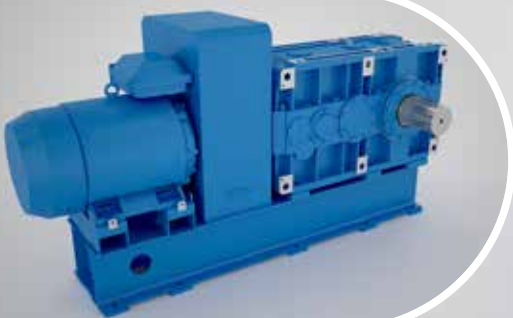
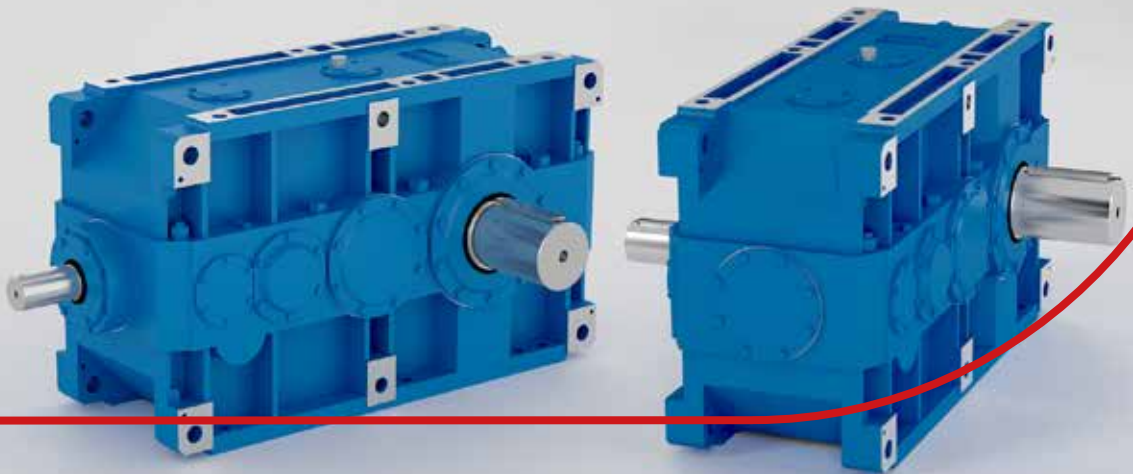


# H series

Helical and bevel helical  
gear reducers

2586-01.02



Size		2I	3I	4I	CI	C2I	C3I
	$M_{N2}$ - $F_{r2}$						
<b>4000</b>	109 kN m - 200 kN						
<b>4001</b>	122 kN m - 200 kN						
<b>4500</b>	140 kN m - 250 kN						
<b>4501</b>	160 kN m - 250 kN						
<b>5000</b>	206 kN m - 315 kN				—		
<b>5001</b>	250 kN m - 315 kN				—		
<b>5600</b>	280 kN m - 400 kN				—		
<b>5601</b>	315 kN m - 400 kN				—		
<b>6300</b>	400 kN m - 400 kN				—		
<b>6301</b>	450 kN m - 400 kN				—		
<b>7101</b>	710 kN m - 630 kN				—		
<b>8001</b>	1000 kN m - 900 kN				—		

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# Your worldwide partner for high quality solutions

## Who we are

In brief:

1953 Founded as a family business and still privately owned today



Rossi in the 70's

70's First in Italy to adopt a completely modular system for helical and bevel helical gear reducers; first in Italy to adopt a case hardened, tempered, ground gear pairs on helical and bevel helical gear reducers

80's Worm gear reducers and gearmotors with universal mounting, single-piece housing and ZI involute profile; Extension of the direct sales organization abroad with the addition of German, English, French and Spanish subsidiaries.

90's Helical and bevel helical gear reducers and gearmotors with universal mounting and single-piece housing; first transmission manufacturer in Italy and second in Europe to obtain Quality System Certification ISO 9001.

1994 The only manufacturer to offer 3-year-warranty

1997 Acquisition of Seimec (Rossi Motor Division)

2002 Acquisition of SMEI (Rossi Planetary Division, WIND)



Rossi Planetary Gear Reducer Division

2003 ISO 9001 - 2000 (Vision 2000)

2004 New affiliated company in U.S.A.  
Habasit acquires important share in Rossi, to reinforce global presence and develop growth strategy

2009 (July) Habasit Holding owns 100% Rossi

2010 Logo and Company name change: from "Rossi Motoriduttori" to "Rossi S.p.A."



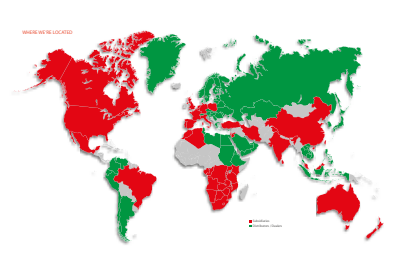
Rossi Industrial Gear Reducer Division, today

2014-'16 Our US, UK, Brazil and China subsidiaries move to new facilities, striving to improve our customer service thanks to our modern structures and technologies

For more than 60 years we have been developing our business for the most demanding applications in order to become one of the world's leading gearbox and gearmotor manufacturers. Even in the toughest environment, we are recognized for providing state of the art technology, solid value and commitment to our customers.

## Where you can find us

Close to you, with facilities on six continents and each with a direct sales system to provide excellent service. Visit our website to find your nearest facility. We are where you need us to be.



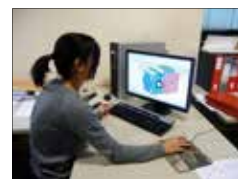
## What we believe in

Choosing the drive with the right technical specifications is vital for reliability and economy. We believe in integrity, ethical behavior, experience, creativity, innovation, good teamwork and above all customer focus: this what we at Rossi believe in. We strive to be a reliable company with the right flexibility and know-how to respond to all market requests, all over the world, in all application fields, without ignoring our commitment to the environment and value on all human safety



## What we can do for you

Rossi employs highly skilled specialists in different fields, there to provide you with the support and experience needed to find the best solution for your application and commercial demands, and to accompany you step by step through the entire supply process.



## What you can do for us, to help us improve

You are at the center of all we do, that is why we want your feedback and suggestions on how we can improve. You know your business better than anyone and by knowing what works for you will allow us to improve our service offering to you. We regard every relationship as a partnership and look for mutual benefits that will enhance our partnership at all times.



## Who you can contact

A well-organized Global after-sale service with the sole purpose of getting our customers back up and running quickly and cost effectively. Our online Rossi for You portal, allowing you to have 24/7/365 day access to all the documentations concerning our supplies, order tracking, and news in real time.









## What we do







Our wide standard product range and design allows us to provide the customer with the right engineered solution for every application including a 3 year worldwide warranty.



## Gearmotors



Type of gear		Catalog
Worm gearmotors		A
Standardfit worm gearmotors		AS
Coaxial gearmotors		E
Standardfit coaxial gearmotors		ES
Helical and bevel helical gear reducers		G
Planetary (in-line and bevel helical) gearmotors		EP

## Gear reducers


Type of gear		Catalog
Worm gear reducers		A
Helical and bevel helical gear reducers		G
Heavy duty helical and bevel helical gear reducers		H
Planetary (in-line and bevel helical) gear reducers		EP
Right angle shaft gear reducers		L
Shaft mounted helical gear units		P







## Motors

Type		Catalog
Asynchronous three-phase high efficiency and premium efficiency motors		TX
Standard and high efficiency brake motors		TX

## Motion control

Type		Catalog
Worm, coaxial, helical and bevel helical servo gear reducers		SR

## Specific industrial segments

Type		Catalog
Extruders, Parallel shaft gear reducers and gearmotors		GX
Combined units		
Slewing drives		EP
Heavy duty gear reducers on swing bases		RE

# Features and **Benefits**

10 sizes with nominal torque from 109 to 450 kN m

Increased performance maintaining the same final reduction center distance, when compared with Rossi's previous catalog H02

Sizes based on uniform incremental steps

- **Improved ratings for the same required torque and more compact gear reducers compared with previous catalog H02**



Gears designed, machined and measured according to high quality requirements (tooth grinding accuracy class  $\leq$  DIN 6, both for cylindrical and bevel gears)

Bevel gears machined in closed-loop grinding process with correction of the measured deviations

Gear housings made with single placement bore machining and controlled through very high precision three-dimensional measuring systems

Load rating, according to standards, based on surface durability (pitting) and tooth bending strength

- **Reliable and repeatable performances, suitable to satisfy Customer specifications**



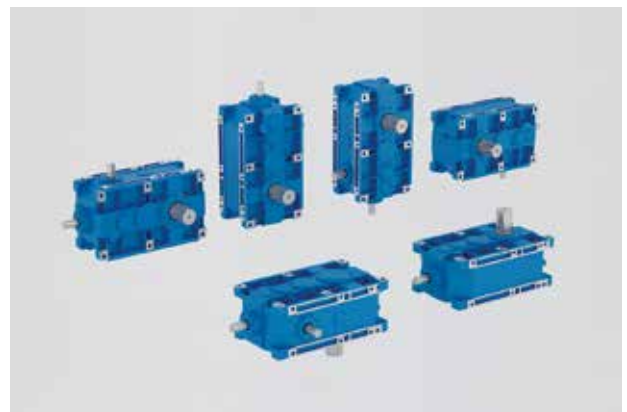
Horizontal center split housing cast in two halves from spheroidal cast iron (UNI ISO 1083) with reinforced stiffening ribs

- **Gear reducers suitable for low temperature operation (down to  $-20^{\circ}$  C) without installation of accessories**



Flexible mounting arrangements - typical mountings include horizontal, vertical, inclined and oscillating mounting positions

- **Easy maintenance**





## Features and **Benefits**

Standard painting to UNI EN ISO 12944-2 (corrosivity class C3)

Special painting cycles up to corrosivity class C5-M

- **Suitable for applications in aggressive or marine environments**
- **Possibility of international certifications**

### Coating layers (Class C5-M)



Dual compound  
zinc epoxy paint

Dual-compound  
epoxy primer

Water-based  
polyurethane  
enamel

Final on load inspection on test bench for all gear units manufactured, in order to grant high reliability and quality

- **Trouble-free commissioning**



Several non-standard designs for all sizes:  
Additional intermediate shaft overhung for bevel helical gear reducers  
Backstop device  
High and low speed shaft seal with labyrinth and grease feeder (taconite)

- **Product configuration according to customer's specifications, stock availability**



Several accessories available for all sizes:  
pre-arrangement for vibration monitoring devices  
oil heater  
oil temperature probes  
bearing temperature probes

- **Remote control for an user friendly maintenance**
- **Totally reduced cost of ownership**



# Symbols and units of measure

Symbols used in the catalog and formulae, in alphabetical order, with relevant units of measure.

Symbol	Definition	Units of measure			Notes
		In the catalog	In the formulae		
			Technical System	SI <sup>1)</sup> System	
	dimensions	mm	–		1 inch (in) = 24,5 mm; 1 foot (ft) 30,48 cm
<i>a</i>	acceleration	–	m/s <sup>2</sup>		
<i>d</i>	diameter	–	m		
<i>f</i>	frequency	Hz	Hz		
<i>f<sub>s</sub></i>	service factor				
<i>f<sub>t</sub></i>	thermal factor				
<i>F</i>	force	–	kgf	N <sup>2)</sup>	1 kgf ≈ 9,81 N ≈ 0,981 daN
<i>F<sub>r</sub></i>	radial load	N	–		
<i>F<sub>a</sub></i>	axial load	N	–		
<i>g</i>	acceleration of gravity	–	m/s <sup>2</sup>		normal value 9,81 m/s <sup>2</sup>
<i>G</i>	weight (weight force)	–	kgf	N	1 pound (lbf) = 4,4482 N
<i>Gd<sup>2</sup></i>	dynamic moment	–	kgf m <sup>2</sup>	–	
<i>i</i>	transmission ratio				$i = \frac{n_1}{n_2}$
<i>I</i>	electric current	–	A		
<i>J</i>	moment of inertia	kg m <sup>2</sup>	–	kg m <sup>2</sup>	
<i>L<sub>h</sub></i>	bearing life	h	–		
<i>m</i>	mass	kg	kgf s <sup>2</sup> /m	kg <sup>3)</sup>	
<i>M</i>	torque	N m	kgf m	N m	1 kgf m ≈ 9,81 N m ≈ 0,981 daN m
<i>Mf</i>	braking torque	N m	kgf m	N m	1 kgf m ≈ 9,81 N m ≈ 0,981 daN m
<i>n</i>	angular speed	min <sup>-1</sup>	rev/min	–	1 min <sup>-1</sup> ≈ 0,105 rad/s
<i>P</i>	power	kW	CV	W	1 CV ≈ 736 W ≈ 0,736 kW
<i>P<sub>t</sub></i>	thermal power	kW	–		
<i>r</i>	radius	–	m		
<i>R</i>	variation ratio				$R = \frac{n_{2 \max}}{n_{2 \min}}$
<i>s</i>	distance	–	m		
<i>t</i>	Celsius temperature	°C	–		1 °F = 1,8 · °C + 32
<i>t</i>	time	s min h d	s		1 min = 60 s 1 h = 60 min = 3 600 s 1 d = 24 h = 86 400 s
<i>U</i>	voltages	V	V		
<i>v</i>	velocity	–	m/s		
<i>W</i>	work, energy	MJ	kgf m	J <sup>4)</sup>	
<i>z</i>	frequency of starting	starts/h	–		
<i>α</i>	angular acceleration	–	rad/s <sup>2</sup>		
<i>η</i>	efficiency				
<i>η<sub>s</sub></i>	static efficiency				
<i>μ</i>	friction coefficient				
<i>φ</i>	plane angle	°	rad		1 rev = 2 π rad $1^\circ = \frac{\pi}{180} \text{ rad}$
<i>ω</i>	angular velocity	–	–	rad/s	1 rad/s ≈ 9,55 min <sup>-1</sup>

Additional indexes and other signs

Ind.	Definition
max	maximum
min	minimum
N	nominal
1	relating to HSS (input)
2	relating to LSS (output)
÷	from ... to
≈	approximately equal to
≧	greater than or equal to
≦	less than or equal to

- 1) SI are the initials of the International Unit System, defined and approved by the General Conference on Weights and Measures as the only system of units of measure.  
See CNR UNI 10 003-84 (DIN 1 301-93 NF X 02.004, BS 5 555-93, ISO 1 000-92).  
UNI: Ente Nazionale Italiano di Unificazione.  
DIN: Deutscher Normenausschuss (DNA).  
NF: Association Française de Normalisation (AFNOR).  
BS: British Standards Institution (BSI).  
ISO: International Organization for Standardization.
- 2) Newton [N] is the force imparting an acceleration of 1 m/s<sup>2</sup> to a mass of 1 kg.
- 3) Kilogramme [kg] is the mass of the prototype kept at Sèvres (i.e. 1 dm<sup>3</sup> of distilled water at 4 °C).  
Joule [J] is the work done when the point of application of a force of 1 N is displaced through a distance of 1 m.

# 1 - General specifications

## 1 - General specifications

**Closer size and performance steps; 5 size pairs (standard and strengthened) with final reduction center distance to R 20 series, for a total of 12 sizes with performance intervals by about 18%**

**Universal mounting:** suitable for **horizontal** or **vertical mounting**

**Rigid and precise spheroidal cast iron housing; high oil capacity**

**Gear pairs design especially studied to obtain high resistance, motion regularity, low noise and high efficiency with consequent low heating**

**High, reliable and tested performances**

**Prearranged for backstop device, possibility of double extension low and high speed shaft**

**Possibility of withstanding high loads on shaft ends**

**Possibility of obtaining multiple and 90° drives with no restriction on direction of rotation of input/output shafts**

**Manufacturing and product management flexibility**

**High manufacturing quality standard**

**Minimum maintenance requirements**

Large size gear reducers **produced in series** specifically conceived for granting highest reliability in **heaviest application conditions**. This series combines and exalts the **traditional qualities** of helical and bevel helical gear reducers – **strength, efficiency, compactness, reliability** – with advantages derived from modern design, manufacturing and operating criteria – **universality and application ease, wide size range, service, economy** – the advantages typically associated with high quality gear reducers produced in series.

### Main structural features

Main specifications are:

- **universal** mounting with feet integral with housing on 2 faces or frontal with spigot on low speed shaft cover (see ch. 6);
- closer size and performance steps; 5 size pairs (standard and strengthened) with final reduction center distance to R 20 series, for a total of **12 sizes** with performance intervals by about 18%; the size pairs are obtained with the same housing and many components in common;
- gear reducer overall sized so as to permit the transmission of **high nominal and maximum torques**, and to withstand **high loads on the high and low speed shaft ends**;
- cylindrical low speed shaft end with key (right, left or double extension);
- cylindrical high speed shaft end with key;
- possibility of **second high speed shaft extension** (excluding C3I);
- improved and upgraded modular construction both for component parts and assembled product;
- standardized dimensions and compliance with standards;
- **spheroidal cast iron** housing (400-15 UNI ISO 1083); stiffening ribs and high oil capacity;
- bearings: swinging roller bearings on low speed and intermediate shafts; **coupled** taper roller bearings plus one swinging roller bearing on high speed shafts with train of gears 2I, C1, C2I, C3I and intermediate train of gears C1 and C2I, taper roller bearing plus one cylindrical roller bearing on high speed shaft with train of gears 3I;
- oil bath lubrication; synthetic or mineral oil (ch. 13) including filler plug with **valve**, drain and level plug; sealed;
- additional bearings lubrication through proper pipelines or pump;
- natural or forced cooling (by fan, coil or independent cooling unit with heat exchanger, see ch. 12);
- metal plugs; magnetic drain plug;
- paint: external coating in water-soluble dual-compound polyurethan enamel resistant to atmospheric and aggressive agents (corrosivity class C3 ISO 12944-2); suitable for further coats only with dual-compound products after degreasing and sanding; color blue RAL 5010 DIN 1843, other colors and/or painting cycles on request, see ch. 12); internal protection in synthetic paint appropriate for resistance to mineral oils or to polyalphaolefines synthetic oils;
- optional designs: backstop device (always prearranged), shaft mounting arrangements, **hollow** low speed shaft with shrink disc or keyway, special paints, etc. (ch. 12).

# 1 - General specifications

## Train of gears

- 2, 3, 4 cylindrical gear pairs (helical gear units);
- 1 bevel gear pair plus 1, 2, 3 helical gear pairs (bevel helical type);
- 5 sizes pairs (normal and strengthened); with final reduction center distance to R 20 series for a total of **12 sizes**;
- nominal transmission ratios to R 20 series for trains of gears 2I ( $i_N = 10 \dots 25$ ); 3I ( $i_N = 25 \dots 125$ , excluding  $i_N = 112$ ), C1 ( $i_N = 8 \dots 20$ ) and C2I ( $i_N = 20 \dots 125$ , excluding  $i_N = 112$ ); to R 10 series for 4I ( $i_N = 125 \dots 315$ ) and C3I ( $i_N = 125 \dots 315$ );
- casehardened and hardened gear pairs in 16 CrNi4 or 20 MnCr5 (depending on size) and 18 NiCrMo5 steel, according to UNI 7846-78;
- helical toothed cylindrical gear pairs with **ground** profile;
- GLEASON spiral bevel gear pairs with **ground** profile;
- gear load capacity calculated for tooth breakage and pitting.

## Specific standards

- nominal transmission ratios and principal dimensions according to UNI 2016 (DIN 323-74, NF X 01.001, BS 2045-65, ISO 3-73);
- tothing profile to UNI 6587-69 (DIN 867-86, NF E 23.011, BS 436.2-70, ISO 53-74);
- shaft heights to UNI 2946-68 (DIN 747-76, NF E 01.051, BS 5186-75, ISO 496-73);
- medium series fixing holes to UNI 1728-83 (DIN 69-71, NF E 27.040, BS 4186-67, ISO/R 273);
- cylindrical shaft ends to UNI ISO 775-88 (DIN 748, NF E 22.051, BS 4506-70, ISO/R 775) with tapped butt-end hole to UNI 9321 (DIN 332 Bl. 2-70, NF E 22.056) excluding correspondence d-D;
- parallel keys UNI 6604-69 (DIN 6885 Bl. 1-68, NF E 27.656 and 22.175, BS 4235.1-72, ISO/R 773-69);
- mounting positions derived from CEI 2-14 (DIN EN 60034-7, IEC 34.7);
- load capacity verified according to UNI 8862, DIN 3990, AFNOR E 23-015, ISO 6336; thermal capacity verified.

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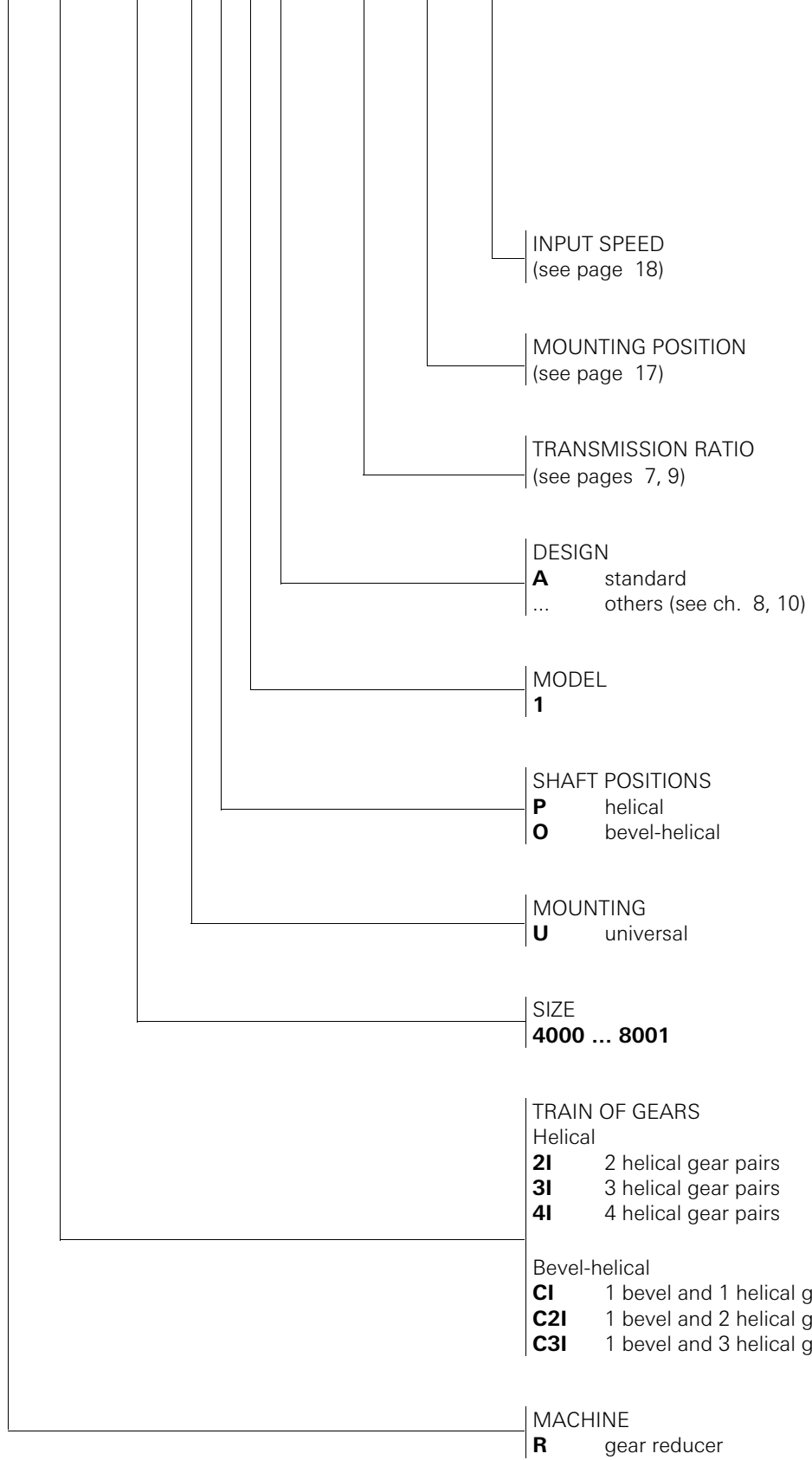


## 2 - Designation

**Designation code**

**R C2I 5600 U O 1 A - 25,4 B3**

**2**

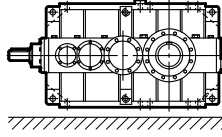


## 2 - Designation

### Gear reducer mounting position

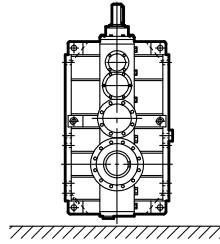
**Mounting positions of gear reducers and gearmotors are stated at ch. 8, 10.** Here following see some designation examples of important mounting positions.

