500	9.598	10.286	—	10.000	10.000	10.000	9.875	9.643	10.111	10.010	10.427	—	—
	11.2	11.143	11.143	11.453	—	10.893	10.893	11.071	11.471	10.972	11.250	10.901	11.333	—	—
	12.5	12.094	12.206	12.463	—	12.400	12.500	12.500	12.344	11.957	12.639	12.607	12.152	—	—
	14.0	14.041	14.171	14.571	—	13.507	13.507	13.729	14.224	13.606	13.950	13.729	14.183	—	—
	16.0	14.589	14.725	15.857	—	—	15.500	15.500	15.306	—	15.672	—	15.417	—	—
18.0	—	—	—	—	—	—	—	16.947	—	—	—	—	—	—	
<b>3x</b> 	14.0	—	—	—	—	14.009	—	—	—	—	—	—	—	—	—
	16.0	15.931	15.543	—	—	15.566	—	—	—	15.188	—	15.618	—	15.902	—
	18.0	18.496	18.045	18.587	—	17.308	18.910	17.260	—	18.265	17.719	18.300	17.735	18.457	17.691
	20.0	19.817	19.895	20.696	21.215	20.235	20.948	19.487	19.244	19.938	19.906	19.929	20.700	19.991	20.471
	22.4	23.008	23.098	22.522	22.541	22.500	22.042	21.802	22.588	22.613	23.262	21.698	22.500	21.659	22.139
	25.0	24.039	24.454	24.054	24.652	25.000	24.583	24.579	24.308	24.686	26.027	25.425	24.641	26.181	24.096
	28.0	27.910	28.391	29.146	27.454	28.320	27.232	28.343	27.731	28.267	28.800	28.232	28.760	28.356	27.882
	31.5	30.671	30.697	30.565	31.903	31.467	30.942	31.952	33.040	30.857	32.533	30.739	31.261	30.722	31.363
	35.5	35.609	35.639	36.914	34.887	36.000	34.276	34.796	35.798	34.862	36.000	36.019	34.908	35.660	34.136
	40.0	38.489	38.640	40.171	40.539	40.000	39.333	41.248	38.795	38.263	40.124	40.184	40.743	38.622	39.500
	45.0	44.686	44.861	42.904	43.971	43.896	43.571	44.918	42.952	43.813	44.400	43.760	44.286	43.951	42.719
	50.0	46.690	47.495	51.987	48.970	48.773	47.960	49.526	50.080	47.829	50.427	47.646	49.406	47.619	48.613
	56.0	54.207	55.142	54.518	56.904	55.800	53.128	53.934	55.448	54.036	55.800	55.830	54.107	55.273	52.910
	63.0	59.570	59.620	60.703	62.226	62.000	60.967	63.934	60.132	58.989	62.193	60.798	63.151	59.864	61.225
71.0	69.161	69.219	66.060	72.309	67.536	67.536	69.623	72.134	67.121	68.820	—	68.643	—	66.214	
80.0	—	—	—	—	—	77.500	78.607	77.625	—	77.316	—	—	—	—	
90.0	—	—	—	—	—	—	—	85.944	—	—	—	—	—	—	
<b>4x</b> 	71.0	—	—	—	—	70.800	—	—	—	71.498	—	66.861	—	72.872	—
	80.0	77.021	78.252	81.978	81.642	78.667	77.356	—	—	78.050	82.290	78.345	75.927	84.583	80.969
	90.0	89.421	94.536	91.278	93.568	90.000	85.690	86.990	—	88.181	91.059	92.894	88.620	91.610	93.692
	100.0	98.268	98.229	95.251	103.743	100.000	96.694	103.119	96.987	96.262	101.491	101.848	96.326	99.256	101.326
	112.0	114.089	105.597	118.125	113.461	111.392	108.929	112.296	116.345	111.182	112.306	110.912	115.205	115.208	110.285
	125.0	118.545	127.386	128.548	128.656	123.769	121.706	125.679	125.201	121.371	127.964	120.762	125.223	124.779	127.615
	140.0	—	132.555	137.096	140.708	139.830	137.105	136.864	141.798	141.333	141.600	141.503	137.137	139.844	138.014
	160.0	154.425	159.908	159.341	163.484	160.000	154.711	162.241	152.592	154.286	162.667	157.865	160.061	162.319	155.383
	180.0	179.287	181.444	177.418	181.869	178.227	174.286	179.673	177.999	174.311	180.000	171.914	173.980	175.804	179.800
	200.0	197.025	196.458	202.476	211.337	198.030	194.730	201.087	200.321	190.286	198.345	187.182	194.096	190.478	194.450
	224.0	228.177	227.766	225.447	231.102	223.728	215.711	218.982	226.877	219.067	219.480	219.330	212.562	221.090	211.642
	250.0	237.681	254.773	256.348	256.564	248.587	244.444	252.424	244.148	239.143	252.133	238.849	248.095	239.458	244.900
	280.0	—	265.110	268.832	280.597	284.400	274.210	282.686	284.798	270.182	279.000	—	269.668	—	—
	315.0	308.850	312.566	317.756	325.662	316.000	310.733	325.856	315.172	294.943	310.964	—	—	—	—
	355.0	—	362.888	353.805	362.681	344.214	344.214	354.855	367.649	335.604	344.100	—	—	—	—
	400.0	394.050	392.363	403.774	421.444	—	395.000	400.643	395.635	—	386.581	—	—	—	—
	450.0	457.491	455.532	449.583	460.861	—	—	—	438.036	—	—	—	—	—	—
500.0	475.362	473.327	489.252	489.665	—	—	—	—	—	—	—	—	—	—	

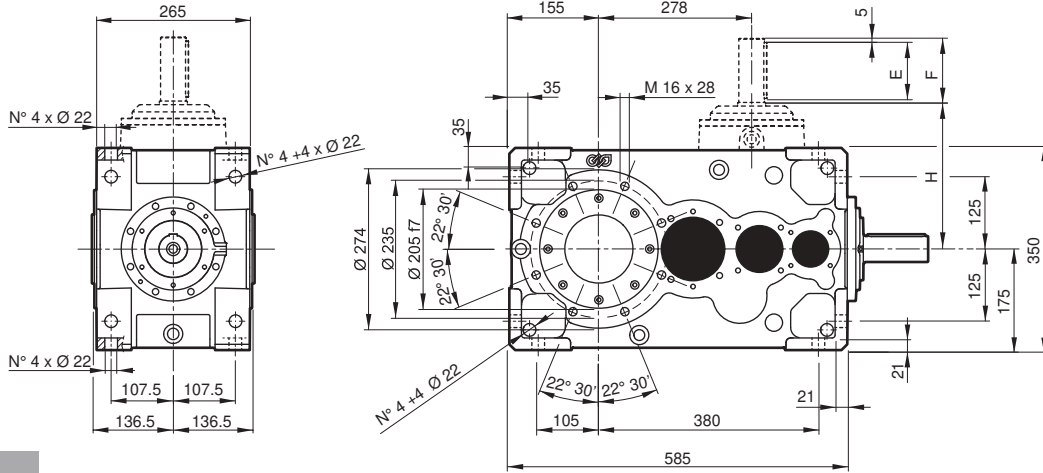
HDO



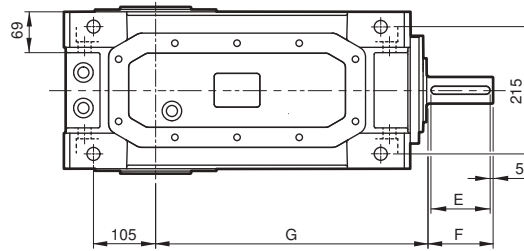
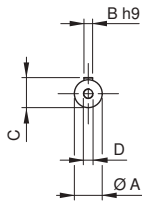
31 DIMENSIONS AND WEIGHT

HDO 71

HDO



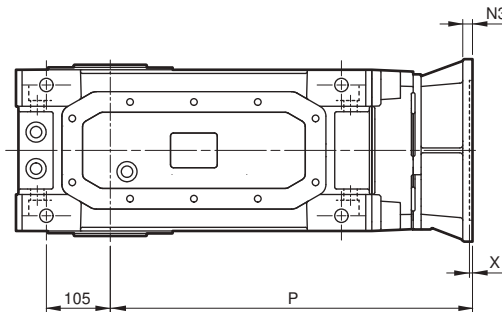
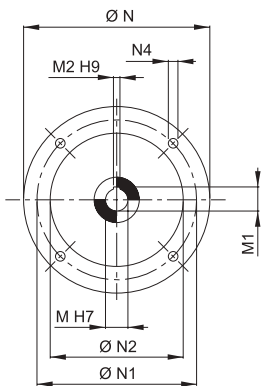
VP



Dimensions are in [mm].

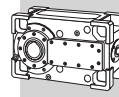
VP	i =	A	B	C	D	E	F	G	H	LP
HDO 71 2	5.6 ... 14.6	45 k6	14	48.5	M16x36	100	110	460	—	210
HDO 71 3	15.9 ... 69.2	32 k6	10	35	M12x28	70	80	507	229	195
HDO 71 4	77.0 ... 475.4	24 j6	8	27	M8x19	50	60	543	—	215

AD



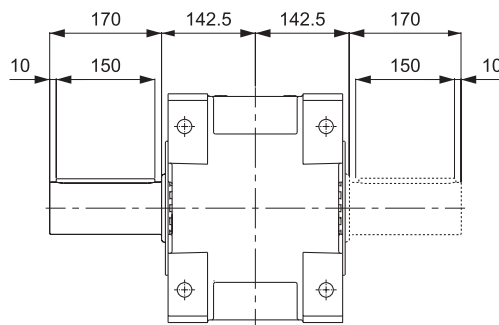
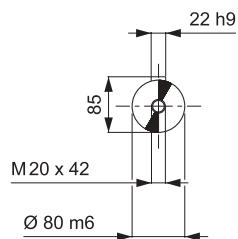
Dimensions are in [mm].

AD	M	M1	M2	N	N1	N2	N3	N4	X	P
HDO 71 3_132	38	41.3	10	300	265	230	16	14	5	595.5
HDO 71 3_160	42	45.3	12	350	300	250	23	18	6	626.5
HDO 71 3_180	48	51.8	14	350	300	250	23	18	6	626.5
HDO 71 3_200	55	59.3	16	400	350	300	—	M16x23	7	651.5

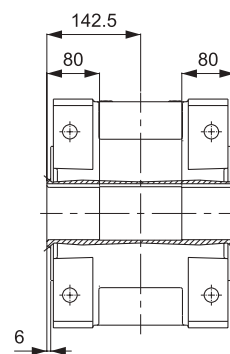
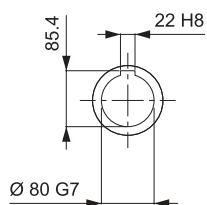


# HDO 71

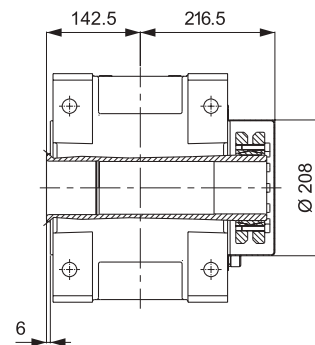
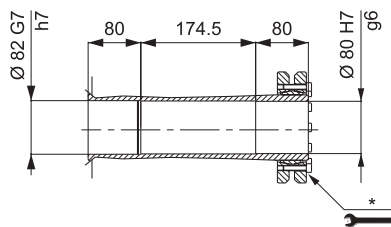
LP



H



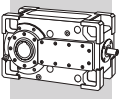
S



HDO

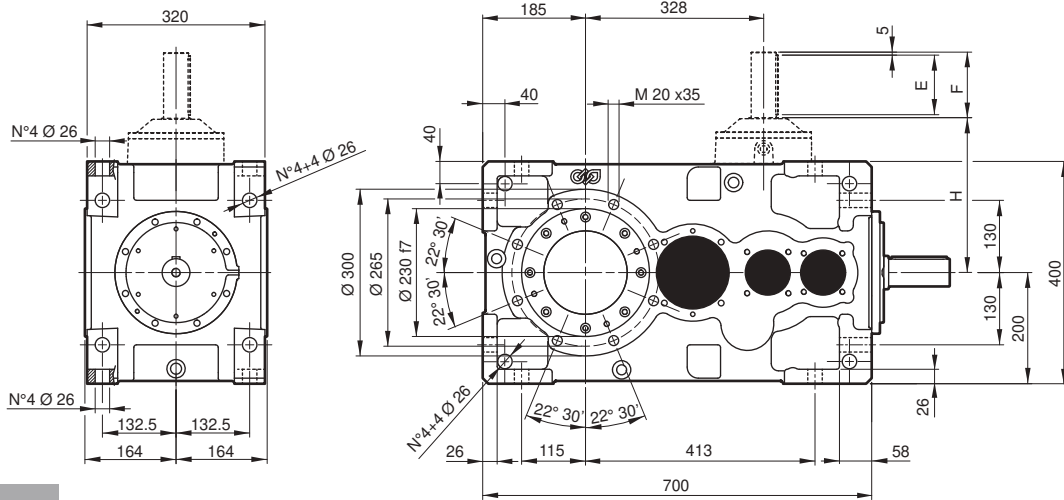
\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

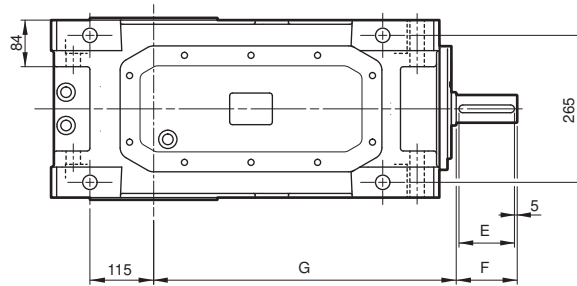
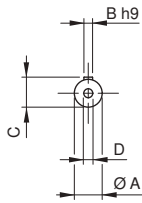


# HDO 81

HDO



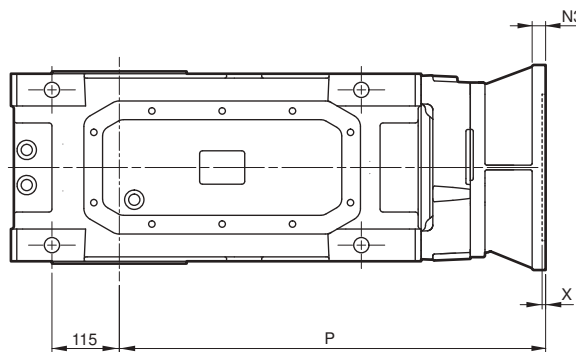
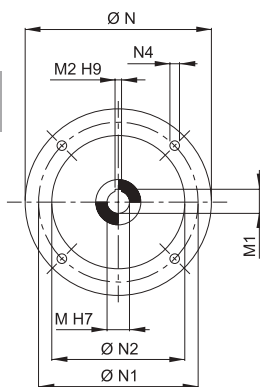
VP



Dimensions are in [mm].

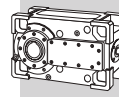
VP	i =	A	B	C	D	E	F	G	H	LP
HDO 81 2	5.5 ... 14.7	50 k6	14	53.5	M16x36	100	110	545.5	—	340
HDO 81 3	15.5 ... 69.2	42 k6	12	45	M16x36	100	110	600	272	330
HDO 81 4	78.3 ... 473.3	28 j6	8	31	M10x22	50	60	645	—	340

AD



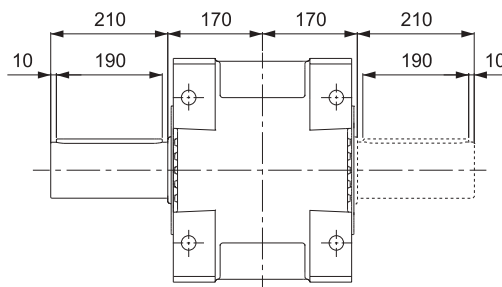
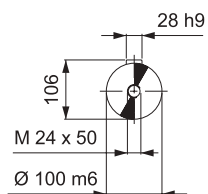
Dimensions are in [mm].

AD	M	M1	M2	N	N1	N2	N3	N4	X	P
HDO 81 3_160	42	45.3	12	350	300	250	23	18	6	727.5
HDO 81 3_180	48	51.8	14	350	300	250	23	18	6	727.5
HDO 81 3_200	55	59.3	16	400	350	300	—	M16x23	7	752.5

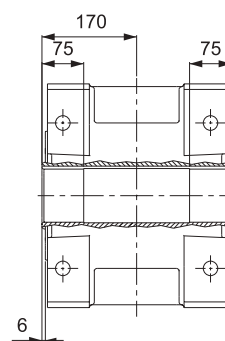
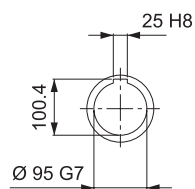


# HDO 81

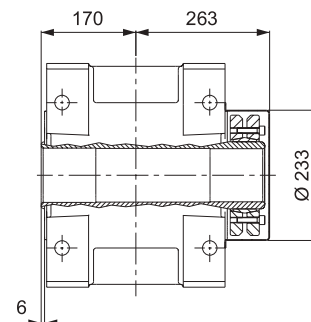
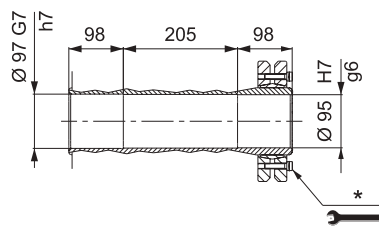
LP



H



S

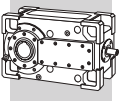


HDO

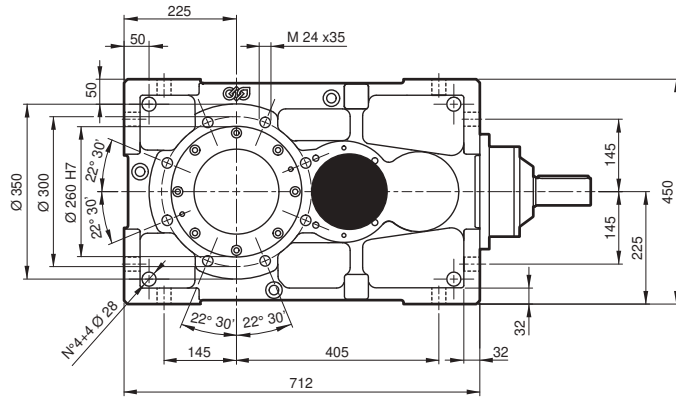
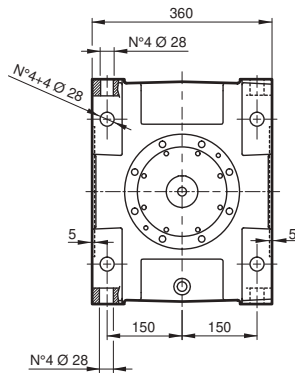
\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

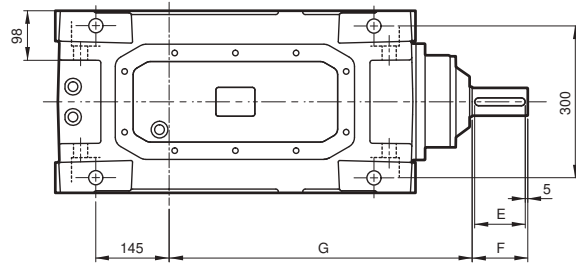
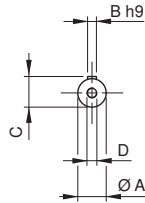




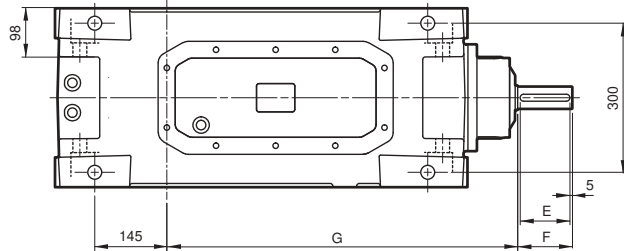
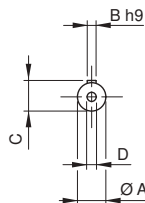
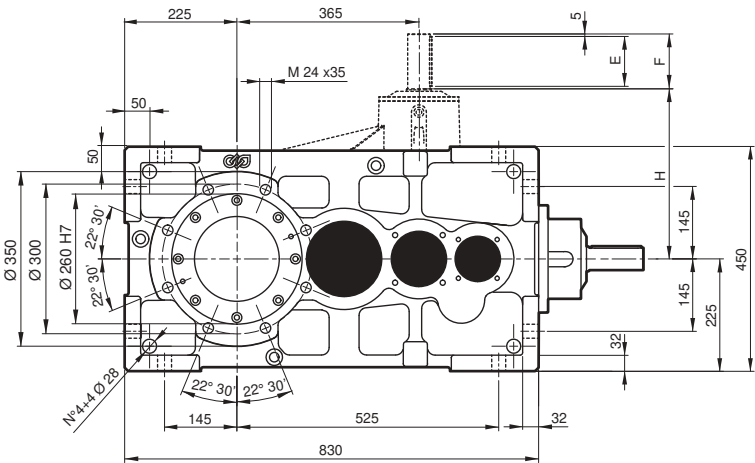
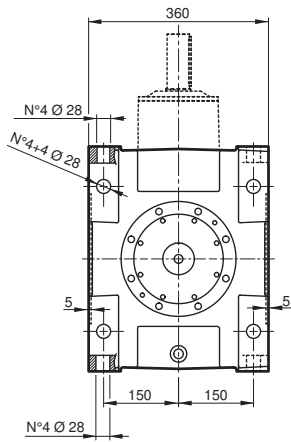
# HDO 91



## HDO 91 2

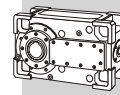


## HDO 91 3 HDO 91 4



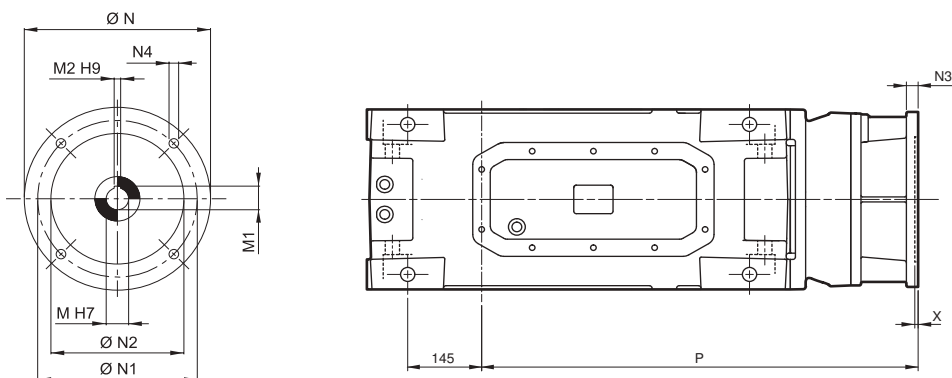
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	G	H	LP
HDO 91 2	7.4 ... 15.9	55 m6	16	59	M20x42	100	110	599	—	430
HDO 91 3	18.6 ... 66.1	45 k6	14	48.5	M16x36	100	110	706	341	490
HDO 91 4	82 ... 489.3	32 k6	10	35	M12x28	70	80	711	—	495



# HDO 91

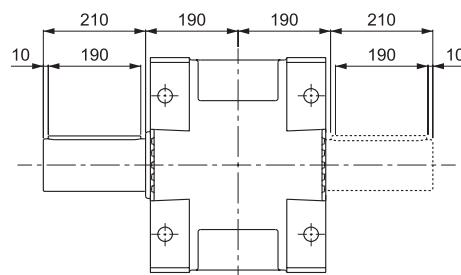
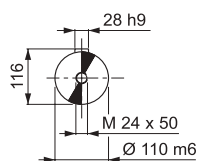
**AD**



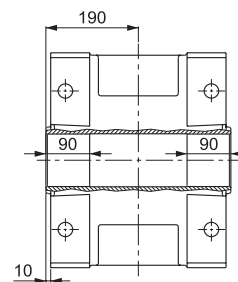
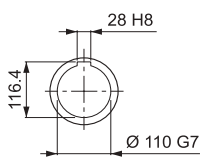
Dimensions are in [mm].