1. **Standard** mounting position **B3**; in case of no specific needs, **prefer the adoption of B3 mounting positions** as it is the most advised from a technical and economic point of view (maximum simplification of lubrication system, lower oil splash, lower gear reducer heating, stock availability).

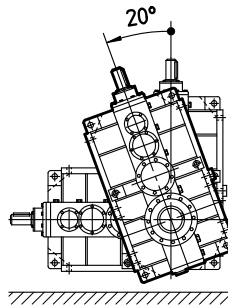


2. **Non-standard** mounting positions

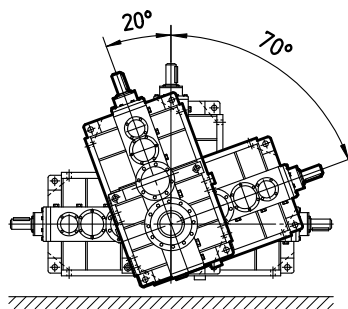
- 2a. Mounting position to catalog (see ch. 8, 10), **one only** and **fixed**, differing from B3; e.g.: mounting position **B6**



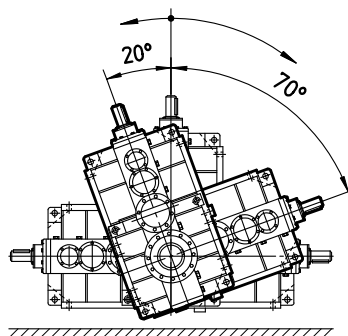
- 2b. **Inclined** and **fixed** mounting position ; e.g.: mounting position **B6 - 20° B3**



- 2c. **One only mounting position but defined within a predetermined angle**; e.g.: mounting position included among **B6 - 20° B3 / B6 - 70° B8**



- 2d. **Oscillatory mounting position** (gear reducer oscillating when running); e.g.: mounting position **B6 - 20° B3 / B6 - 70° B8 oscillatory**



UT. C 2172

## 2 - Designation

### Input speed

The designation is **always** to be completed stating the **input speed**  $n_1$ , chosen among the available ones as per catalog: **1 800** min<sup>-1</sup> (4 poles 60 Hz), **1 500** min<sup>-1</sup> (4 poles 50 Hz), **1 200** min<sup>-1</sup> (6 poles 60 Hz), **1 000** min<sup>-1</sup> (6 poles 50 Hz), **750** min<sup>-1</sup> (8 poles 50 Hz), **90** min<sup>-1</sup> (applications at low input speed).

Example:

R C2I 4501 UO1H-81,2 B3  $n_1 = 1\ 800\ \text{min}^{-1}$

R 3I 5600 UP1A-127 B3  $n_1 = 1\ 000\ \text{min}^{-1}$

### Accessories and non-standard designs

In the event of a gear reducer being required in a design different from those stated above, specify it in detail (ch. 12).

### 3 - Service factor $f_s$

### 3 - Service factor $f_s$

Service factor  $f_s$  takes into account the different running conditions (nature of load, running time, frequency of starting, speed  $n_2$ , other considerations) which must be referred to when performing calculations of gear reducer selection and verification.

The power and torques shown in the catalog are nominal values (i.e. valid for  $f_s = 1$ ).

The **minimum service factor required** is given by the following ratio:

$$f_s \text{ required} \geq f_{s1} \cdot f_{s2} \cdot f_{s3} \cdot f_{s4} \cdot f_{s5}$$

where  $f_{s1} \dots f_{s5}$  are stated in the following tables.

Service factor  $f_{s1}$  based on the **nature of load** and **running time**

Nature of load <sup>1)</sup> of the driven machine		$f_{s1}$				
		Running time [h/d]				
Ref.	Description	2	4	8	16	24
<b>a</b>	<b>Uniform</b>	1	1	1	1,18	1,32
<b>b</b>	<b>Moderate overloads</b> (1,6 times the normal load)	1,12	1,18	1,25	1,5	1,7
<b>c</b>	<b>Heavy overloads</b> (2,5 times the normal load)	1,4	1,5	1,7	2	2,24

Service factor  $f_{s2}$  based on **nature of load** and of **frequency of starting**

Nature of load <sup>1)</sup> of the driven machine		$f_{s2}$					
		Frequency of starting z [starts/h]					
Ref.	Description	1	2	4	8	16	32
<b>a</b>	<b>Uniform</b>	1	1,06	1,12	1,18	1,25	1,5
<b>b</b>	<b>Moderate overloads</b> (1,6 times the normal load)	1	1	1,06	1,12	1,18	1,4
<b>c</b>	<b>Heavy overloads</b> (2,5 times the normal load)	1	1	1	1,06	1,12	1,32

Service factor  $f_{s3}$  based on **motor type**

Motor type Description	$f_{s3}$
<b>Electric, turbine</b>	1
<b>Electric three-phase with brake</b>	1,06 <sup>4)</sup>
<b>Internal combustion</b> multi-cylinder	1,25
single-cylinder	1,5

Service factor  $f_{s4}$  based on **reliability level**

Reliability level <sup>5)</sup>	$f_{s4}$
<b>Standard</b>	1
<b>Average</b>	1,25
<b>High</b>	1,4

Service factor  $f_{s5}$  based on **output angular speed  $n_2$**

Output speed $n_2$ [min <sup>-1</sup> ]	$f_{s5}$
<b>&gt; 560</b>	1,32
<b>560 – 355</b>	1,25
<b>355 – 224</b>	1,18
<b>224 – 140</b>	1,12
<b>140 – 90</b>	1,06
<b>≤ 90</b>	1

Details and considerations about service factor.

$f_s$  values stated above are valid for:

- maximum time on overload 15 s, on starting 3 s; if over and/or subject to heavy shock effect, consult us;
- a whole number of overload cycles (or start) **imprecisely completed** in 1, 2, 3 or 4 revolutions of low speed shaft; if **precisely**, a continuous overload should be assumed;

Motors having a starting torque not exceeding nominal values (star-delta starting, particular types of motor operating on direct current, and single-phase motors), and particular types of coupling between gear reducer and motor, and gear reducer and driven machine (flexible, centrifugal, fluid and safety couplings, clutches and belt drives) affect service factor favourably, allowing its reduction in certain heavy-duty applications; consult us for verification.

1) For indication on the type of load of the driven machine according to the application, see table on next page.

4) For Y-Δ starting, running with inverter or with «soft start» devices,  $f_{s3} = 1$ .

5) Reliability degrees higher than normal are required in presence of very difficult maintenance, great importance of gear reducer in the production cycle, safety, etc.



## Classification of nature of load according to application

Application	Ref. load *	Application	Ref. load *	Application	Ref. load *
<b>Stirrers and mixers</b> Liquids: – constant density – varying density, solids in suspension, high viscosity concrete mixers, mullers, flash mixer-concrete mixers, mullers, flash mixers	a b c	<b>Lumber and woodworking industries</b> mechanical loaders, pallet stackers conveyors for: – boards, chips, waste – logs machine tools (planing, cutting, cross-cut and re-sawing, tenoning, bevelling, moulding, sanding, sizing and scratch-brushing machinery etc.): – feed drive – cutter drive barkers: – mechanical and hydraulic – drum	a, b b c	transverse drive rollers, draw benches, coilers, inverter, draglines, flattening rolls, bending rolls pushers, descaling equipment, pipe welders, mill roll train drives, rolling mills, forging presses, billet croppers, power hammers, punches, impact extruders, tapping machines, straightening presses Rollerways	b c
<b>Feeders and batchers</b> rotary (roller, table, sector) belt, screw, plate reciprocating, shaker	a, b c	<b>Oil industry</b> paraffin filter presses, chillers rotary drilling equipment pumping equipment	b, c b c	<b>Mills</b> rotary (rod, roller, pebble, ball) hammer, pin crusher, centrifugal, impact, rolling (ball or roller)	b, c <sup>3)</sup> b c
<b>Compressors</b> centrifugal (single-stage, multi-stage) rotary (vane, lobe, screw) axial reciprocating: – multi-cylinder – single-cylinder	a b b c	<b>Textile industry</b> calenders, cards, pickers, dryers, nappers, spinners, slashers, pads, soapers, washers, mangles, tenter frames, looms (Jacquard), warping machines, winders, knitting machines, dyeing machines, twisting frames, gig mills, cutters	b c b	<b>Pumps</b> rotary (gear, screw, lobe, vane) and axial centrifugal: – liquids, constant density – liquids, variable density or high viscosity proportioning alternative: – single acting ( $\geq 3$ cylinders), $\geq$ double acting ( $\leq 2$ cylinders) – single acting (2 cylinders), double acting single cylinder	a, b a b b b c
<b>Elevators</b> belt, centrifugal or gravity discharge, screw jacks, escalators bucket, arm and tray elevators, paddle wheel, hoists, skips man lifts, mobile scaffolding, passenger transport (cable cars, chair, ski, gondola lifts etc.)	a, b b a, b	<b>Clay working machinery</b> pug mills, extruders, rotary deslimers brick and tile presses	b c b	<b>Rotating drums</b> dryers, chillers, rotary kilns, washing machines tumblers, cement kilns	b c b c
<b>Excavators and dredges</b> cable reels, conveyors, pumps, winches (manoeuvring and utility), stackers, draining wheels cutter head drives, cutters, excavators (bucket ladder, paddle wheel, cutter) vehicles: – on rails – crawlers	b c b c	<b>Rubber and plastics industries</b> extruders: – plastics – rubber mixing mills, warming mills, friction calenders, refiners, tubers and strainers, rolling mills crackers, masticators	b c b c	<b>Transport conveyors</b> belts (plastic, rubber, metal) for: – fine grade loose material – coarse grade loose material or discrete items belt, apron, bucket, slat, tray, roller, screw, chain, overhead rail, assembly drag (slat, flight, chain, Redler, etc.) ground level chain, flow accumulating reciprocating, shaker overhead power rail	a b b b
<b>Crushers and granulators</b> sugar cane, rubber, plastics minerals, stone	b b	<b>Wrapping and stacking machinery</b> wrapping (film, cardboard), binding, strapping and labelling equipment palletizing/depalletizing and stacking/unstacking machinery, palletizing robots	a b	<b>Sewage treatment</b> biological tanks (revolving disk) dewatering screws, collectors, rotary screens, thickeners, vacuum filters, anaerobic digestion tanks aerators, rotary breakers	b c c <sup>4)</sup> a
<b>Cranes, winches and travelling lifts</b> travel (bridge, trolley, forks) <sup>1)</sup> slewing hoist <sup>2)</sup>	a, b a	<b>Engineering machine tools</b> boring, shaping, planing, broaching, gear cutting and FMS machines, etc.: – main drivers (cut and feed) – auxiliary drives (tools magazine, chip conveyor, workpiece infeed)	a b	<b>Screen and riddles</b> air washing, travelling water intake rotary (stone, gravel, cereals) vibrating screens, riddles, jigs	b c a b c
<b>Food</b> cookers (cereals and malt), mash tubs slicers, dough mixers, meat grinders, beet slicers, centrifuges, peelers, wine-making plant, bottle/bin/cratewashers, rinsers, fillers, corkers, cappers, extruders, crate filling and emptying equipment	b b	<b>Mechanisms</b> indexing, crank and slotted link, Maltese cross, articulated parallelogram rod and crank, cam control (cam and tappet, cam and rocker)	a b	<b>Fans</b> small diameter (centrifugal, axial-flow) large diameter (mines, furnaces, etc.) cooling towers (inducted or forced draft), ducted, piston	b c a b
<b>Paper mills</b> winders, suction rolls, dryers, embossing machinery, bleachers, press rolls, coating rolls, paper rolls, beaters, and pulpers agitators, mixers, extruders, chip feeders, calenders, felt dryers and stretchers, rag grinders, washers, thickeners cutters, chippers, calenders (super), felt whippers, glazing machines, presses	a b c	<b>Metal mills</b> shears: – trimming, cropping, facing – for sheet/plate, ingots, billets	c b c		a b c

\* Nature of load reference admits of modification where precise knowledge of duty is available.

1) In the traverse movement of the bridge usually it is necessary to have at least  $f_s > 1,6$  and in the storeyard cranes  $f_s > 2$  (container handling).

2) For selection of  $f_s$  to F.E.M./I-10.1987, consu+it us.

3) See cat. S.

4) See supplement to cat. A design.

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## 4 - Thermal power $P_t$ [kW]

## 4 - Thermal power $P_t$ [kW]

The nominal thermal power  $P_{tN}$ , stated in red in the table, is that which can be applied at the gear reducer input, without exceeding 95 °C<sup>1)</sup> approximately oil temperature when operating in following running conditions:

- input speed  $n_1 = 1\,500 \text{ min}^{-1}$
- mounting position B3;
- continuous duty S1;
- maximum ambient temperature 20 °C (in the table the values also refer to 40 °C);
- maximum altitude 1 000 m above sea level;
- air speed  $\geq 1,25 \text{ m/s}$  (typical value in presence of a self-cooled motor).

Nominal thermal power  $P_{tN}$

$T_{amb}$	Train of gears	Gear reducer size						
		$P_{tN}$ [kW]						
		4000, 4001	4500, 4501	5000, 5001	5600, 5601	6300, 6301	7101	8001
20 °C	2I	315	355	500	560	710	850	1 180
	3I	236	265	375	425	530	630	900
	4I	180	200	280	315	400	475	630
	CI	300	425	—	—	—	—	—
	C2I	236	265	375	425	530	630	900
	C3I	180	200	280	315	400	475	630
40 °C	2I	236	265	375	425	530	630	900
	3I	180	200	280	315	400	475	670
	4I	132	150	212	236	300	355	500
	CI	224	315	—	—	—	—	—
	C2I	180	200	280	315	400	475	670
	C3I	132	150	212	236	300	355	500

Always verify that the power applied  $P_1$  is lower than or equal to gear reducer thermal power  $P_{tN}$  multiplied by correction coefficients  $ft_1, ft_2, ft_3, ft_4, ft_5$  (stated in the following tables) considering the various operating conditions:

$$P_1 \leq P_{tN} \cdot ft_1 \cdot ft_2 \cdot ft_3 \cdot ft_4 \cdot ft_5$$

When the power applied is not constant and when the exact load cycle is given, it is possible, or advisable, to calculate the equivalent power applied, according to the formula:

$$P_{1eqth} = \frac{1}{\eta} \sqrt[3]{\frac{P_{21}^3 \cdot t_1 + P_{22}^3 \cdot t_2 + \dots + P_{2i}^3 \cdot t_i + \dots + P_{2n}^3 \cdot t_n}{t_c}}$$

where:

$\eta$  is the gear reducer efficiency (see ch. 6);

$P_{2i}$  [kW] is the power, referred to the gear reducer output, required in the time interval  $t_i$  [s];

$t_c = t_1 + t_2 + \dots + t_i + \dots + t_n$  is the total duration of load cycle [s].

In these cases choose factor  $ft_2$  from the continuous duty column S1.

Whenever the thermal verification should not be satisfied, in spite the prearrangement of cooling system, it is possible to install an **independent cooling unit with heat exchanger** (see ch. 12); consult us.

Thermal power needs not be taken into account when maximum duration of continuous running time is 1 – 3 h (from small to large gear reducer sizes) followed by rest periods long enough to restore the gear reducer to near ambient temperature (likewise 2 – 4 h). For maximum ambient temperature higher than 50 °C or lower than 0 °C consult us.

- 1) Corresponding to an average temperature of the external housing surface of approximately 85 °C; locally housing temperature can achieve the oil temperature.
- 3) If, simultaneously, forced cooling with coil is acting, multiply the values by 1,8.
- 4) For positions, dimensions and design verification see ch. 12.
- 5) Value also valid for electric fan (installed by the Buyer).
- 6) With axial fan, values are to be multiplied by 1,12. Consult us.
- 7) (Duration of running on load / 60) · 100 [%].

#### 4 - Thermal power $P_t$ [kW]

Thermal factor  $ft_1$  ( $= ft_{1a} \cdot ft_{1b}$ ) according to **cooling system** and **input speed  $n_1$**

Cooling system				$ft_{1a}, ft_{1b}$				
				input speed $n_1$ [min <sup>-1</sup> ]				
				<b>750</b>	<b>1 000</b>	<b>1 200</b>	<b>1 500</b>	<b>1 800</b>
$ft_{1a}$	Natural convection	train of gears	2I, CI	1,18	1,12	1,06	1	0,85
			3I, 4I, C2I, C3I	1,06	1,06	1,03	1	0,95
$ft_{1b}$	Forced cooling <sup>(3) (4) (6)</sup>	with 1 radial fan (helical gear units)		1,12	1,18	1,25	1,32	1,4
		with 2 radial fans (helical gear units)		1,25	1,4	1,6	1,8 <sup>(5)</sup>	2
		with 1 radial fan (bevel helical gear units)						
		with water coil <sup>(4)</sup>		2				

Thermal factor  $ft_2$  according to **ambient temperature** and **service**

Maximum ambient temperature °C	$ft_2$				
	Continuous duty <b>S1</b>	Intermittent duty <b>S3 ... S6</b>			
		Cyclic duration factor [%] for 60 min running <sup>(7)</sup>			
		<b>60</b>	<b>40</b>	<b>25</b>	<b>15</b>
<b>50</b>	0,6	0,71	0,8	0,95	1
<b>40</b>	0,75	0,9	1	1,12	1,25
<b>30</b>	0,9	1,06	1,18	1,32	1,5
<b>20</b>	<b>1</b>	1,18	1,32	1,5	1,7
<b>≤ 10</b>	1,12	1,32	1,5	1,7	1,9

Thermal factor  $ft_4$  according to **altitude of installation**

Altitude a.s.l. [m]	$ft_4$
<b>≤ 1 000</b>	<b>1</b>
<b>1 000 – 2 000</b>	0,95
<b>2 000 – 3 000</b>	0,9
<b>3 000 – 4 000</b>	0,85
<b>≥ 4 000</b>	0,8

Thermal factor  $ft_3$  according to **mounting position** (see also ch. 8, 10): where it is not specified  $ft_3 = 1$

Train of gears	$ft_3$					
	mounting position					
	<b>B3</b>	<b>B6</b>	<b>B7</b>	<b>V5</b>	<b>V6</b>	
<b>2I</b>	1	0,9	0,8	0,8	0,9	
<b>3I</b>	1	0,9	0,8	0,8	0,9	
<b>4I</b>	1	0,9	0,8	0,8	0,9	
<b>CI</b>	UO1A, UO1A sin, UO1F, UO1F sin, UO1N, UO1N sin, UO1V, UO1V sin, UO1S, UO1S sin, UO1L, UO1L sin	1	0,85	0,71	0,85 lower low speed wheel 0,71 upper low speed wheel	
	UO1H, UO1H sin, UO1G, UO1G sin, UO1M, UO1M sin	0,85	0,71	0,6	0,71 lower low speed wheel 0,6 upper low speed wheel	
<b>C2I</b>	UO1A, UO1Asin, UO1F, UO1Fsin, UO1N, UO1Nsin, UO1V, UO1Vsin, UO1S, UO1Ssin, UO1L, UO1Lsin	1	0,9	0,8	0,9 upper low speed wheel 0,8 lower low speed wheel	
	UO1H, UO1H sin, UO1G, UO1G sin, UO1M, UO1M sin	0,9	0,8	0,71	0,8 upper low speed wheel 0,71 lower low speed wheel	
<b>C3I</b>		1	0,9	0,8	0,9 lower low speed wheel 0,8 upper low speed wheel	

Thermal factor  $ft_5$  according to cooling air speed on housing

Air speed m/s	Installation environment	$ft_5$
<b>&lt; 0,63</b>	very small environment or without air movements or with protected gear reducer	consult us
<b>0,63</b>	small environment and with limited air movements	0,71
<b>1</b>	wide environment without air movements	0,9
<b>1,25</b>	wide environment with light air movements (e.g. gearmotor with self-cooled motor)	<b>1</b>
<b>2,5</b>	open and cooled	1,18
<b>4</b>	with heavy air movements	1,32

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# 5 - Selection

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5.4 - Selection questionnaire.....	30

5.1 - Preliminary considerations

Motor power

Taking into account the efficiency of the gear reducer, and other drives – if any – motor power is to be as near as possible to the power rating required by the driven machine: accurate calculation is therefore recommended.

The power required by the machine can be calculated, seeing that it is related directly to the power-requirement of the work to be carried out, to friction (starting, sliding or rolling friction) and inertia (particularly when mass and/or acceleration or deceleration are considerable). It can also be determined experimentally on the basis of tests, comparisons with existing applications, or readings taken with ammeters or wattmeters.

An oversized motor would involve: a greater starting current and consequently larger fuses and heavier cable; a higher running cost as power factor (cosφ) and efficiency would suffer; greater stress on the drive, causing danger of mechanical failure, drive being normally proportionate to the power rating required by the machine, not to motor power.

In such cases, a detailed description of duty requirement must be made available: duration and frequency per hour of work cycle, acceleration and deceleration requirements if any, inertia, loads deriving from friction and work. In the absence of such data it is essential to provide all details which will permit their determination.

Only high values of ambient temperature, altitude, frequency of starting or other particular conditions require an increase in motor power.

Input speed  $n_1$

The maximum gear reducer input speed, valid for **continuous duty S1 and in absence of a forced lubrication system of gears and bearings (with eventual heat exchanger)**, is stated in the following table according to train of gears and gear reducer size.

For intermittent duty or for particular needs, higher speeds are possible, but always lower than  $n_{1peak}$ ; consult us.

Peak speed is admitted for a maximum duration of 5 s, including a proper rest period, or a low or null speed period for the cooling of gear reducer, especially on high speed shaft side.

For variable  $n_1$ , the selection should be carried out on the basis of  $n_{1max}$ , but it should also be verified on the basis of  $n_{1min}$ .

When there is a belt drive between motor and gear reducer, different input speeds  $n_1$  should be examined in order to select the most suitable unit from engineering and economy standpoints alike.

Input speed should not be higher than 1 800  $min^{-1}$ , unless conditions make it necessary; better to take advantage of the transmission, and use an input speed lower than 900  $min^{-1}$ .