AD	M	M1	M2	N	N1	N2	N3	N4	X	P
HDO 91 3_180	48	51.8	14	350	300	250	23	18	6	855.5
HDO 91 3_200	55	59.3	16	400	350	300	—	M16x23	7	880.5
HDO 91 4_160	42	45.3	12	350	300	250	23	18	6	855.5
HDO 91 4_180	48	51.8	14	350	300	250	23	18	6	855.5
HDO 91 4_200	55	59.3	16	400	350	300	—	M16x23	7	880.5

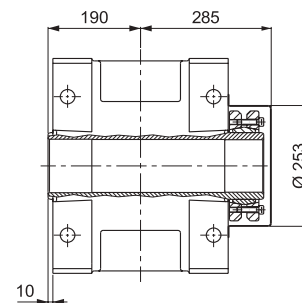
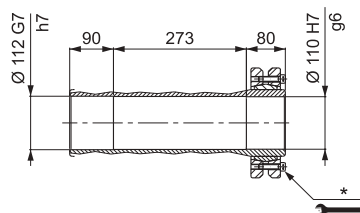
**LP**



**H**

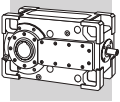


**S**

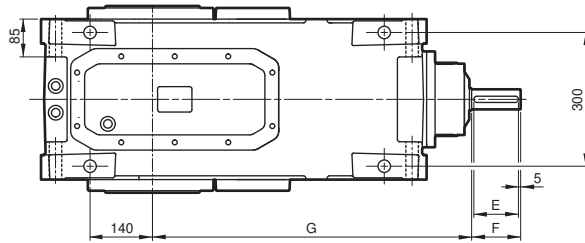
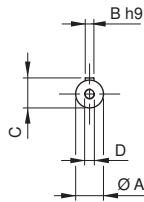
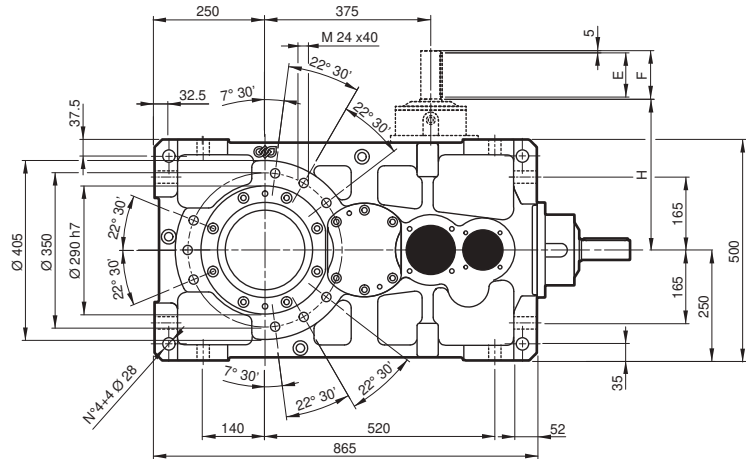
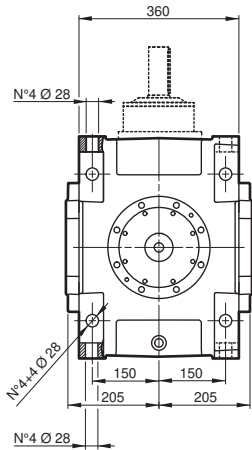


\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].



# HDO 95

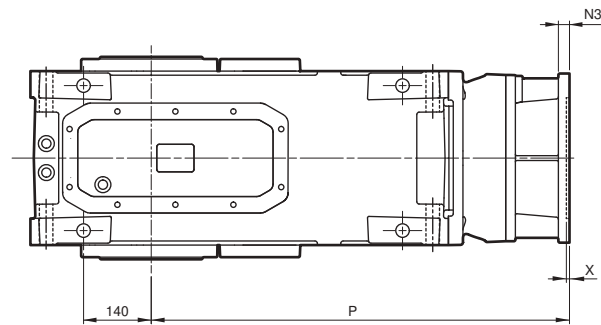
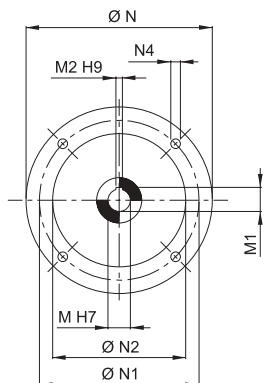


**HDO 95 3**  
**HDO 95 4**

Dimensions are in [mm].

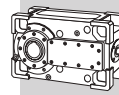
VP	i =	A	B	C	D	E	F	G	H	LP
<b>HDO 95 3</b>	<b>21.2 ... 72.3</b>	45 k6	14	48.5	M16x36	100	110	716	341	560
<b>HDO 95 4</b>	<b>81.6 ... 489.7</b>	32 k6	10	35	M12x28	70	80	711	—	565

**AD**



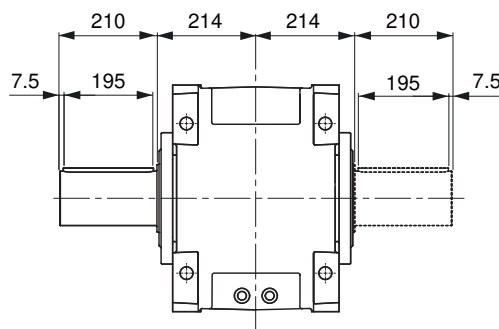
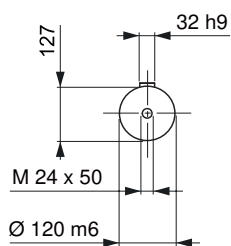
Dimensions are in [mm].

AD	M	M1	M2	N	N1	N2	N3	N4	X	P
<b>HDO 95 3_180</b>	48	51.8	14	350	300	250	23	18	6	865.5
<b>HDO 95 3_200</b>	55	59.3	16	400	350	300	—	M16x23	7	890.5
<b>HDO 95 4_160</b>	42	45.3	12	350	300	250	23	18	6	865.5
<b>HDO 95 4_180</b>	48	51.8	14	350	300	250	23	18	6	865.5
<b>HDO 95 4_200</b>	55	59.3	16	400	350	300	—	M16x23	7	890.5

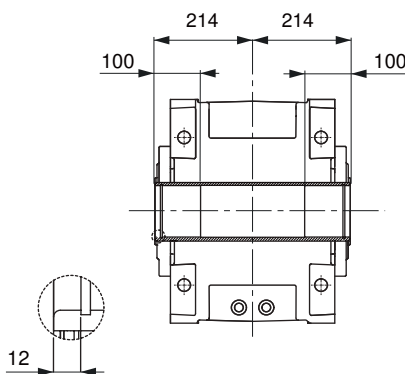
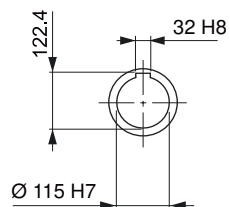


# HDO 95

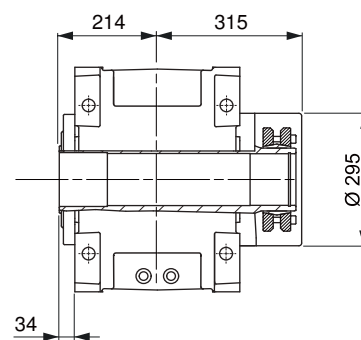
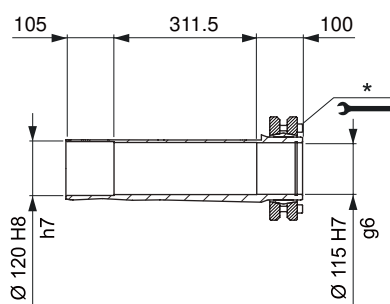
LP



H



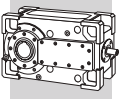
S



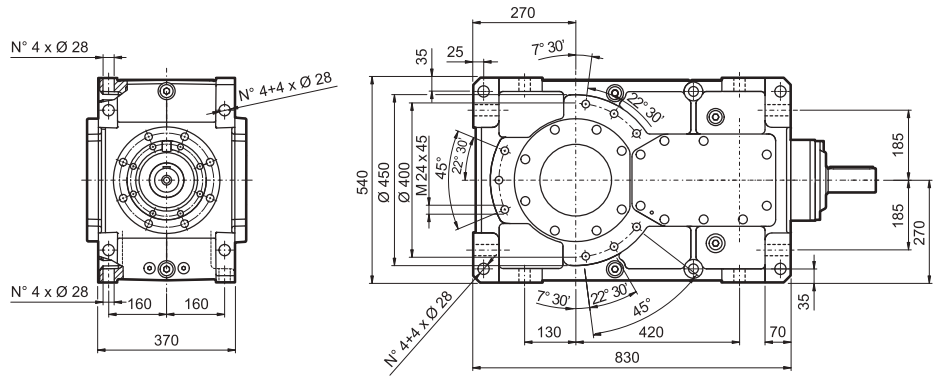
HDO

\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

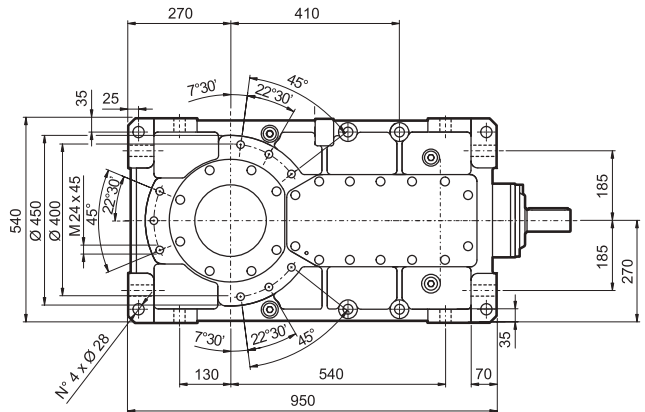
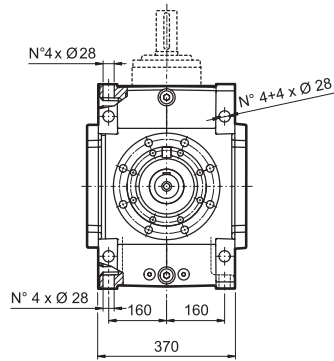
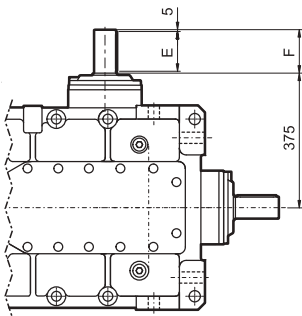
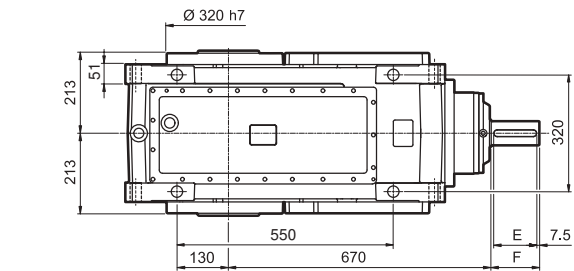
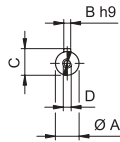
Dimensions are in [mm].



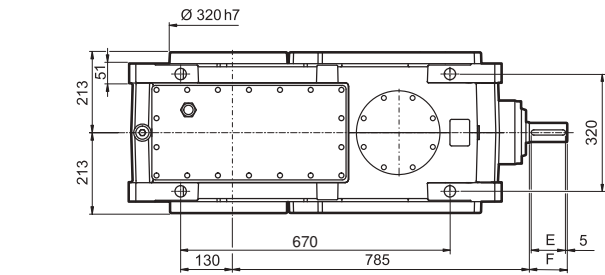
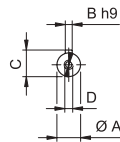
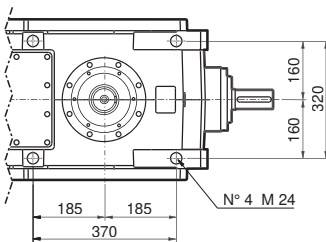
# HDO 100




## HDO 100 2

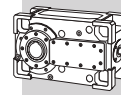


## HDO 100 3 HDO 100 4



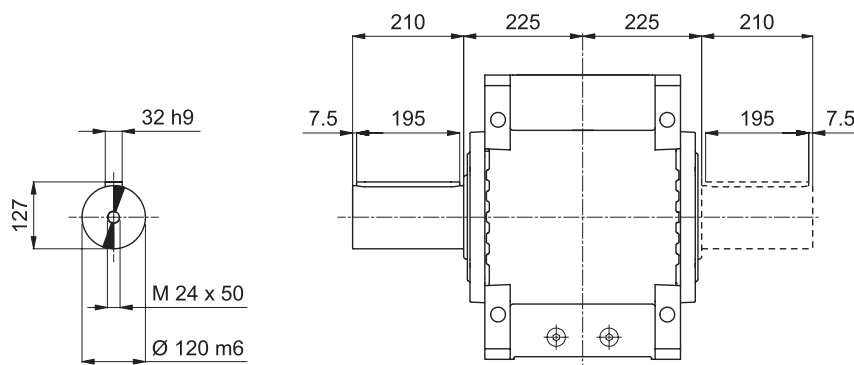
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	 LP
HDO 100 2	5.8 ... 13.5	70 m6	20	74.5	M20x42	125	140	640
HDO 100 3	14 ... 17.3	55 m6	16	59	M20x42	100	110	715
HDO 100 3	20.2 ... 67.5	45 k6	14	48.5	M16x36	100	110	715
HDO 100 4	70.8 ... 139.8	35 k6	10	38	M12x28	70	80	730
HDO 100 4	160 ... 344.2	32 k6	10	35	M12x28	70	80	730

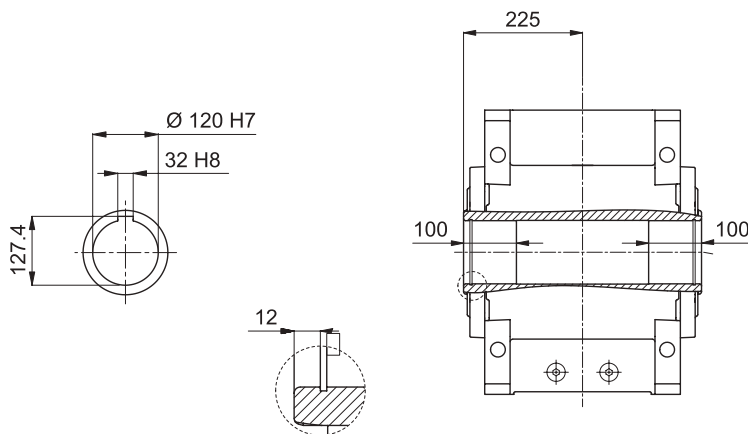


# HDO 100

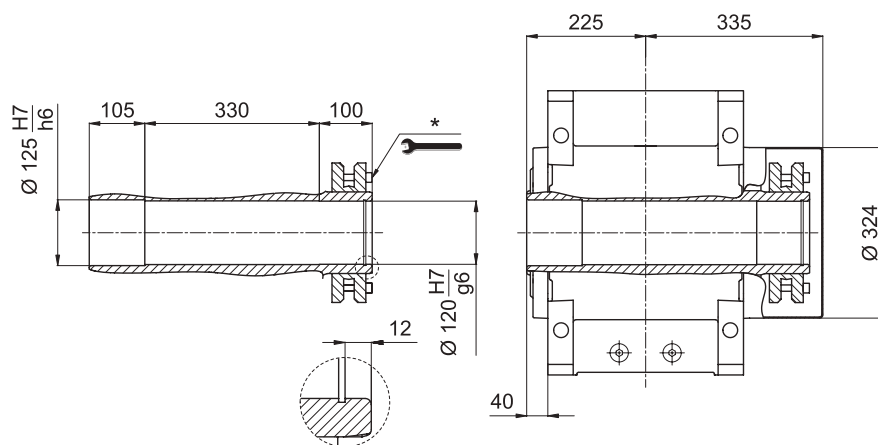
LP



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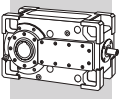


S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

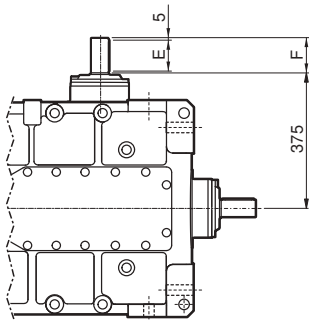
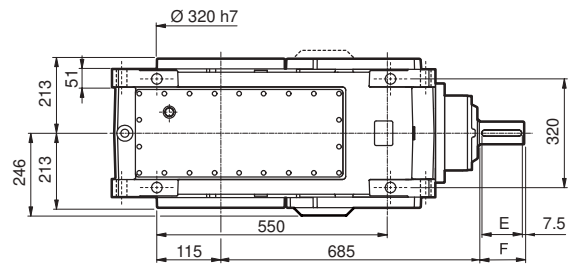
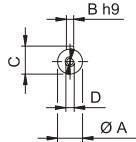
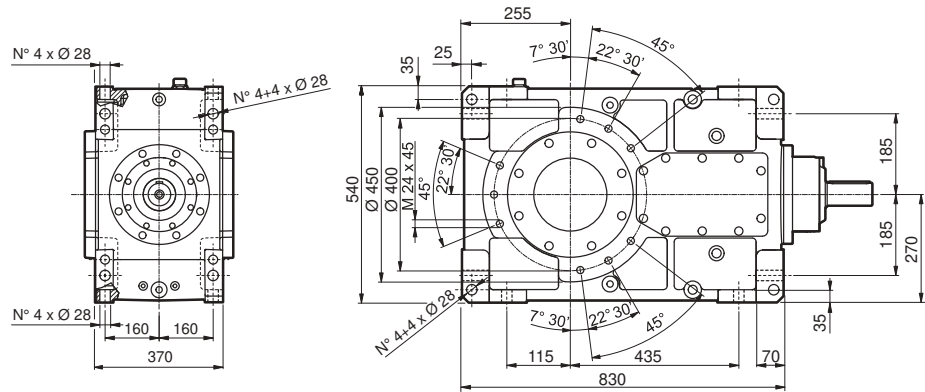
Dimensions are in [mm].



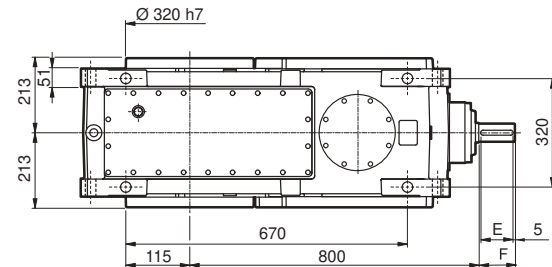
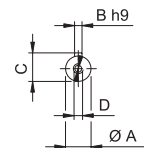
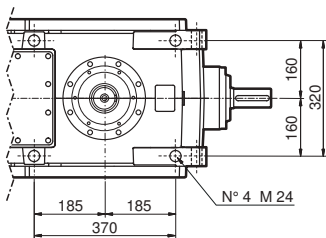
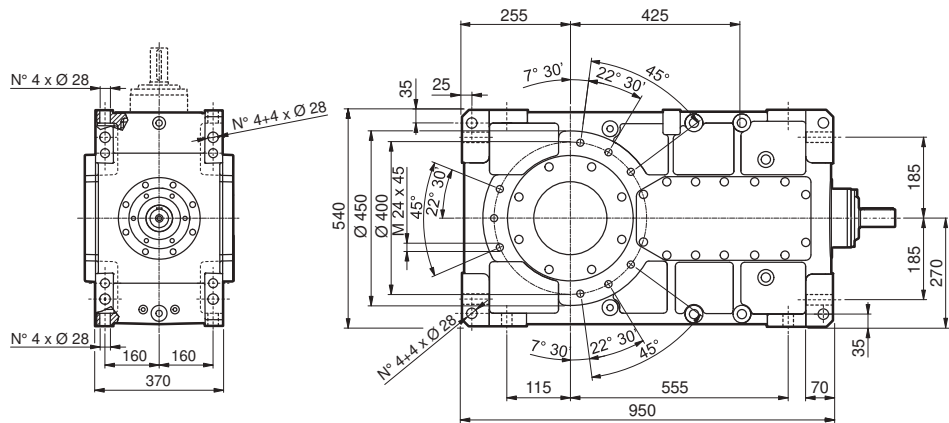
# HDO 110

HDO


## HDO 110 2

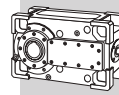


## HDO 110 3 HDO 110 4



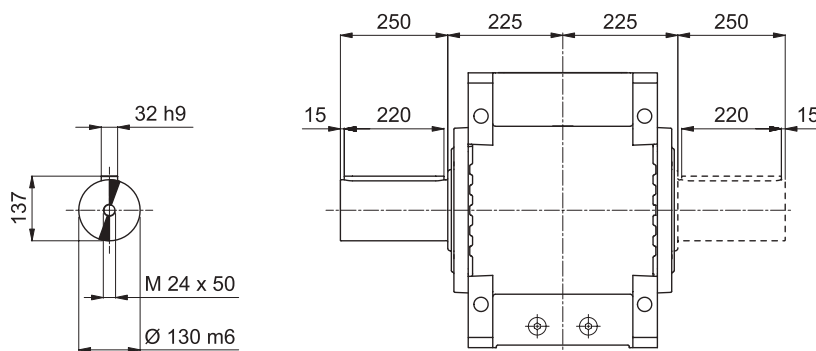
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	 LP
HDO 110 2	6.4 ... 15.5	70 m6	20	74.5	M20x42	125	140	695
HDO 110 3	18.9 ... 20.9	55 m6	16	59	M20x42	100	110	770
HDO 110 3	22 ... 77.5	45 k6	14	48.5	M16x36	100	110	770
HDO 110 4	77.4 ... 121.7	35 k6	10	38	M12x28	70	80	765
HDO 110 4	137.1 ... 395	32 k6	10	35	M12x28	70	80	765

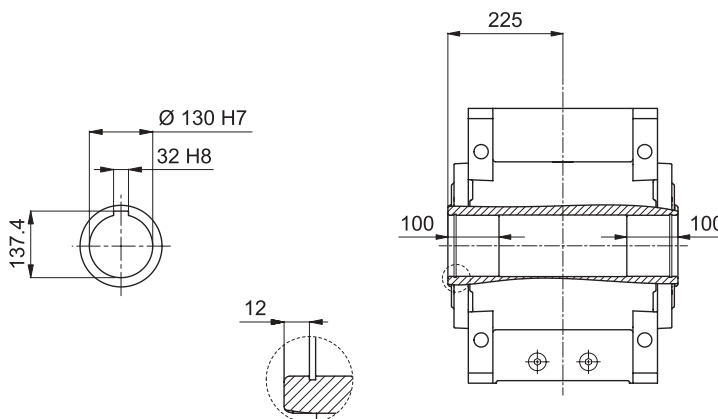


# HDO 110

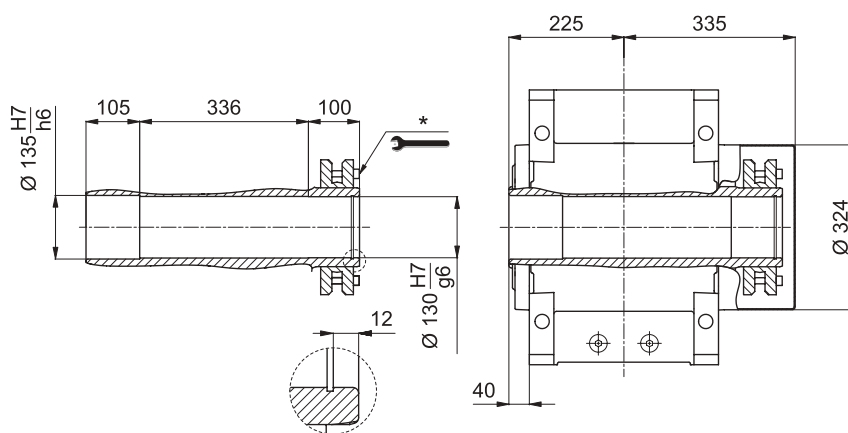
LP



H



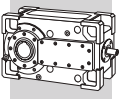
S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

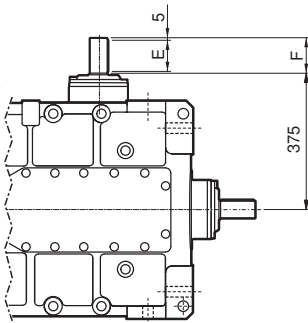
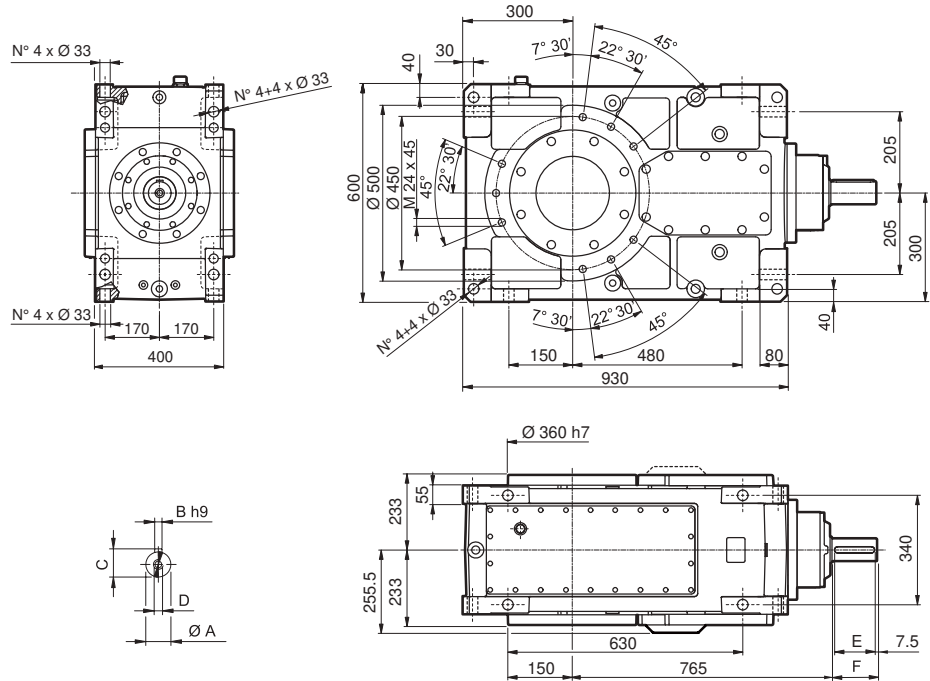




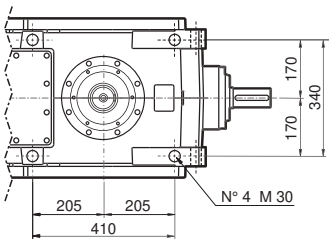
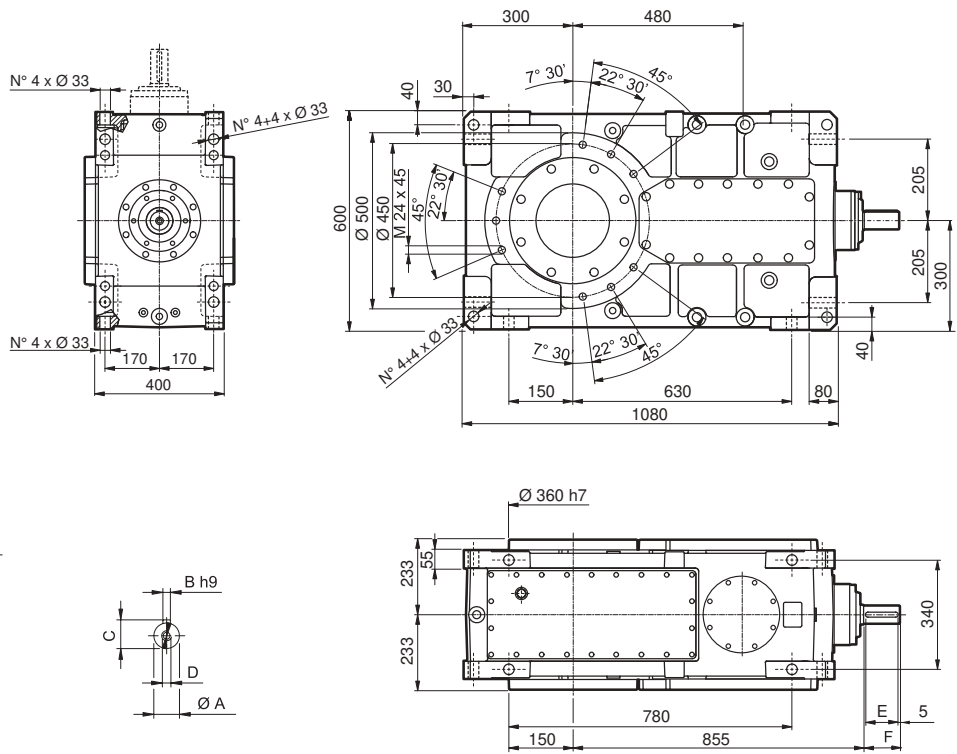
# HDO 120

HDO


## HDO 120 2

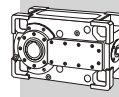


## HDO 120 3 HDO 120 4



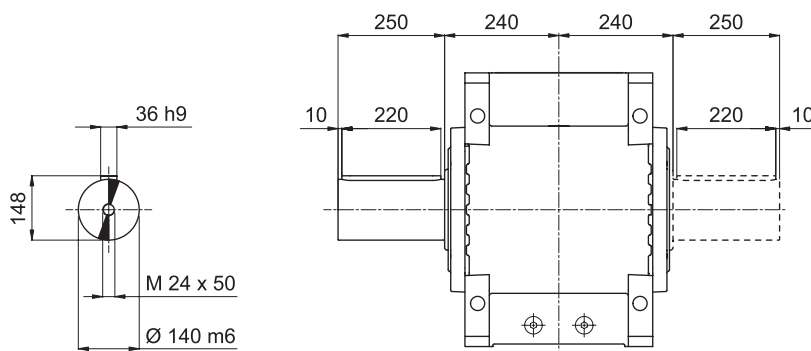
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	 LP
HDO 120 2	6.6 ... 15.5	70 m6	20	74.5	M20x42	125	140	945
HDO 120 3	17.3 ... 24.6	55 m6	16	59	M20x42	100	110	1025
HDO 120 3	28.3 ... 78.6	45 k6	14	48.5	M16x36	100	110	1025
HDO 120 4	87 ... 162.2	35 k6	10	38	M12x28	70	80	990
HDO 120 4	179.7 ... 400.6	32 k6	10	35	M12x28	70	80	990

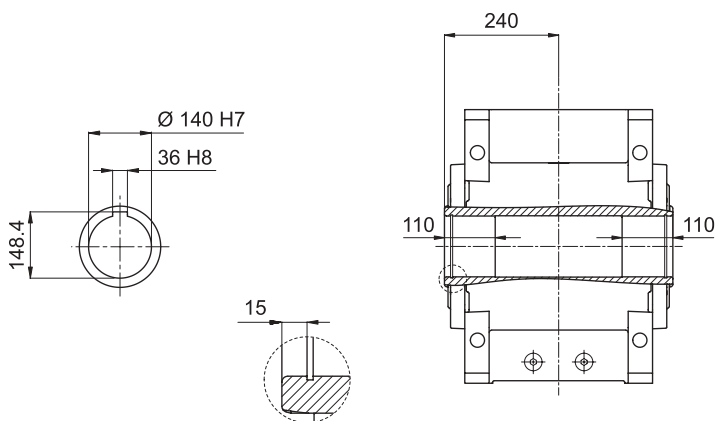


# HDO 120

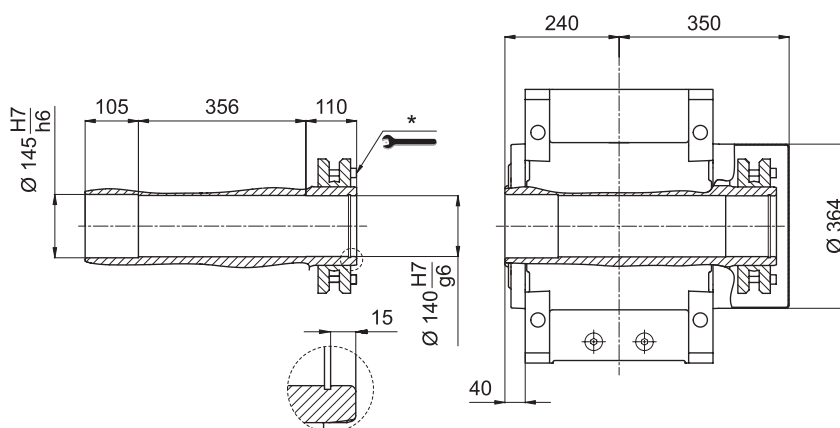
LP



H

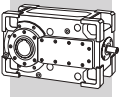


S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

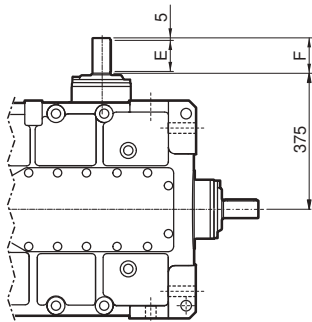
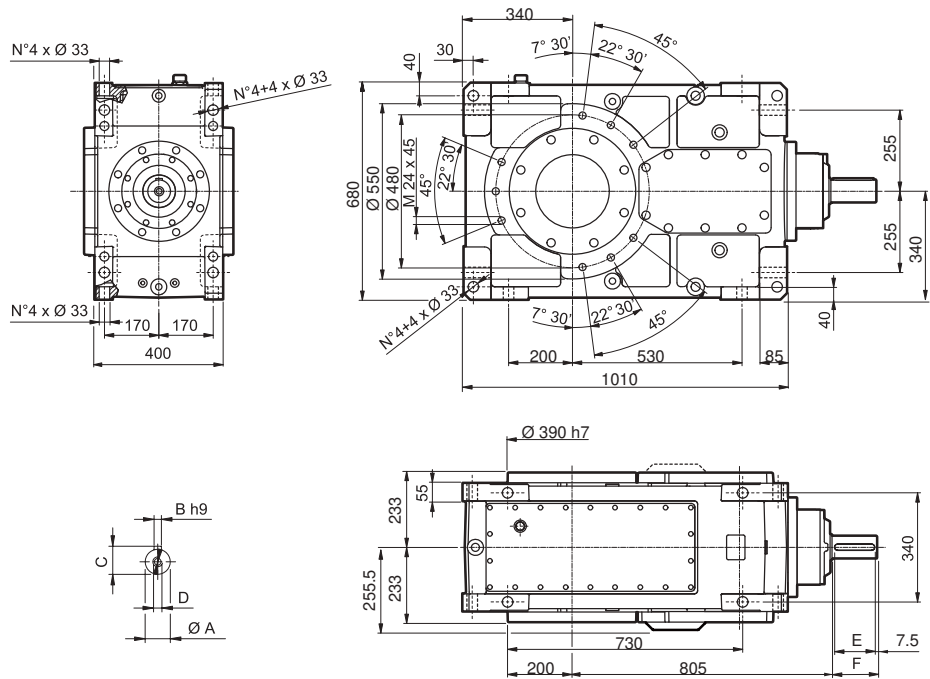
Dimensions are in [mm].



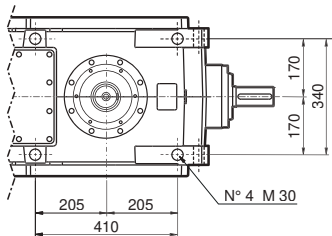
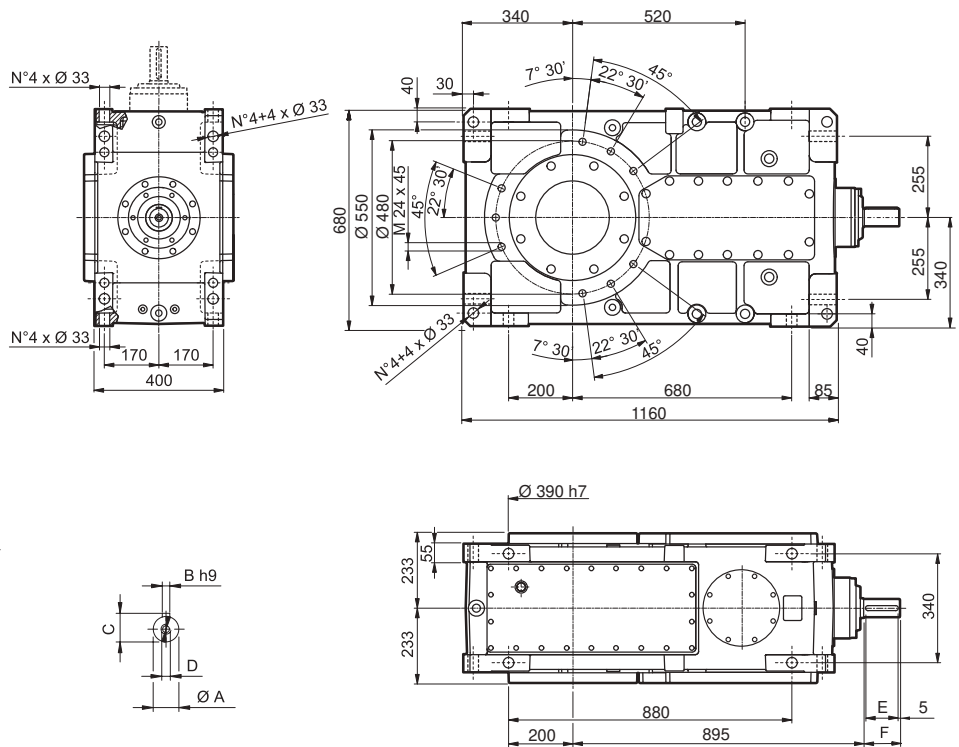
# HDO 125

HDO


## HDO 125 2

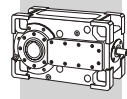


## HDO 125 3 HDO 125 4



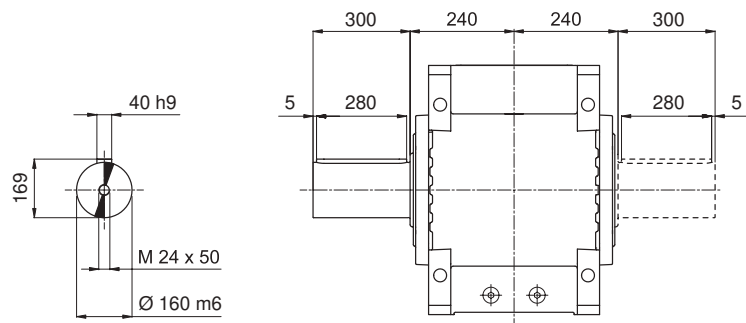
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	 LP
HDO 125 2	7.4...17.0	70 m6	20	74.5	M20x42	125	140	1130
HDO 125 3	19.2...35.8	55 m6	16	59	M20x43	100	110	1205
HDO 125 3	38.8...85.9	45 k6	14	48.5	M16x36	100	110	1205
HDO 125 4	97.0...178.0	35 k6	10	38	M12x28	70	80	1165
HDO 125 4	200.3...438.0	32 k6	10	35	M12x28	70	80	1165

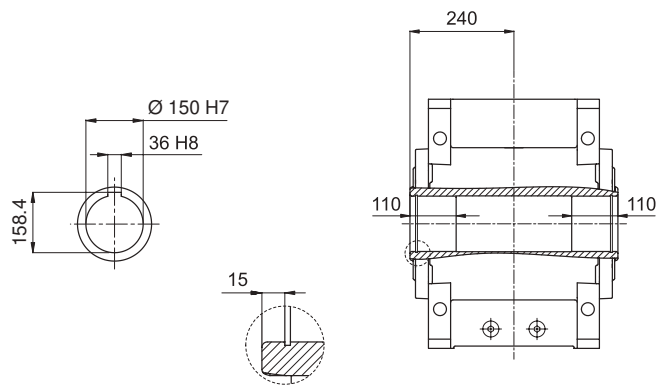


# HDO 125

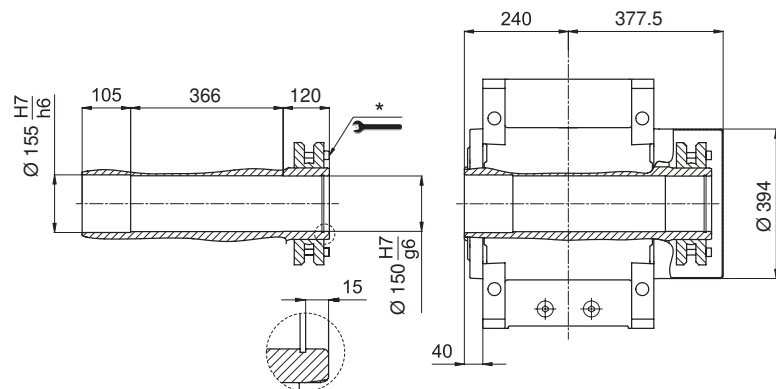
LP



H



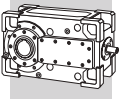
S



HDO

\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

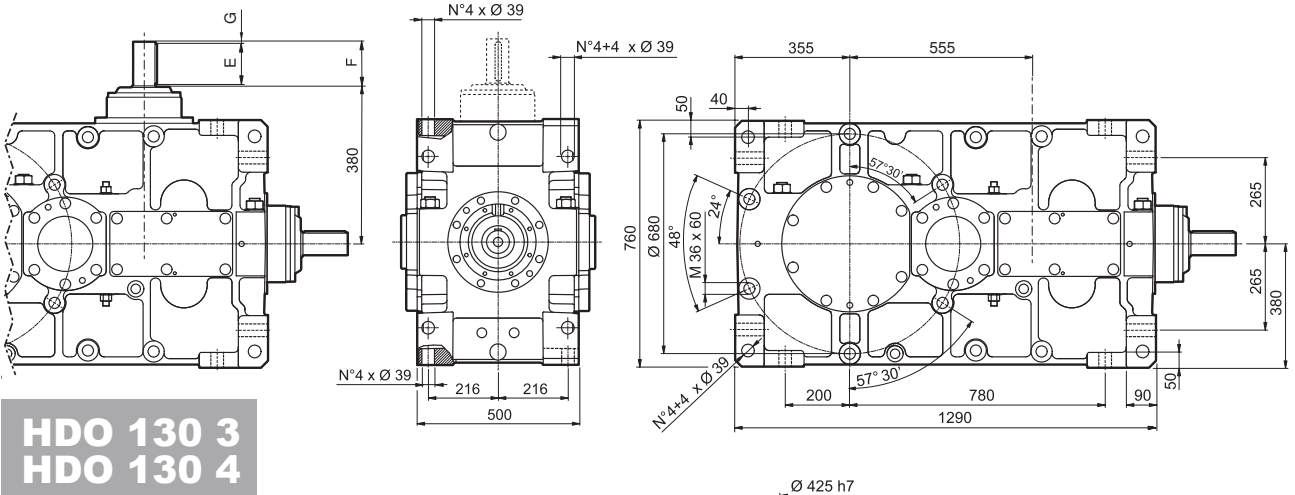
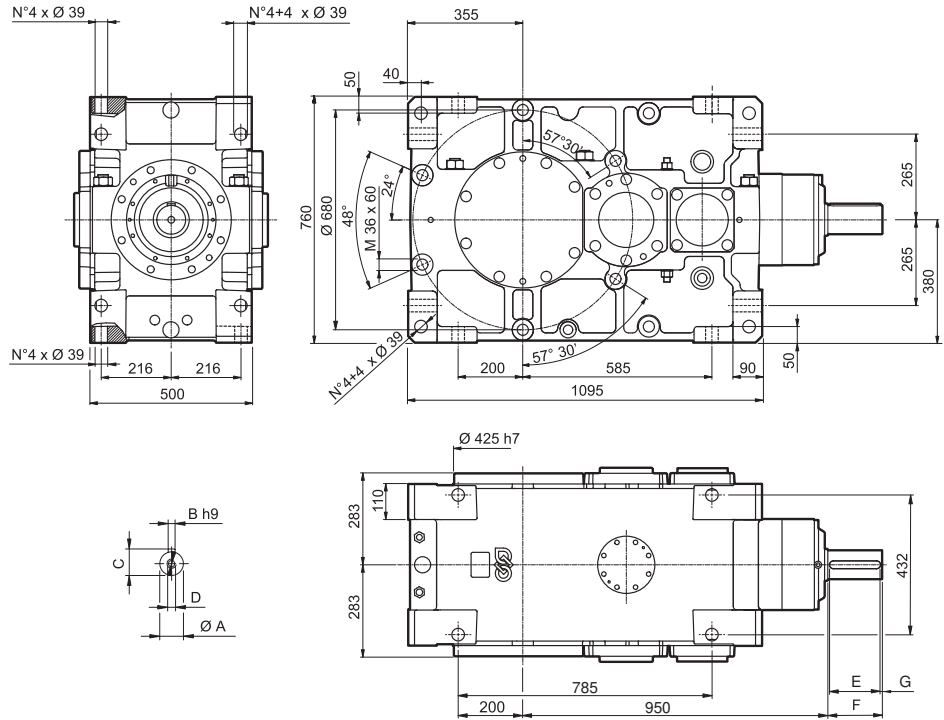
Dimensions are in [mm].



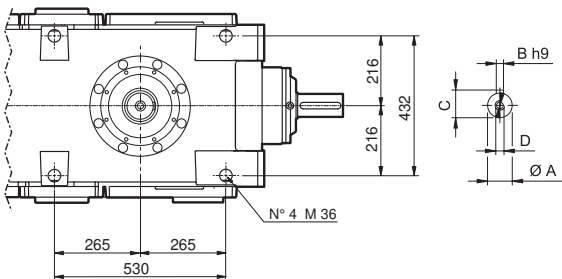
# HDO 130

HDO


## HDO 130 2

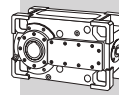


## HDO 130 3 HDO 130 4



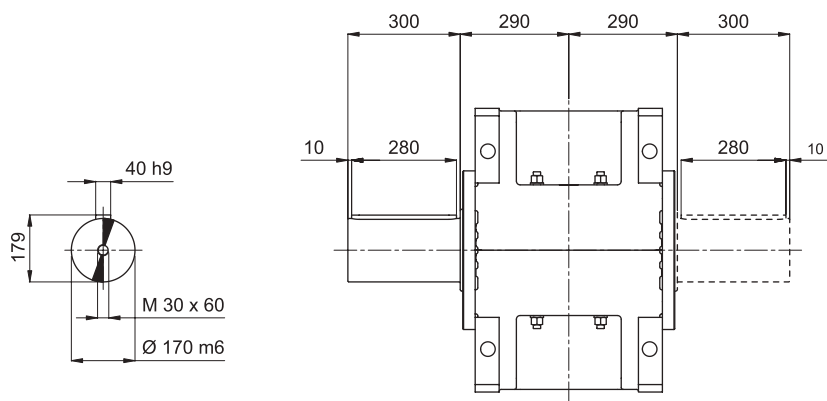
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	G	H	 LP
HDO 130 2	5.7 ... 13.6	90 m6	25	95	M24x50	160	170	5	—	1570
HDO 130 3	15.2 ... 67.1	70 m6	20	74.5	M20x42	125	140	7.5	1040	1730
HDO 130 4	71.5 ... 335.6	45 k6	14	48.5	M16x36	100	110	5	1105	1700

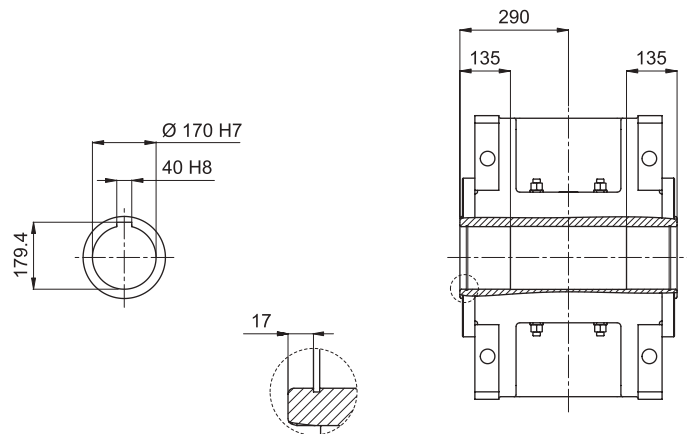


# HDO 130

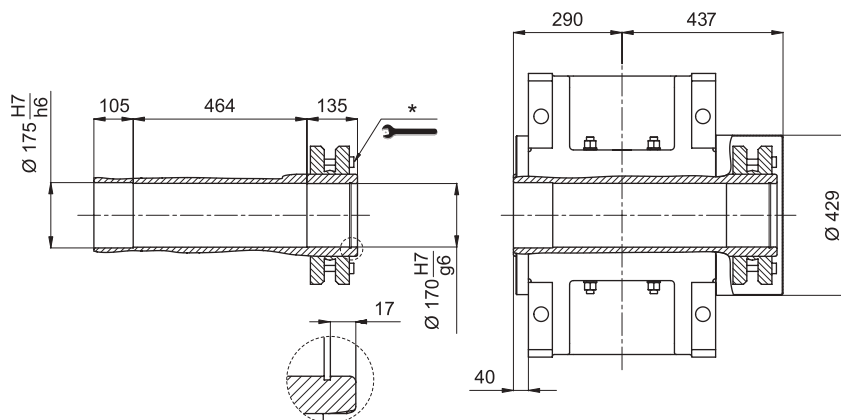
LP



H



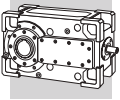
S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

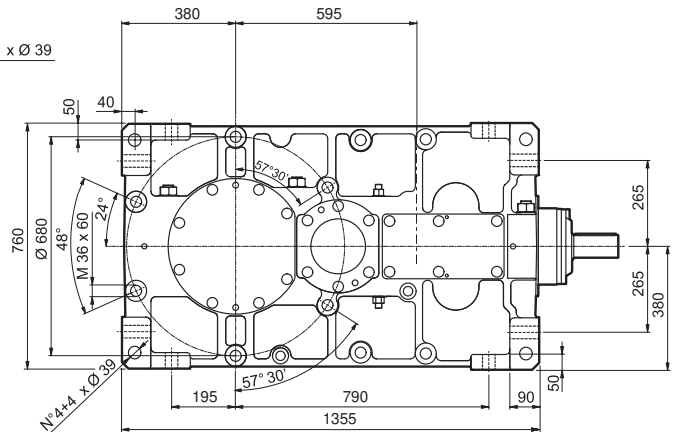
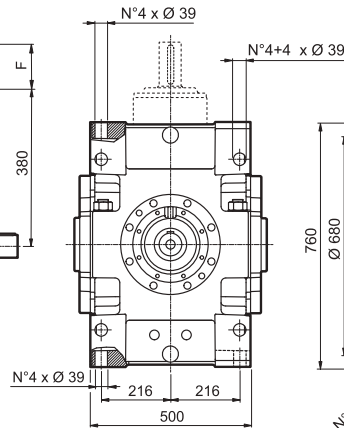
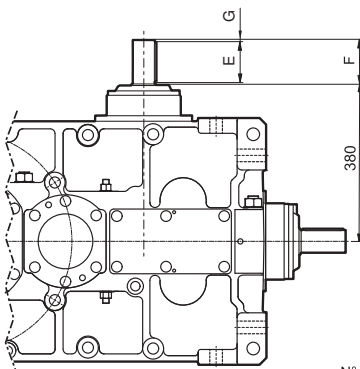
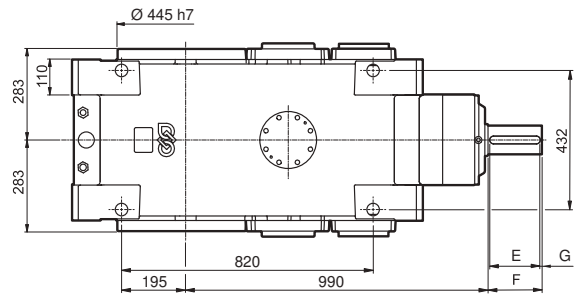
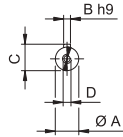
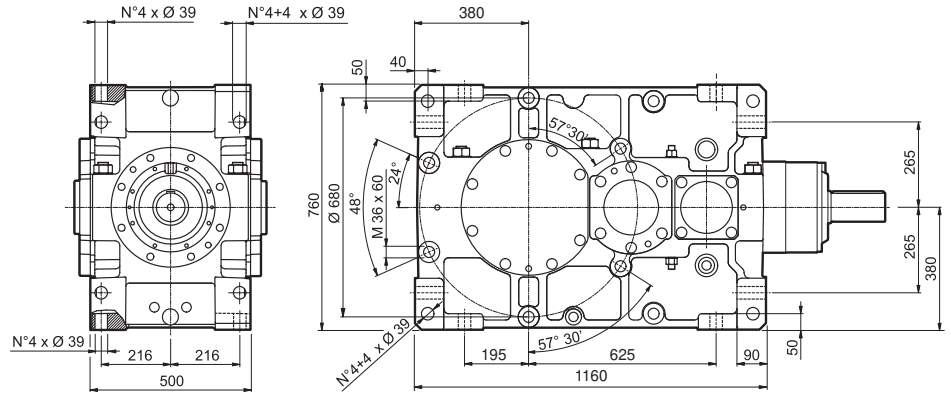
HDO