Size	Train of gears																	
	2I			3I			4I			CI			C2I			C3I		
	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$	$\dot{n}_N$	$n_{1max}$	$n_{1peak}$
	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$	$min^{-1}$
<b>4000, 4001</b>	all	1 600	2 120	all	1 800	2 240	all	1 800	2 360	8 ... 11,2 12,5 ... 18	1 250 1 600	2 120 2 120	20 ... 25 28 ... 40 45 ... 100	1 400 1 600 1 800	2 240 2 240 2 240	all	1 800	2 360
<b>4500, 4501</b>	all	1 600	2 120	all	1 800	2 240	all	1 800	2 360	8 ... 10 11,2 ... 12,5 14 ... 20	1 180 1 250 1 600	2 120 2 120 2 120	22,4 ... 28 31,5 ... 45 50 ... 125	1 400 1 600 1 800	2 240 2 240 2 240	all	1 800	2 360
<b>5000, 5001</b>	all	1 250	2 000	≤ 31,5 ≥ 35,5	1 600 1 800	2 120 2 120	all	1 800	2 240	-	-	-	22,4 ... 25 28 ... 40 45 ... 100	1 180 1 250 1 600	2 120 2 120 2 120	all	1 800	2 240
<b>5600, 5601</b>	all	1 250	2 000	≤ 40 ≥ 45	1 600 1 800	2 120 2 120	all	1 800	2 240	-	-	-	25 ... 28 31,5 ... 45 50 ... 125	1 180 1 250 1 600	2 120 2 120 2 120	all	1 800	2 240
<b>6300, 6301</b>	all	1 060	1 900	≤ 31,5 35,5 ... 50 ≥ 56	1 400 1 600 1 800	2 000 2 000 2 000	all	1 800	2 120	-	-	-	28 ... 35,5 40 ... 56 63 ... 100	1 180 1 250 1 600	2 000 2 000 2 000	all	1 800	2 120
<b>7101</b>	≤ 14 ≥ 16	900 1 060	1 400	≤ 35,5 40 ... 50 ≥ 56	1 180 1 400 1 700	2 000	≤ 160 ≥ 200	1 600 1 800	2 120	-	-	-	≤ 40 ≥ 45	900 1 180	1 700	≤ 125 160 ≥ 200	1 400 1 600 1 800	2 120
<b>8001</b>	≤ 14 ≥ 16	800 900	1 250	≤ 35,5 40 ... 50 ≥ 56	950 1 120 1 400	1850	≤ 160 ≥ 200	1 320 1 600	2 000	-	-	-	≤ 40 ≥ 45	900 1 180	1 600	≤ 125 160 ≥ 200	1 180 1 250 1 600	2 000

**5.2 - Determining the gear reducer size**

**Constant load**

- Fill out the questionnaire for the selection on page 31; in particular, make available required output power  $P_2$ , the angular speeds  $n_2$  and  $n_1$ , the running conditions (nature of load, frequency of starting h/d, frequency of starting z, other considerations) referring to ch. 3.
- Determine service factor  $f_s$  required on the basis of running conditions (ch. 3).
- Select the gear reducer size (also, the train of gears and transmission ratio  $i$  at the same time) on the basis of  $n_2, n_1$  and of a power  $P_{N2}$  greater than or equal to  $P_2 \cdot f_s$  (ch. 7 and 9).
- Calculate power  $P_1$  required at input side of gear reducer using the formula  $P_2 / \eta$ , where  $\eta = 0,97 \div 0,94$  is the efficiency of gear reducer (ch. 6).

When for reasons of motor standardization, power  $P_1$  applied at input side of gear reducer turns out to be higher than the power required (considering motor/gear reducer efficiency), it must be certain that this excess power applied will never be required, and frequency of starting z is so low as not to affect service factor (ch. 3).

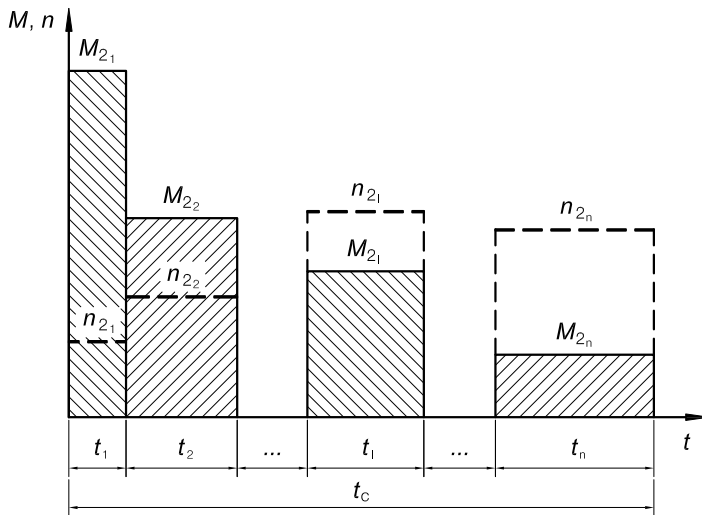
Otherwise, make the selection by multiplying  $P_{N2}$  by  $P_1$  applied  $P_1$  required.

Calculations can also be made on the basis of torque instead of power; this method is even preferable for low  $n_2$  values.

**Variable load**

- Fill out the questionnaire for the selection on page 31; in particular, make available the torque  $M_2$  and the angular speed  $n_2$  required at gear reducer output, the running conditions (nature of load, duration of running required, frequency of starting z, other considerations) referring to ch. 3.
- In presence of required torque  $M_2$  and angular speed  $n_2$  variable in time, according to a given load cycle, calculate the equivalent torque  $M_{2eq}$  and angular speed  $n_{2eq}$  with the following formulae:

**5**



$$M_{2eq} = \sqrt[p]{\frac{M_{2_1}^p \cdot n_{2_1} \cdot t_1 + M_{2_2}^p \cdot n_{2_2} \cdot t_2 + \dots + M_{2_i}^p \cdot n_{2_i} \cdot t_i + \dots + M_{2_n}^p \cdot n_{2_n} \cdot t_n}{n_{2eq} \cdot t_c}}$$

$$n_{2eq} = \frac{n_{2_1} \cdot t_1 + n_{2_2} \cdot t_2 + \dots + n_{2_i} \cdot t_i + \dots + n_{2_n} \cdot t_n}{t_c}$$

where:

- $M_{2eq}$  [N m] is the equivalent torque of load cycle
- $M_{2_i}$  [N m] is the torque required (constant) of load level i
- $n_{2eq}$  [min<sup>-1</sup>] is the equivalent speed in the load cycle
- $n_{2_i}$  [min<sup>-1</sup>] is the low speed shaft speed (constant) of load level i
- $t_i$  [min] is the duration of interval i
- $t_c$  [min] is the total duration of cycle ( $t_1 + \dots + t_i + \dots + t_n$ )
- $p = 6,61$  for a running duration  $\leq 8$  h/d
- $p = 3,33$  for a running duration  $> 8$  h/d

### 5.3 - Verifications

- Verify possible radial loads  $F_{r1}$ ,  $F_{r2}$  and axial loads  $F_{a2}$  according to instructions and values given in ch. 11.
- When a load chart is available, and/or there are overloads – due to starting on full load (especially with high inertias and low transmission ratios), braking, shocks, gear reducers in which the low speed shaft becomes driving member due to driven machine inertia, or other static or dynamic causes - verify that the maximum torque peak (ch. 6) is always lower than  $M_{2max}$  (see ch. 7, 9), if higher or if it cannot be evaluated in the above cases, install a safety device so that  **$M_{2max}$  will never be exceeded.**
- Verify that the input speed is lower than or equal to  $n_{1max}$  (see ch. 5.1);
- Verify for each single interval  $i$  of the eventual load cycle that the required torque  $M_{2i}$  is lower than  $M_{2max}$  and that input speed (relevant to output shaft speed  $n_{2i}$ ) is  $n_{1i} \leq n_{1max}$  (see ch. 5.1);
- Verify the possible need for forced cooling (ch. 4 and 12).
- For gear reducers with **backstop device**, having particular  $i_N$  or low values of  $f_s$ , verify load capacity of backstop device according to the values given in the table «Backstop device load capacity» (ch. 12).

### 5.4 - Selection questionnaire

Make available all data and information necessary for a correct gear reducer selection by filling out the questionnaire on next page.

Attach any technical specifications relevant to gear reducer, excluding data regarding the machine of the plant.

When possible, attach all possible drawings, pictures and/or any further information facilitating the technical and economic selection.

# 5 - Selection

## 1 Application conditions

Application / Industry sector

Type of machine to be driven

- new machine
- existing machine, running gear reducer currently applied

Ambient temperature [°C]  
min                      standard                      max

Altitude [m above sea level]

- Environment:
- normal (industrial) indoor
  - normal (industrial) outdoor
  - dusty
  - corrosive / humid

- Gear reducer position:
- small environment with limited air movement ( $v_{air} < 0,63$  m/s)
  - wide environment with free air movement ( $v_{air} \geq 1,25$  m/s)
  - open space, prot. against extremes of weather and solar radiance

## 2 Load data

Required output speed [min<sup>-1</sup>]  
min                      nominal                      max

Torque required at low speed shaft [N m]  
min                      nominal                      max

Required output power [kW]  
min                      nominal                      max

Input speed (gear reducers) [min<sup>-1</sup>]  
min                      nominal                      max

- Nature of load:
- uniform
  - moderate overloads
  - heavy overloads

Frequency of starting [starts/h]

Machine moment of inertia [kg m<sup>2</sup>]  
min                      standard                      max

Running time [h/d]

Total duration [h]

Duty cycle (S1 ... S10)

Load cycle attached

- yes
- no

## 3 Motor

- Motor type:
- asynchronous three-phase (a.c.)
  - asynchr. three-phase with inverter
  - d.c. motor with relevant converter
  - int. combust. motor (single-cylinder)
  - int. combust. motor (multi-cylinder)

Power  $P_1$  [kW]  
min                      nominal                      max

Nominal speed  $n_1$  [min<sup>-1</sup>]  
min                      nominal                      max

a.c. motor supply:  
voltage [V]                      frequency [Hz]

IEC motor size (a.c. motor)

- Type of a.c. motor starting:
- direct
  - Y /  $\Delta$
  - soft starter / inverter

- Electromagnetic motor
- parking brake
  - work
  - safety
- Braking torque [N m]

Starting torque [N m]

Moment of inertia [kg m<sup>2</sup>]

- Electric motor design (a.c. and d.c.):
- with independent cooling fan
  - with encoder:
  - with tacho-generator

- System of motor-gear reducer mounting:
- with coupling
  - with trapezoidal belts
- | section | No. | $d_m$ [mm] | $d_1$ [mm] |
|---------|-----|------------|------------|
|         |     |            |            |
- with timing belt
- | section | No. | $d_m$ [mm] |
|---------|-----|------------|
|         |     |            |

Eventual limit to drive dimensions

## 4 Gear reducer

Mounting position

- Direction of rotation of output shaft
- white arrow
  - black arrow
  - white and black arrow

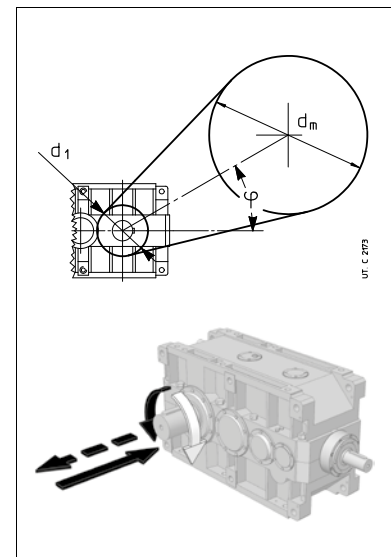
- Backstop device (if present)
- free rotation, white arrow
  - free rotation, black arrow

- Type of admitted cooling
- with fan
  - with coil
  - with internal exchanger
  - with UR O/A unit
  - with UR O/W unit

- Type of machine coupling
- shaft mounting
  - with fluid / flexible coupling
  - with cardan joint
  - with toothed belt drive
- | pitch | $d_m$ | $d_1$ | $\varphi$ |
|-------|-------|-------|-----------|
|       |       |       |           |
- with chain
- | pitch | No. | $z_2$ | $z_3$ | overhang [mm] | $\varphi$ |
|-------|-----|-------|-------|---------------|-----------|
|       |     |       |       |               |           |
- straight tooth cylindrical gear
- | pitch | No. | $z_2$ | $z_3$ | overhang [mm] | $\varphi$ |
|-------|-----|-------|-------|---------------|-----------|
|       |     |       |       |               |           |

Eventual axial load  $F_a$  [N]

Eventual limit to drive dimensions



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# 6 - Structural and operational details

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## Sound levels $L_{WA}$ and $L_{pA}$

Standard production sound power level  $L_{WA}$  [dB(A)]<sup>1)</sup> and mean sound pressure level  $L_{pA}$  [dB(A)]<sup>2)</sup> assuming nominal load, and input speed  $n_1 = 1\,500^{(3)} \text{ min}^{-1}$ . Tolerance +3 dB(A).

If required, gear reducers can be supplied with reduced sound levels (normally 3 dB(A) less than tabulated values): consult us.

In case of gear reducers with fan cooling, add to the values in the table 3 dB(A) for 1 fan and 5 dB(A) for 2 fans.

Size	Helical gear reducers						Bevel helical gear reducers					
	R 2I		R 3I		R 4I		R CI		R C2I		R C3I	
	$i_N \leq 12,5$ $L_{WA}$ $L_{pA}$	$i_N \geq 14$ $L_{WA}$ $L_{pA}$	$i_N \leq 63$ $L_{WA}$ $L_{pA}$	$i_N \geq 71$ $L_{WA}$ $L_{pA}$	$i_N \leq 160$ $L_{WA}$ $L_{pA}$	$i_N \geq 200$ $L_{WA}$ $L_{pA}$	$i_N \leq 16$ $L_{WA}$ $L_{pA}$	$i_N \geq 18$ $L_{WA}$ $L_{pA}$	$i_N \leq 63$ $L_{WA}$ $L_{pA}$	$i_N \geq 71$ $L_{WA}$ $L_{pA}$	$L_{WA}$ $L_{pA}$	
<b>4000 ... 4501</b>	<b>105</b> 93	<b>102</b> 90	<b>101</b> 89	<b>98</b> 86	<b>95</b> 83	<b>92</b> 80	<b>101</b> 89	<b>96</b> 84	<b>98</b> 86	<b>96</b> 84	<b>92</b> 80	
<b>5000 ... 5601</b>	- -	<b>106</b> 94	<b>105</b> 93	<b>102</b> 90	<b>99</b> 87	<b>96</b> 84	- -	- -	<b>101</b> 89	<b>99</b> 87	<b>96</b> 84	
<b>6300, 6301</b>	- -	<b>110</b> 98	<b>109</b> 97	<b>106</b> 94	<b>103</b> 91	<b>100</b> 88	- -	- -	<b>104</b> 92	<b>102</b> 90	<b>99</b> 87	
<b>7101</b>	- -	<b>112</b> 100	<b>111</b> 99	<b>108</b> 96	<b>105</b> 93	<b>102</b> 90	- -	- -	<b>106</b> 94	<b>104</b> 92	<b>102</b> 90	
<b>8001</b>	- -	<b>114</b> 102	<b>113</b> 101	<b>110</b> 98	<b>107</b> 95	<b>104</b> 92	- -	- -	<b>107</b> 95	<b>105</b> 93	<b>103</b> 91	

1) To ISO/CD 8579.

2) Mean value of measurement at 1 m from external profile of gear reducer standing in free field on a reflecting surface.

3) In the speed range  $n_1$  750 – 1 800  $\text{min}^{-1}$ , sum to the table values: -3 dB(A) for 750  $\text{min}^{-1}$ ; -2 dB(A) for 1000  $\text{min}^{-1}$ ; -1 dB(A) for  $n_1 = 1\,200 \text{ min}^{-1}$ ; +2 dB(A) for  $n_1 = 1\,800 \text{ min}^{-1}$ .

## Efficiency

The efficiency stated in the table is rough and referred to nominal running conditions (torque, speed, temperature); it is necessary to keep in mind that the efficiency value can diminish considerably for values of  $M_2 \ll M_{N2}$ .

Nominal efficiency	Helical gear reducers			Bevel helical gear reducers		
	R 2I	R 3I	R 4I	R CI	R C2I	R C3I
$\eta$	0.970	0.955	0.940	0.970	0.955	0.940

## Overloads

When a gear reducer is subjected to high static and dynamic overloads, the need arises for verifying that such overloads will always remain lower than  $M_{2max}$  (see ch. 7, 9).

Overloads are normally generated when one has:

- starting on full load (especially for high inertias and low transmission ratios), braking, shocks;
- gear reducers in which the low speed shaft becomes driving member due to driven machine inertia;
- applied power higher than that required; other static or dynamic causes.

The following general observations on overloads are accompanied by some formulae for carrying out evaluations in certain typical instances.

Where no evaluation is possible, install safety devices which will keep values within  $M_{2max}$ .

## Starting torque

When starting on full load (especially for high inertias and low transmission ratios) verify that  $M_{2max}$  is equal to or greater than starting torque, by using the following formula:

$$M_{2 \text{ start}} = \left( \frac{M_{\text{start}}}{M_N} \cdot M_2 \text{ available} - M_2 \text{ required} \right) \cdot \frac{J}{J + J_0} + M_2 \text{ required}$$

where:

$M_{\text{start}}$  and  $M_N$  are the starting torque and the motor nominal torque, respectively;

$M_2 \text{ required}$  is the torque absorbed by the machine through work and frictions;

$M_2 \text{ available}$  is the output torque due to motor nominal power;

$J_0$  is the moment of inertia (of mass) of the motor;

$J$  is the external moment of inertia (of mass) in  $\text{kg m}^2$  (gear reducers, couplings, driven machine) referred to the motor shaft;

NOTE: when seeking to verify that starting torque is sufficiently high for starting, take into account starting friction, if any, in evaluating  $M_2 \text{ required}$ .

**Stopping machines with high kinetic energy (high moments of inertia combined with high speeds) with brake motor**

$$\left( \frac{Mf}{\eta} \cdot i + M_2 \text{ required} \right) \cdot \frac{J}{J + J_0} - M_2 \text{ required} \leq M_{2max}$$

where:

$Mf$  is the braking torque applied on high speed shaft; for other symbols see above and ch. 1.

## 6 - Structural and operational details

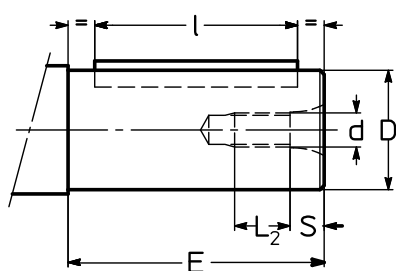
### Moment of inertia (of mass) $J_1$ [kg m<sup>2</sup>]

The moment of inertia is referred to the high speed shaft of gear reducer, design with only one single HSS and LSS end; the one referred to the low speed shaft is given by following ratio:  $J_2 = J_1 \cdot i^2$ .

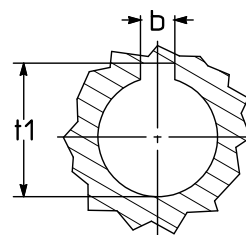
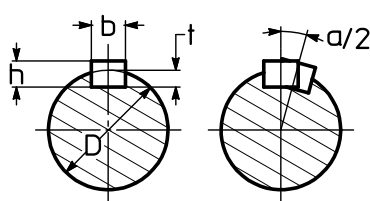
Train of gears	$i_N$	Gear reducer size <sup>1)</sup>									
		Moment of inertia of mass $J_1$ [kg m <sup>2</sup> ]									
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301
<b>2I</b>	10	0,713	0,732	–	–	–	–	–	–	–	–
	11,2	0,684	0,7	0,8	0,813	–	–	–	–	–	–
	12,5	0,467	0,478	0,757	0,769	–	–	–	–	–	–
	14	0,448	0,458	0,521	0,53	1,393	1,429	1,609	1,633	3,593	3,643
	16	0,431	0,44	0,495	0,502	1,333	1,363	1,522	1,543	3,412	3,428
	18	0,297	0,303	0,469	0,475	0,994	1,017	1,439	1,457	3,296	3,332
	20	0,286	0,291	0,45	0,455	0,956	0,975	1,39	1,406	2,39	2,4
	22,4	0,279	0,284	0,31	0,314	0,808	0,823	1,023	1,035	2,318	2,34
	25	0,21	0,213	0,298	0,301	0,79	0,803	0,862	0,871	–	–
	28	0,206	0,208	0,224	0,226	0,602	0,611	0,653	0,659	1,526	1,539
<b>3I</b>	31,5	0,202	0,204	0,217	0,219	0,588	0,595	0,633	0,638	1,476	1,481
	35,5	0,149	0,15	0,211	0,212	0,418	0,423	0,613	0,617	0,996	1,004
	40	0,146	0,147	0,156	0,157	0,409	0,413	0,601	0,605	0,966	0,969
	45	0,133	0,134	0,152	0,153	0,362	0,365	0,425	0,427	0,834	0,953
	50	0,131	0,132	0,137	0,138	0,356	0,359	0,374	0,376	0,816	0,818
	56	0,075	0,076	0,135	0,135	0,241	0,243	0,366	0,368	0,555	0,63
	63	0,074	0,075	0,078	0,079	0,237	0,239	0,249	0,25	0,543	0,544
	71	0,054	0,054	0,077	0,077	0,164	0,165	0,244	0,245	0,363	0,538
	80	0,053	0,053	0,056	0,056	0,162	0,163	0,169	0,17	0,356	0,357
	90	0,048	0,048	0,054	0,055	0,148	0,149	0,166	0,167	0,352	0,353
<b>4I</b>	100	0,047	0,047	0,054	0,054	0,147	0,148	0,164	0,165	0,317	0,317
	125	–	–	0,048	0,048	–	–	–	–	–	–
	125	0,044	0,044	0,045	0,045	0,128	0,129	0,131	0,131	0,275	0,276
	160	0,035	0,035	0,035	0,035	0,106	0,106	0,108	0,108	0,248	0,248
	200	0,021	0,021	0,022	0,022	0,05	0,05	0,051	0,051	0,112	0,112
<b>CI</b>	250	0,017	0,017	0,018	0,018	0,042	0,042	0,042	0,042	0,101	0,101
	315	0,015	0,015	0,017	0,017	0,036	0,036	0,042	0,042	0,084	0,084
	8	0,964	0,993	1,387	–	–	–	–	–	–	–
	9	0,916	0,943	1,284	1,309	–	–	–	–	–	–
	10	0,872	0,894	1,035	1,229	–	–	–	–	–	–
	11,2	0,845	0,866	0,969	0,985	–	–	–	–	–	–
	12,5	0,572	0,587	0,921	0,934	–	–	–	–	–	–
	14	0,556	0,569	0,634	0,644	–	–	–	–	–	–
	16	0,388	0,397	0,603	0,612	–	–	–	–	–	–
	18	0,378	0,386	0,426	–	–	–	–	–	–	–
<b>C2I</b>	20	0,398	0,403	0,408	0,413	–	–	–	–	–	–
	22,4	0,391	0,395	0,42	0,423	1,26	1,274	–	–	–	–
	25	0,384	0,388	0,409	0,412	1,236	1,248	1,311	1,319	–	–
	28	0,298	0,3	0,399	0,402	0,953	0,962	1,278	1,285	1,642	1,655
	31,5	0,293	0,296	0,31	0,311	0,938	0,946	0,986	0,992	1,597	1,601
	35,5	0,272	0,274	0,303	0,305	0,859	0,864	0,965	0,97	1,568	1,577
	40	0,269	0,271	0,279	0,281	0,849	0,854	0,879	0,883	1,169	1,172
	45	0,181	0,182	0,275	0,276	0,564	0,568	0,866	0,869	1,028	1,156
	50	0,179	0,18	0,186	0,186	0,558	0,561	0,577	0,579	1,01	1,012
	56	0,124	0,124	0,183	0,184	0,383	0,386	0,569	0,571	0,671	1,002
<b>C3I</b>	63	0,122	0,123	0,126	0,127	0,38	0,381	0,391	0,393	0,66	0,661
	71	0,114	0,114	0,125	0,125	0,358	0,359	0,386	0,387	0,652	0,655
	80	0,113	0,114	0,124	0,124	0,356	0,357	0,383	0,384	0,443	0,443
	100	0,068	0,069	0,075	0,075	0,221	0,222	0,239	0,24	0,438	0,438
	125	–	–	0,069	0,069	–	–	0,223	0,223	–	–
	125	0,051	0,052	0,052	0,053	0,163	0,163	0,166	0,166	0,319	0,319
<b>C3I</b>	160	0,034	0,034	0,034	0,034	0,104	0,105	0,106	0,106	0,215	0,215
	200	0,027	0,027	0,027	0,027	0,087	0,087	0,088	0,088	0,137	0,169
	250	0,016	0,016	0,016	0,016	0,052	0,052	0,053	0,053	0,108	0,108
	315	0,013	0,013	0,013	0,013	0,044	0,044	0,045	0,045	0,065	0,065

1) For sizes 7101 and 8001, consult us.