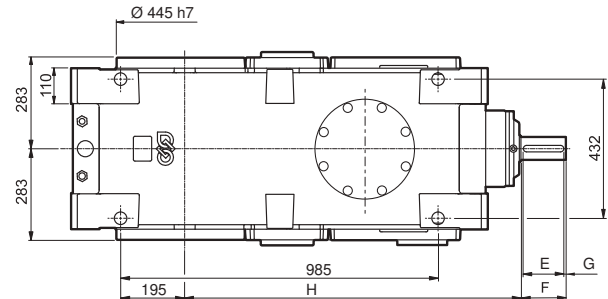
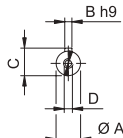
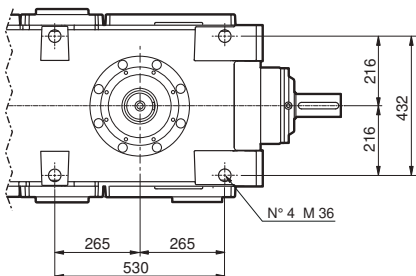
# HDO 140

HDO

## HDO 140 2

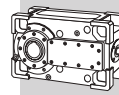


## HDO 140 3 HDO 140 4



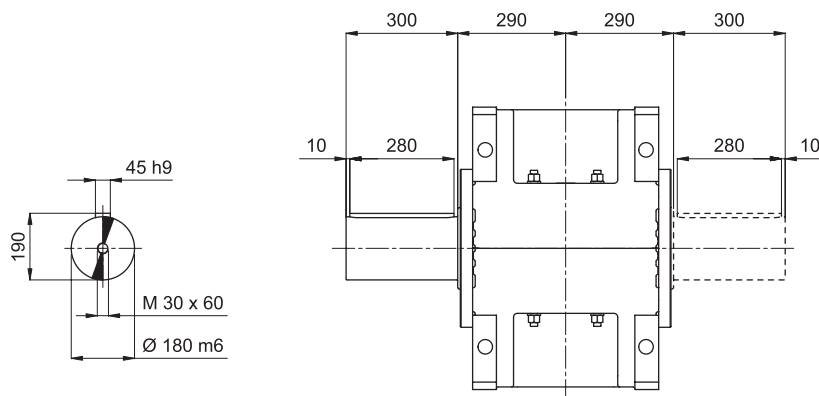
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	G	H	LP
HDO 140 2	6.6 ... 15.7	90 m6	25	95	M24x50	160	170	5	—	1710
HDO 140 3	17.7 ... 77.3	70 m6	20	74.5	M20x42	125	140	7.5	1080	1960
HDO 140 4	82.3 ... 386.6	45 k6	14	48.5	M16x36	100	110	5	1145	1925

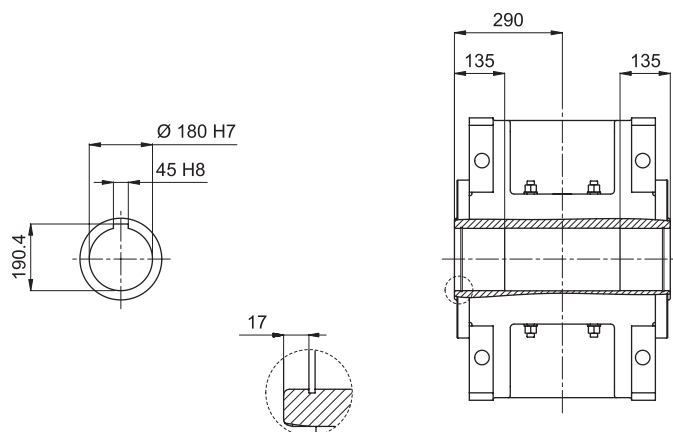


# HDO 140

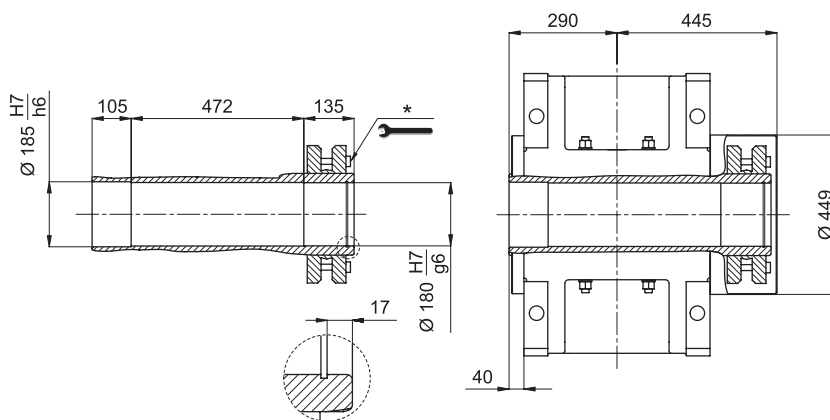
LP



H



S

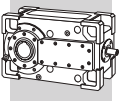


\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

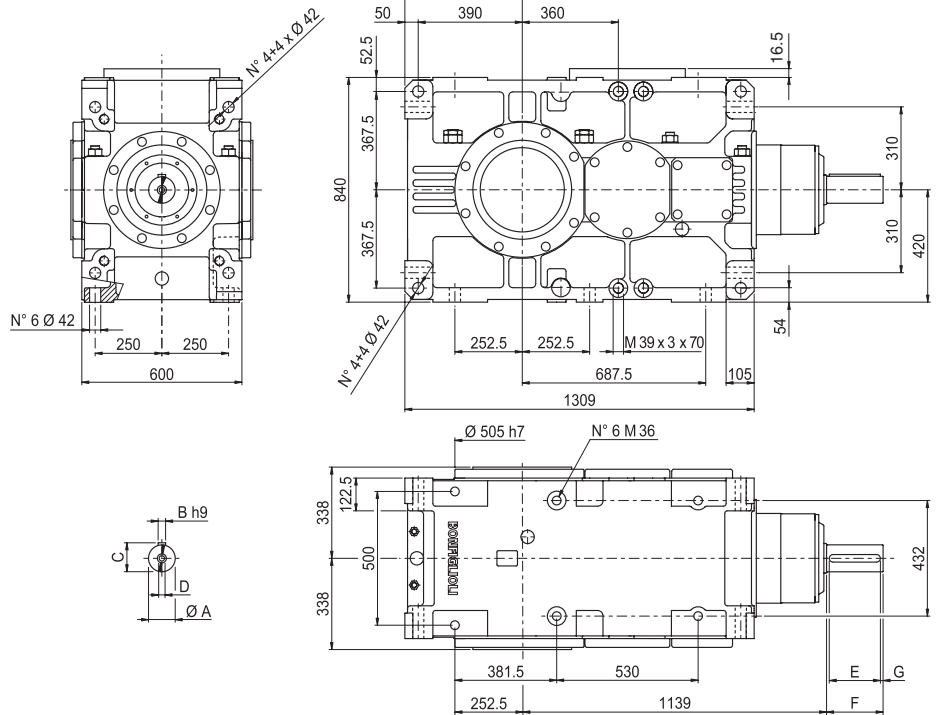
HDO



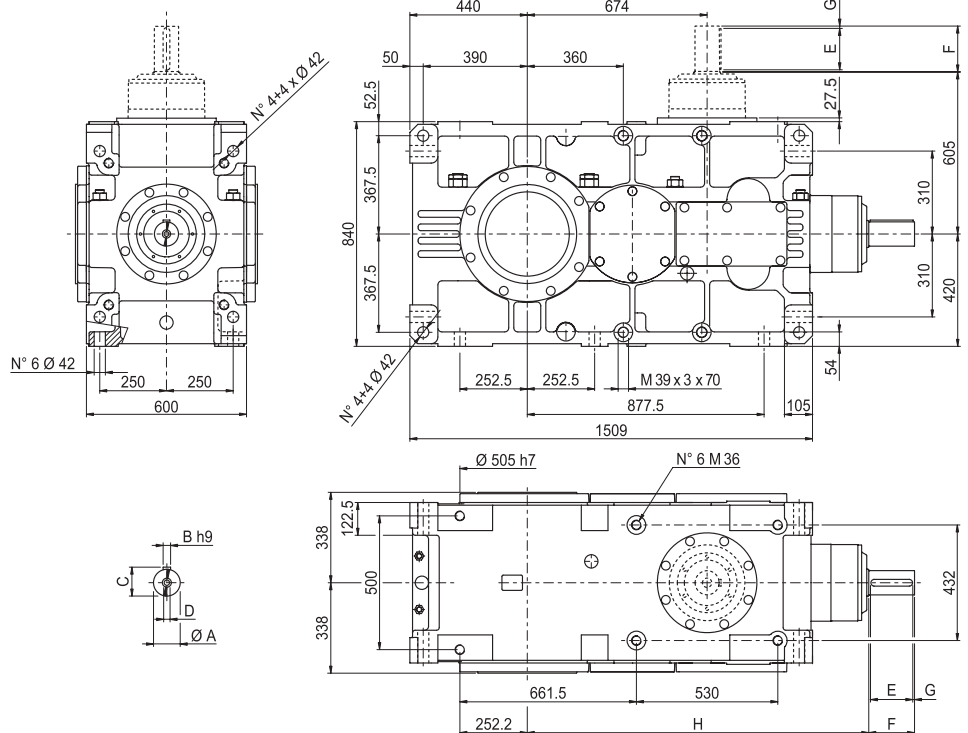


# HDO 150

## HDO 150 2

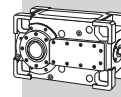


## HDO 150 3 HDO 150 4



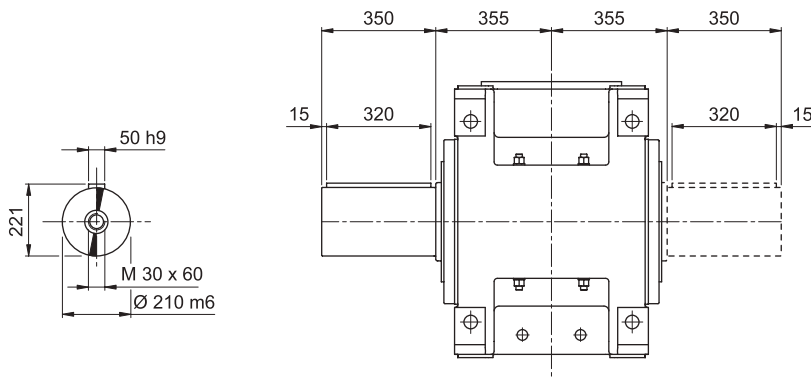
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	G	H	LP
HDO 150 2	5.5 ... 7.0	110 m6	28	116	M24x50	190	210	10	—	2795
HDO 150 2	8.1 ... 13.7	100 m6	28	106	M24x50	190	210	10	—	2795
HDO 150 3	15.6 ... 60.8	90 m6	25	95	M24x50	160	170	5	1279	2895
HDO 150 4	66.9 ... 92.9	55 m6	16	59	M20x42	90	110	5	1249	2875
HDO 150 4	101.8 ... 238.8	45 k6	14	48.5	M16x36	100	110	5	1249	2875

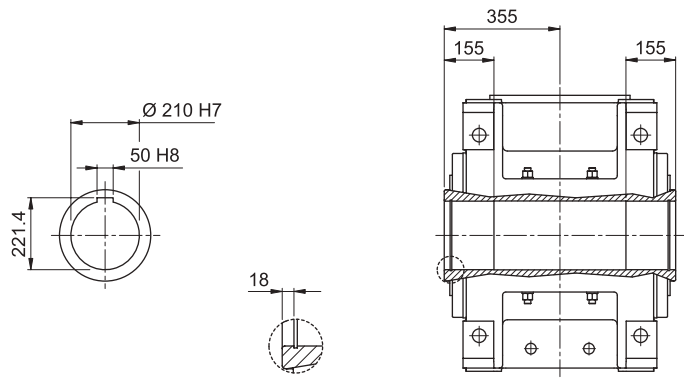


# HDO 150

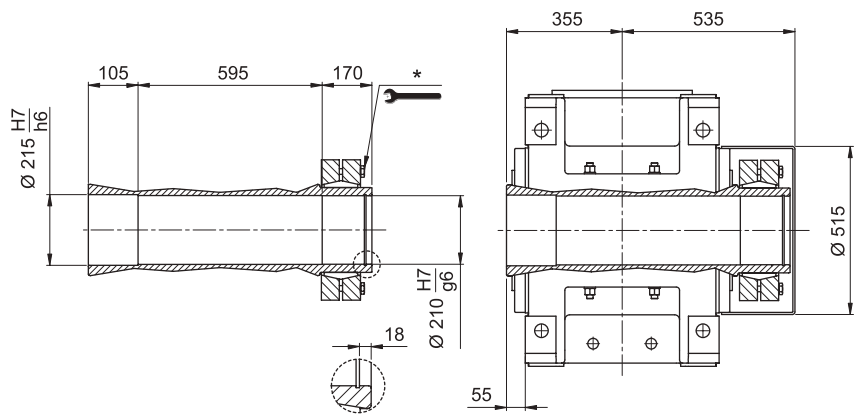
LP



H



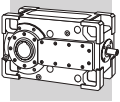
S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

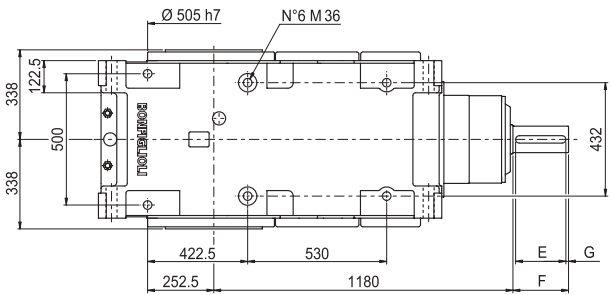
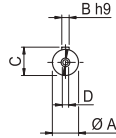
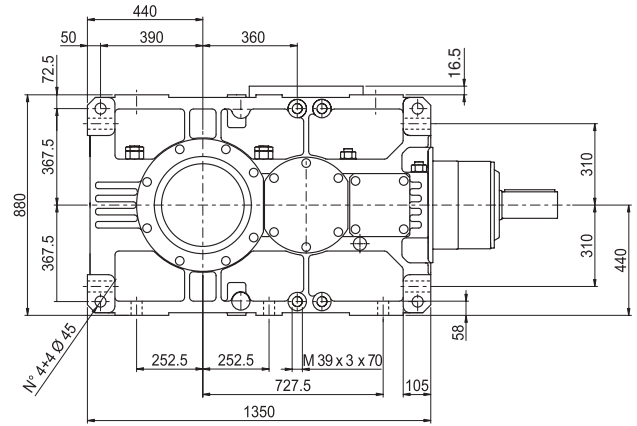
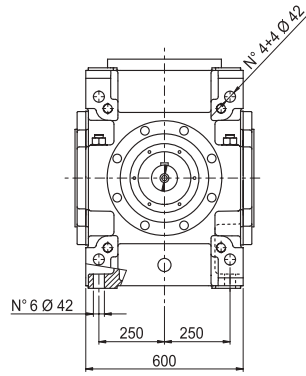
Dimensions are in [mm].

HDO

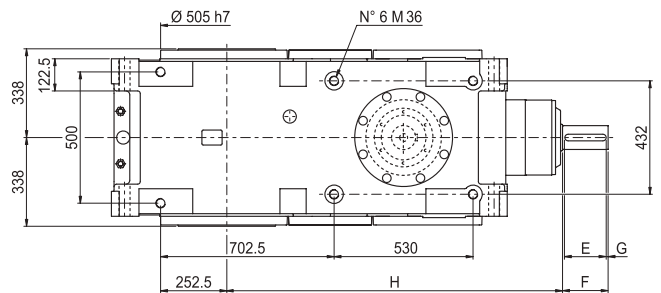
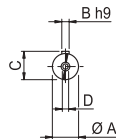
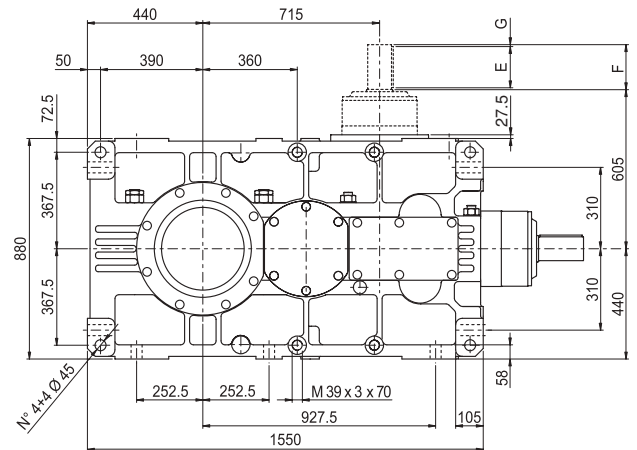
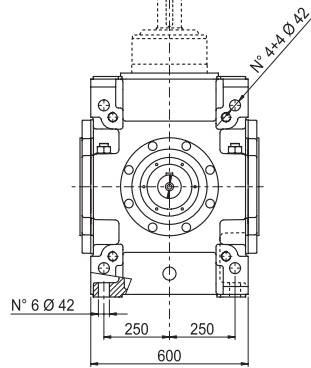


# HDO 160


## HDO 160 2

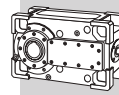


## HDO 160 3 HDO 160 4



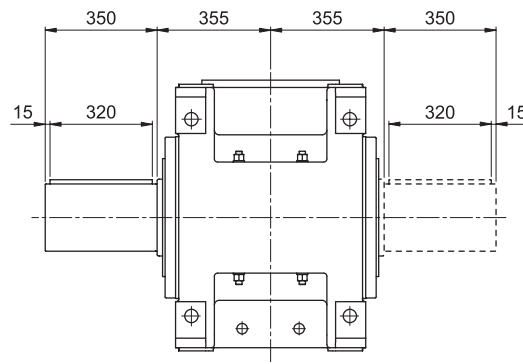
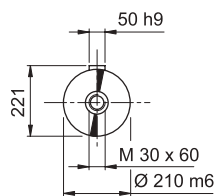
Dimensions are in [mm].

VP	i =	A	B	C	D	E	F	G	H	 LP
HDO 160 2	7.3 ... 7.9	110 m6	28	116	M24x50	190	210	10	—	3075
HDO 160 2	8.9 ... 15.4	100 m6	28	106	M24x50	190	210	10	—	3075
HDO 160 3	17.7 ... 68.6	90 m6	25	95	M24x50	160	170	5	1320	3175
HDO 160 4	75.9 ... 96.3	55 m6	16	59	M20x42	90	110	10	1290	3160
HDO 160 4	115.2 ... 269.7	45 k6	14	48.5	M16x36	100	110	5	1290	3160

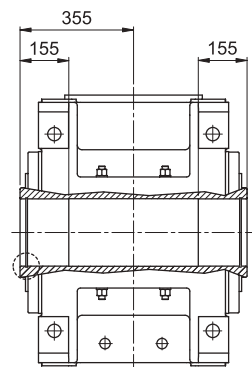
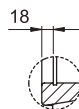
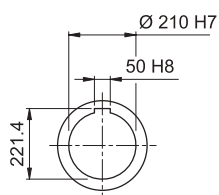


# HDO 160

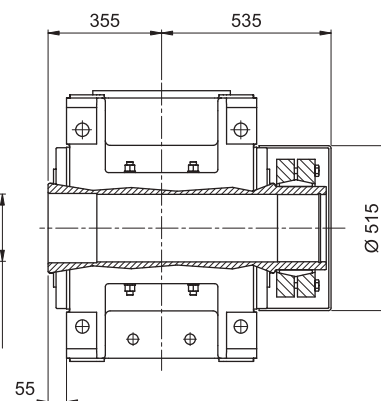
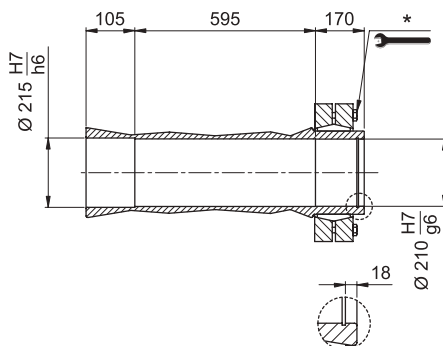
LP



H

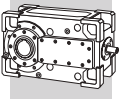


S



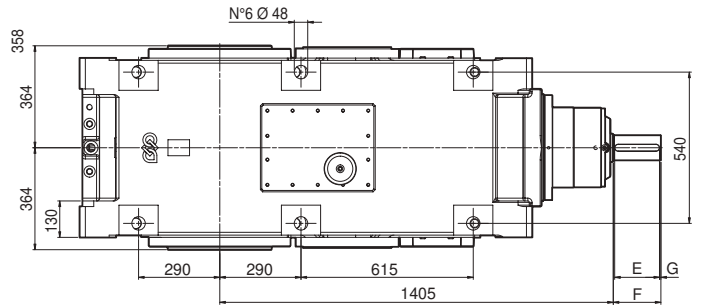
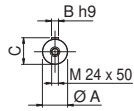
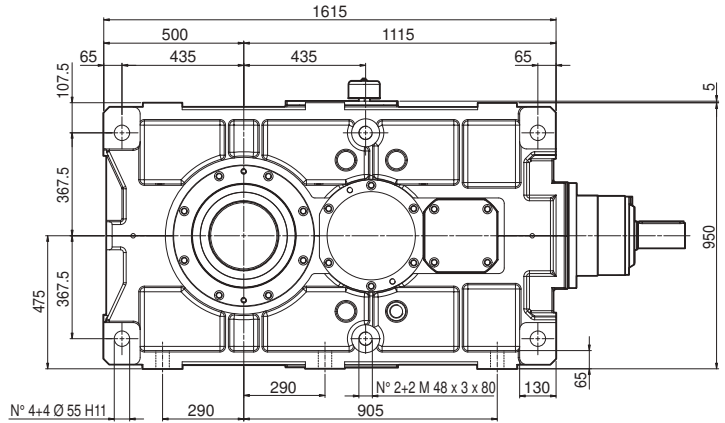
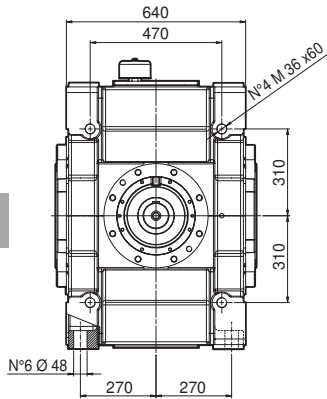
\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].



# HDO 170

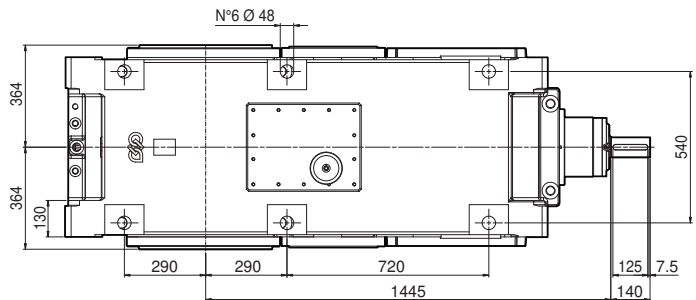
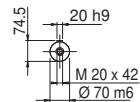
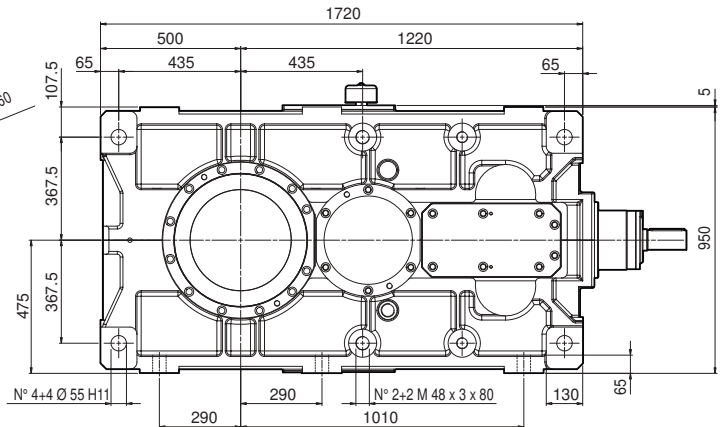
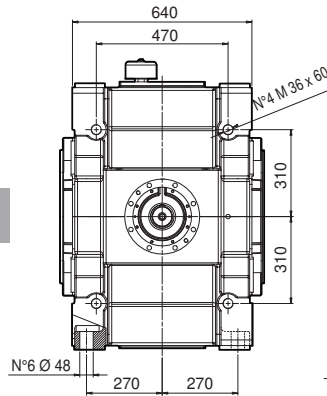
## HDO 170 3



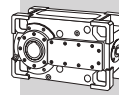
Dimensions are in [mm].

VP	i =	A	B	C	E	F	G	LP
HDO 170 3	15.9 ... 21.7	100 m6	28	106	190	210	10	3675
HDO 170 3	26.2 ... 59.9	90 m6	25	95	160	170	5	3675

## HDO 170 4

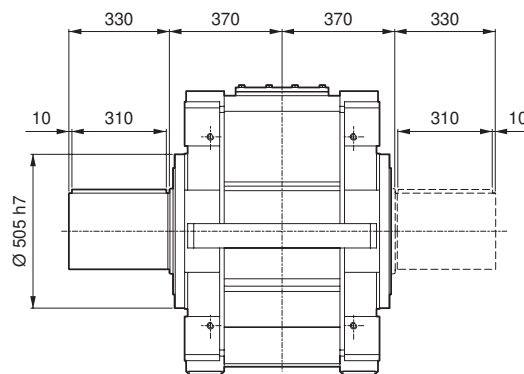
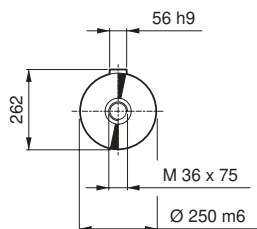


VP	LP
HDO 170 4	3780

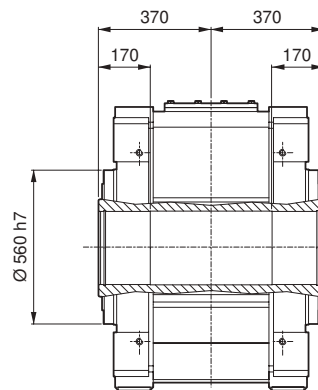
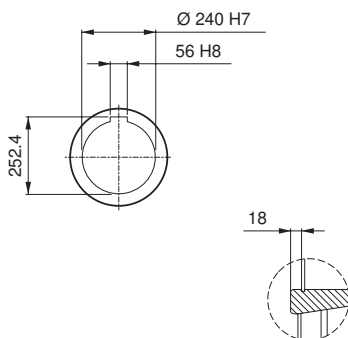


# HDO 170

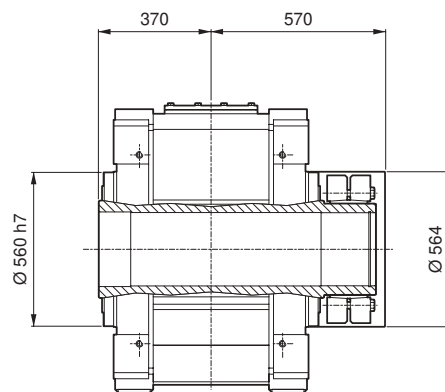
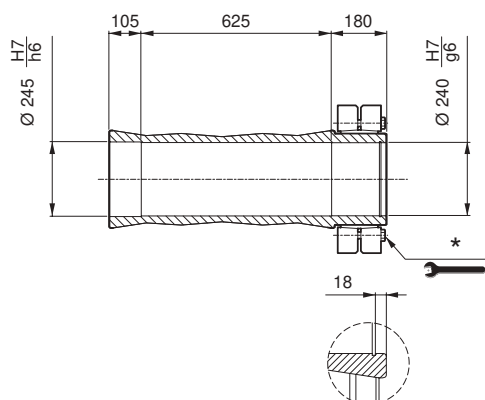
LP



H

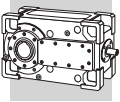


S



\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

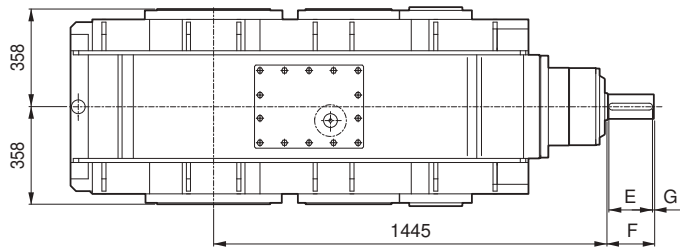
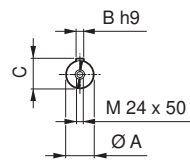
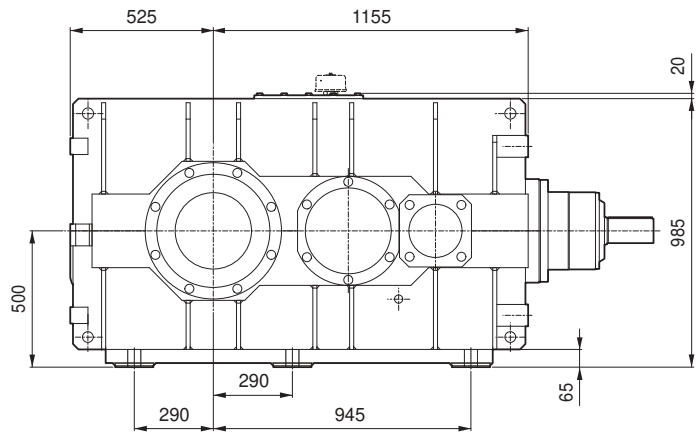
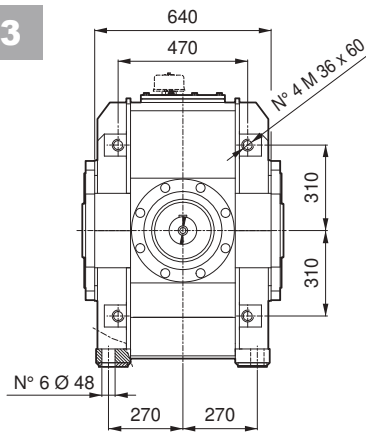
Dimensions are in [mm].



# HDO 180

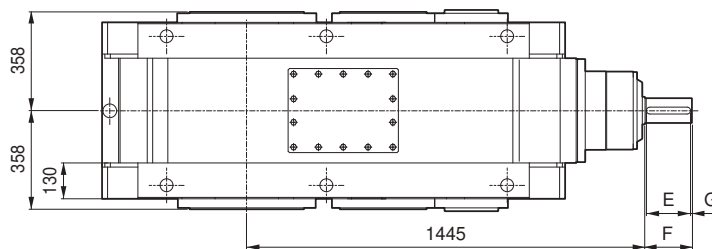
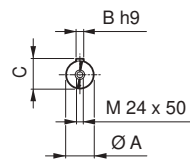
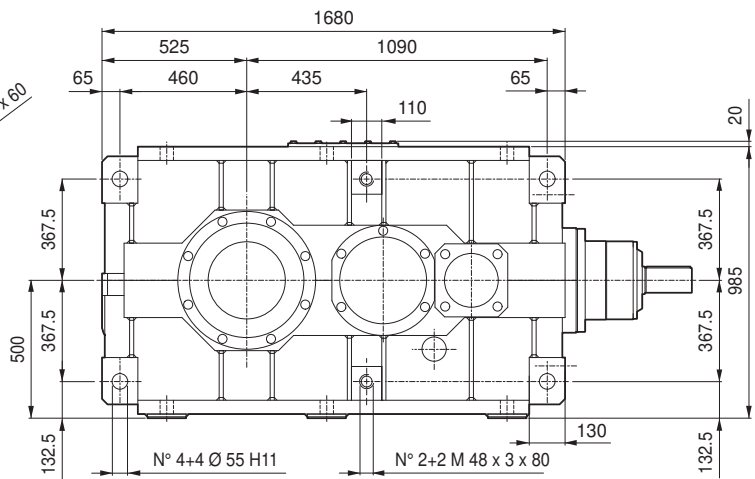
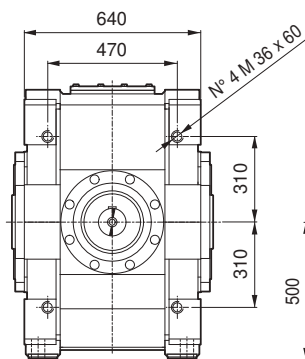
## HDO 180 3

**B3**



## HDO 180 3

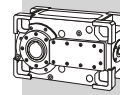
**V5**



Dimensions are in [mm].

VP	i =	A	B	C	E	F	G	LP
HDO 180 3	17.7 ... 27.9	100 m6	28	106	190	210	10	3820
HDO 180 3	31.4 ... 66.2	90 m6	25	95	160	170	5	3820

HDO

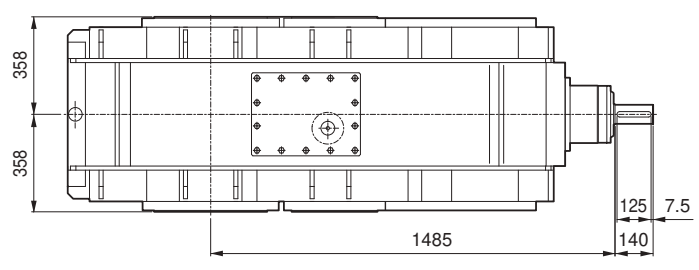
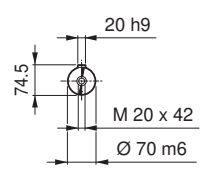
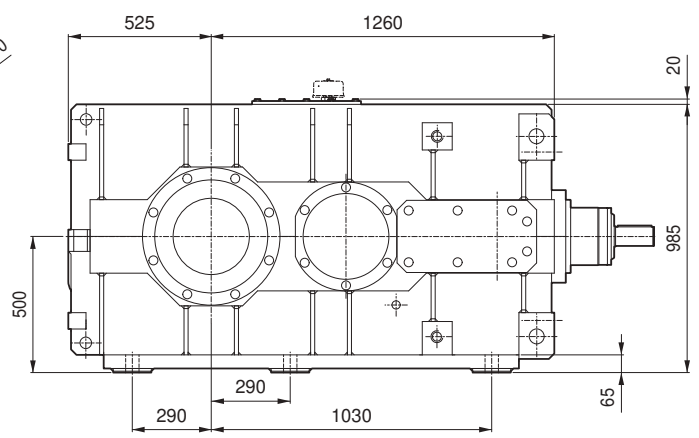
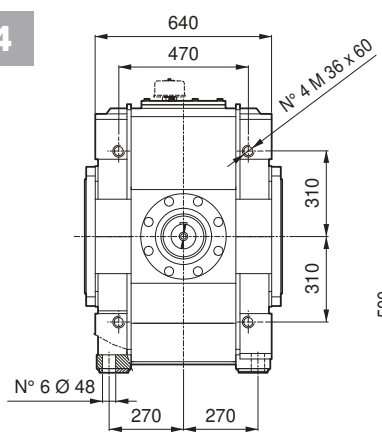


**HDO**

# HDO 180

## HDO 180 4

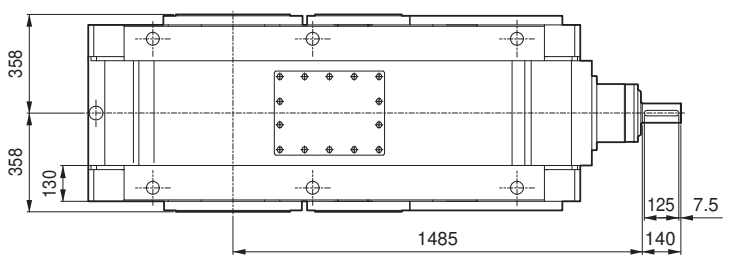
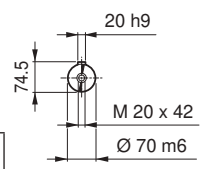
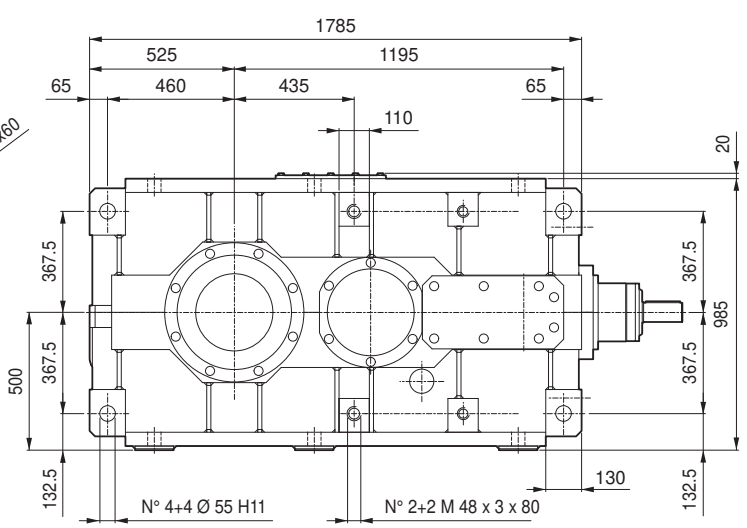
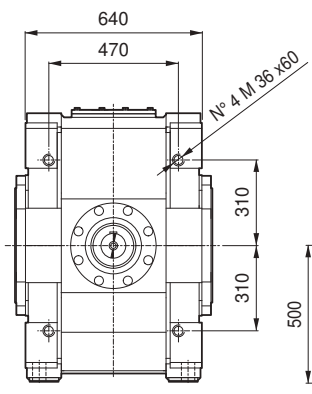
**B3**



Dimensions are in [mm].

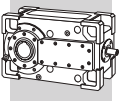
## HDO 180 4

**V5**



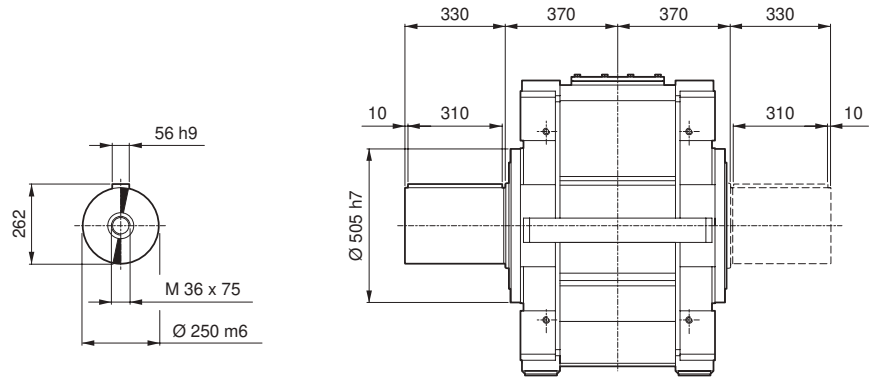
<b>VP</b>	<b>LP</b>
<b>HDO 180 4</b>	<b>3875</b>



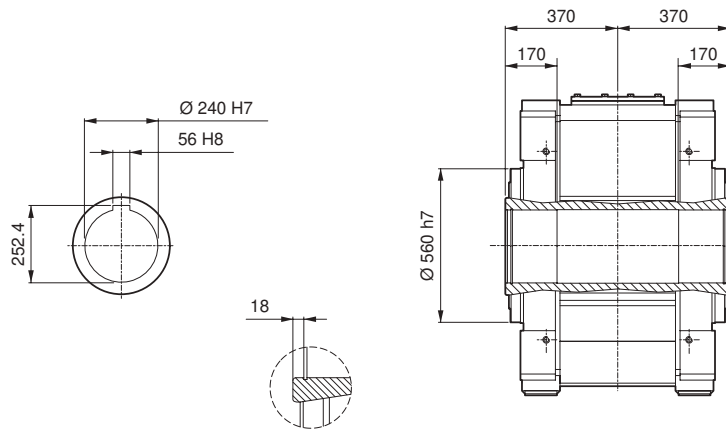


# HDO 180

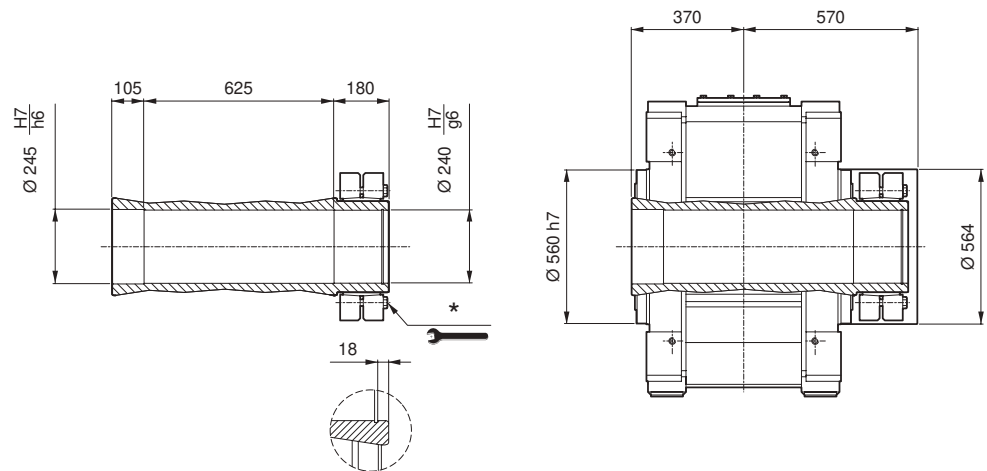
LP



H

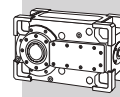


S

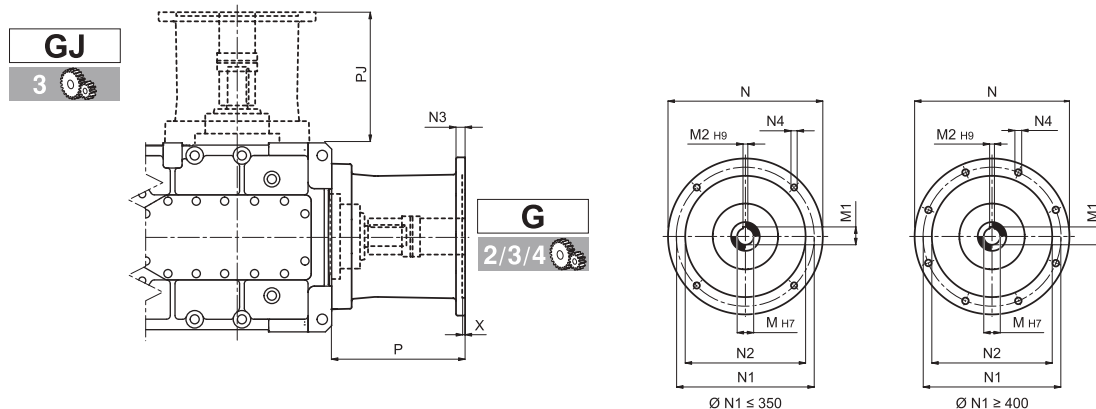


\* For correct use, refer to the "OPERATION AND MAINTENANCE MANUAL".

Dimensions are in [mm].

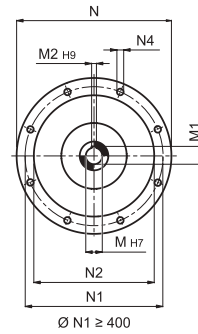
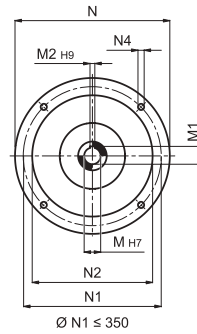
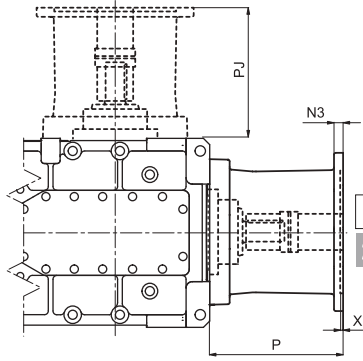
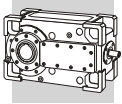


### 31.1 MOTOR MOUNTING WITH BELL HOUSING AND FLEXIBLE COUPLING



	M	M1	M2	N	N1	N2	N3	N4	X	P	PJ
HDO 71 3_132	38	41.3	10	300	265	230	16	M12x20	5	246.5	—
HDO 71 3_160	42	45.3	12	350	300	250	23	18	6	276.5	—
HDO 71 3_180	48	51.8	14	350	300	250	23	18	6	276.5	—
HDO 71 2/3_200	55	59.3	16	400	350	300	—	M16x23	7	301.5	—
HDO 71 2/3_225	60	64.4	18	450	400	350	25	18	7	309.5	—
HDO 81 3_160	42	45.3	12	350	300	250	48	18	7	320	—
HDO 81 3_180	48	51.8	14	350	300	250	48	18	7	320	—
HDO 81 2/3_200	55	59.3	16	400	350	300	—	M16x23	7	320	—
HDO 81 2/3_225	60	64.4	18	450	400	350	25	18	7	356	—
HDO 81 2/3_250	65	69.4	18	550	500	450	30	18	6	386	—
HDO 81 2/3_280	75	79.9	20	550	500	450	30	18	6	386	—
HDO 91 4_112	28	31.3	8	250	215	180	15	14	5	260	—
HDO 91 4_132	38	41.3	10	300	265	230	—	M12x20	6	280	—
HDO 91 3/4_160	42	45.3	12	350	300	250	23	18	6	346	—
HDO 91 3/4_180	48	51.8	14	350	300	250	23	18	6	346	—
HDO 91 2/3/4_200	55	59.3	16	400	350	300	—	M16x23	7	371	—
HDO 91 2/3/4_225	60	64.4	18	450	400	350	26	18	7	378	—
HDO 91 2/3_250	65	69.4	18	550	500	450	30	18	6	408	—
HDO 91 2/3_280	75	79.9	20	550	500	450	30	18	6	408	—
HDO 95 4_112	28	31.3	8	250	215	180	15	14	5	260	—
HDO 95 4_132	38	41.3	10	300	265	230	—	M12x20	6	280	—
HDO 95 3/4_160	42	45.3	12	350	300	250	23	18	6	346	—
HDO 95 3/4_180	48	51.8	14	350	300	250	23	18	6	346	—
HDO 95 3/4_200	55	59.3	16	400	350	300	—	M16x23	7	371	—
HDO 95 3/4_225	60	64.4	18	450	400	350	26	18	7	378	—
HDO 95 3_250	65	69.4	18	550	500	450	30	18	6	408	—
HDO 95 3_280	75	79.9	20	550	500	450	30	18	6	408	—
HDO 100 2_250	65	69.4	18	550	500	450	30	18	6	420.5	—
HDO 100 2_280	75	79.9	20	550	500	450	30	18	6	420.5	—
HDO 100 2_315	80	85.4	22	660	600	550	22	22	10	457	—
HDO 100 3_160	42	45.3	12	350	300	250	23	18	6	351	351
HDO 100 3_180	48	51.8	14	350	300	250	23	18	6	351	351
HDO 100 3_200	55	59.3	16	400	350	300	—	M16x23	7	376	376
HDO 100 3_225	60	64.4	18	450	400	350	26	18	7	383	383
HDO 100 3_250	65	69.4	18	550	500	450	30	18	6	413	413
HDO 100 3_280	75	79.9	20	550	500	450	30	18	6	413	413
HDO 100 3_315	80	85.4	22	660	600	550	22	22	10	449.5	449.5

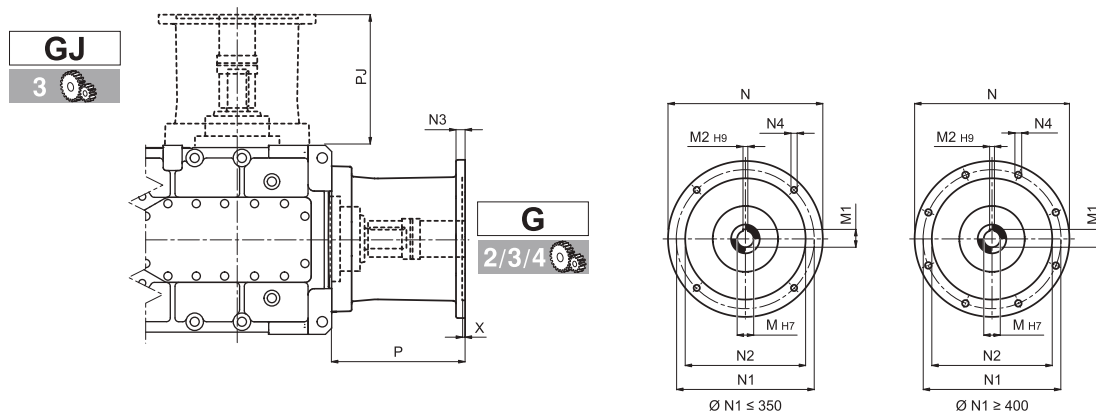
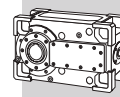
Dimensions are in [mm].