### High and low speed shaft end



Gear reducer



(Hollow) machine shaft

UTZ 2099

Shaft end						Key			Keyway				
D ∅	E	d ∅	S	L <sub>2</sub>	$\alpha/2_{\max}$ arc min 1)	b h9	x	h h11	x	l	b h9 hub N9 shaft	t shaft	t <sub>1</sub> shaft
38 k6	80	M10	7,6	18,4	3,27	10	x	8	x	70	10	5	41,3
48 k6	110	M12	9,5	22,5	3,08	14	x	9	x	90	14	5,5	51,8
55 m6	110	M12	9,5	22,5	2,75	16	x	10	x	90	16	6	59,3
60 m6	140	M16	12,7	27,3	2,46	18	x	11	x	110	18	7	64,4
65 m6	140	M16	12,7	27,3	2,33	18	x	11	x	110	18	7	69,4
70 m6	140	M16	12,7	27,3	2,55	20	x	12	x	125	20	7,5	74,9
75 m6	140	M16	12,7	27,3	2,38	20	x	12	x	125	20	7,5	79,9
80 m6	170	M20	16	34	2,23	22	x	14	x	140	22	9	85,4
90 m6	170	M20	16	34	1,99	25	x	14	x	140	25	9	95,4
100 m6	210	M24	19	41	1,79	28	x	16	x	180	28	10	106,4
110 m6	210	M24	19	41	1,63	28	x	16	x	180	28	10	116,4
120 m6	210	M30	22	45	1,78	B32	x	18	x	180	32	11	127,4
125 m6	210	M30	22	45	1,71	32	x	18	x	180	32	11	132,4
140 m6	250	M30	22	45	1,52	36	x	20	x	180	36	12	148,4
150 m6	245	M36	27	54	1,42	36	x	20	x	220	36	12	158,4
150 m6	250	M36	27	54	1,42	B36	x	20	x	210	36	12	158,4
180 m6	300	M36	27	54	1,18	45	x	25	x	250	45	15	190,4
190 m6	280	M36	27	54	1,12	B45	x	25	x	250	45	15	200,4
200 m6	280	M36	27	54	1,07	B45	x	25	x	250	45	15	210,4
200 m6	350	M36	27	54	1,07	45	x	25	x	320	45	15	210,4
210 m6	300	M36	27	54	1,02	B50	x	28	x	280	50	17	221,4
220 m6	300	M36	27	54	0,97	B50	x	28	x	280	50	17	231,4
240 m6	330	M45	33	67	1,06	B56	x	32	x	300	56	20	252,4
250 m6	330	M45	33	67	1,02	B56	x	32	x	300	56	20	262,4
270 m6	380	M45	33	67	0,94	B63	x	32	x	360	63	20	282,4
280 m6	380	M45	33	67	0,91	B63	x	32	x	360	63	20	292,4
300 m6	430	M45	33	67	0,85	B70	x	36	x	400	70	22	314,4
320 m6	430	M45	33	67	0,80	B70	x	36	x	400	70	22	334,4
360 m6	590	M45	33	67	1,45	B80	x	40	x	550	90	25	375,4
400 m6	660	M45	33	67	1,50	B90	x	45	x	610	90	28	417,4

1) Maximum angular disalignment of keyways on double extension shafts.

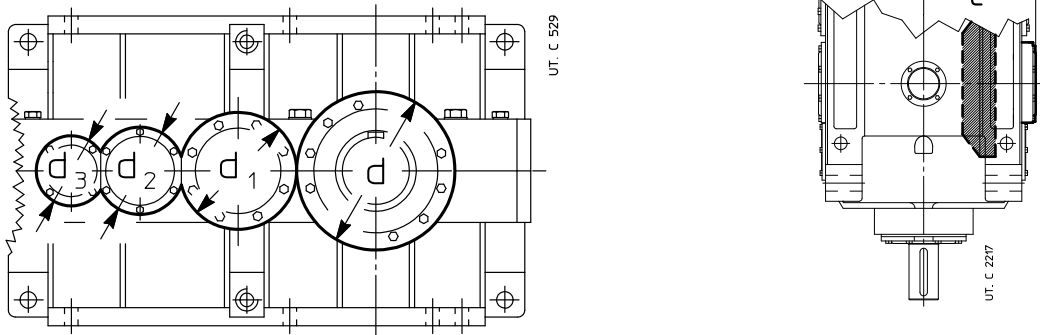
### Plug dimensions

The filler, drain and level plugs have standard threading G 1" for size ≤ 6301, G 1 1/4" for size 7101, G 1 1/2" for size 8001.

## 6 - Structural and operational details

### Side-cover dimensions

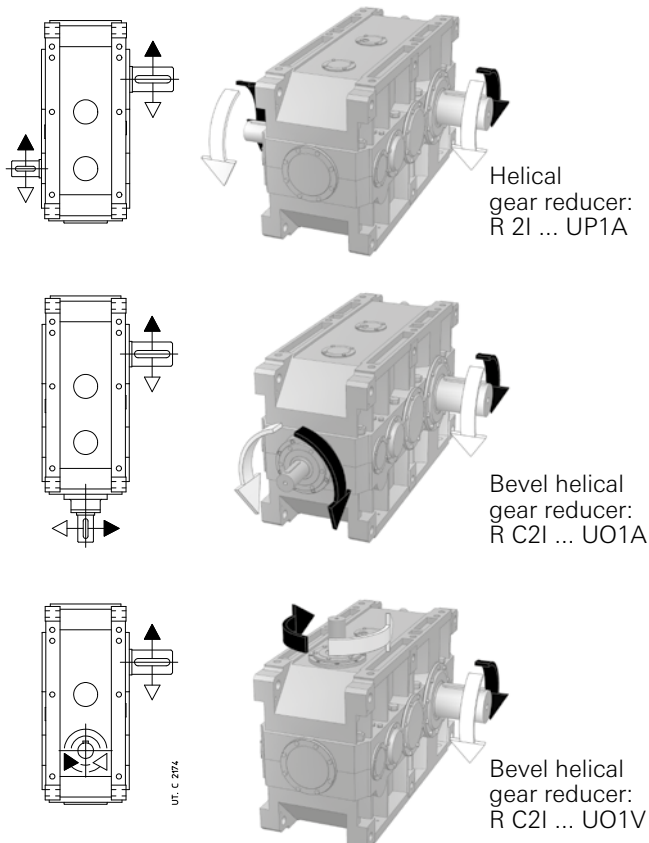
The low speed shaft covers are machined for spigot. For cover height, consider the difference  $C - H_1$  (ch. 8 and 10); for trains of gears CI and C2I the cover dimensions on bevel wheel side are stated in the table. Diameter tolerance  $\pm 0,5$  (excluding  $d$  dimension).



Grandezza	Rotismo									
	2I				3I, 4I, C2I, C3I			2I, 3I, 4I, CI C2I, C3I		
	$d_3$ Ø		$d_2$ Ø		$d_3$ Ø	$d_2$ Ø	$c'$ (C2I)	$d_1$ Ø	$c'$ (CI)	$d$ Ø h7
<b>4000, 4001</b>	$i_N \leq 11,2$ 170	$i_N \geq 12,5$ 190	$i_N \leq 11,2$ 259	$i_N \geq 12,5$ 248	190	248	318	340	363 <sup>1)</sup>	432
<b>4500, 4501</b>	$i_N \leq 12,5$ 170	$i_N \geq 14$ 190	$i_N \leq 12,5$ 259	$i_N \geq 14$ 248	190	248	318	340	363 <sup>1)</sup>	472
<b>5000, 5001</b>	228		320		228	320	423 <sup>1)</sup>	388	–	530
<b>5600, 5601</b>	228		320		228	320	423	432	–	590
<b>6300, 6301</b>	248		362		248	362	468	510	–	648
<b>7101</b>	320		490		320	490	518	648	–	782 <sup>2)</sup>
<b>8001</b>	388		550		388	550	580	782	–	889 <sup>2)</sup>

- 1) Overhanging from  $C$  dimension (see ch. 10.1 and 10.2).  
 2) For hollow low speed shaf: 842 (size 7101), 969 (size 8001).

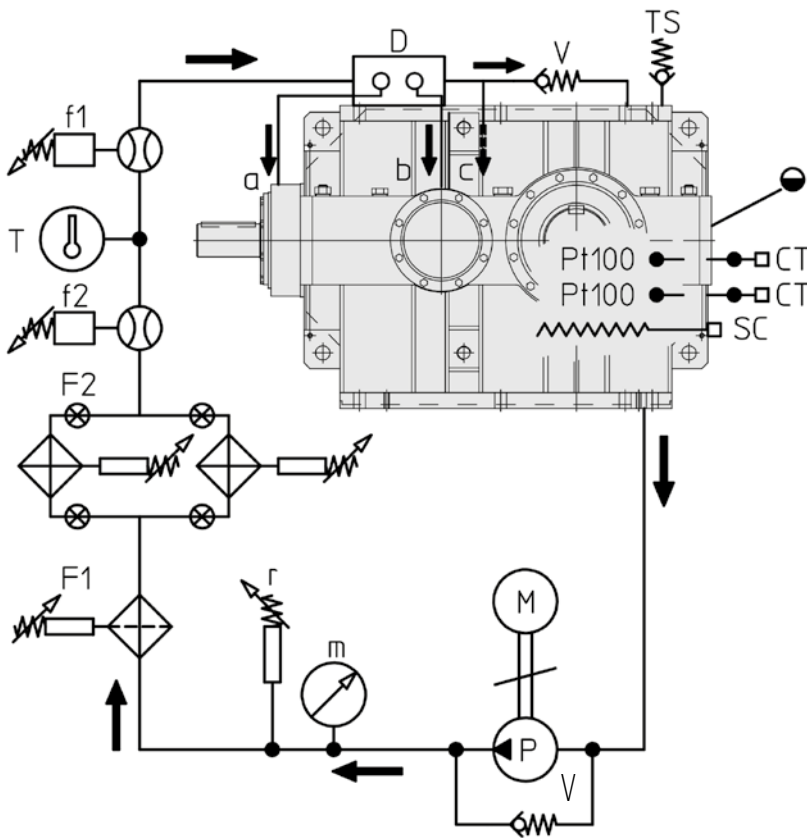
### Direction of rotation



The correspondence between gear reducer high speed shaft and low speed shaft direction of rotation is given at ch. 8 and 10 and it is according to design and train of gears. For the arrows' meaning interpretation refer to the examples on the left.

**Forced lubrication of bearings and/or gears with motor pump: hydraulic circuit diagram**

The bearings and/or the gears to be forced lubricated are determined by Rossi according to gear reducer and application.



**As standard**

a, b, c	Gear pair/bearing pipes
m	Pressure gauge (0 – 16 bar)
M	Motor pump (1,5 kW, 230.400 V 50 Hz)
P	Pump (30 dm <sup>3</sup> /min)
T	Thermometer 0 – 120 °C
V	Safety valve
r	Minimum pressure gauge
TS	Filler plug
D	Flow rate
☉	Oil level (approx.)

**On request**

Pt100*	Oil temperature probe (separate)*
f1	Electric flow switch: vertical mounting
f2	Visible flow switch
F1	Filter
F2	Exchange filter
CT03N*, CT10N*	Control devices with 2 and 3 thresholds (separately supplied); supply 230 V 50 Hz*
SC*	Oil heater*

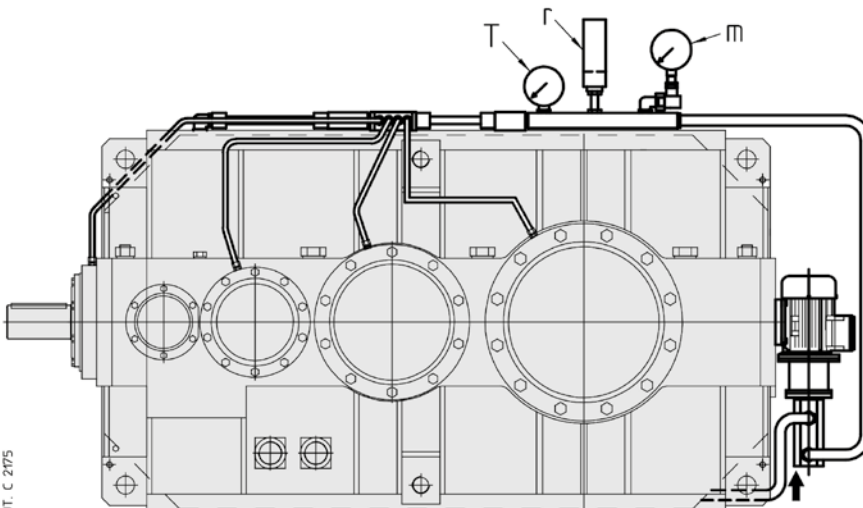
\* On request, but necessary for gear reducer starting at  $T_{ambient}$  ( $= T_{oil}$ )  $\leq 25$  °C: pre-heat the oil with the heater.

**Starting at low temperature ( $T_{oil} = T_{ambient} \leq 25$  °C) of gear reducer with forced lubrication**

Always foresee oil heater and 2-threshold signalling device CT03N + Pt100 and 3-threshold signalling device CT10N + Pt100..

- **CT03N** (2-threshold device) and relevant temperature probe Pt100, to pilot the heater; set the operating threshold at 50 °C (stopping the heater supply) and the reset threshold at 30 °C.
- **CT10N** (3-threshold device) and relevant temperature probe Pt100 to start the motor pump and the motor of gear reducer; it is advised to delay the starting of gear reducer motor by at least 1 min from the motor pump starting so that oil is already circulating: the motor pump must run simultaneously with gear reducer; set the operating threshold at 30 °C to start the gear reducer and the motor pump, the reset threshold at 10 °C and the safety threshold at 90 °C.

For starting at  $T_{oil} (= T_{ambient}) \leq 0$  °C it is necessary to adjust the calibration of devices CT03N and CT10N according to real ambient temperature (see also point B1 in the table at ch. 12 (8)).

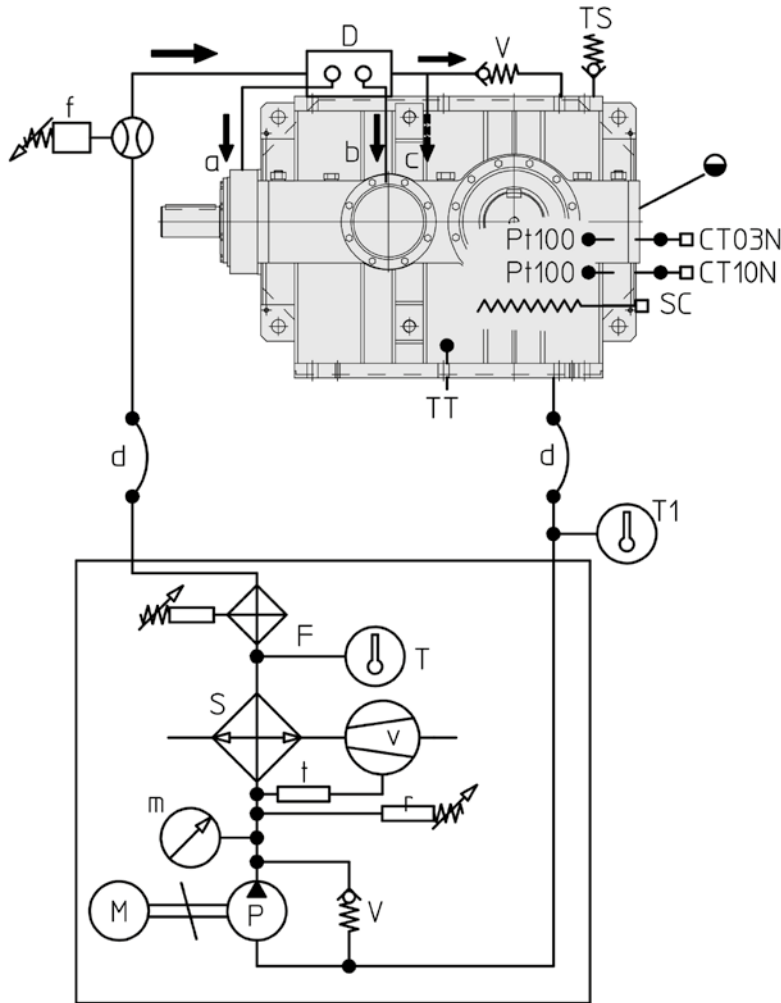


**Example of forced lubrication with motor pump**

the exact position of motor pump depends on the gear reducer size, train of gears, mounting position and available dimensions: for this reason, on request, a drawing of the specific solution will be supplied; pipes are usually realized with suction and delivery flexible pipes and with rigid pipes between the flow rate and the bearings.

**Bearing and/or gear pair forced lubrication with oil/air or oil/water independent cooling unit: hydraulic circuit diagram**

The bearings and/or the gears to be forced lubricated are determined by Rossi according to gear reducer and application.



**As standard**

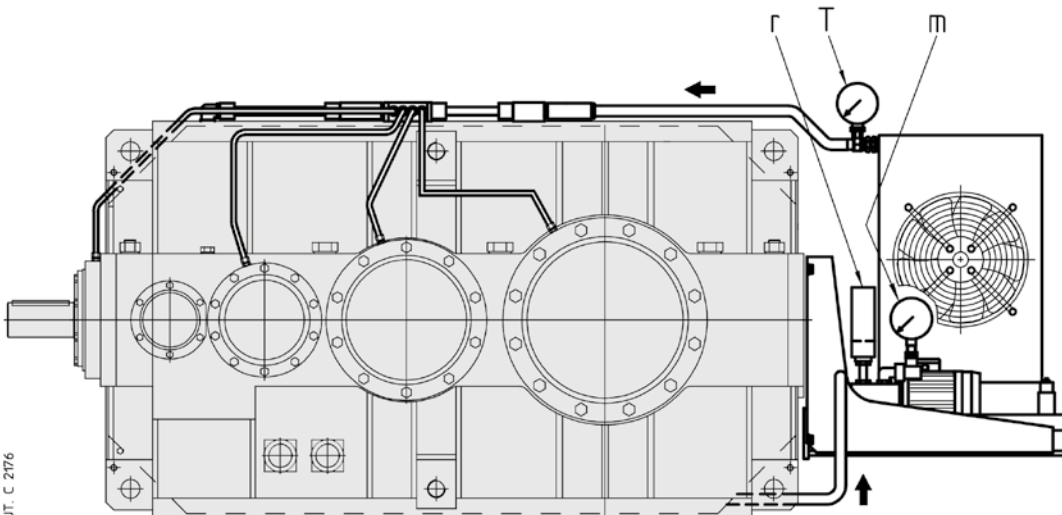
a, b, c	Gear pair/bearing pipes
d	Flexible connection (by Customer)
m	Pressure gauge (0 – 16 bar)
M	Motor pump (ch. 12 (10))
P	Pump (ch. 12 (10))
S	Oil/air or oil/water exchanger
v	Motor fan (UR O/A)
t	Fan thermostat 0 ÷ 90 °C (UR O/A)
T	Thermometer 0 – 120 °C
V	Safety valve
r	Minimum pressure gauge
TS	Filler plug
D	Flow rate
☉	Approx. oil level

**On request**

Pt100*	Oil temperature probe (loose)*
f	Flow switch (loose)
F	Filter with electric blockage warning (with UR O/A it is supplied loose)
CT03N*, CT10N*	Control devices with 2 and 3 thresholds (separately supplied); supply 230 V 50 Hz*
T1	Thermometer 0 – 120 °C
TT	Bi-metal type thermostat
SC*	Oil heater*

\* On request, but necessary for gear reducer starting at  $T_{ambient}$  ( $= T_{oil}$ )  $\leq 25$  °C: pre-heat the oil with the heater.

For **starting at low temperature**: see previous page.



**Example of forced lubrication with cooling unit:**

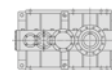
the exact position of cooling unit depends on the gear reducer size, on train of gears, mounting position and available dimensions: for this reason, on request, a drawing of specific solution is supplied; the pipes are usually realized with suction/delivery flexible pipes and with rigid pipes between the flow rate and the bearings.

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## 7 - Selection tables

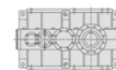
(helical gear reducers)



$n_1 = 1\ 800\ \text{min}^{-1}$

Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2\text{max}}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
21	10	180	1820▲ 95 (155)	2000▲ 105 (180)	—	—	—	—	—	—	—	—	—	—
	11.2	160	1600▲ 95 (155)	1780▲ 106 (180)	1890▲ 114 (212)	2040▲ 123 (243)	—	—	—	—	—	—	—	—
	12.5	140	1440▲ 95 (160)	1610▲ 106 (180)	1690▲ 116 (212)	1790▲ 122 (243)	—	—	—	—	—	—	—	—
	14	132	1270▲ 95 (160)	1420▲ 106 (180)	1550▲ 118 (218)	1710▲ 130 (243)	2150▲ 160 (315)	2420▲ 180 (365)	2970▲ 224 (425)	3360▲ 253 (487)	4410▲ 335 (600)	4820▲ 366 (710)	—	—
	16	112	1100▲ 95 (155)	1180▲ 102 (175)	1370▲ 118 (218)	1510▲ 130 (250)	1880▲ 160 (307)	2080▲ 177 (355)	2640▲ 224 (425)	3010▲ 255 (500)	3830▲ 335 (600)	4210▲ 375 (710)	—	—
	18	100	1010▲ 95 (155)	1130▲ 106 (180)	1180▲ 117 (206)	1250▲ 124 (236)	1720▲ 160 (307)	1940▲ 180 (355)	2310▲ 224 (412)	2570▲ 249 (462)	3460▲ 335 (580)	3840▲ 373 (670)	—	—
	20	90	881▲ 95 (155)	980▲ 106 (180)	1080▲ 118 (218)	1210▲ 132 (250)	1510▲ 160 (307)	1700▲ 180 (355)	2110▲ 224 (437)	2420▲ 257 (500)	3020▲ 335 (615)	3330▲ 375 (710)	—	—
	22.4	80	796▲ 95 (145)	888▲ 106 (170)	953▲ 118 (206)	1040▲ 128 (236)	1340▲ 160 (315)	1510▲ 180 (365)	1850▲ 224 (412)	2120▲ 257 (475)	2730▲ 335 (580)	3050▲ 375 (670)	—	—
31	25	71	711 95 (170)	753 101 (195)	865▲ 118 (190)	968▲ 132 (218)	1220▲ 160 (300)	1370▲ 180 (345)	1650▲ 224 (412)	1890▲ 257 (487)	—	—	3390▲ 462 (925)	—
	28	63	658 100 (170)	704 107 (195)	746 115 (218)	803 124 (250)	1250▲ 190 (335)	1380▲ 210 (387)	1470▲ 227 (450)	1590▲ 245 (487)	2200▲ 320 (630)	2540▲ 371 (750)	3390▲ 497 (1000)	—
	31.5	56	571 100 (170)	639 112 (195)	698 122 (230)	748 131 (265)	1090▲ 190 (325)	1220▲ 212 (375)	1380▲ 241 (450)	1510▲ 262 (530)	1910▲ 320 (630)	2170▲ 371 (750)	3390▲ 575 (1150)	—
	35.5	50	525 100 (170)	577 110 (195)	622 125 (230)	663 133 (257)	991 190 (335)	1110 212 (375)	1230▲ 243 (425)	1380▲ 274 (500)	1750▲ 327 (650)	2020▲ 378 (750)	3370▲ 630 (1120)	—
	40	45	456 100 (165)	511 112 (190)	571 125 (230)	609 133 (265)	867 190 (335)	968 212 (375)	1120▲ 243 (462)	1290▲ 280 (530)	1520▲ 327 (650)	1730▲ 378 (750)	2920▲ 630 (1180)	—
	45	40	417 100 (170)	467 112 (195)	497 125 (218)	556 140 (250)	787 190 (335)	878 212 (387)	972 243 (437)	1120 280 (500)	1380▲ 333 (670)	1620▲ 386 (775)	2570▲ 625 (1220)	—
	50	35.5	362 100 (170)	406 112 (195)	453 125 (236)	508 140 (272)	689 190 (335)	768 212 (387)	881 243 (475)	1010 280 (545)	1270▲ 352 (670)	1370▲ 386 (775)	2250▲ 630 (1220)	—
	56	31.5	328 100 (170)	368 112 (195)	394 125 (224)	442 140 (257)	639 190 (345)	714 212 (387)	772 243 (450)	890 280 (515)	1170 354 (670)	1310 394 (775)	2100▲ 630 (1250)	2870▲ 900 (1750)
	63	28	285 100 (170)	319 112 (195)	357 125 (243)	400 140 (272)	560 190 (345)	624 212 (387)	716 243 (475)	825 280 (545)	1020 355 (670)	1160 412 (775)	1820▲ 630 (1250)	2490▲ 900 (1750)
	71	25	267 100 (175)	299 112 (200)	310 125 (224)	348 140 (257)	504 190 (355)	562 212 (400)	627 243 (450)	723 280 (515)	935 355 (690)	1060 412 (800)	1660▲ 630 (1250)	2260▲ 900 (1800)
	80	22.4	232 100 (175)	260 112 (200)	290 125 (243)	325 140 (280)	441 190 (355)	492 212 (400)	564 243 (487)	650 280 (560)	812 355 (690)	926 412 (800)	1440▲ 630 (1250)	1970▲ 900 (1800)
	90	20	214 100 (175)	239 112 (200)	252 125 (230)	283 140 (265)	403 190 (355)	450 212 (400)	494 243 (462)	570 280 (530)	733 355 (650)	850 412 (750)	1330▲ 630 (1250)	1860▲ 900 (1800)
100	18	185 100 (175)	208 112 (200)	229 125 (243)	257 140 (280)	353 190 (355)	394 212 (400)	451 243 (487)	520 280 (545)	641 355 (690)	731 412 (800)	1150▲ 630 (1250)	1620▲ 900 (1800)	
125	14	—	—	183 125 (212)	205 140 (243)	—	—	361 243 (425)	416 280 (487)	—	—	—	—	
41	125	14	142 95 (180)	159 106 (206)	185 125 (250)	212 143 (290)	278 190 (365)	301 206 (412)	350 243 (487)	399 277 (560)	486 345 (690)	554 400 (800)	899▲ 650 (1250)	1350▲ 925 (1800)
	160	11.2	118 100 (180)	132 112 (206)	146 125 (250)	168 145 (290)	226 190 (365)	248 209 (412)	285 243 (487)	326 278 (560)	396 353 (690)	440 400 (800)	730▲ 650 (1250)	1050▲ 925 (1800)
	200	9	98,6 100 (180)	110 112 (206)	122 125 (250)	141 145 (290)	169 190 (365)	188 212 (412)	213 243 (487)	244 278 (560)	301 345 (690)	342 400 (800)	579 650 (1250)	813▲ 925 (1800)
	250	7.1	77,6 100 (180)	86,9 112 (206)	95,7 125 (250)	111 145 (290)	137 190 (365)	153 212 (412)	173 243 (487)	198 278 (560)	246 355 (690)	280 412 (800)	471 650 (1250)	630▲ 925 (1800)
	315	5,6	63,1 100 (180)	70,7 112 (206)	73,4 125 (230)	85,1 145 (265)	108 190 (365)	120 212 (412)	134 243 (462)	155 280 (530)	197 355 (690)	224 412 (800)	371 650 (1250)	497▲ 925 (1800)