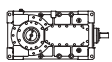



HDO

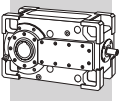
	M	M1	M2	N	N1	N2	N3	N4	X	P	PJ
HDO 100 4 112	28	31.3	8	250	215	180	15	14	5	265	—
HDO 100 4 132	38	41.3	10	300	265	230	—	M12x20	6	285	—
HDO 100 4 160	42	45.3	12	350	300	250	23	18	6	351	—
HDO 100 4 180	48	51.8	14	350	300	250	23	18	6	351	—
HDO 100 4 200	55	59.3	16	400	350	300	—	M16x23	7	376	—
HDO 100 4 225	60	64.4	18	450	400	350	26	18	7	383	—
HDO 110 2 280	75	79.9	20	550	500	450	30	18	6	420.5	—
HDO 110 2 315	80	85.4	22	660	600	550	22	22	10	457	—
HDO 110 3 160	42	45.3	12	350	300	250	23	18	6	351	351
HDO 110 3 180	48	51.8	14	350	300	250	23	18	6	351	351
HDO 110 3 200	55	59.3	16	400	350	300	—	M16x23	7	376	376
HDO 110 3 225	60	64.4	18	450	400	350	26	18	7	383	383
HDO 110 3 250	65	69.4	18	550	500	450	30	18	6	413	413
HDO 110 3 280	75	79.9	20	550	500	450	30	18	6	413	413
HDO 110 3 315	80	85.4	22	660	600	550	22	22	10	449.5	449.5
HDO 110 4 112	28	31.3	8	250	215	180	15	14	5	265	—
HDO 110 4 132	38	41.3	10	300	265	230	—	M12x20	6	285	—
HDO 110 4 160	42	45.3	12	350	300	250	23	18	6	351	—
HDO 110 4 180	48	51.8	14	350	300	250	23	18	6	351	—
HDO 110 4 200	55	59.3	16	400	350	300	—	M16x23	7	376	—
HDO 110 4 225	60	64.4	18	450	400	350	26	18	7	383	—
HDO 120 2 315	80	85.4	22	660	600	550	22	22	10	482	—
HDO 120 3 200	55	59.3	16	400	350	300	—	M16x23	7	346	—
HDO 120 3 225	60	64.4	18	450	400	350	26	18	7	353	353
HDO 120 3 250	65	69.4	18	550	500	450	30	18	6	383	383
HDO 120 3 280	75	79.9	20	550	500	450	30	18	6	383	383
HDO 120 3 315	80	85.4	22	660	600	550	22	22	10	419.5	419.5
HDO 120 4 132	38	41.3	10	300	265	230	—	M12x40	6	255	—
HDO 120 4 160	42	45.3	12	350	300	250	23	18	6	321	—
HDO 120 4 180	48	51.8	14	350	300	250	23	18	6	321	—
HDO 120 4 200	55	59.3	16	400	350	300	—	M16x23	7	346	—
HDO 120 4 225	60	64.4	18	450	400	350	26	18	7	353	—
HDO 125 2 315	80	85.4	22	660	600	550	22	22	10	482	—
HDO 125 3 200	55	59.3	16	400	350	300	—	M16x23	7	346	306
HDO 125 3 225	60	64.4	18	450	400	350	26	18	7	353	313
HDO 125 3 250	65	69.4	18	550	500	450	30	18	6	383	343
HDO 125 3 280	75	79.9	20	550	500	450	30	18	6	383	343
HDO 125 3 315	80	85.4	22	660	600	550	22	22	10	419.5	375.5
HDO 125 4 132	38	41.3	10	300	265	230	—	M12x40	6	255	—
HDO 125 4 160	42	45.3	12	350	300	250	23	18	6	321	—
HDO 125 4 180	48	51.8	14	350	300	250	23	18	6	321	—
HDO 125 4 200	55	59.3	16	400	350	300	—	M16x23	7	346	—
HDO 125 4 225	60	64.4	18	450	400	350	26	18	7	353	—

Dimensions are in [mm].

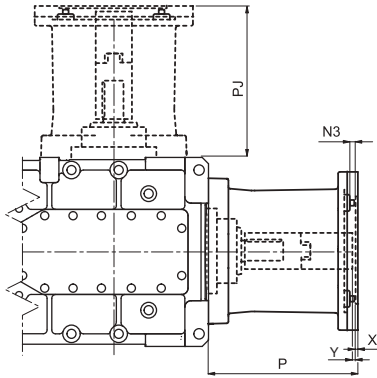


	M	M1	M2	N	N1	N2	N3	N4	X	P	PJ
 HDO 130 2 315	80	85.4	22	660	600	550	22	22	10	590	—
HDO 130 3 250	65	69.4	18	550	500	450	30	18	6	415.5	413
HDO 130 3 280	75	79.9	20	550	500	450	30	18	6	415.5	413
HDO 130 3 315	80	85.4	22	660	600	550	22	22	10	452	449.5
HDO 130 4 160	42	45.3	12	350	300	250	23	18	6	416	—
HDO 130 4 180	48	51.8	14	350	300	250	23	18	6	416	—
HDO 130 4 200	55	59.3	16	400	350	300	—	M16x23	7	441	—
HDO 130 4 225	60	64.4	18	450	400	350	26	18	7	448	—
HDO 130 4 250	65	69.4	18	550	500	450	30	18	6	478	—
HDO 130 4 280	75	79.9	20	550	500	450	30	18	6	478	—
HDO 140 2 315	80	85.4	22	660	600	550	22	22	10	590	—
HDO 140 3 250	65	69.4	18	550	500	450	30	18	6	415.5	413
HDO 140 3 280	75	79.9	20	550	500	450	30	18	6	415.5	413
HDO 140 3 315	80	85.4	22	660	600	550	22	22	10	452	449.5
HDO 140 4 160	42	45.3	12	350	300	250	23	18	6	416	—
HDO 140 4 180	48	51.8	14	350	300	250	23	18	6	416	—
HDO 140 4 200	55	59.3	16	400	350	300	—	M16x23	7	441	—
HDO 140 4 225	60	64.4	18	450	400	350	26	18	7	448	—
HDO 140 4 250	65	69.4	18	550	500	450	30	18	6	478	—
HDO 140 4 280	75	79.9	20	550	500	450	30	18	6	478	—
HDO 150 3 280	75	79.9	20	550	500	450	30	18	6	553.5	528.5
HDO 150 3 315	80	85.4	22	660	600	550	22	22	10	590	565
HDO 150 4 180	48	51.8	14	350	300	250	23	18	6	426	—
HDO 150 4 200	55	59.3	16	400	350	300	—	M16x23	7	451	—
HDO 150 4 225	60	64.4	18	450	400	350	26	18	7	458	—
HDO 150 4 250	65	69.4	18	550	500	450	30	18	6	488	—
HDO 150 4 280	75	79.9	20	550	500	450	30	18	6	488	—
HDO 150 4 315	80	85.4	22	660	600	550	22	22	10	524.5	—
HDO 160 3 280	75	79.9	20	550	500	450	30	18	6	553.5	508.5
HDO 160 3 315	80	85.4	22	660	600	550	22	22	10	590	545
HDO 160 4 180	48	51.8	14	350	300	250	23	18	6	426	—
HDO 160 4 200	55	59.3	16	400	350	300	—	M16x23	7	451	—
HDO 160 4 225	60	64.4	18	450	400	350	26	18	7	458	—
HDO 160 4 250	65	69.4	18	550	500	450	30	18	6	488	—
HDO 160 4 280	75	79.9	20	550	500	450	30	18	6	488	—
HDO 160 4 315	80	85.4	22	660	600	550	22	22	10	524.5	—
HDO 170	 <b>BONFIGLIOLI TECHNICAL SERVICE</b>										
HDO 180											

Dimensions are in [mm].

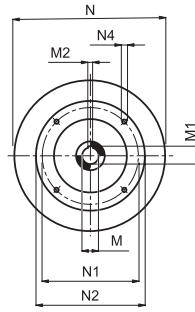


**NGJ**  
3

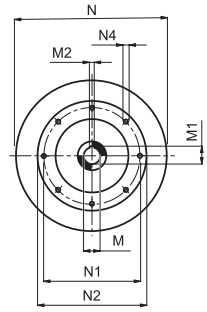


**NG**  
2/3/4

**N180TC ... N360TC**



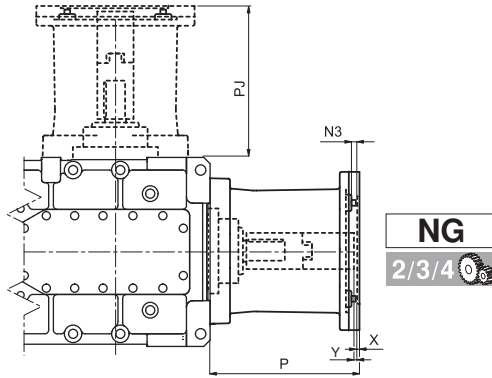
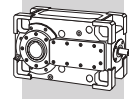
**N400TC ... N440TC**



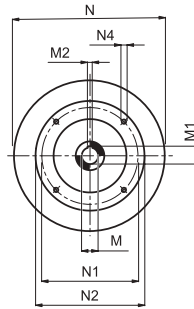
**HDO**

	M	M1	M2	N	N1	N2	N3	N4	X	Y	P	PJ
HDO 71 2/3_N320TC	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	13.228	—
	53.975 <sup>+0.055</sup> / <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	336	—
HDO 71 2/3_N360TC	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	13.228	—
	60.325 <sup>+0.055</sup> / <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	336	—
HDO 71 3_N210TC	1.375 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> / <sub>0</sub>	11.811	7.25	8.520	0.413	0.551	0.217	0.128	10.472	—
	34.925 <sup>+0.035</sup> / <sub>+0.015</sub>	38.557	7.925 <sup>+0.036</sup> / <sub>0</sub>	300	184.15	215.9	10.5	14	5.5	3.25	266	—
HDO 71 3_N250TC	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	11.654	—
	41.275 <sup>+0.045</sup> / <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> / <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	296	—
HDO 71 3_N280TC	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	11.85	—
	47.625 <sup>+0.045</sup> / <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> / <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	301	—
HDO 81 2/3_N320TC	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	15.059	—
	53.975 <sup>+0.055</sup> / <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	382.5	—
HDO 81 2/3_N360TC	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	15.059	—
	60.325 <sup>+0.055</sup> / <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	382.5	—
HDO 81 2/3_N400TC	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	15.65	—
	73.025 <sup>+0.055</sup> / <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	397.5	—
HDO 81 3_N250TC	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	13.366	—
	41.275 <sup>+0.045</sup> / <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> / <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	339.5	—
HDO 81 3_N280TC	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	13.366	—
	47.625 <sup>+0.045</sup> / <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> / <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	344.5	—
HDO 91 2/3_N400TC	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.516	—
	73.025 <sup>+0.055</sup> / <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	419.5	—
HDO 91 2/3/4_N320TC	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	15.925	—
	53.975 <sup>+0.055</sup> / <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	404.5	—
HDO 91 2/3/4_N360TC	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	15.925	—
	60.325 <sup>+0.055</sup> / <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	404.5	—
HDO 91 3/4_N250TC	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.39	—
	41.275 <sup>+0.045</sup> / <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> / <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	365.5	—
HDO 91 3/4_N280TC	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.587	—
	47.625 <sup>+0.045</sup> / <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> / <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	370.5	—
HDO 91 4_N180TC	1.125 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.241	0.25 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.061	11.22	—
	28.575 <sup>+0.035</sup> / <sub>+0.015</sub>	31.521	6.35 <sup>+0.036</sup> / <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	1.55	285	—
HDO 91 4_N210TC	1.375 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	11.22	—
	34.925 <sup>+0.035</sup> / <sub>+0.015</sub>	38.557	7.925 <sup>+0.036</sup> / <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	3.25	285	—
HDO 95 2/3_N400TC	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.516	—
	73.025 <sup>+0.055</sup> / <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	419.5	—
HDO 95 2/3/4_N320TC	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	15.925	—
	53.975 <sup>+0.055</sup> / <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	404.5	—
HDO 95 2/3/4_N360TC	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	15.925	—
	60.325 <sup>+0.055</sup> / <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> / <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	404.5	—
HDO 95 3/4_N250TC	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.39	—
	41.275 <sup>+0.045</sup> / <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> / <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	365.5	—
HDO 95 3/4_N280TC	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.587	—
	47.625 <sup>+0.045</sup> / <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> / <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	370.5	—
HDO 95 4_N180TC	1.125 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.241	0.25 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.061	11.22	—
	28.575 <sup>+0.035</sup> / <sub>+0.015</sub>	31.521	6.35 <sup>+0.036</sup> / <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	1.55	285	—
HDO 95 4_N210TC	1.375 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	11.22	—
	34.925 <sup>+0.035</sup> / <sub>+0.015</sub>	38.557	7.925 <sup>+0.036</sup> / <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	3.25	285	—

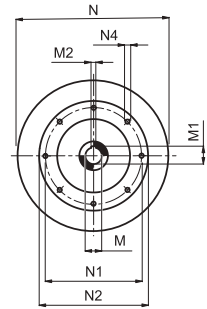
Dimensions are in Inch except when shown in *italic [mm]*



N180TC ... N360TC



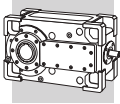
N400TC ... N440TC



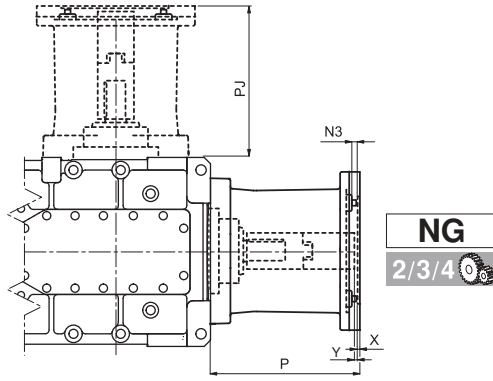
	M	M1	M2	N	N1	N2	N3	N4	X	Y	P	PJ
	2.375 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.122	—
	60.325 <sup>+0.055</sup> <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	409.5	—
	2.875 <sup>+0.0022</sup> <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	17.008	—
	73.025 <sup>+0.055</sup> <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	432	—
	1.625 <sup>+0.0018</sup> <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.587	14.587
	41.275 <sup>+0.045</sup> <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	370.5	370.5
	1.875 <sup>+0.0018</sup> <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.783	14.783
	47.625 <sup>+0.045</sup> <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	375.5	375.5
	2.125 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	16.122	16.122
	53.975 <sup>+0.055</sup> <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	409.5	409.5
	2.375 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.122	16.122
	60.325 <sup>+0.055</sup> <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	409.5	409.5
	2.875 <sup>+0.0022</sup> <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.713	16.713
	73.025 <sup>+0.055</sup> <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	424.5	424.5
	1.125 <sup>+0.0014</sup> <sub>+0.0006</sub>	1.241	0.25 <sup>+0.0014</sup> <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.061	11.417	—
	28.575 <sup>+0.035</sup> <sub>+0.015</sub>	31.521	6.35 <sup>+0.036</sup> <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	1.55	290	—
	1.375 <sup>+0.0014</sup> <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	11.417	—
	34.925 <sup>+0.035</sup> <sub>+0.015</sub>	38.557	7.925 <sup>+0.036</sup> <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	3.25	290	—
	1.625 <sup>+0.0018</sup> <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.587	—
	41.275 <sup>+0.045</sup> <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	370.5	—
	1.875 <sup>+0.0018</sup> <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.783	—
	47.625 <sup>+0.045</sup> <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	375.5	—
	2.125 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	16.122	—
	53.975 <sup>+0.055</sup> <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	409.5	—
	2.375 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.122	—
	60.325 <sup>+0.055</sup> <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	409.5	—
	2.875 <sup>+0.0022</sup> <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	17.008	—
	73.025 <sup>+0.055</sup> <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	432	—
	1.625 <sup>+0.0018</sup> <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.587	14.587
	41.275 <sup>+0.045</sup> <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	370.5	370.5
	1.875 <sup>+0.0018</sup> <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.783	14.783
	47.625 <sup>+0.045</sup> <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	375.5	375.5
	2.125 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	16.122	16.122
	53.975 <sup>+0.055</sup> <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	409.5	409.5
	2.375 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.122	16.122
	60.325 <sup>+0.055</sup> <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	409.5	409.5
	2.875 <sup>+0.0022</sup> <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.713	16.713
	73.025 <sup>+0.055</sup> <sub>+0.025</sub>	81.407	19.05 <sup>+0.05</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	37.8	424.5	424.5
	1.125 <sup>+0.0014</sup> <sub>+0.0006</sub>	1.241	0.25 <sup>+0.0014</sup> <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.061	11.417	—
	28.575 <sup>+0.035</sup> <sub>+0.015</sub>	31.521	6.35 <sup>+0.036</sup> <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	1.55	290	—
	1.375 <sup>+0.0014</sup> <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	11.417	—
	34.925 <sup>+0.035</sup> <sub>+0.015</sub>	38.557	7.925 <sup>+0.036</sup> <sub>0</sub>	250	184.15	215.9	11.5	14	5.5	3.25	290	—
	1.625 <sup>+0.0018</sup> <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	14.587	—
	41.275 <sup>+0.045</sup> <sub>+0.020</sub>	45.618	9.525 <sup>+0.036</sup> <sub>0</sub>	350	184.15	215.9	16.5	14	5.5	2.25	370.5	—
	1.875 <sup>+0.0018</sup> <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	14.783	—
	47.625 <sup>+0.045</sup> <sub>+0.020</sub>	53.381	12.7 <sup>+0.043</sup> <sub>0</sub>	349	228.6	266.7	13	14	5.5	2.25	375.5	—
	2.125 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	16.122	—
	53.975 <sup>+0.055</sup> <sub>+0.025</sub>	59.690	12.7 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2	409.5	—
	2.375 <sup>+0.0022</sup> <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.122	—
	60.325 <sup>+0.055</sup> <sub>+0.025</sub>	67.335	15.875 <sup>+0.043</sup> <sub>0</sub>	449	279.4	317.5	17	17	5.5	2.75	409.5	—

Dimensions are in Inch except when shown in *italic* [mm]

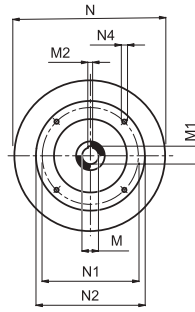




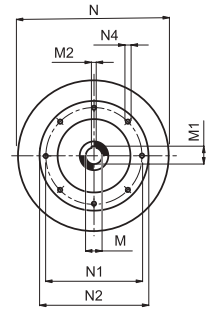
**NGJ**  
3



**N180TC ... N360TC**



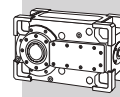
**N400TC ... N440TC**



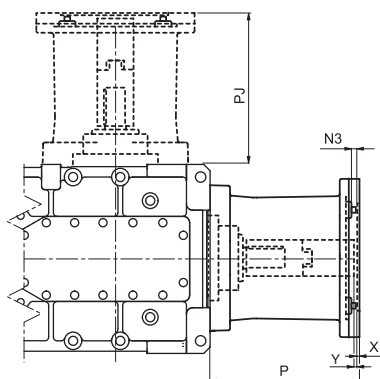
**HDO**

	M	M1	M2	N	N1	N2	N3	N4	X	Y	P	PJ
<b>HDO 120 2_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	20.453	—
	<i>85.725 <sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.23 <sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>519.5</i>	—
<b>HDO 120 3_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	14.941	14.941
	<i>53.975 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>379.5</i>	<i>379.5</i>
<b>HDO 120 3_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	14.941	14.941
	<i>60.325 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>379.5</i>	<i>379.5</i>
<b>HDO 120 3_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	15.531	15.531
	<i>73.025 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05 <sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>394.5</i>	<i>394.5</i>
<b>HDO 120 3_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	17.992	17.992
	<i>85.725 <sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.23 <sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>457</i>	<i>457</i>
<b>HDO 120 4_N210TC</b>	1.375 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	10.236	—
	<i>34.925 <sup>+0.035</sup>/<sub>+0.015</sub></i>	<i>38.557</i>	<i>7.925 <sup>+0.036</sup>/<sub>0</sub></i>	<i>250</i>	<i>184.15</i>	<i>215.9</i>	<i>11.5</i>	<i>14</i>	<i>5.5</i>	<i>3.25</i>	<i>260</i>	—
<b>HDO 120 4_N250TC</b>	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	13.405	—
	<i>41.275 <sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>45.618</i>	<i>9.525 <sup>+0.036</sup>/<sub>0</sub></i>	<i>350</i>	<i>184.15</i>	<i>215.9</i>	<i>16.5</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>340.5</i>	—
<b>HDO 120 4_N280TC</b>	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	13.602	—
	<i>47.625 <sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>53.381</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>349</i>	<i>228.6</i>	<i>266.7</i>	<i>13</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>345.5</i>	—
<b>HDO 120 4_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	14.941	—
	<i>53.975 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>379.5</i>	—
<b>HDO 120 4_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	14.941	—
	<i>60.325 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>379.5</i>	—
<b>HDO 125 2_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	20.453	—
	<i>85.725 <sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.23 <sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>519.5</i>	—
<b>HDO 125 3_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	14.941	13.366
	<i>53.975 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>379.5</i>	<i>339.5</i>
<b>HDO 125 3_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	14.941	13.366
	<i>60.325 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>379.5</i>	<i>339.5</i>
<b>HDO 125 3_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	15.531	13.957
	<i>73.025 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05 <sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>394.5</i>	<i>354.5</i>
<b>HDO 125 3_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	17.992	16.417
	<i>85.725 <sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.23 <sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>457</i>	<i>417</i>
<b>HDO 125 4_N210TC</b>	1.375 <sup>+0.0014</sup> / <sub>+0.0006</sub>	1.518	0.312 <sup>+0.0014</sup> / <sub>0</sub>	9.843	7.25	8.5	0.453	0.551	0.217	0.128	10.236	—
	<i>34.925 <sup>+0.035</sup>/<sub>+0.015</sub></i>	<i>38.557</i>	<i>7.925 <sup>+0.036</sup>/<sub>0</sub></i>	<i>250</i>	<i>184.15</i>	<i>215.9</i>	<i>11.5</i>	<i>14</i>	<i>5.5</i>	<i>3.25</i>	<i>260</i>	—
<b>HDO 125 4_N250TC</b>	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	13.405	—
	<i>41.275 <sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>45.618</i>	<i>9.525 <sup>+0.036</sup>/<sub>0</sub></i>	<i>350</i>	<i>184.15</i>	<i>215.9</i>	<i>16.5</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>340.5</i>	—
<b>HDO 125 4_N280TC</b>	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	13.602	—
	<i>47.625 <sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>53.381</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>349</i>	<i>228.6</i>	<i>266.7</i>	<i>13</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>345.5</i>	—
<b>HDO 125 4_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	14.941	—
	<i>53.975 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>379.5</i>	—
<b>HDO 125 4_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	14.941	—
	<i>60.325 <sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875 <sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>379.5</i>	—

Dimensions are in Inch except when shown in *italic [mm]*

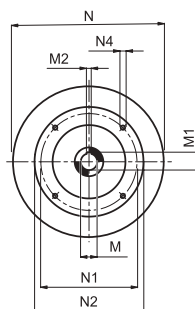


**NGJ**  
3

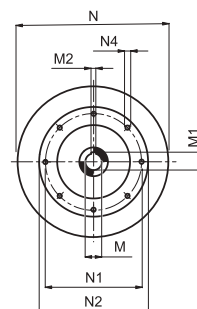


**NG**  
2/3/4

**N180TC ... N360TC**



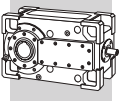
**N400TC ... N440TC**



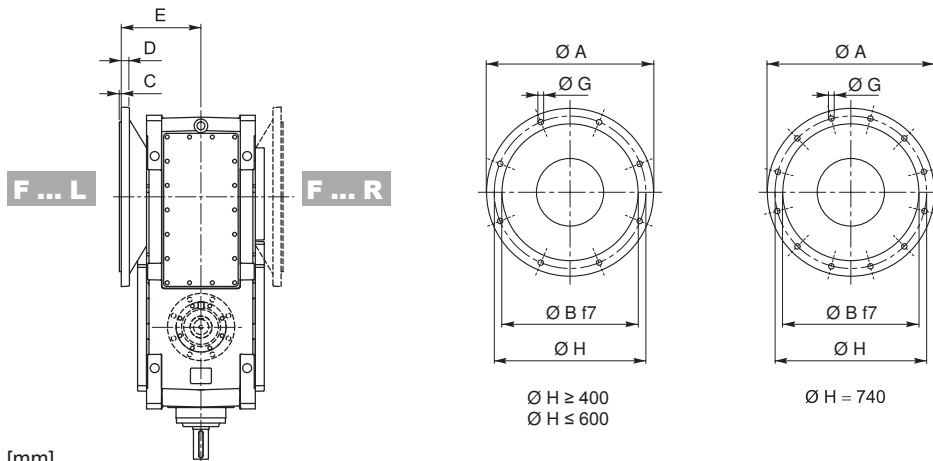
	M	M1	M2	N	N1	N2	N3	N4	X	Y	P	PJ
<b>HDO 130 2_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	24.705	—
	<i>85.725<sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.225<sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>627.5</i>	—
<b>HDO 130 3_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.220	—
	<i>60.325<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>412</i>	—
<b>HDO 130 3_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.811	16.811
	<i>73.025<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05<sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>427</i>	<i>427</i>
<b>HDO 130 3_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	19.272	19.272
	<i>85.725<sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.225<sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>489.5</i>	<i>489.5</i>
<b>HDO 130 4_N250TC</b>	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	17.146	—
	<i>41.275<sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>45.618</i>	<i>9.525<sup>+0.036</sup>/<sub>0</sub></i>	<i>350</i>	<i>184.15</i>	<i>215.9</i>	<i>16.5</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>435.5</i>	—
<b>HDO 130 4_N280TC</b>	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	17.343	—
	<i>47.625<sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>53.381</i>	<i>12.7<sup>+0.043</sup>/<sub>0</sub></i>	<i>349</i>	<i>228.6</i>	<i>266.7</i>	<i>13</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>440.5</i>	—
<b>HDO 130 4_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	18.681	—
	<i>53.975<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>474.5</i>	—
<b>HDO 130 4_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	18.681	—
	<i>60.325<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>474.5</i>	—
<b>HDO 130 4_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	19.272	—
	<i>73.025<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05<sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>489.5</i>	—
<b>HDO 140 2_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	24.705	—
	<i>85.725<sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.225<sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>627.5</i>	—
<b>HDO 140 3_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	16.220	—
	<i>60.325<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>412</i>	—
<b>HDO 140 3_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	16.811	16.811
	<i>73.025<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05<sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>427</i>	<i>427</i>
<b>HDO 140 3_N440TC</b>	3.375 <sup>+0.0026</sup> / <sub>+0.0012</sub>	3.76	0.875 <sup>+0.002</sup> / <sub>0</sub>	25.984	14	16	0.748	0.709	0.236	1.56	19.272	19.272
	<i>85.725<sup>+0.065</sup>/<sub>+0.030</sub></i>	<i>95.504</i>	<i>22.225<sup>+0.05</sup>/<sub>0</sub></i>	<i>660</i>	<i>355.6</i>	<i>406.4</i>	<i>19</i>	<i>18</i>	<i>6</i>	<i>39.6</i>	<i>489.5</i>	<i>489.5</i>
<b>HDO 140 4_N250TC</b>	1.625 <sup>+0.0018</sup> / <sub>+0.0008</sub>	1.796	0.375 <sup>+0.0014</sup> / <sub>0</sub>	13.78	7.25	8.5	0.65	0.551	0.217	0.09	17.146	—
	<i>41.275<sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>45.618</i>	<i>9.525<sup>+0.036</sup>/<sub>0</sub></i>	<i>350</i>	<i>184.15</i>	<i>215.9</i>	<i>16.5</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>435.5</i>	—
<b>HDO 140 4_N280TC</b>	1.875 <sup>+0.0018</sup> / <sub>+0.0008</sub>	2.102	0.5 <sup>+0.0017</sup> / <sub>0</sub>	13.74	9	10.5	0.512	0.551	0.217	0.09	17.343	—
	<i>47.625<sup>+0.045</sup>/<sub>+0.020</sub></i>	<i>53.381</i>	<i>12.7<sup>+0.043</sup>/<sub>0</sub></i>	<i>349</i>	<i>228.6</i>	<i>266.7</i>	<i>13</i>	<i>14</i>	<i>5.5</i>	<i>2.25</i>	<i>440.5</i>	—
<b>HDO 140 4_N320TC</b>	2.125 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.35	0.5 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.079	18.681	—
	<i>53.975<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>59.690</i>	<i>12.7<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2</i>	<i>474.5</i>	—
<b>HDO 140 4_N360TC</b>	2.375 <sup>+0.0022</sup> / <sub>+0.0010</sub>	2.651	0.625 <sup>+0.0017</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	0.108	18.681	—
	<i>60.325<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>67.335</i>	<i>15.875<sup>+0.043</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>2.75</i>	<i>474.5</i>	—
<b>HDO 140 4_N400TC</b>	2.875 <sup>+0.0022</sup> / <sub>+0.0010</sub>	3.205	0.75 <sup>+0.002</sup> / <sub>0</sub>	17.677	11	12.5	0.669	0.669	0.217	1.488	19.272	—
	<i>73.025<sup>+0.055</sup>/<sub>+0.025</sub></i>	<i>81.407</i>	<i>19.05<sup>+0.05</sup>/<sub>0</sub></i>	<i>449</i>	<i>279.4</i>	<i>317.5</i>	<i>17</i>	<i>17</i>	<i>5.5</i>	<i>37.8</i>	<i>489.5</i>	—

Dimensions are in Inch except when shown in *italic [mm]*





### 31.2 MOUNTING FLANGE



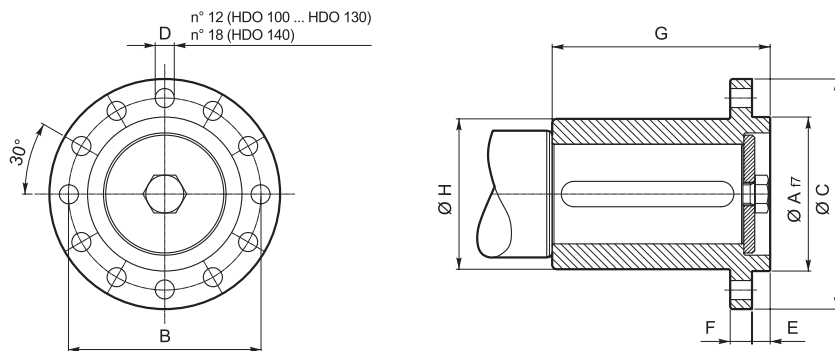
Dimensions are in [mm].

		A	B	C	D	E	G	H
HDO 71	F450	450	350	5	22	210	18	400
	F550	550	450	5	24	210	18	500
HDO 81	F450	450	350	5	22	240	18	400
	F550	550	450	5	24	240	18	500
HDO 91	F550	550	450	5	24	260	18	500
HDO 95	F550	550	450	5	24	315	18	500
HDO 100	F660	660	550	7	30	335	22	600
HDO 110	F660	660	550	7	30	335	22	600
HDO 120	F660	660	550	7	30	355	26	600
HDO 125	F730	730	580	7	35	360	26	660
HDO 130	F800	800	680	7	40	460	26	740
HDO 140	F800	800	680	7	40	460	26	740
HDO 150								
HDO 160								
HDO 170								
HDO 180								

BONFIGLIOLI TECHNICAL SERVICE

### 31.3 MANIFOLD FLANGE

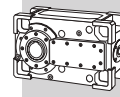
Available for shaft arrangement: L, LJ, LD, R, RJ and RD, all featuring a single output shaft extension.



Dimensions are in [mm].

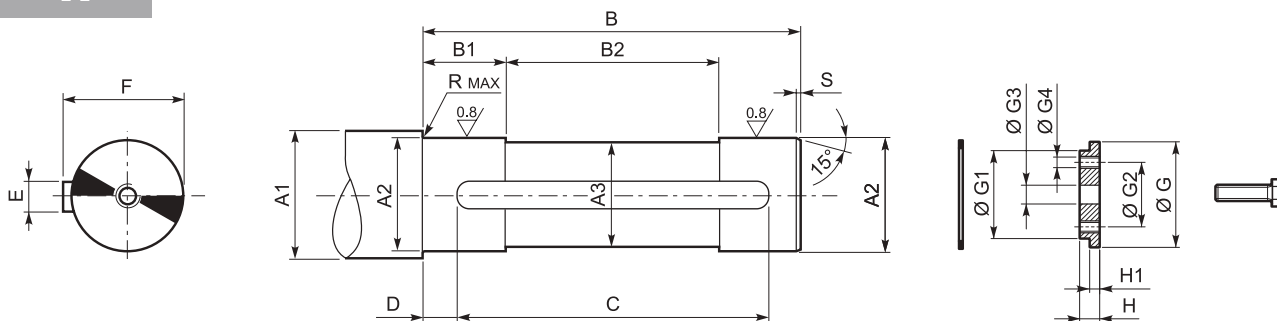
		A	B	C	D	E	F	G	H
HDO 71	FM	125	175	208	19	14	21	195	135
HDO 81	FM	170	212	254	21	20	24	240	166
HDO 91	FM	170	212	254	21	20	24	240	166
HDO 95	FM	200	260	309	25	19	31	244	200
HDO 100	FM	200	260	309	25	19	31	244	200
HDO 110	FM	200	260	309	25	19	31	289	200
HDO 120	FM	200	260	309	25	19	31	289	200
HDO 125	FM	220	320	384	32	19	31	344	240
HDO 130	FM	220	320	384	32	19	31	344	250
HDO 140	FM	250	380	450	32	19	40	344	310
HDO 150									
HDO 160									
HDO 170									
HDO 180									

BONFIGLIOLI TECHNICAL SERVICE









### 31.4 CUSTOMER'S SHAFT

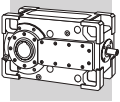
## H



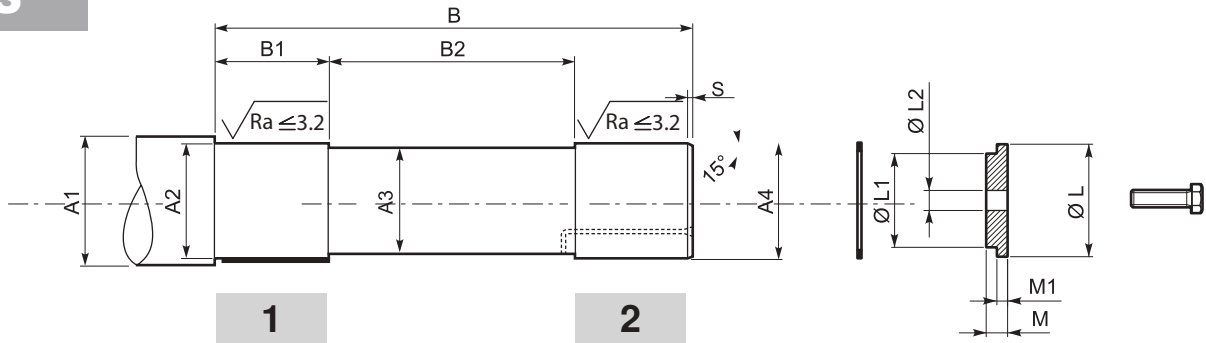
Dimensions are in [mm].

	A1	A2	A3	B	B1	B2	C	D	E	F	R	S	 UNI6604
<b>HDO 71</b>	≥ 89	80 h6	79	283	78	127	220	30	22 h9	85	2.5	2.5	22x14x220A
<b>HDO 81</b>	≥ 104	95 h6	94	338	73	192	280	30	25 h9	100	2.5	2.5	25x14x280A
<b>HDO 91</b>	≥ 121	110 h6	109	378	88	202	320	30	28 h9	116	2.5	2.5	28x16x320A
<b>HDO 95</b>	≥ 128	115 h6	114	398	100	228	340	30	32 h9	122	2.5	2.5	32x18x340A
<b>HDO 100</b>	≥ 133	120 h6	119.5	420	100	250	360	30	32 h9	127	3	2.5	32x18x360A
<b>HDO 110</b>	≥ 143	130 h6	129.5	420	100	250	360	30	32 h9	137	3	2.5	32x18x360A
<b>HDO 120</b>	≥ 153	140 h6	139.5	444	110	260	400	40	36 h9	148	3	2.5	36x20x400A
<b>HDO 125</b>	≥ 163	150 h6	149.5	444	110	260	400	40	36 h9	158	3	2.5	36x20x400A
<b>HDO 130</b>	≥ 183	170 h6	169.5	540	135	310	400	80	40 h9	179	3	2.5	40x22x400A
<b>HDO 140</b>	≥ 193	180 h6	179.5	540	135	310	400	80	45 h9	190	3	2.5	45x25x400A
<b>HDO 150</b>	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
<b>HDO 160</b>	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
<b>HDO 170</b>	≥ 255	240 h6	239.5	697	170	400	506	100	56 h9	252	3	3	56x32x450B
<b>HDO 180</b>	 BONFIGLIOLI TECHNICAL SERVICE												

Out of scope for supply									
	 UNI7437	G	G1	G2	 G3	G4	H	H1	 UNI5739
<b>HDO 71</b>	—	100	80 d9	—	22	—	10	8.5	M20x50
<b>HDO 81</b>	—	115	95 d9	—	26	—	15	13.5	M24x60
<b>HDO 91</b>	—	130	110 d9	—	26	—	15	13.5	M24x60
<b>HDO 95</b>	115x4	115 d9	91	59	26	M16	24	12	M24x70
<b>HDO 100</b>	120x4	120 d9	96	64	26	M16	24	12	M24x70
<b>HDO 110</b>	130x4	130 d9	105	69	26	M20	24	12	M24x70
<b>HDO 120</b>	140x4	140 d9	115	79	26	M20	30	15	M24x80
<b>HDO 125</b>	150x4	150 d9	122	86	26	M20	30	15	M24x80
<b>HDO 130</b>	170x4	170 d9	142	102	33	M24	34	17	M30x90
<b>HDO 140</b>	180x4	180 d9	150	110	33	M24	34	17	M30x90
<b>HDO 150</b>	210x5	210 d9	178	140	33	M24	36	18	M30x100
<b>HDO 160</b>	210x5	210 d9	178	140	33	M24	36	18	M30x100
<b>HDO 170</b>	240x5	240 d9	208	160	39	M24	36	18	M36x110
<b>HDO 180</b>	 BONFIGLIOLI TECHNICAL SERVICE								



S



Dimensions are in [mm].

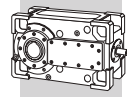
	A1	A2	A3	A4	B	B1	B2	R	S
HDO 71	≥ 104	82 h7	79	80 g6	332	77	174	2.5	2.5
HDO 81	≥ 119	97 h7	94	95 g6	398	95	205	2.5	2.5
HDO 91	≥ 128	112 h7	109	110 g6	440	87	273	2.5	2.5
HDO 95	≥ 133	120 h6	114.5	115 g6	498	104	309	2.5	2.5
HDO 100	≥ 138	125 h6	119.5	120 g6	517	104	328	3	2.5
HDO 110	≥ 148	135 h6	129.5	130 g6	523	104	334	3	2.5
HDO 120	≥ 158	145 h6	139.5	140 g6	550	104	354	3	2.5
HDO 125	≥ 168	155 h6	149.5	150 g6	570	104	363	3	2.5
HDO 130	≥ 188	175 h6	169.5	170 g6	681	104	462	3	2.5
HDO 140	≥ 198	185 h6	179.5	180 g6	689	104	470	3	2.5
HDO 150	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDO 160	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDO 170	BONFIGLIOLI TECHNICAL SERVICE								
HDO 180	BONFIGLIOLI TECHNICAL SERVICE								

Out of scope for supply

	 UNI7437	L	L1	 L2	M	M1	 UNI5739
HDO 71	—	100	80 d9	22	10	8.5	M20x50
HDO 81	—	115	95 d9	26	15	13.5	M24x60
HDO 91	—	130	110 d9	26	15	13.5	M24x60
HDO 95	115x4	115 d9	91	26	16	12	M24x65
HDO 100	120x4	120 d9	96	26	16	12	M24x65
HDO 110	130x4	130 d9	105	26	16	12	M24x65
HDO 120	140x4	140 d9	115	26	19	15	M24x70
HDO 125	150x4	150 d9	122	26	19	15	M24x70
HDO 130	170x4	170 d9	142	33	21	17	M30x80
HDO 140	180x4	180 d9	150	33	21	17	M30x80
HDO 150	210x5	210 d9	178	33	29	18	M30x90
HDO 160	210x5	210 d9	178	33	29	18	M30x90
HDO 170	BONFIGLIOLI TECHNICAL SERVICE						
HDO 180	BONFIGLIOLI TECHNICAL SERVICE						

To facilitate part removal in the area of the cylindrical guide opposite the shrink disc, install a machine pivot to which a self-lubricating cylindrical bushing (1) can be fitted and/or with a hole big enough to allow application of a rust treatment (2).

In the presence of external thrust loads, vibration, safety problems, requirements for enhanced reliability, or unfavourable mounting positions (e.g. V5 mounting positions, output shaft directed downwards), install suitable devices to secure the shaft in an axial direction and prevent accidental decoupling.



## BEVEL HELICAL GEAR UNITS SERIES HDO ATEX CONFIGURATION

Selection of the the product must fit through the compilation of the selection form (see page 11). For a safe selection it is strongly recommended to rely on the long time experience of the Bonfiglioli Technical Service Dept.

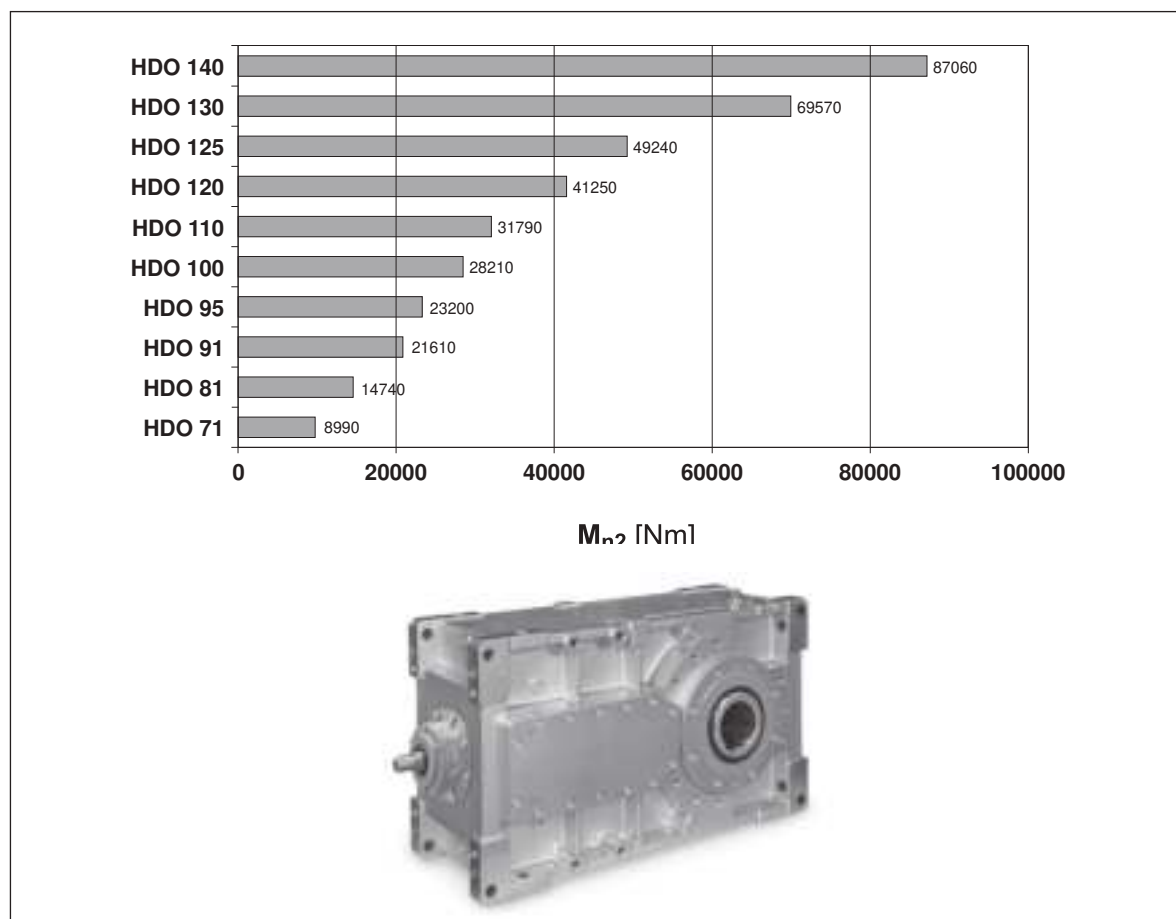
### 32 INSTALLATION, USE AND MAINTENANCE

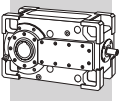
All the instructions for installation, use and maintenance of the product are given in the unit's Manual. This can be downloaded from [www.bonfiglioli.com](http://www.bonfiglioli.com) where the manual is available in PDF format in a number of languages.

This document must be kept in a suitable place, in the vicinity of the installed gear unit, as a reference for all persons authorised to work with or on the product throughout its service life.

### 33 CONSTRUCTION OF ATEX-SPECIFIED EQUIPMENT

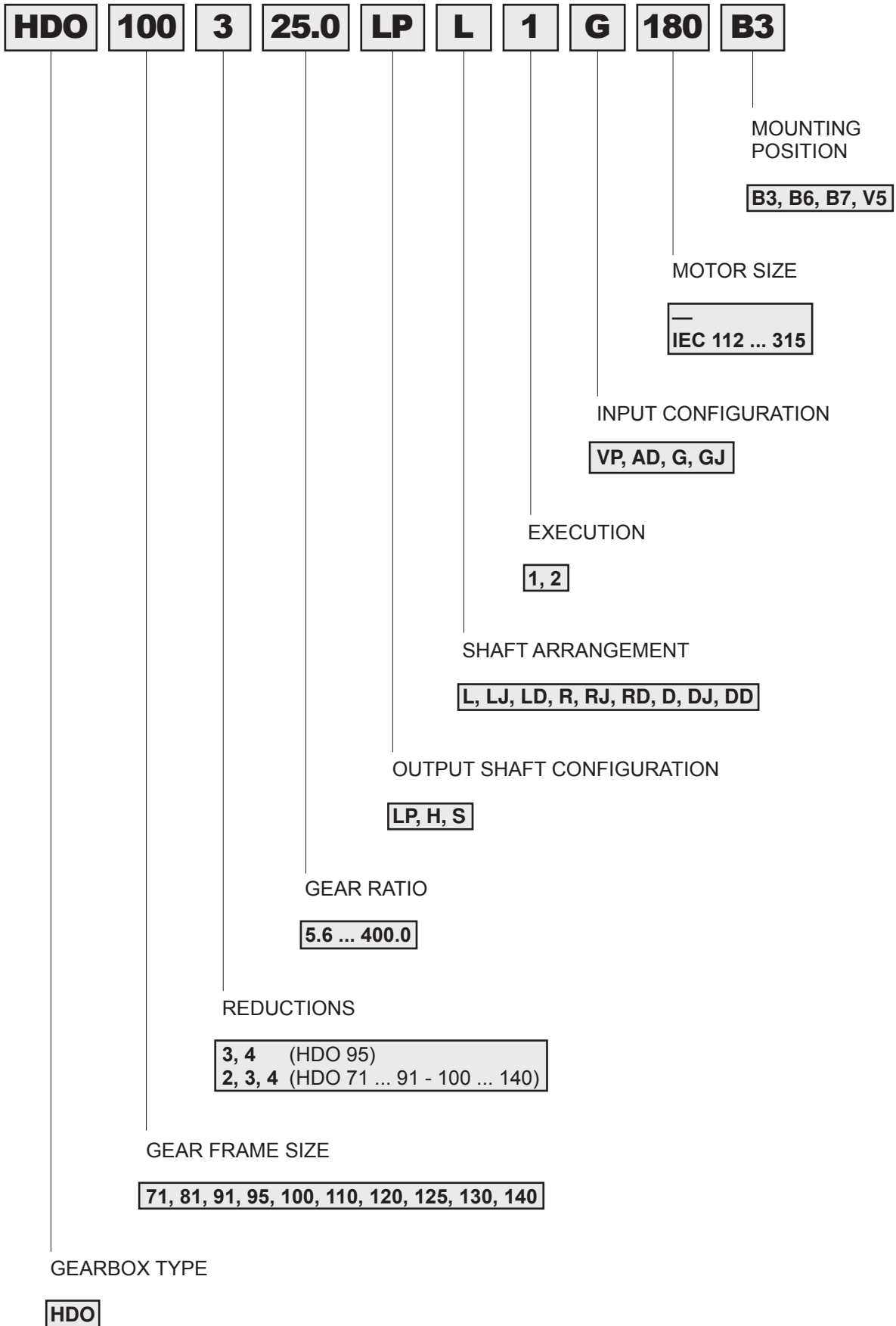
- Equipped with service plugs for periodic lubricant level checks.
- Equipped with vent caps with anti-intrusion valve.
- Fluoro elastomer seal rings as standard.
- No plastic component parts..
- Nameplate indication of the product category and type of protection.
- Components operable at above the operating temperature.
- Temperature indicator supplied along with each unit.