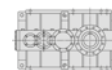
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 1\ 500\ \text{min}^{-1}$

Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2max}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	150	1590 <b>100</b> (160)	1780 <b>112</b> (180)	—	—	—	—	—	—	—	—	—	—
	11.2	132	1400 <b>100</b> (160)	1570 <b>112</b> (180)	1700 <b>123</b> (218)	1800 <b>130</b> (250)	—	—	—	—	—	—	—	—
	12.5	118	1260 <b>100</b> (160)	1420 <b>112</b> (185)	1520 <b>125</b> (218)	1610 <b>132</b> (250)	—	—	—	—	—	—	—	—
	14	106	1110 <b>100</b> (160)	1250 <b>112</b> (185)	1370 <b>125</b> (218)	1480 <b>135</b> (250)	1910▲ <b>170</b> (325)	2120▲ <b>189</b> (375)	2690▲ <b>243</b> (437)	3010▲ <b>272</b> (500)	3900▲ <b>355</b> (615)	4300▲ <b>392</b> (710)	—	—
	16	95	966 <b>100</b> (155)	1060 <b>110</b> (180)	1210 <b>125</b> (218)	1350 <b>140</b> (250)	1670▲ <b>170</b> (315)	1820▲ <b>185</b> (365)	2390▲ <b>243</b> (437)	2670▲ <b>272</b> (500)	3380▲ <b>355</b> (615)	3740▲ <b>400</b> (710)	—	—
	18	85	890 <b>100</b> (160)	997 <b>112</b> (185)	1050 <b>125</b> (206)	1120 <b>133</b> (236)	1530▲ <b>170</b> (315)	1710▲ <b>190</b> (365)	2090▲ <b>243</b> (412)	2310▲ <b>268</b> (475)	3050▲ <b>355</b> (580)	3440▲ <b>400</b> (670)	—	—
	20	75	772 <b>100</b> (160)	865 <b>112</b> (185)	954 <b>125</b> (224)	1070 <b>140</b> (257)	1340▲ <b>170</b> (315)	1490▲ <b>190</b> (365)	1910▲ <b>243</b> (450)	2140▲ <b>272</b> (515)	2670▲ <b>355</b> (630)	2960▲ <b>400</b> (730)	—	—
	22.4	67	698 <b>100</b> (150)	782 <b>112</b> (175)	841 <b>125</b> (212)	930 <b>138</b> (243)	1190▲ <b>170</b> (325)	1330▲ <b>190</b> (375)	1670▲ <b>243</b> (425)	1870▲ <b>272</b> (487)	2410▲ <b>355</b> (600)	2710▲ <b>400</b> (690)	—	—
3I	25	60	624 <b>100</b> (170)	676 <b>109</b> (195)	764 <b>125</b> (195)	855 <b>140</b> (224)	1080▲ <b>170</b> (300)	1210▲ <b>190</b> (355)	1490▲ <b>243</b> (425)	1660▲ <b>272</b> (487)	—	—	3040▲ <b>498</b> (1000)	5860▲ <b>950</b> (1700)
	28	53	581 <b>106</b> (170)	624 <b>114</b> (195)	646 <b>120</b> (224)	679 <b>126</b> (250)	1100 <b>200</b> (345)	1180 <b>216</b> (387)	1250 <b>232</b> (462)	1340 <b>249</b> (500)	1870▲ <b>327</b> (650)	2160▲ <b>379</b> (750)	3040▲ <b>535</b> (1060)	5170▲ <b>950</b> (1700)
	31.5	47,5	504 <b>106</b> (175)	561 <b>118</b> (200)	600 <b>126</b> (230)	657 <b>138</b> (265)	959 <b>200</b> (335)	1070 <b>224</b> (387)	1190 <b>249</b> (462)	1280 <b>267</b> (530)	1620▲ <b>327</b> (650)	1850▲ <b>379</b> (750)	3040▲ <b>620</b> (1180)	4490▲ <b>950</b> (1700)
	35.5	42,5	464 <b>106</b> (175)	517 <b>118</b> (200)	547 <b>132</b> (236)	596 <b>144</b> (257)	869 <b>200</b> (335)	974 <b>224</b> (387)	1080 <b>257</b> (437)	1200 <b>286</b> (500)	1490 <b>333</b> (670)	1720 <b>386</b> (775)	2980▲ <b>670</b> (1150)	4060▲ <b>950</b> (1600)
	40	37,5	403 <b>106</b> (170)	448 <b>118</b> (195)	503 <b>132</b> (236)	548 <b>144</b> (272)	761 <b>200</b> (335)	852 <b>224</b> (387)	986 <b>257</b> (475)	1110 <b>290</b> (545)	1290 <b>333</b> (670)	1470 <b>386</b> (775)	2590▲ <b>670</b> (1220)	3530▲ <b>950</b> (1750)
	45	33,5	369 <b>106</b> (170)	410 <b>118</b> (195)	437 <b>132</b> (224)	497 <b>150</b> (257)	690 <b>200</b> (345)	773 <b>224</b> (400)	857 <b>257</b> (450)	955 <b>286</b> (515)	1170 <b>340</b> (690)	1380 <b>394</b> (800)	2290▲ <b>670</b> (1250)	3260▲ <b>950</b> (1750)
	50	30	320 <b>106</b> (170)	356 <b>118</b> (195)	399 <b>132</b> (243)	453 <b>150</b> (280)	604 <b>200</b> (345)	677 <b>224</b> (400)	776 <b>257</b> (475)	873 <b>289</b> (560)	1100 <b>365</b> (690)	1160 <b>394</b> (800)	1990▲ <b>670</b> (1250)	2830▲ <b>950</b> (1750)
	56	26,5	290 <b>106</b> (175)	323 <b>118</b> (200)	347 <b>132</b> (224)	394 <b>150</b> (257)	561 <b>200</b> (355)	628 <b>224</b> (400)	681 <b>257</b> (450)	760 <b>287</b> (530)	1000 <b>365</b> (690)	1110 <b>399</b> (800)	1860 <b>670</b> (1250)	2520▲ <b>950</b> (1800)
	63	23,6	252 <b>106</b> (175)	280 <b>118</b> (200)	314 <b>132</b> (243)	357 <b>150</b> (280)	491 <b>200</b> (355)	550 <b>224</b> (400)	631 <b>257</b> (487)	712 <b>290</b> (560)	870 <b>365</b> (690)	995 <b>425</b> (800)	1620 <b>670</b> (1250)	2190▲ <b>950</b> (1800)
	71	21,2	236 <b>106</b> (175)	263 <b>118</b> (200)	273 <b>132</b> (230)	310 <b>150</b> (265)	442 <b>200</b> (355)	495 <b>224</b> (400)	553 <b>257</b> (462)	619 <b>288</b> (530)	801 <b>365</b> (690)	914 <b>425</b> (800)	1470 <b>670</b> (1250)	1990▲ <b>950</b> (1800)
	80	19	205 <b>106</b> (175)	228 <b>118</b> (200)	255 <b>132</b> (243)	290 <b>150</b> (280)	387 <b>200</b> (355)	433 <b>224</b> (400)	497 <b>257</b> (487)	561 <b>290</b> (560)	696 <b>365</b> (690)	796 <b>425</b> (800)	1280 <b>670</b> (1250)	1730▲ <b>950</b> (1800)
	90	17	189 <b>106</b> (175)	210 <b>118</b> (200)	222 <b>132</b> (230)	252 <b>150</b> (265)	354 <b>200</b> (355)	396 <b>224</b> (400)	436 <b>257</b> (462)	489 <b>288</b> (530)	628 <b>365</b> (650)	731 <b>425</b> (750)	1180 <b>670</b> (1250)	1640▲ <b>950</b> (1800)
	100	15	164 <b>106</b> (175)	182 <b>118</b> (200)	202 <b>132</b> (243)	229 <b>150</b> (280)	309 <b>200</b> (355)	347 <b>224</b> (400)	398 <b>257</b> (487)	449 <b>290</b> (560)	549 <b>365</b> (690)	628 <b>425</b> (800)	1020 <b>670</b> (1250)	1420▲ <b>950</b> (1800)
	125	11,8	—	—	161 <b>132</b> (212)	183 <b>150</b> (243)	—	—	318 <b>257</b> (425)	359 <b>290</b> (487)	—	—	—	—
4I	125	11,8	122 <b>98</b> (180)	136 <b>109</b> (206)	154 <b>125</b> (250)	178 <b>145</b> (290)	244 <b>200</b> (365)	263 <b>216</b> (412)	292 <b>243</b> (487)	334 <b>278</b> (560)	407 <b>347</b> (690)	461 <b>400</b> (800)	772 <b>670</b> (1250)	1160▲ <b>950</b> (1800)
	160	9,5	104 <b>106</b> (180)	116 <b>118</b> (206)	128 <b>132</b> (250)	140 <b>145</b> (290)	198 <b>200</b> (365)	222 <b>224</b> (412)	244 <b>250</b> (487)	272 <b>278</b> (560)	340 <b>365</b> (690)	366 <b>400</b> (800)	627 <b>670</b> (1250)	896▲ <b>950</b> (1800)
	200	7,5	87,1 <b>106</b> (180)	97 <b>118</b> (206)	107 <b>132</b> (250)	117 <b>145</b> (290)	148 <b>200</b> (365)	166 <b>224</b> (412)	187 <b>256</b> (487)	203 <b>278</b> (560)	260 <b>358</b> (690)	285 <b>400</b> (800)	498 <b>670</b> (1250)	696 <b>950</b> (1800)
	250	6	68,5 <b>106</b> (180)	76,3 <b>118</b> (206)	84,2 <b>132</b> (250)	92,1 <b>145</b> (290)	120 <b>200</b> (365)	135 <b>224</b> (412)	152 <b>257</b> (487)	165 <b>278</b> (560)	210 <b>365</b> (690)	241 <b>425</b> (800)	404 <b>670</b> (1250)	539 <b>950</b> (1800)
	315	4,75	55,7 <b>106</b> (180)	62,1 <b>118</b> (206)	64,6 <b>132</b> (230)	73,4 <b>150</b> (265)	94,7 <b>200</b> (365)	106 <b>224</b> (412)	118 <b>257</b> (462)	134 <b>290</b> (530)	168 <b>365</b> (690)	193 <b>425</b> (800)	319 <b>670</b> (1250)	425 <b>950</b> (1800)

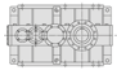
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 1\ 200\ \text{min}^{-1}$

Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2\text{max}}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	118	1280 100 (160)	1430 112 (185)	—	—	—	—	—	—	—	—	—	—
	11,2	106	1120 100 (160)	1260 112 (185)	1380 125 (218)	1490 135 (250)	—	—	—	—	—	—	—	—
	12,5	95	1010 100 (165)	1140 112 (185)	1220 125 (218)	1330 136 (250)	—	—	—	—	—	—	—	—
	14	85	892 100 (165)	999 112 (185)	1100 125 (224)	1180 135 (250)	1540 171 (325)	1720 192 (375)	2160 244 (437)	2420 273 (500)	3130▲ 357 (630)	3450▲ 393 (730)	5620▲ 630 (1060)	7770▲ 900 (1500)
	16	75	774 100 (160)	867 112 (180)	970 125 (224)	1090 140 (257)	1340 171 (315)	1500 192 (365)	1920 244 (437)	2150 273 (515)	2720▲ 357 (630)	3010▲ 402 (730)	4880▲ 630 (1150)	6760▲ 900 (1650)
	18	67	714 100 (160)	799 112 (185)	843 125 (212)	929 138 (243)	1230 171 (325)	1380 192 (375)	1680 244 (425)	1880 273 (487)	2460▲ 357 (580)	2770▲ 402 (690)	4410▲ 630 (1090)	6110▲ 900 (1550)
	20	60	620 100 (160)	694 112 (185)	765 125 (224)	858 140 (257)	1080 171 (325)	1210 192 (375)	1530 244 (450)	1720 273 (515)	2150▲ 357 (630)	2380▲ 402 (730)	3900▲ 630 (1150)	5560▲ 900 (1650)
	22,4	53	560 100 (150)	627 112 (175)	675 125 (212)	756 140 (243)	956 171 (325)	1070 192 (375)	1350 244 (425)	1510 273 (487)	1940▲ 357 (600)	2180▲ 402 (690)	3530▲ 630 (1120)	5030▲ 900 (1550)
3I	25	47,5	516 104 (175)	560 112 (200)	612 125 (195)	686 140 (224)	869 171 (307)	974 192 (355)	1200 244 (425)	1340 273 (500)	—	—	2520▲ 515 (1030)	4710▲ 950 (1700)
	28	42,5	465 106 (175)	516 118 (200)	535 124 (224)	546 126 (250)	878 200 (345)	978 223 (400)	1030 238 (462)	1080 251 (500)	1510 330 (650)	1750 382 (775)	2520▲ 555 (1120)	4150▲ 950 (1700)
	31,5	37,5	404 106 (175)	450 118 (200)	496 130 (236)	544 143 (272)	768 200 (335)	863 225 (387)	988 258 (462)	1030 269 (545)	1310 330 (650)	1490 382 (775)	2520▲ 640 (1220)	3600▲ 950 (1700)
	35,5	33,5	372 106 (175)	414 118 (200)	439 132 (236)	493 149 (257)	696 200 (345)	783 225 (387)	867 258 (437)	962 286 (515)	1200 336 (670)	1390 390 (775)	2390▲ 670 (1150)	3250▲ 950 (1650)
	40	30	323 106 (170)	359 118 (195)	403 132 (236)	453 149 (272)	609 200 (345)	685 225 (387)	791 258 (475)	893 291 (545)	1040 336 (670)	1190 390 (775)	2080 670 (1220)	2830▲ 950 (1750)
	45	26,5	295 106 (175)	329 118 (200)	351 132 (224)	398 150 (257)	553 200 (345)	622 225 (400)	688 258 (450)	765 287 (515)	948 343 (690)	1110 397 (800)	1840 670 (1250)	2610▲ 950 (1800)
	50	23,6	256 106 (175)	285 118 (200)	320 132 (243)	364 150 (280)	484 200 (345)	544 225 (400)	623 258 (487)	701 290 (560)	880 366 (690)	943 400 (800)	1600 670 (1250)	2270▲ 950 (1800)
	56	21,2	232 106 (175)	259 118 (200)	278 132 (230)	316 150 (265)	449 200 (355)	505 225 (400)	546 258 (462)	609 288 (530)	804 366 (690)	888 400 (800)	1490 670 (1250)	2020 950 (1800)
	63	19	202 106 (175)	224 118 (200)	252 132 (243)	286 150 (280)	393 200 (355)	442 225 (400)	506 258 (487)	571 291 (560)	699 366 (690)	798 426 (800)	1300 670 (1250)	1760 950 (1800)
	71	17	189 106 (175)	210 118 (200)	219 132 (230)	249 150 (265)	354 200 (355)	398 225 (400)	444 258 (462)	496 288 (530)	643 366 (690)	733 426 (800)	1180 670 (1250)	1600 950 (1800)
	80	15	164 106 (175)	183 118 (200)	205 132 (243)	233 150 (280)	310 200 (355)	348 225 (400)	399 258 (487)	450 291 (560)	559 366 (690)	638 426 (800)	1020 670 (1250)	1390 950 (1800)
	90	13,2	151 106 (175)	168 118 (200)	178 132 (230)	203 150 (265)	283 200 (355)	318 225 (400)	350 258 (462)	392 289 (530)	504 366 (650)	586 426 (750)	943 670 (1250)	1310 950 (1800)
	100	11,8	131 106 (175)	146 118 (200)	162 132 (243)	184 150 (280)	248 200 (355)	279 225 (400)	319 258 (487)	360 291 (560)	441 366 (690)	504 426 (800)	818 670 (1250)	1140 950 (1800)
	125	9,5	—	—	129 132 (212)	147 150 (243)	—	—	255 258 (425)	288 291 (487)	—	—	—	—
4I	125	9,5	101 101 (180)	113 113 (206)	123 125 (250)	143 145 (290)	195 200 (365)	218 223 (412)	234 243 (487)	267 278 (560)	337 359 (690)	369 400 (800)	619 670 (1250)	928 950 (1800)
	160	7,5	83,6 106 (180)	93,1 118 (206)	103 132 (250)	112 145 (290)	159 200 (365)	178 225 (412)	201 258 (487)	217 278 (560)	273 366 (690)	294 401 (800)	503 670 (1250)	719 950 (1800)
	200	6	69,8 106 (180)	77,7 118 (206)	85,8 132 (250)	93,7 145 (290)	119 200 (365)	133 225 (412)	150 258 (487)	162 278 (560)	213 366 (690)	228 400 (800)	399 670 (1250)	558 950 (1800)
	250	4,75	54,9 106 (180)	61,1 118 (206)	67,5 132 (250)	73,7 145 (290)	96,3 200 (365)	108 225 (412)	122 258 (487)	132 278 (560)	169 366 (690)	193 426 (800)	324 670 (1250)	432 950 (1800)
	315	3,75	44,7 106 (180)	49,7 118 (206)	51,8 132 (230)	58,8 150 (265)	75,9 200 (365)	85,3 225 (412)	95,1 258 (462)	107 291 (530)	135 366 (690)	154 426 (800)	256 670 (1250)	341 950 (1800)

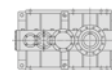
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 1\ 000\ \text{min}^{-1}$

Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2max}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	100	1070 <b>101</b> (165)	1200 <b>113</b> (185)	—	—	—	—	—	—	—	—	—	—
	11,2	90	941 <b>101</b> (165)	1050 <b>113</b> (185)	1160 <b>126</b> (224)	1300 <b>141</b> (250)	—	—	—	—	—	—	—	—
	12,5	80	849 <b>101</b> (165)	950 <b>113</b> (190)	1020 <b>126</b> (224)	1150 <b>141</b> (257)	—	—	—	—	—	—	—	—
	14	71	747 <b>101</b> (165)	836 <b>113</b> (190)	921 <b>126</b> (224)	989 <b>135</b> (257)	1300 <b>174</b> (335)	1460 <b>196</b> (387)	1820 <b>247</b> (450)	2020 <b>274</b> (500)	2640 <b>361</b> (630)	2880 <b>394</b> (730)	4710▲ <b>635</b> (1090)	6510▲ <b>905</b> (1550)
	16	63	648 <b>101</b> (160)	726 <b>113</b> (185)	812 <b>126</b> (224)	911 <b>141</b> (257)	1140 <b>174</b> (325)	1280 <b>196</b> (375)	1610 <b>247</b> (450)	1810 <b>276</b> (515)	2290 <b>361</b> (630)	2530 <b>406</b> (730)	4090 <b>635</b> (1150)	5660▲ <b>905</b> (1650)
	18	56	598 <b>101</b> (165)	669 <b>113</b> (190)	706 <b>126</b> (212)	792 <b>141</b> (243)	1040 <b>174</b> (325)	1170 <b>196</b> (375)	1410 <b>247</b> (425)	1590 <b>276</b> (487)	2070 <b>361</b> (600)	2330 <b>406</b> (690)	3690 <b>635</b> (1120)	5110▲ <b>905</b> (1550)
	20	50	519 <b>101</b> (165)	581 <b>113</b> (190)	641 <b>126</b> (230)	719 <b>141</b> (265)	909 <b>174</b> (325)	1020 <b>196</b> (375)	1290 <b>247</b> (462)	1450 <b>276</b> (515)	1810 <b>361</b> (650)	2000 <b>406</b> (750)	3270 <b>635</b> (1180)	4650▲ <b>905</b> (1700)
	22,4	45	469 <b>101</b> (155)	525 <b>113</b> (180)	565 <b>126</b> (218)	634 <b>141</b> (250)	808 <b>174</b> (335)	910 <b>196</b> (375)	1130 <b>247</b> (437)	1270 <b>276</b> (500)	1630 <b>361</b> (615)	1840 <b>406</b> (710)	2950 <b>635</b> (1120)	4210▲ <b>905</b> (1600)
3I	25	40	442 <b>106</b> (175)	492 <b>118</b> (200)	513 <b>126</b> (200)	575 <b>141</b> (230)	735 <b>174</b> (315)	828 <b>196</b> (365)	1010 <b>247</b> (437)	1130 <b>276</b> (500)	—	—	2240 <b>550</b> (1090)	3940▲ <b>955</b> (1750)
	28	35,5	389 <b>106</b> (175)	433 <b>118</b> (200)	476 <b>132</b> (230)	484 <b>134</b> (257)	733 <b>201</b> (355)	830 <b>227</b> (400)	917 <b>255</b> (475)	917 <b>255</b> (515)	1280 <b>336</b> (670)	1480 <b>389</b> (775)	2240 <b>595</b> (1180)	3470▲ <b>955</b> (1750)
	31,5	31,5	337 <b>106</b> (180)	376 <b>118</b> (206)	423 <b>133</b> (236)	481 <b>151</b> (272)	641 <b>201</b> (345)	726 <b>227</b> (387)	830 <b>260</b> (475)	917 <b>287</b> (545)	1110 <b>336</b> (670)	1270 <b>389</b> (775)	2220 <b>675</b> (1220)	3010▲ <b>955</b> (1750)
	35,5	28	310 <b>106</b> (180)	346 <b>118</b> (206)	368 <b>133</b> (243)	418 <b>151</b> (257)	582 <b>201</b> (345)	658 <b>227</b> (400)	728 <b>260</b> (450)	804 <b>287</b> (515)	1020 <b>342</b> (690)	1180 <b>397</b> (800)	2000 <b>675</b> (1180)	2720▲ <b>955</b> (1650)
	40	25	269 <b>106</b> (175)	300 <b>118</b> (200)	338 <b>133</b> (243)	384 <b>151</b> (280)	509 <b>201</b> (345)	576 <b>227</b> (400)	664 <b>260</b> (487)	749 <b>293</b> (560)	884 <b>342</b> (690)	1010 <b>397</b> (800)	1740 <b>675</b> (1250)	2370 <b>955</b> (1800)
	45	22,4	247 <b>106</b> (175)	275 <b>118</b> (200)	294 <b>133</b> (230)	334 <b>151</b> (265)	462 <b>201</b> (355)	523 <b>227</b> (400)	578 <b>260</b> (462)	639 <b>287</b> (530)	840 <b>365</b> (690)	932 <b>400</b> (800)	1540 <b>675</b> (1250)	2190 <b>955</b> (1800)
	50	20	214 <b>106</b> (175)	238 <b>118</b> (200)	268 <b>133</b> (243)	305 <b>151</b> (280)	404 <b>201</b> (355)	457 <b>227</b> (400)	523 <b>260</b> (487)	588 <b>292</b> (560)	739 <b>369</b> (690)	840 <b>428</b> (800)	1340 <b>675</b> (1250)	1900 <b>955</b> (1800)
	56	18	194 <b>106</b> (175)	216 <b>118</b> (200)	233 <b>133</b> (230)	265 <b>151</b> (265)	375 <b>201</b> (355)	425 <b>227</b> (400)	459 <b>260</b> (462)	509 <b>288</b> (530)	675 <b>369</b> (690)	773 <b>417</b> (800)	1250 <b>675</b> (1250)	1690 <b>955</b> (1800)
	63	16	168 <b>106</b> (175)	188 <b>118</b> (200)	211 <b>133</b> (243)	240 <b>151</b> (280)	328 <b>201</b> (355)	372 <b>227</b> (400)	425 <b>260</b> (487)	479 <b>293</b> (560)	587 <b>369</b> (690)	668 <b>428</b> (800)	1090 <b>675</b> (1250)	1470 <b>955</b> (1800)
	71	14	158 <b>106</b> (175)	176 <b>118</b> (200)	183 <b>133</b> (230)	209 <b>151</b> (265)	296 <b>201</b> (355)	335 <b>227</b> (400)	373 <b>260</b> (462)	414 <b>289</b> (530)	540 <b>369</b> (690)	614 <b>428</b> (800)	987 <b>675</b> (1250)	1340 <b>955</b> (1800)
	80	12,5	137 <b>106</b> (175)	153 <b>118</b> (200)	172 <b>133</b> (243)	195 <b>151</b> (280)	259 <b>201</b> (355)	293 <b>227</b> (400)	335 <b>260</b> (487)	378 <b>293</b> (560)	469 <b>369</b> (690)	534 <b>428</b> (800)	857 <b>675</b> (1250)	1160 <b>955</b> (1800)
	90	11,2	126 <b>106</b> (175)	141 <b>118</b> (200)	149 <b>133</b> (230)	170 <b>151</b> (265)	237 <b>201</b> (355)	268 <b>227</b> (400)	294 <b>260</b> (462)	327 <b>289</b> (530)	423 <b>369</b> (650)	491 <b>428</b> (750)	790 <b>675</b> (1250)	1100 <b>955</b> (1800)
	100	10	110 <b>106</b> (175)	122 <b>118</b> (200)	135 <b>133</b> (243)	154 <b>151</b> (280)	207 <b>201</b> (355)	234 <b>227</b> (400)	268 <b>260</b> (487)	302 <b>293</b> (560)	371 <b>369</b> (690)	422 <b>428</b> (800)	685 <b>675</b> (1250)	955 <b>955</b> (1800)
	125	8	—	—	108 <b>133</b> (212)	123 <b>151</b> (243)	—	—	214 <b>260</b> (425)	242 <b>293</b> (487)	—	—	—	—
4I	125	8	88,8 <b>106</b> (180)	98,9 <b>118</b> (206)	103 <b>125</b> (250)	119 <b>145</b> (290)	163 <b>201</b> (365)	185 <b>227</b> (412)	195 <b>243</b> (487)	223 <b>278</b> (560)	289 <b>369</b> (690)	308 <b>400</b> (800)	518 <b>675</b> (1250)	777 <b>955</b> (1800)
	160	6,3	69,8 <b>106</b> (180)	77,8 <b>118</b> (206)	86,1 <b>133</b> (250)	93,6 <b>145</b> (290)	132 <b>201</b> (365)	150 <b>227</b> (412)	169 <b>260</b> (487)	181 <b>278</b> (560)	230 <b>369</b> (690)	261 <b>428</b> (800)	421 <b>675</b> (1250)	601 <b>955</b> (1800)
	200	5	58,3 <b>106</b> (180)	64,9 <b>118</b> (206)	71,8 <b>133</b> (250)	78,1 <b>145</b> (290)	99 <b>201</b> (365)	112 <b>227</b> (412)	126 <b>260</b> (487)	135 <b>278</b> (560)	179 <b>369</b> (690)	192 <b>404</b> (800)	334 <b>675</b> (1250)	467 <b>955</b> (1800)
	250	4	45,9 <b>106</b> (180)	51,1 <b>118</b> (206)	56,5 <b>133</b> (250)	61,4 <b>145</b> (290)	80,4 <b>201</b> (365)	91 <b>227</b> (412)	103 <b>260</b> (487)	111 <b>280</b> (560)	142 <b>369</b> (690)	162 <b>428</b> (800)	272 <b>675</b> (1250)	362 <b>955</b> (1800)
	315	3,15	37,3 <b>106</b> (180)	41,5 <b>118</b> (206)	43,4 <b>133</b> (230)	49,3 <b>151</b> (265)	63,4 <b>201</b> (365)	71,7 <b>227</b> (412)	79,9 <b>260</b> (462)	90,1 <b>293</b> (530)	114 <b>369</b> (690)	129 <b>428</b> (800)	214 <b>675</b> (1250)	285 <b>955</b> (1800)

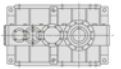
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 750 \text{ min}^{-1}$

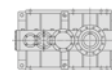
Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2max}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	75	808 101 (165)	904 113 (190)	—	—	—	—	—	—	—	—	—	—
	11,2	67	711 101 (165)	795 113 (190)	875 127 (230)	984 142 (257)	—	—	—	—	—	—	—	—
	12,5	60	642 101 (170)	718 113 (195)	772 127 (230)	868 142 (265)	—	—	—	—	—	—	—	—
	14	53	565 101 (170)	631 113 (195)	695 127 (230)	744 136 (257)	995 177 (345)	1130 201 (387)	1380 250 (462)	1520 275 (515)	2010 366 (650)	2170 395 (750)	3560 640 (1120)	4910 910 (1600)
	16	47,5	490 101 (165)	548 113 (190)	613 127 (230)	689 142 (265)	871 177 (335)	988 201 (375)	1230 250 (462)	1380 281 (530)	1750 366 (650)	1930 412 (750)	3090 640 (1180)	4270 910 (1700)
	18	42,5	452 101 (170)	505 113 (195)	533 127 (218)	599 142 (250)	796 177 (335)	904 201 (387)	1080 250 (437)	1210 281 (500)	1570 366 (615)	1770 412 (710)	2790 640 (1150)	3860 910 (1600)
	20	37,5	392 101 (170)	438 113 (195)	484 127 (236)	544 142 (272)	697 177 (335)	791 201 (387)	982 250 (475)	1100 281 (530)	1380 366 (670)	1520 412 (775)	2470 640 (1220)	3510 910 (1750)
	22,4	33,5	354 101 (160)	396 113 (185)	427 127 (224)	480 142 (257)	619 177 (345)	703 201 (387)	861 250 (450)	966 281 (515)	1240 366 (630)	1400 412 (730)	2230 640 (1150)	3180 910 (1650)
3I	25	30	333 107 (180)	371 119 (206)	387 127 (206)	435 142 (236)	563 177 (325)	639 201 (375)	766 250 (450)	853 279 (515)	—	—	1860 610 (1220)	2980 960 (1800)
	28	26,5	293 107 (180)	326 119 (206)	357 132 (236)	403 149 (257)	552 201 (365)	631 230 (412)	704 261 (487)	762 282 (515)	986 345 (690)	1140 400 (800)	1860 655 (1250)	2620 960 (1800)
	31,5	23,6	254 107 (180)	283 119 (206)	319 134 (243)	363 152 (280)	483 201 (355)	552 230 (400)	630 263 (487)	702 293 (560)	894 359 (690)	976 400 (800)	1670 680 (1250)	2270 960 (1800)
	35,5	21,2	234 107 (180)	260 119 (206)	278 134 (243)	316 152 (265)	438 201 (355)	501 230 (400)	552 263 (462)	605 288 (530)	770 345 (690)	892 400 (800)	1510 680 (1180)	2060 960 (1700)
	40	19	203 107 (175)	226 119 (200)	255 134 (243)	290 152 (280)	383 201 (355)	438 230 (400)	504 263 (487)	568 296 (560)	698 360 (690)	761 400 (800)	1310 680 (1250)	1790 960 (1800)
	45	17	186 107 (175)	207 119 (200)	222 134 (230)	252 152 (265)	348 201 (355)	398 230 (400)	438 263 (462)	481 288 (530)	644 373 (690)	699 400 (800)	1160 680 (1250)	1650 960 (1800)
	50	15	161 107 (175)	180 119 (200)	203 134 (243)	230 152 (280)	304 201 (355)	348 230 (400)	397 263 (487)	444 294 (560)	561 374 (690)	635 431 (800)	1010 680 (1250)	1430 960 (1800)
	56	13,2	146 107 (175)	163 119 (200)	176 134 (230)	200 152 (265)	283 201 (355)	323 230 (400)	348 263 (462)	383 289 (530)	513 374 (690)	599 431 (800)	946 680 (1250)	1280 960 (1800)
	63	11,8	127 107 (175)	141 119 (200)	159 134 (243)	181 152 (280)	247 201 (355)	283 230 (400)	322 263 (487)	362 295 (560)	445 374 (690)	505 431 (800)	821 680 (1250)	1110 960 (1800)
	71	10,6	119 107 (175)	132 119 (200)	139 134 (230)	158 152 (265)	223 201 (355)	255 230 (400)	283 263 (462)	312 290 (530)	410 374 (690)	463 431 (800)	746 680 (1250)	1010 960 (1800)
	80	9,5	103 107 (175)	115 119 (200)	130 134 (243)	148 152 (280)	195 201 (355)	223 230 (400)	254 263 (487)	286 295 (560)	356 374 (690)	404 431 (800)	647 680 (1250)	876 960 (1800)
	90	8,5	95 107 (175)	106 119 (200)	113 134 (230)	128 152 (265)	178 201 (355)	204 230 (400)	223 263 (462)	246 291 (530)	321 374 (650)	371 431 (750)	597 680 (1250)	830 960 (1800)
	100	7,5	82,5 107 (175)	91,9 119 (200)	102 134 (243)	116 152 (280)	156 201 (355)	178 230 (400)	203 263 (487)	229 296 (560)	281 374 (690)	319 431 (800)	518 680 (1250)	721 960 (1800)
	125	6	—	—	81,8 134 (212)	93,1 152 (243)	—	—	163 263 (425)	183 296 (487)	—	—	—	—
4I	125	6	66,8 107 (180)	74,5 119 (206)	78,4 127 (250)	89,2 145 (290)	123 201 (365)	140 230 (412)	158 263 (487)	167 278 (560)	219 374 (690)	249 431 (800)	392 680 (1250)	586 960 (1800)
	160	4,75	52,6 107 (180)	58,6 119 (206)	65,1 134 (250)	70,2 145 (290)	99,7 201 (365)	114 230 (412)	128 263 (487)	136 278 (560)	174 374 (690)	197 431 (800)	318 680 (1250)	454 960 (1800)
	200	3,75	43,9 107 (180)	48,9 119 (206)	54,3 134 (250)	58,6 145 (290)	74,5 201 (365)	85,2 230 (412)	95,8 263 (487)	103 281 (560)	136 374 (690)	154 431 (800)	252 680 (1250)	352 960 (1800)
	250	3	34,5 107 (180)	38,5 119 (206)	42,7 134 (250)	46,1 145 (290)	60,5 201 (365)	69,2 230 (412)	77,8 263 (487)	83,5 282 (560)	108 374 (690)	122 431 (800)	205 680 (1250)	273 960 (1800)
	315	2,36	28,1 107 (180)	31,3 119 (206)	32,8 134 (230)	37,3 152 (265)	47,7 201 (365)	54,6 230 (412)	60,6 263 (462)	68,3 296 (530)	86,2 374 (690)	97,7 431 (800)	162 680 (1250)	215 960 (1800)





$n_1 \leq 90 \text{ min}^{-1}$

Train of gears	$i_N$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2max}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	9	101 106 (180)	113 118 (206)	–	–	–	–	–	–	–	–	–	–
	11,2	8	89,1 106 (180)	99,2 118 (206)	109 132 (243)	124 150 (280)	–	–	–	–	–	–	–	–
	12,5	7,1	80,4 106 (180)	89,5 118 (206)	96,5 132 (243)	110 150 (280)	–	–	–	–	–	–	–	–
	14	6,3	70,8 106 (180)	78,8 118 (206)	86,9 132 (243)	92,4 140 (280)	135 200 (365)	159 236 (412)	181 272 (487)	186 281 (560)	248 376 (690)	266 404 (800)	447 670 (1220)	614 950 (1700)
	16	5,6	61,4 106 (175)	68,4 118 (200)	76,6 132 (243)	87,1 150 (280)	118 200 (355)	139 236 (400)	160 272 (487)	175 297 (560)	220 384 (690)	253 450 (800)	388 670 (1250)	534 950 (1800)
	18	5	56,6 106 (175)	63 118 (200)	66,6 132 (230)	75,7 150 (265)	108 200 (355)	127 236 (400)	140 272 (462)	151 292 (530)	206 400 (650)	232 450 (750)	351 670 (1220)	483 950 (1700)
	20	4,5	49,1 106 (175)	54,7 118 (200)	60,5 132 (243)	68,7 150 (280)	94,2 200 (355)	111 236 (400)	128 272 (487)	143 303 (560)	174 385 (690)	200 450 (800)	311 670 (1250)	439 950 (1800)
	22,4	4	44,4 106 (165)	49,4 118 (190)	53,3 132 (230)	60,6 150 (265)	83,8 200 (355)	98,8 236 (400)	112 272 (462)	121 293 (530)	163 400 (650)	183 450 (750)	281 670 (1220)	397 950 (1700)
3I	25	3,55	40,8 109 (180)	45,6 122 (206)	48,4 132 (212)	55 150 (243)	76,2 200 (335)	89,9 236 (375)	99,9 272 (462)	109 298 (530)	–	–	260 710 (1250)	371 1000 (1800)
	28	3,15	35,9 109 (180)	40,1 122 (206)	42,8 132 (236)	48,7 150 (280)	67,7 206 (365)	82,2 250 (412)	88,1 272 (487)	97,2 300 (560)	133 388 (690)	154 450 (800)	242 710 (1250)	327 1000 (1800)
	31,5	2,8	31,1 109 (180)	34,8 122 (206)	40 140 (243)	45,8 160 (280)	59,2 206 (355)	71,9 250 (400)	80,5 280 (487)	90 313 (560)	119 400 (690)	132 450 (800)	210 710 (1250)	284 1000 (1800)
	35,5	2,5	28,6 109 (180)	32 122 (206)	34,8 140 (243)	39,8 160 (272)	53,7 206 (355)	65,2 250 (400)	70,6 280 (462)	78,8 313 (530)	107 400 (690)	120 450 (800)	190 710 (1220)	256 1000 (1700)
	40	2,24	24,9 109 (175)	27,8 122 (200)	32 140 (243)	36,5 160 (280)	47 206 (355)	57,1 250 (400)	64,4 280 (487)	72,5 315 (560)	93 400 (690)	103 450 (800)	165 710 (1250)	223 1000 (1800)
	45	2	22,7 109 (175)	25,4 122 (200)	27,8 140 (230)	31,8 160 (265)	42,7 206 (355)	51,8 250 (400)	56 280 (462)	63 315 (530)	82,9 400 (690)	94,4 450 (800)	146 710 (1250)	206 1000 (1800)
	50	1,8	19,7 109 (175)	22,1 122 (200)	25,4 140 (243)	29 160 (280)	37,3 206 (355)	45,3 250 (400)	50,7 280 (487)	57,1 315 (560)	72 400 (690)	79,6 450 (800)	127 710 (1250)	179 1000 (1800)
	56	1,6	17,9 109 (175)	20 122 (200)	22,1 140 (230)	25,2 160 (265)	34,7 206 (355)	42,1 250 (400)	44,5 280 (462)	50 315 (530)	65,8 400 (690)	75 450 (800)	118 710 (1250)	159 1000 (1800)
	63	1,4	15,5 109 (175)	17,4 122 (200)	20 140 (243)	22,8 160 (280)	30,3 206 (355)	36,8 250 (400)	41,2 280 (487)	46,4 315 (560)	57,2 400 (690)	63,2 450 (800)	103 710 (1250)	138 1000 (1800)
	71	1,25	14,6 109 (175)	16,3 122 (200)	17,4 140 (230)	19,9 160 (265)	27,3 206 (355)	33,1 250 (400)	36,1 280 (462)	40,7 315 (530)	52,7 400 (690)	58 450 (800)	93,5 710 (1250)	126 1000 (1800)
	80	1,12	12,6 109 (175)	14,1 122 (200)	16,3 140 (243)	18,6 160 (280)	23,9 206 (355)	29 250 (400)	32,5 280 (487)	36,5 315 (560)	45,8 400 (690)	50,6 450 (800)	81,1 710 (1250)	109 1000 (1800)
	90	1	11,6 109 (175)	13 122 (200)	14,1 140 (230)	16,2 160 (265)	21,9 206 (355)	26,5 250 (400)	28,5 280 (462)	32 315 (530)	41,3 400 (650)	46,4 450 (750)	74,8 710 (1250)	104 1000 (1800)
	100	0,9	10,1 109 (175)	11,3 122 (200)	12,8 140 (243)	14,7 160 (280)	19,1 206 (355)	23,2 250 (400)	26 280 (487)	29,2 315 (560)	36,1 400 (690)	39,9 450 (800)	64,9 710 (1250)	89,9 1000 (1800)
	125	0,71	–	–	10,3 140 (212)	11,7 160 (243)	–	–	20,8 280 (425)	23,4 315 (487)	–	–	–	–
	4I	125	0,71	8,19 109 (180)	9,16 122 (206)	10,4 140 (250)	11,4 154 (290)	15,1 206 (365)	18,3 250 (412)	20,2 280 (487)	21,8 303 (560)	28,2 400 (690)	31,1 450 (800)	49,1 710 (1250)
160		0,56	6,44 109 (180)	7,21 122 (206)	8,16 140 (250)	9,26 159 (290)	12,2 206 (365)	14,8 250 (412)	16,4 280 (487)	18,2 311 (560)	22,4 400 (690)	24,7 450 (800)	39,9 710 (1250)	56,6 1000 (1800)
200		0,45	5,37 109 (180)	6,02 122 (206)	6,81 140 (250)	7,78 160 (290)	9,14 206 (365)	11,1 250 (412)	12,3 280 (487)	13,8 315 (560)	17,4 400 (690)	19,3 450 (800)	31,6 710 (1250)	44 1000 (1800)
250		0,36	4,23 109 (180)	4,73 122 (206)	5,36 140 (250)	6,12 160 (290)	7,43 206 (365)	9,02 250 (412)	9,96 280 (487)	11,2 315 (560)	13,8 400 (690)	15,3 450 (800)	25,7 710 (1250)	34 1000 (1800)
315		0,28	3,44 109 (180)	3,85 122 (206)	4,11 140 (230)	4,69 160 (265)	5,85 206 (365)	7,1 250 (412)	7,75 280 (462)	8,71 315 (530)	11,1 400 (690)	12,2 450 (800)	20,3 710 (1250)	26,9 1000 (1800)

Summary of transmission ratios  $i$ 

Train of gears	$i_N$	Gear reducer size											
		$i$											
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	9,86	9,86	–	–	–	–	–	–	–	–	–	–
	11,2	11,2	11,2	11,4	11,4	–	–	–	–	–	–	–	–
	12,5	12,4	12,4	12,9	12,9	–	–	–	–	–	–	–	–
	14	14,1	14,1	14,3	14,3	14*	14*	14,2*	14,2*	14,3	14,3	14,1	14,6
	16	16,3	16,3	16,2	16,2	16*	16*	16*	16*	16,5	16,8	16,3	16,8
	18	17,6	17,6	18,7	18,7	17,5*	17,5*	18,3	18,3	18,3	18,3	18*	18,6
	20	20,3	20,3	20,6	20,6	20*	20*	20*	20*	20,9	21,3	20,3	20,4
22,4	22,5*	22,5*	23,3	23,3	22,5*	22,5*	22,8	22,8	23,1	23,1	22,5*	22,6	
3I	25	25,2	25,2	25,7	25,7	24,8	24,8	25,7	25,7	–	–	25,7	25,4
	28	28,7	28,7	29,1	29,1	28,7	28,7	29,1	29,1	27,4	27,5	27,7	28,8
	31,5	33	33	32,9	32,9	32,8	32,8	32,8	32,8	31,6	32,2	31,9	33,2
	35,5	35,9	35,9	37,9	37,9	36,1	36,1	37,4	37,4	35,2	35,2	35,3	36,8
	40	41,3	41,3	41,3	41,3	41,3	41,3	41	41	40,5	41,3	40,7	42,3
	45	45,2	45,2	47,4	47,4	45,5	45,5	47,1	47,1	45,5	44,9	45,9	45,8
	50	52,1	52,1	52	52	52*	52*	52*	52*	52,3	53,3	52,9	52,7
	56	57,4	57,4	59,7	59,7	56*	56*	59,3*	59,3*	57,3	56,6	56,5	59,1
	63	66,2	66,2	66	66	64*	64*	64*	64*	65,9	67,1	65,1	68,1
	71	70,6	70,6	75,9	75,9	71,1	71,1	73*	73*	71,6	73,1	71,6	74,9
	80	81,3	81,3	81,2	81,2	81,2	81,2	81,2	81,2	82,4	83,9	82,5	86,3
	90	88,2	88,2	93,3	93,3	88,8	88,8	92,7	92,7	91,3	91,3	89,5	91
	100	102	102	103	103	102	102	102	102	104	106	103	105
125	–	–	129	129	–	–	127	127	–	–	–	–	
4I	125	125	125	127	127	129	129	131	131	134	136	136	129
	160	159	159	162	162	159	159	161	161	168	171	168	166
	200	191	191	194	194	212	212	215	215	216	220	211	214
	250	243	243	246	246	261	261	265	265	272	277	260	277
	315	299	299	321	321	332	332	341	341	340	347	330	351

\* Finite transmission ratio.

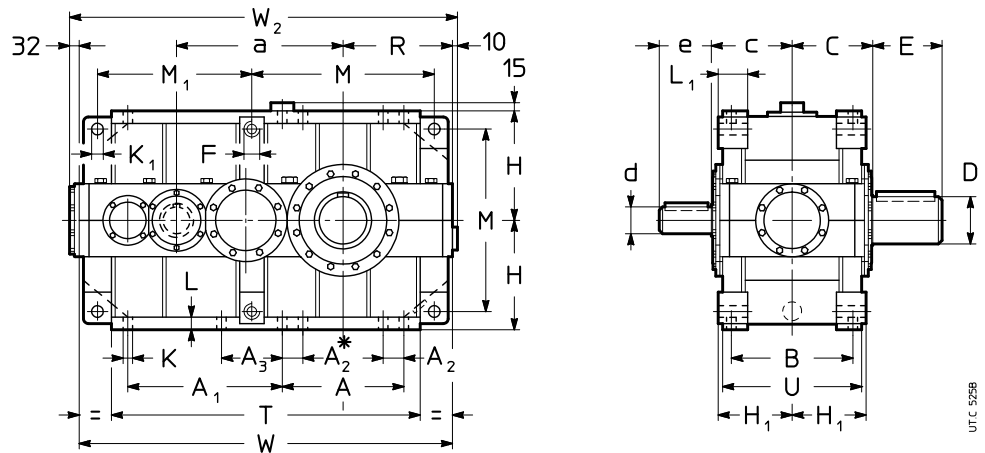
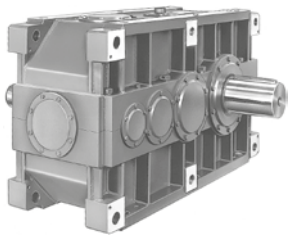


# 8 - Dimensions, designs, mounting positions (helical gear reducers)

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## 8.1 - Gear reducers R 2I

### Dimensions



\* For size  $\geq 6300$ .

Size	a	A	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	c	F	H <sub>h11</sub>	H <sub>h12</sub>	K ∅	K <sub>1</sub> ∅ H11	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub>	kg	
																					M <sub>1</sub>	R
<b>4000</b> <b>4001</b>	700	505	625	90	-	500	330	330	M45	450	296	39	48	52	116	750	1260	580	1525	1567	2320	2390
<b>4500</b> <b>4501</b>	750	505	675	90	-	500	358	330	M45	450	296	39	48	52	116	750	1310	580	1575	1617	2660	2750
<b>5000</b> <b>5001</b>	875	630	785	115	-	625	410	426 <sup>3)</sup>	M56	560	370	48	60	65	148	930	1575	725	1905	1947	4540	4680
<b>5600</b> <b>5601</b>	935	630	845	115	-	625	445	426	M56	560	370	48	60	65	148	930	1635	725	1965	2007	5430	5630
<b>6300</b> <b>6301</b>	1080	770	970	115	-	695	490	472	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	7650	7930
<b>7101</b>	1270	930	1228	115	590	843	601	537	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	12950	13450
<b>8001</b>	1430	1008	1286	145	596	944	682	600	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	19850	20570

Size	D ∅	E	d ∅	e	d ∅	e
<b>4000</b> <b>4001</b>	190 200	280	$i_N \leq 11,2$ 110	210	$i_N \geq 12,5$ 90	170
<b>4500</b> <b>4501</b>	210 220	300	$i_N \leq 12,5$ 110	210	$i_N \geq 14$ 90	170
<b>5000</b> <b>5001</b>	240 250	330	-	-	110	210
<b>5600</b> <b>5601</b>	270 280	380	-	-	110	210
<b>6300</b> <b>6301</b>	300 320	430	-	-	125	210
<b>7101</b>	360	590	-	-	180	300
<b>8001</b>	400	660	-	-	200	350

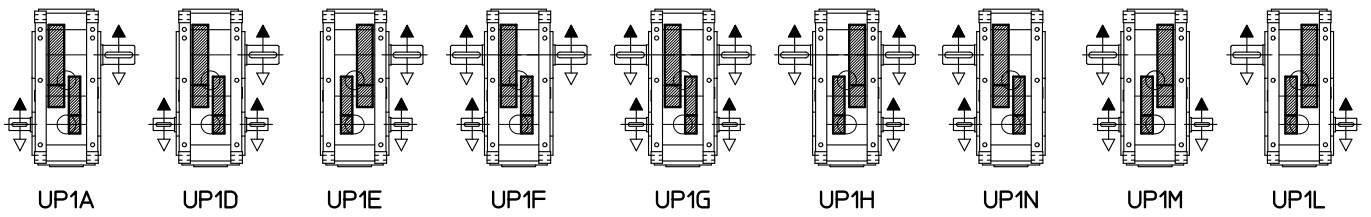
- 1) Working length on thread  $1,7 \cdot F$ .
- 2) For mounting positions B6, B7, V5, V6, dimension  $W_2$  increases by approx. 20 for overall dimensions of filler plug.
- 3) **c** dimension overhangs from **C** dimension.
- 4) Values valid for double extension low speed shaft end.

## 8 - Dimensions, designs, mounting positions (helical gear reducers)

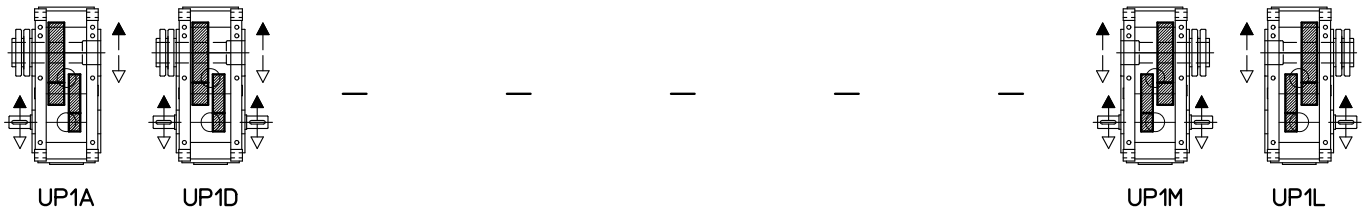
### 8.1 - R 2l gear reducers

#### Designs (direction of rotation)

Solid low speed shaft (standard)



Hollow low speed shaft with shrink disc on machine opposite side (on request)



Hollow low speed shaft with shrink disc on machine side (on request)



Hollow low speed shaft with keyway (on request)



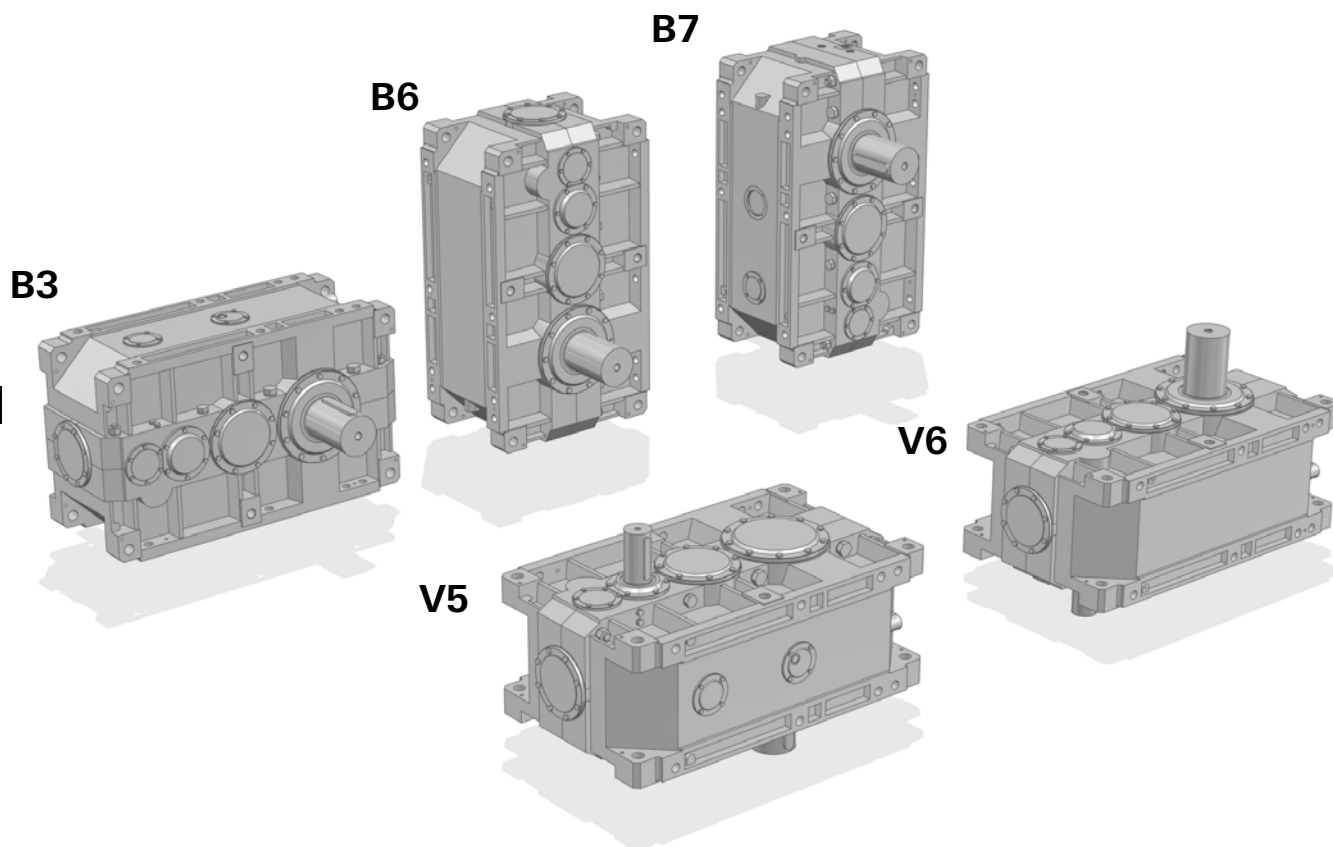
UT. C 2177

## 8 - Dimensions, designs, mounting positions (helical gear reducers)

### 8.1 - R 2l gear reducers

#### Mounting positions

Except specific needs, prefer mounting position B3 (see ch. 2).



▼ Possible high oil splash: for the corrective factor  $ft_3$  of nominal thermal power  $P_{tN}$  see ch. 4.

🔥 Possible bearing lubrication pump: consult us for verification.

1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).

\* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

▼ Oil filler plug

● Oil level plug

■ Oil drain plug

▼ Oil filler plug on opposite side (not in view)

▣ Oil level plug on opposite side (not in view)

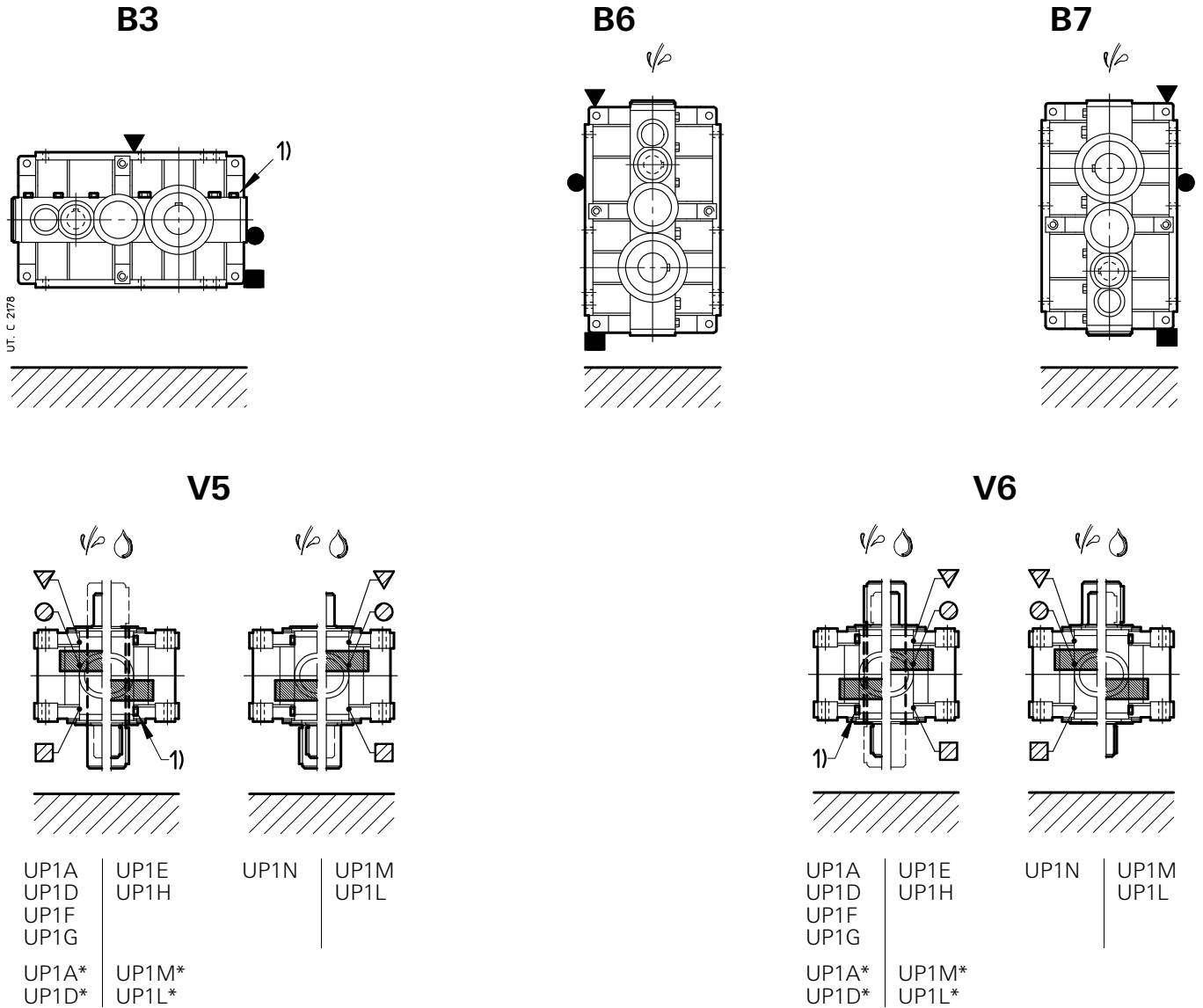
⊙ Oil drain plug on opposite side (not in view)

## 8 - Dimensions, designs, mounting positions (helical gear reducers)

### 8.1 - R 2l gear reducers

#### Lubrication - Plug position and oil quantity

Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.

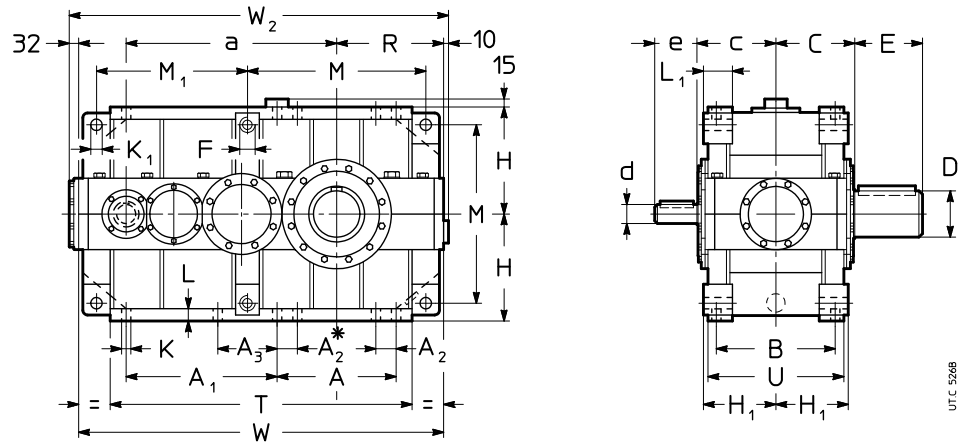
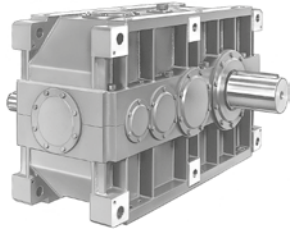


Size	Oil quantity [l]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	118	150	224	236	250
<b>4500, 4501</b>	112	140	236	224	250
<b>5000, 5001</b>	236	300	450	475	500
<b>5600, 5601</b>	224	265	450	450	500
<b>6300, 6301</b>	335	400	670	630	710
<b>7101</b>	560	670	1120	1000	1120
<b>8001</b>	950	1060	1800	1700	1900

See notes at previous page.

## 8.2 - Gear reducers R 3I

### Dimensions



\* For sizes  $\geq 6300$ .

Size	a	A	A <sub>1</sub> M <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	c	F 1)	H h <sub>11</sub> R	H <sub>1</sub> h <sub>12</sub>	K ∅	K <sub>1</sub> ∅ H <sub>11</sub>	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub> 2)	kg 3)	
<b>4000</b> <b>4001</b>	900	505	625	90	-	500	330	325	M45	450	296	39	48	52	116	750	1260	580	1525	1567	2370 2450	2440 2530
<b>4500</b> <b>4501</b>	950	505	675	90	-	500	358	325	M45	450	296	39	48	52	116	750	1310	580	1575	1617	2700 2780	2790 2890
<b>5000</b> <b>5001</b>	1125	630	785	115	-	625	410	405	M56	560	370	48	60	65	148	930	1575	725	1905	1947	4620 4740	4760 4900
<b>5600</b> <b>5601</b>	1185	630	845	115	-	625	445	405	M56	560	370	48	60	65	148	930	1635	725	1965	2007	5530 5650	5730 5870
<b>6300</b> <b>6301</b>	1380	770	970	115	-	695	490	455	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	7760 7860	8040 8190
<b>7101</b>	1630	930	1228	115	590	843	601	510	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	13190	13690
<b>8001</b>	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	20430	21150

Size	D ∅	E	d ∅		e	
<b>4000</b> <b>4001</b>	190 200	280	$i_N \leq 50$		$i_N \geq 56$	
			80	170	65	140
<b>4500</b> <b>4501</b>	210 220	300	$i_N \leq 56$		$i_N \geq 63$	
			80	170	65	140
<b>5000</b> <b>5001</b>	240 250	330	$i_N \leq 50$		$i_N \geq 56$	
			100	210	80	170
<b>5600</b> <b>5601</b>	270 280	380	$i_N \leq 56$		$i_N \geq 63$	
			100	210	80	170
<b>6300</b> <b>6301</b>	300 320	430	$i_N \leq 50$		$i_N \geq 56$	
			110	210	90	170
<b>7101</b>	360	590	120	210	-	-
<b>8001</b>	400	660	150	250	-	-

1) Working length on thread  $1,7 \cdot F$ .

2) For mounting positions B6, B7, V5, V6, dimension W<sub>2</sub> increases by approx. 20 for overall dimensions of filler plug.

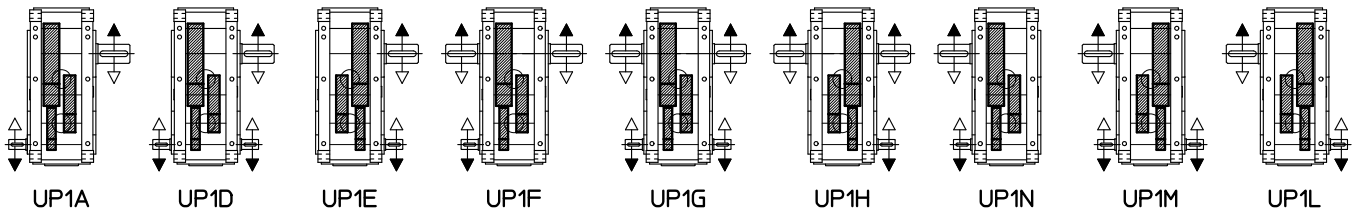
3) Values valid for double extension low speed shaft end.

# 8 - Dimensions, designs, mounting positions (helical gear reducers)

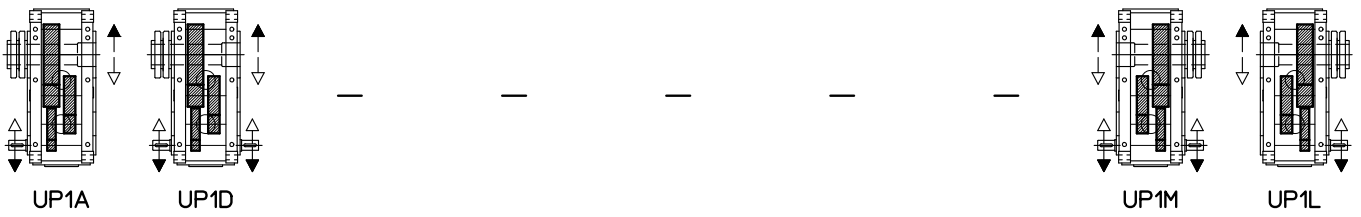
## 8.2 - Gear reducers R 3I

### Designs (direction of rotation)

Solid low speed shaft (standard)



Hollow low speed shaft with shrink disc on machine opposite side (on request)



Hollow low speed shaft with shrink disc on machine side (on request)



Hollow low speed shaft with keyway (on request)

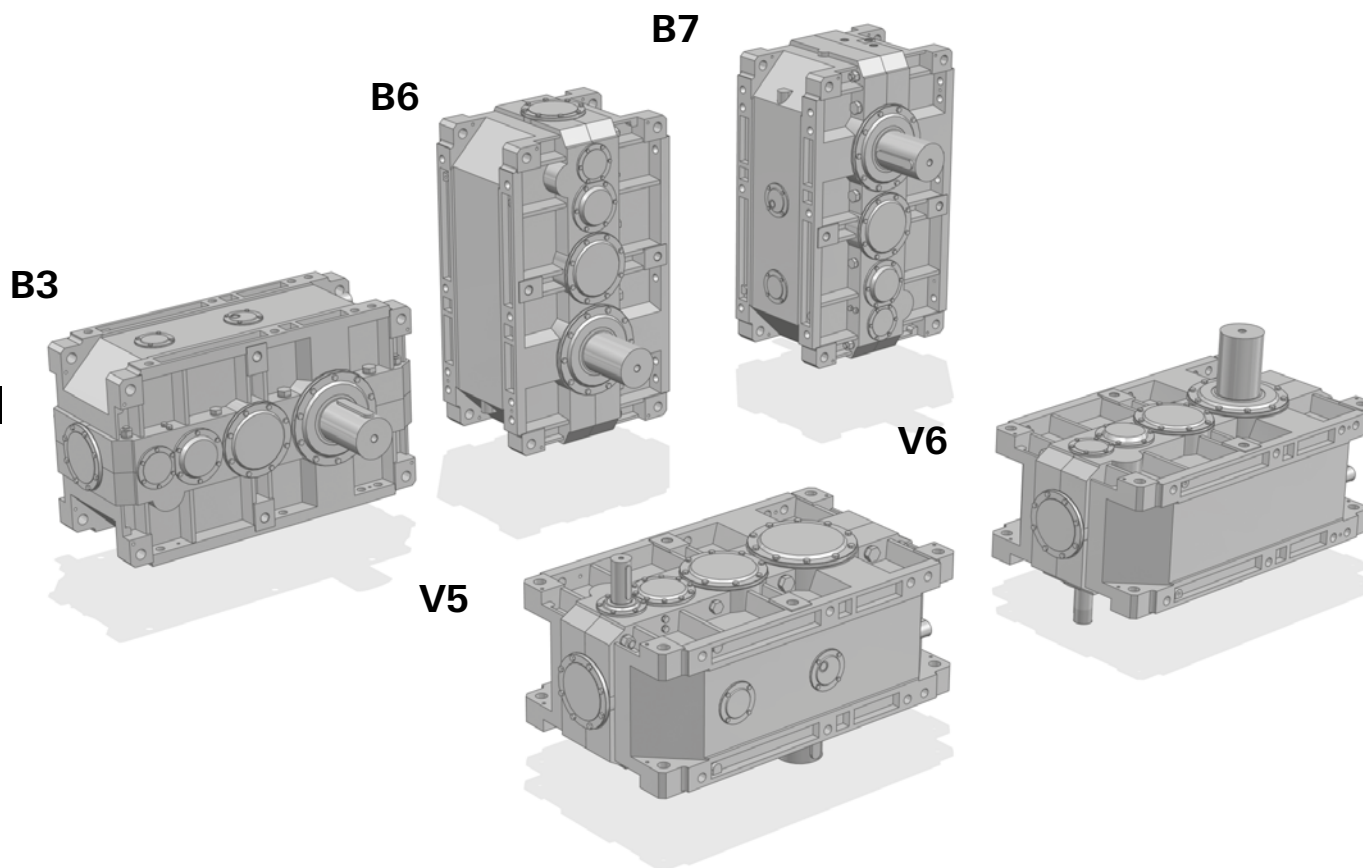


8  
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8.2 - Gear reducers R 3I

**Mounting positions**

Except specific needs, prefer mounting position B3 (see ch. 2).