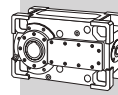


34 DESIGNATION

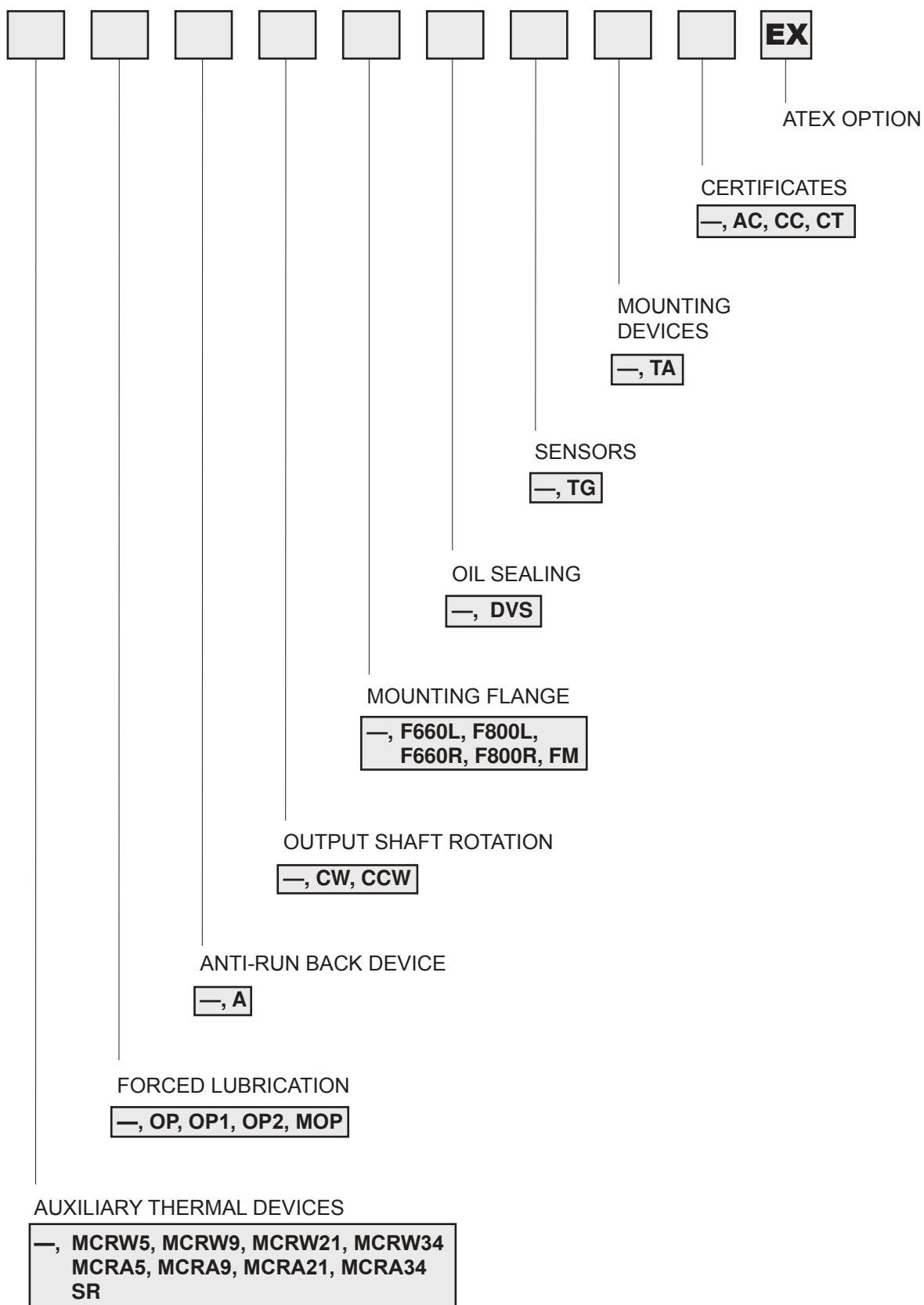
34.1 BASE VARIANTS



HDO

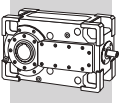


### 34.2 OPTIONAL VARIANTS



HDO

REMARK: The multiple selection of some of the variants may be subject to technical or dimensional constraints. Consult with the factory to have your selection approved.



### 34.3 AUXILIARY COOLING WITH AUTONOMOUS COOLING UNIT

Two types of cooling unit are available, each in a range of sizes providing different cooling capacities. The two types use different cooling media for the oil: MCRW...EX – water/oil heat exchanger and MCRA...EX – air/oil heat exchanger. If an autonomous cooling unit is installed on the advice of the Bonfiglioli Technical Service, no additional forced lubrication devices are required. See section 26.7.2. The following chart shows device availability according to gearbox size. Your selection must take into account the deficit in thermal power that must be made up by contribution  $P_{TMCRW}$  or  $P_{TM CRA}$  as shown in the chart in section 28.

	MCRW5_EX MCRA5_EX	MCRW9_EX MCRA9_EX	MCRW21_EX MCRA21_EX	MCRW34_EX MCRA34_EX
HDO 100_EX	X	X		
HDO 110_EX	X	X		
HDO 120_EX	X	X	X (*)	
HDO 125_EX	X	X	X (**)	
HDO 130_EX	X	X	X	X (**)
HDO 140_EX	X	X	X	X (**)

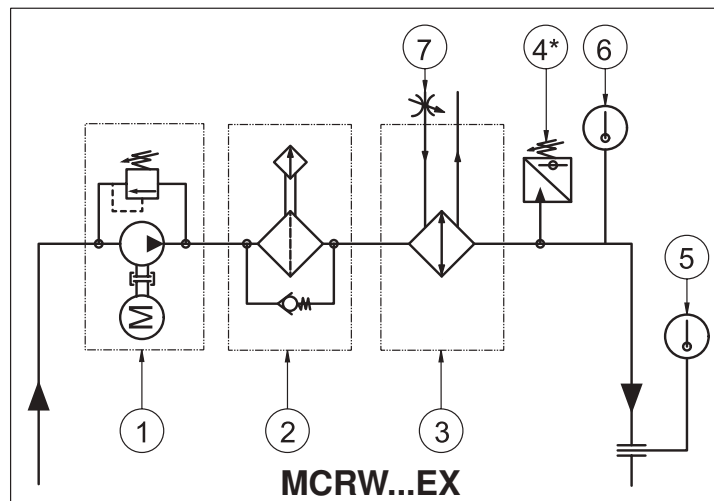
(\*) not available for mounting position B3.

(\*\*) not available for double reduction units in the mounting position B3.

The main components of the cooling units are as follows:

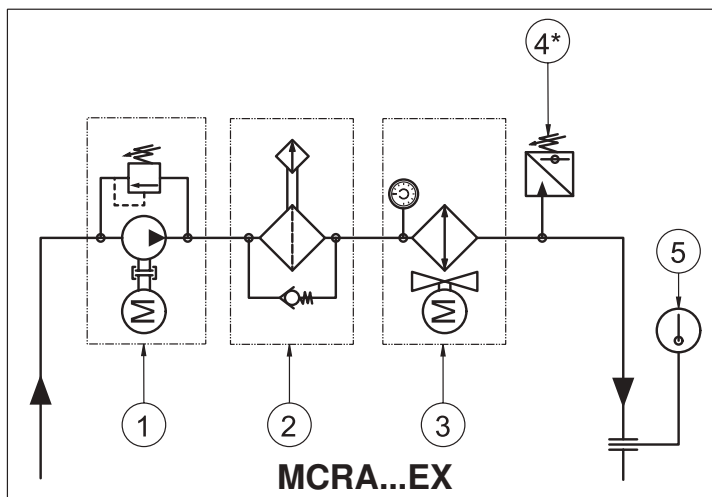
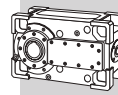
#### MCRW...EX

- 1) motorpump complete with by-pass circuit
- 2) filter with clogging visual indicator
- 3) water/oil heat exchanger
- 4) minimum pressure switch (only available in combination with forced lubrication)
- 5) maximum temperature thermostat
- 6) minimum temperature switch
- 7) electro-valve



#### MCRA...EX

- 1) motorpump complete with by-pass circuit
- 2) filter with clogging visual indicator
- 3) air/oil heat exchanger with thermostat
- 4) minimum pressure switch (only available in combination with forced lubrication)
- 5) maximum temperature thermostat



**General warnings:**

**MCRW...EX** : provide a water supply system that corresponds to the following specifications:

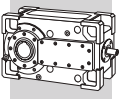
- max. pressure, 10 bar
- maximum delivery temperature, 20°C
- minimum flow rate  $Q_{H_2O}$  as per the chart:

	MCRW5_EX	MCRW9_EX	MCRW21_EX	MCRW34_EX
$Q_{H_2O}$ [l/min]	10	18	31	56

**MCRA...EX** : leave sufficient space around the heat exchanger to ensure an unrestricted air flow.

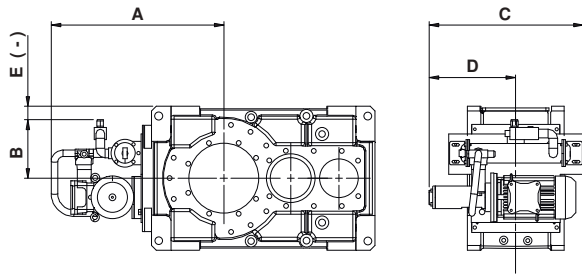
Cooling units maximum dimensions				
	X	Y	Z	
	MCRW5_EX	500	288	432
	MCRW9_EX	565	328	409
	MCRW21_EX	641	382	429
	MCRW34_EX	811	430	551
	MCRA5_EX	630	505	788
	MCRA9_EX	808	605	648
	MCRA21_EX	640	605	921
	MCRA34_EX	921	605	699



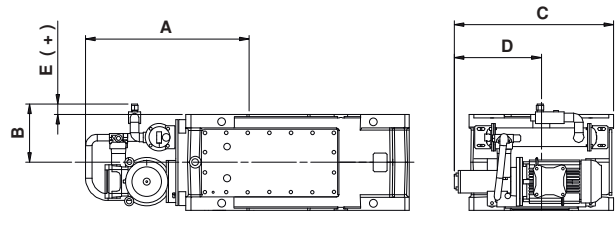


## MCRW...EX

**B3**



**V5**



### B3 - MCRW5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	596	247	500	295	-23
	110	2x ; 3x ; 4x	581				-23
	120	2x ; 3x ; 4x	626				-53
	125	2x ; 3x ; 4x	666				-93
	130	2x ; 3x ; 4x	681				-133
	140	2x ; 3x ; 4x	706				-133

### V5 - MCRW5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	596	247	500	295	62
	110	2x ; 3x ; 4x	581				62
	120	2x ; 3x ; 4x	626				47
	125	2x ; 3x ; 4x	666				47
	130	2x ; 3x ; 4x	681				-3
	140	2x ; 3x ; 4x	706				-3

### B3 - MCRW9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	610.5	224	565	295	-46
	110	2x ; 3x ; 4x	595.5				-46
	120	2x ; 3x ; 4x	640.5				-76
	125	2x ; 3x ; 4x	680.5				-116
	130	2x ; 3x ; 4x	695.5				-156
	140	2x ; 3x ; 4x	720.5				-156

### V5 - MCRW9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	610.5	224	565	295	39
	110	2x ; 3x ; 4x	595.5				39
	120	2x ; 3x ; 4x	640.5				24
	125	2x ; 3x ; 4x	680.5				24
	130	2x ; 3x ; 4x	695.5				-26
	140	2x ; 3x ; 4x	720.5				-26

### B3 - MCRW21\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x ; 3x ; 4x	—	—	—	—	—
	125	2x	—	—	—	—	—
		3x ; 4x	760	—	—	—	-96
	130	2x ; 3x ; 4x	775	244	641.5	361.5	-136
	140	2x ; 3x ; 4x	800	—	—	—	-136

### V5 - MCRW21\_EX

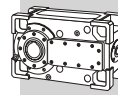
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x ; 3x ; 4x	720	244	641.5	361.5	44
	125	2x ; 3x ; 4x	760				44
	130	2x ; 3x ; 4x	775				-6
	140	2x ; 3x ; 4x	800				-6

### B3 - MCRW34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	—	—	—	—	—
		3x ; 4x	823	366	811	431	-14
	140	2x	—	—	—	—	—
		3x ; 4x	848	366	811	431	-14

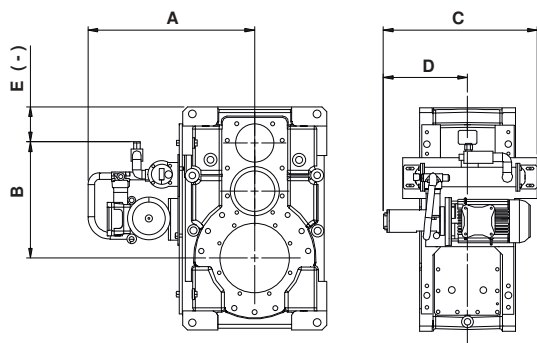
### V5 - MCRW34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x ; 3x ; 4x	823	366	811	431	116
	140	2x ; 3x ; 4x	848				116

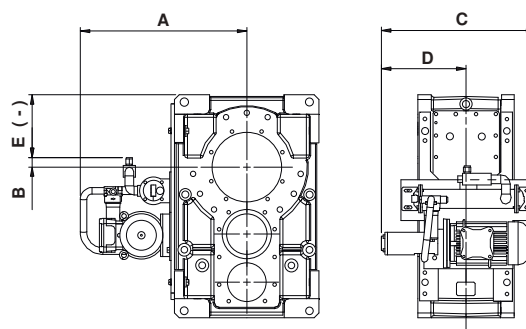


### MCRW...EX

**B6**



**B7**



#### B6 - MCRW5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	573	465	500	295	-95
		3x ; 4x	573	585			-95
	110	2x	573	480			-95
		3x ; 4x	573	600			-95
	120	2x	603	473			-157
		3x ; 4x	603	608			-172
	125	2x	643	473			-197
		3x ; 4x	643	608			-212
	130	2x	683	479.5			-260.5
		3x ; 4x	683	575.8			-359.3
	140	2x	683	501.5			-278.5
		3x ; 4x	683	585.8			-389.3

#### B7 - MCRW5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	573	29	500	295	-241
		3x ; 4x	573	-91			-361
	110	2x	573	14			-241
		3x ; 4x	573	-106			-361
	120	2x	603	21			-279
		3x ; 4x	603	-114			-414
	125	2x	643	21			-319
		3x ; 4x	643	-114			-454
	130	2x	683	14.5			-340.5
		3x ; 4x	683	-86			-441
	140	2x	683	-8.5			-388.5
		3x ; 4x	683	-91			-471

#### B6 - MCRW9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	587.5	442	565	295	-118
		3x ; 4x	587.5	562			-118
	110	2x	587.5	457			-118
		3x ; 4x	587.5	577			-118
	120	2x	617.5	450			-180
		3x ; 4x	617.5	585			-195
	125	2x	657.5	450			-220
		3x ; 4x	657.5	585			-235
	130	2x	697.5	456.5			-283.5
		3x ; 4x	697.5	552.8			-382.3
	140	2x	697.5	478.5			-301.5
		3x ; 4x	697.5	562.8			-412.3

#### B7 - MCRW9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	587.5	6	565	295	-264
		3x ; 4x	587.5	-114			-384
	110	2x	587.5	-9			-264
		3x ; 4x	587.5	-129			-384
	120	2x	617.5	-2			-302
		3x ; 4x	617.5	-137			-437
	125	2x	657.5	-2			-342
		3x ; 4x	657.5	-137			-477
	130	2x	697.5	-8.5			-363.5
		3x ; 4x	697.5	-109			-464
	140	2x	697.5	-31.5			-411.5
		3x ; 4x	697.5	-114			-494

#### B6 - MCRW21\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x	697	470	641.2	361.2	-160
		3x ; 4x	697	605			-175
	125	2x	737	470			-200
		3x ; 4x	737	605			-215
	130	2x	777	476.5			263.5
		3x ; 4x	777	572.8			-362.3
	140	2x	777	498.5			-281.5
		3x ; 4x	777	582.8			-392.3

#### B7 - MCRW21\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x	697	18	641.2	361.2	-282
		3x ; 4x	697	-117			-417
	125	2x	737	18			-322
		3x ; 4x	737	-117			-457
	130	2x	777	11.5			-343.5
		3x ; 4x	777	-89			-444
	140	2x	777	-11.5			-391.5
		3x ; 4x	777	-94			-474

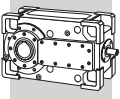
#### B6 - MCRW34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	825	618.5	811	431	-121.5
		3x ; 4x	825	714.8			-220.3
	140	2x	825	640.5			-139.5
		3x ; 4x	825	724.8			-250.3

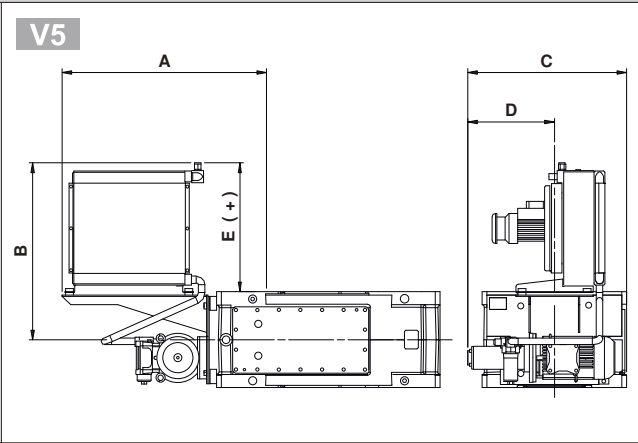
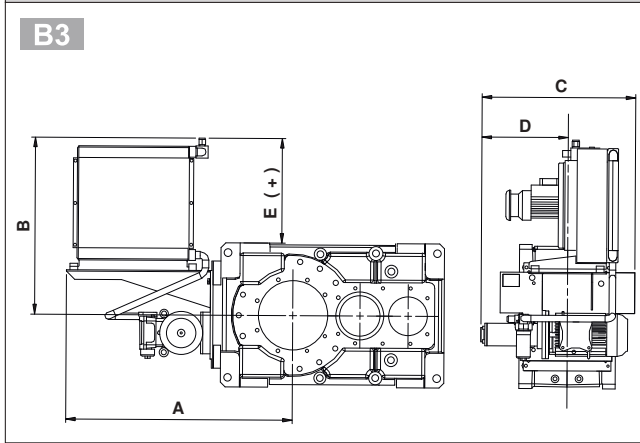
#### B7 - MCRW34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	825	153.5	811	431	-201.5
		3x ; 4x	825	53			-302
	140	2x	825	130.5			-249.5
		3x ; 4x	825	48			-332

HDO



MCRA...EX



B3 - MCRA5_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	813	603	642	430	333
	110	2x ; 3x ; 4x	798				333
	120	2x ; 3x ; 4x	843				303
	125	2x ; 3x ; 4x	883				263
	130	2x ; 3x ; 4x	898				223
	140	2x ; 3x ; 4x	923				223

V5 - MCRA5_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	813	603	642	430	418
	110	2x ; 3x ; 4x	798				418
	120	2x ; 3x ; 4x	843				403
	125	2x ; 3x ; 4x	883				403
	130	2x ; 3x ; 4x	898				353
	140	2x ; 3x ; 4x	923				353

B3 - MCRA9_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	913	623	678	295.5	353
	110	2x ; 3x ; 4x	898				353
	120	2x ; 3x ; 4x	943				323
	125	2x ; 3x ; 4x	983				283
	130	2x ; 3x ; 4x	998				243
	140	2x ; 3x ; 4x	1023				243

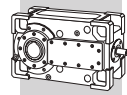
V5 - MCRA9_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x ; 3x ; 4x	913	623	678	295.5	438
	110	2x ; 3x ; 4x	898				438
	120	2x ; 3x ; 4x	943				423
	125	2x ; 3x ; 4x	983				423
	130	2x ; 3x ; 4x	998				373
	140	2x ; 3x ; 4x	1023				373

B3 - MCRA21_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x ; 3x ; 4x	—	—	—	—	—
	125	2x	—	—	—	—	—
		3x ; 4x	983	—	—	—	396
	130	2x ; 3x ; 4x	998	736	640.5	360.5	356
	140	2x ; 3x ; 4x	1023	—	—	—	356

V5 - MCRA21_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x ; 3x ; 4x	943	736	640.5	360.5	536
	125	2x ; 3x ; 4x	983				536
	130	2x ; 3x ; 4x	998				486
	140	2x ; 3x ; 4x	1023				486

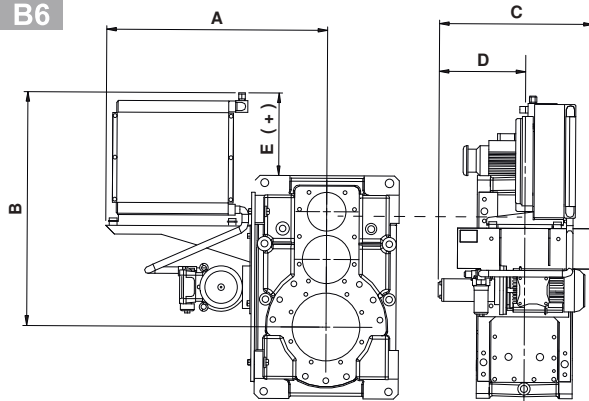
B3 - MCRA34_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	—	—	—	—	—
		3x ; 4x	998	736	701	416	356
	140	2x	—	—	—	—	—
		3x ; 4x	1023	736	701	416	356

V5 - MCRA34_EX							
			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x ; 3x ; 4x	998	736	701	416	486
	140	2x ; 3x ; 4x	1023				486

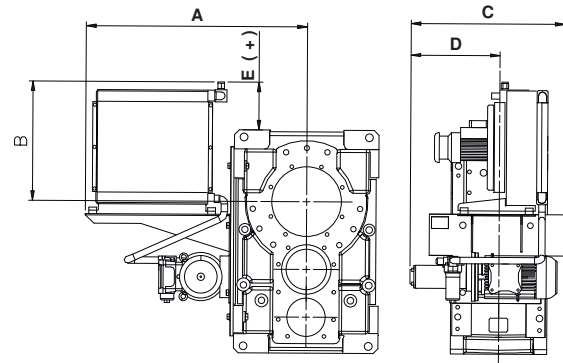


### MCRA...EX

**B6**



**B7**



#### B6 - MCRA5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	790	820.5	641.7	430	260.5
		3x ; 4x	790	940.5			260.5
	110	2x	790	835.5			260.5
		3x ; 4x	790	955.5			260.5
	120	2x	820	828.5			198.5
		3x ; 4x	820	963.5			183.5
	125	2x	860	828.5			158.5
		3x ; 4x	860	963.5			143.5
	130	2x	900	835			95
		3x ; 4x	900	931.3			-3.8
	140	2x	900	857			77
		3x ; 4x	900	941.3			-33.8

#### B7 - MCRA5\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	790	384.5	641.7	430	114.5
		3x ; 4x	790	264.5			-5.5
	110	2x	790	369.5			114.5
		3x ; 4x	790	249.5			-5.5
	120	2x	820	376.5			76.5
		3x ; 4x	820	241.5			-58.5
	125	2x	860	376.5			36.5
		3x ; 4x	860	241.5			-98.5
	130	2x	900	370			15
		3x ; 4x	900	269.5			-85.5
	140	2x	900	347			-33
		3x ; 4x	900	264.5			-115.5

#### B6 - MCRA9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	890	840.5	680	295.2	280.5
		3x ; 4x	890	960.5			280.5
	110	2x	890	855.5			280.5
		3x ; 4x	890	975.5			280.5
	120	2x	920	848.5			218.5
		3x ; 4x	920	983.5			203.5
	125	2x	960	848.5			178.5
		3x ; 4x	960	983.5			163.5
	130	2x	1000	855			115
		3x ; 4x	1000	951.3			16.3
	140	2x	1000	877			97
		3x ; 4x	1000	961.3			-13.8

#### B7 - MCRA9\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	100	2x	890	404.5	680	295.2	134.5
		3x ; 4x	890	284.5			14.5
	110	2x	890	389.5			134.5
		3x ; 4x	890	269.5			14.5
	120	2x	920	396.5			96.5
		3x ; 4x	920	261.5			-38.5
	125	2x	960	396.5			56.5
		3x ; 4x	960	261.5			-78.5
	130	2x	1000	390			35
		3x ; 4x	1000	289.5			-65.5
	140	2x	1000	367			-13
		3x ; 4x	1000	284.5			-95.5

#### B6 - MCRA21\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x	920	962	640.2	360.2	332
		3x ; 4x	920	1097			317
	125	2x	960	962			292
		3x ; 4x	960	1097			277
	130	2x	1000	968.5			228.5
		3x ; 4x	1000	1064.8			129.8
	140	2x	1000	990.5			210.5
		3x ; 4x	1000	1074.8			99.8

#### B7 - MCRA21\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	120	2x	920	510	640.2	360.2	210
		3x ; 4x	920	375			75
	125	2x	960	510			170
		3x ; 4x	960	375			35
	130	2x	1000	503.5			148.5
		3x ; 4x	1000	403			48
	140	2x	1000	480.5			100.5
		3x ; 4x	1000	398			18

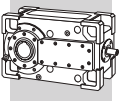
#### B6 - MCRA34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	1000	966	701	416	226
		3x ; 4x	1000	1062.3			127.3
	140	2x	1000	988			208
		3x ; 4x	1000	1072.3			97.3

#### B7 - MCRA34\_EX

			A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
HDO	130	2x	1000	501	701	416	146
		3x ; 4x	1000	400.5			45.5
	140	2x	1000	478			98
		3x ; 4x	1000	395.5			15.5

**HDO**




## 35 OTHER INFORMATION ABOUT GEARBOX AND GEARMOTOR

Mounting positions, technical data, motor availability, moments of inertia and dimensions of **HDO-EX (Atex)** series don't change among equivalent **HDO** product series. All of these information can be obtained in the related chapters of this catalogue.



## INDEX OF REVISIONS

BR_CAT_HDPO_IE3_ENG_R01_0	
	Description
162...172	Fixed some dimensions for HDP 100 ... HDP 160 gearboxes.
362, 364	Fixed some dimensions for HDO 150 - HDO 160 gearboxes.

2020 12 30

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