- ⚠ Possible high oil splash: for the corrective factor  $ft_3$  of nominal thermal power  $P_{tw}$  see ch. 4.
- 🔥 Possible bearing lubrication pump: consult us for verification.
- 1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).
- \* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

- ▼ Oil filler plug
- Oil level plug
- Oil drain plug
- ▼ Oil filler plug on opposite side (not in view)
- ▣ Oil level plug on opposite side (not in view)
- ⊙ Oil drain plug on opposite side (not in view)

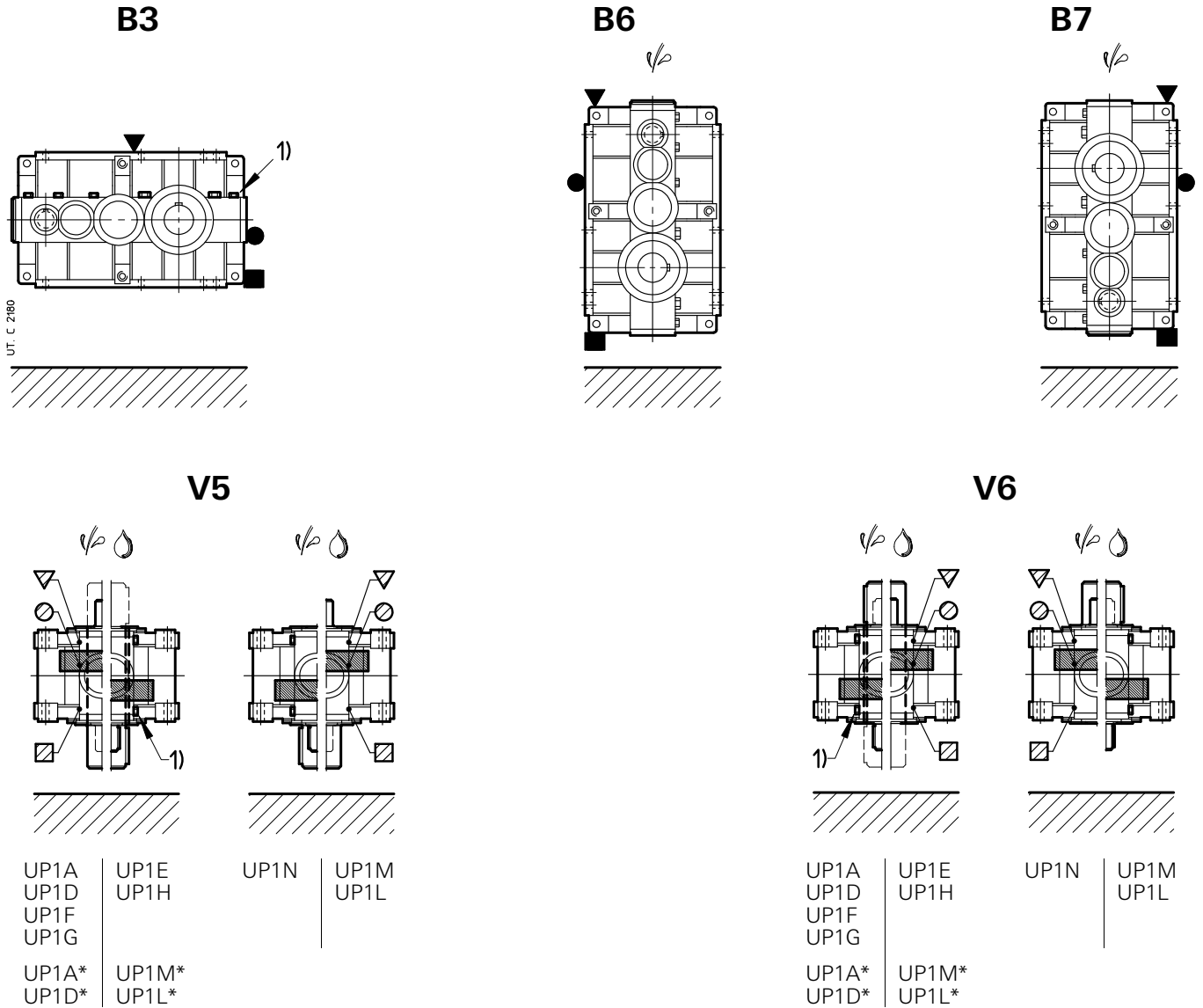


## 8 - Dimensions, designs, mounting positions (helical gear reducers)

### 8.2 - Gear reducers R 3l

#### Lubrication - Plug position and oil quantity

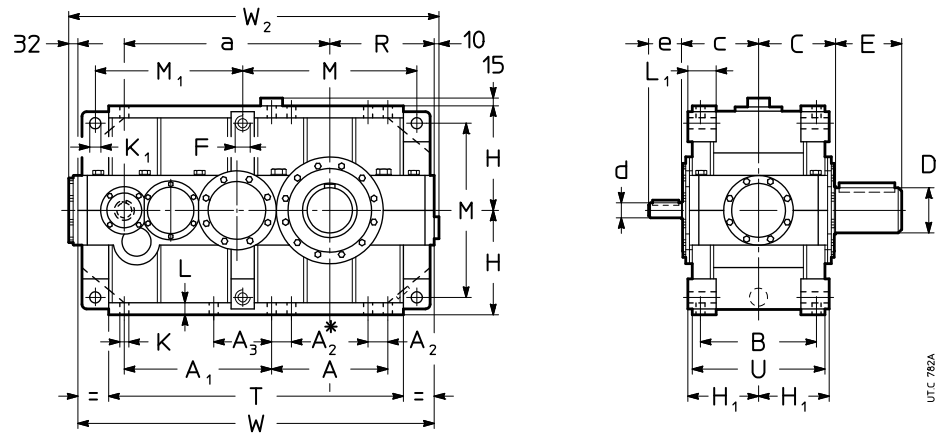
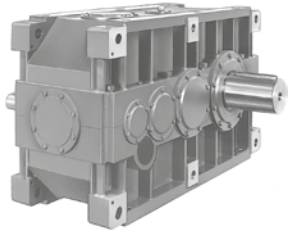
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



Size	Oil quantity [l]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	140	236	224	236	250
<b>4500, 4501</b>	140	236	224	236	250
<b>5000, 5001</b>	280	450	450	450	500
<b>5600, 5601</b>	280	450	450	450	500
<b>6300, 6301</b>	400	630	670	630	710
<b>7101</b>	630	950	1060	1000	1120
<b>8001</b>	1060	1800	1700	1800	1900

### 8.3 - Gear reducers R 4I

#### Dimensions



\* For sizes  $\geq 6300$ .

Size	a	A	A <sub>1</sub> M <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	c	F	H <sub>h11</sub> R	H <sub>h12</sub>	K ∅	K <sub>1</sub> ∅ H11	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub>	kg	
									1)												2)	3)
<b>4000</b> <b>4001</b>	900	505	625	90	-	500	330	325	M45	450	296	39	48	52	116	750	1260	580	1525	1567	2360 2430	2430 2510
<b>4500</b> <b>4501</b>	950	505	675	90	-	500	358	325	M45	450	296	39	48	52	116	750	1310	580	1575	1617	2650 2720	2740 2830
<b>5000</b> <b>5001</b>	1125	630	785	115	-	625	410	405	M56	560	370	48	60	65	148	930	1575	725	1905	1947	4630 4740	4770 4900
<b>5600</b> <b>5601</b>	1185	630	845	115	-	625	445	405	M56	560	370	48	60	65	148	930	1635	725	1965	2007	5520 5640	5720 5860
<b>6300</b> <b>6301</b>	1380	770	970	115	-	695	490	455	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	7730 7830	8010 8160
<b>7101</b>	1630	930	1228	115	590	843	601	540	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	13230	13730
<b>8001</b>	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	20420	21140

Size	D ∅	E	d ∅ 4) i <sub>N</sub> ≤ 160		d ∅ i <sub>N</sub> ≥ 200	
<b>4000</b> <b>4001</b>	190 200	280	55	110	48	110
<b>4500</b> <b>4501</b>	210 220	300	55	110	48	110
<b>5000</b> <b>5001</b>	240 250	330	70	140	55	110
<b>5600</b> <b>5601</b>	270 280	380	70	140	55	110
<b>6300</b> <b>6301</b>	300 320	430	75	140	60	140
<b>7101</b>	360	590	90	170	-	-
<b>8001</b>	400	660	110	210	-	-

1) Working length on thread  $1,7 \cdot F$ .

2) For mounting positions B6, B7, V5, V6, dimension  $W_2$  increases by 20 for overall dimensions of filler plug.

3) Values valid for double extension low speed shaft end.

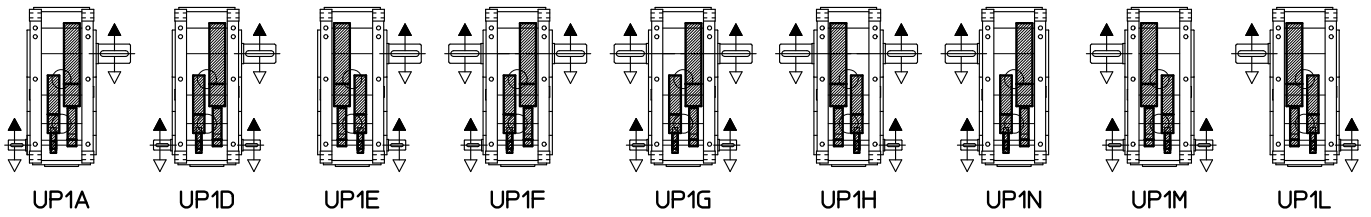
4) For size  $\leq 6301$ , the second high speed shaft end (UP1D, UP1G, UP1M) has the dimensions of high speed shaft end for  $i_N \geq 200$ .

# 8 - Dimensions, designs, mounting positions (helical gear reducers)

## 8.3 - Gear reducers R 4l

### Designs (direction of rotation)

Solid low speed shaft (standard)



Hollow low speed shaft with shrink disc on machine opposite side (on request)



Hollow low speed shaft with shrink disc on machine side (on request)



Hollow low speed shaft with keyway (on request)



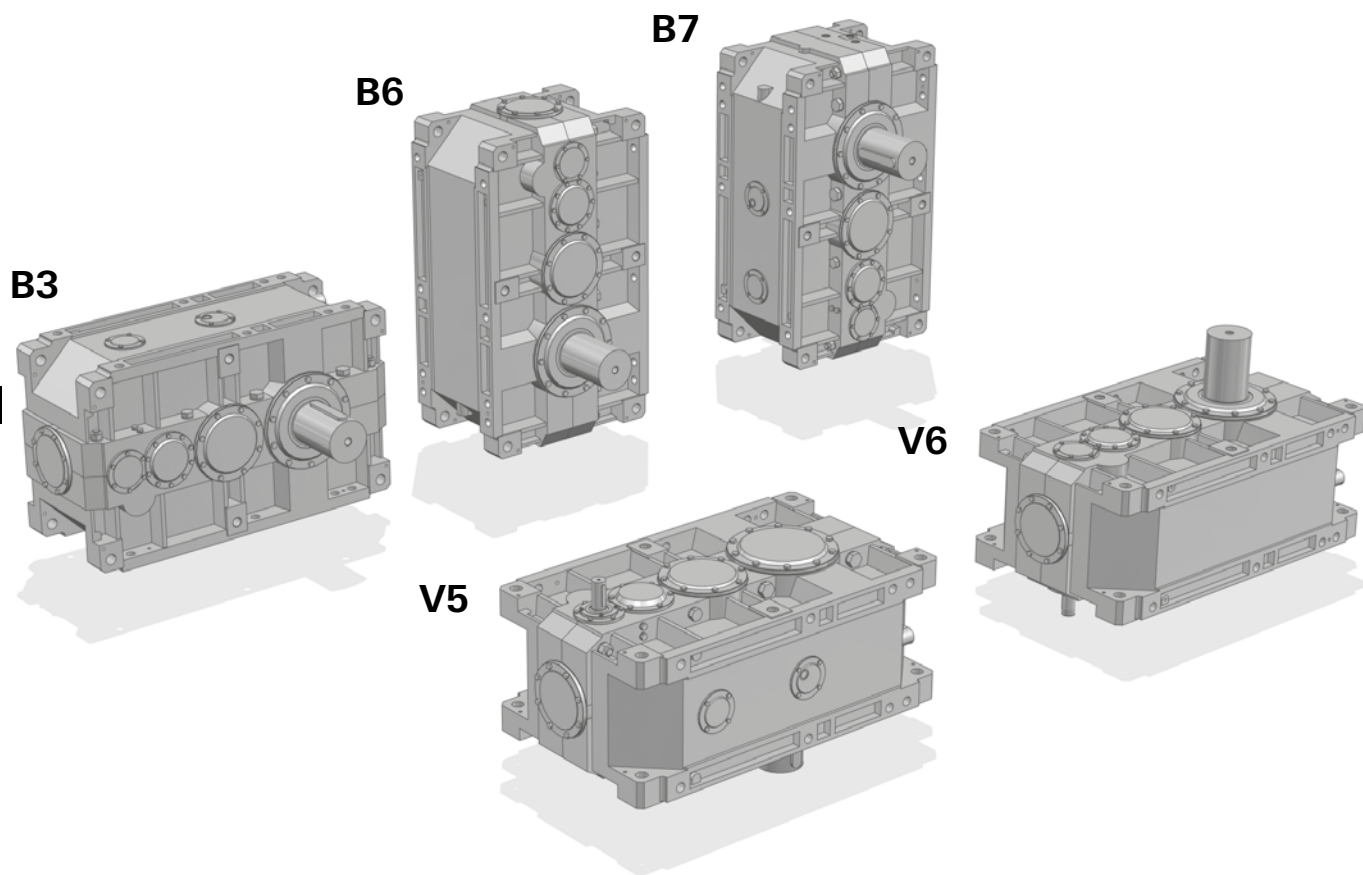
**8**

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8.3 - Gear reducers R 4I

**Mounting positions**

Except specific needs, prefer mounting position B3 (see ch. 2).



⚠ Possible high oil splash: for the corrective factor  $ft_3$  of nominal thermal power  $P_{tN}$  see ch. 4.

🔥 Possible bearing lubrication pump: consult us for verification.

1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).

\* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

- ▼ Oil filler plug
- Oil level plug
- Oil drain plug

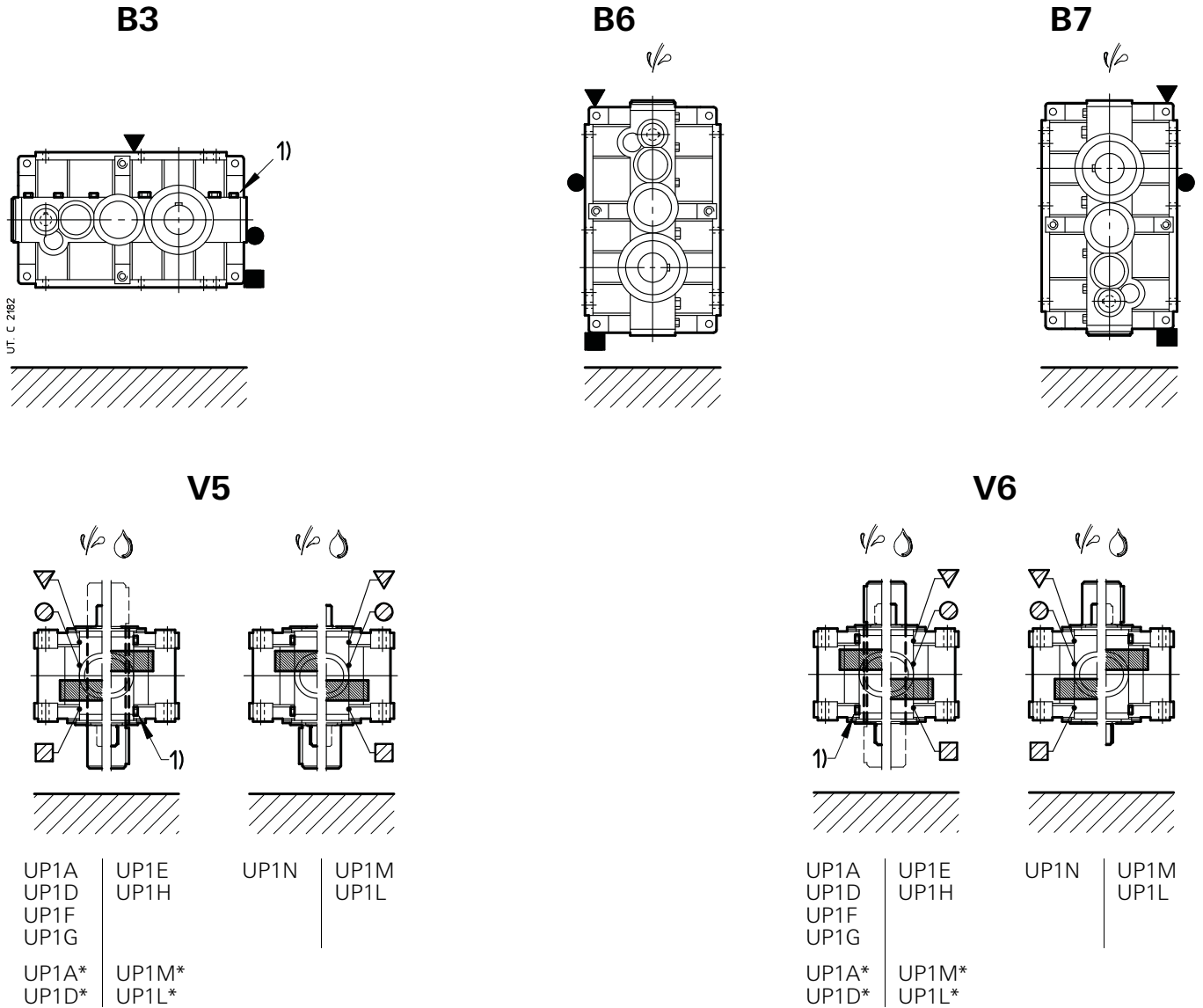
- ▼ Oil filler plug on opposite side (not in view)
- ▣ Oil level plug on opposite side (not in view)
- ⊙ Oil drain plug on opposite side (not in view)

## 8 - Dimensions, designs, mounting positions (helical gear reducers)

### 8.3 - Gear reducers R 4l

#### Lubrication - Plug position and oil quantity

Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.

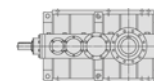


Size	Oil quantity [l]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	160	265	224	250	265
<b>4500, 4501</b>	160	265	224	250	265
<b>5000, 5001</b>	315	530	425	500	530
<b>5600, 5601</b>	315	530	425	500	530
<b>6300, 6301</b>	450	750	630	710	750
<b>7101</b>	750	1120	1060	1120	1120
<b>8001</b>	1180	2000	1700	1900	1900

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## 9 - Selection tables

(bevel helical gear reducers)



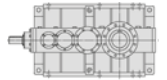
$n_1 = 1\ 800\ \text{min}^{-1}$

Train of gears		$n_{N2}$ $\text{min}^{-1}$	Gear reducer size											
			$P_{N2}$ [kW]											
			$M_{N2}$ ( $M_{2\text{max}}$ ) [kN m]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
CI	8	224	1770▲ 73 (140)	1910▲ 79 (155)	2260▲ 97 (195)	-	-	-	-	-	-	-	-	-
	9	200	1710▲ 80 (145)	1870▲ 88 (170)	2020▲ 100 (190)	2230▲ 110 (218)	-	-	-	-	-	-	-	-
	10	180	1480▲ 80 (145)	1670▲ 90 (170)	1860▲ 100 (200)	2050▲ 112 (206)	-	-	-	-	-	-	-	-
	11,2	160	1340▲ 80 (150)	1510▲ 90 (170)	1620▲ 100 (195)	1810▲ 112 (224)	-	-	-	-	-	-	-	-
	12,5	140	1180▲ 80 (150)	1270▲ 87 (175)	1470▲ 100 (195)	1640▲ 112 (195)	-	-	-	-	-	-	-	-
	14	132	1060▲ 80 (140)	1190▲ 90 (165)	1280▲ 100 (200)	1430▲ 112 (224)	-	-	-	-	-	-	-	-
	16	112	927▲ 80 (150)	989▲ 85 (165)	1160▲ 100 (185)	1260▲ 108 (212)	-	-	-	-	-	-	-	-
	18	100	838▲ 80 (145)	942▲ 90 (165)	989▲ 98 (195)	-	-	-	-	-	-	-	-	-
C2I	20	90	908▲ 95 (165)	984▲ 103 (190)	916▲ 100 (185)	989▲ 108 (218)	-	-	-	-	-	-	-	-
	22,4	80	824▲ 98 (165)	899▲ 107 (190)	953▲ 115 (224)	1040▲ 125 (250)	1610▲ 190 (325)	1760▲ 207 (375)	-	-	-	-	-	-
	25	71	730▲ 100 (160)	803▲ 110 (185)	877▲ 120 (224)	958▲ 131 (257)	1370▲ 185 (315)	1500▲ 202 (365)	1800▲ 243 (450)	2040▲ 275 (515)	-	-	-	-
	28	63	672▲ 100 (165)	753▲ 112 (185)	782▲ 123 (212)	858▲ 135 (243)	1290▲ 190 (325)	1440▲ 212 (375)	1580▲ 243 (425)	1810▲ 278 (487)	1980▲ 300 (600)	2200▲ 335 (670)	-	-
	31,5	56	584▲ 100 (165)	654▲ 112 (185)	731▲ 125 (230)	807▲ 138 (265)	1110▲ 188 (325)	1260▲ 212 (375)	1440▲ 243 (450)	1660▲ 280 (515)	1830▲ 320 (650)	2020▲ 360 (730)	-	-
	35,5	50	534▲ 100 (165)	598▲ 112 (190)	636▲ 125 (212)	712▲ 140 (243)	1020▲ 190 (335)	1140▲ 212 (375)	1260▲ 243 (425)	1460▲ 280 (500)	1730▲ 335 (630)	1960▲ 380 (710)	-	-
	40	45	463▲ 100 (165)	519▲ 112 (190)	580▲ 125 (230)	650▲ 140 (265)	895▲ 190 (335)	999▲ 212 (375)	1150▲ 243 (462)	1320▲ 280 (530)	1600▲ 350 (650)	1800▲ 400 (750)	-	-
	45	40	423 100 (170)	474 112 (195)	505▲ 125 (218)	565▲ 140 (250)	811▲ 190 (335)	905▲ 212 (387)	1000▲ 243 (437)	1160▲ 280 (500)	1480▲ 355 (650)	1700▲ 412 (630)	-	-
	50	35,5	367 100 (170)	411 112 (195)	460 125 (236)	515 140 (272)	710▲ 190 (335)	792▲ 212 (387)	908▲ 243 (475)	1050▲ 280 (545)	1280▲ 355 (670)	1460▲ 412 (750)	-	-
	56	31,5	334 100 (170)	374 112 (195)	400 125 (224)	448 140 (257)	639▲ 190 (345)	714▲ 212 (387)	796▲ 243 (450)	917▲ 280 (515)	1170▲ 355 (670)	1340▲ 412 (630)	-	-
	63	28	290 100 (170)	324 112 (195)	363 125 (243)	406 140 (272)	560▲ 190 (345)	624▲ 212 (387)	716▲ 243 (475)	825▲ 280 (545)	1020▲ 355 (670)	1160▲ 412 (775)	-	-
	71	25	267 100 (175)	299 112 (200)	316 125 (224)	353 140 (257)	512▲ 190 (355)	571▲ 212 (400)	627▲ 243 (450)	723▲ 280 (515)	917▲ 355 (650)	1060▲ 412 (630)	-	-
	80	22,4	232 100 (175)	260 112 (200)	286 125 (243)	321 140 (280)	448▲ 190 (355)	499▲ 212 (400)	573▲ 243 (487)	660▲ 280 (545)	801▲ 355 (690)	913▲ 412 (775)	-	-
	90	20	214 100 (175)	239 112 (200)	252 125 (230)	283 140 (265)	409▲ 190 (355)	457▲ 212 (400)	502▲ 243 (462)	578▲ 280 (530)	723▲ 355 (650)	839▲ 412 (750)	-	-
	100	18	185 100 (175)	208 112 (200)	229 125 (243)	257 140 (280)	358▲ 190 (355)	400▲ 212 (400)	458▲ 243 (487)	528▲ 280 (545)	659▲ 355 (600)	767▲ 412 (690)	1020▲ 550 (1090)	1630▲ 925 (1800)
125	14	-	-	183 125 (212)	205 140 (243)	-	-	366▲ 243 (425)	422▲ 280 (487)	-	-	-	-	
C3I	125	14	145 100 (175)	162 112 (200)	181 125 (243)	203 140 (280)	275 190 (355)	307 212 (400)	352 243 (487)	406 280 (560)	508 355 (670)	535 381 (750)	941▲ 650 (1250)	1280▲ 925 (1800)
	160	11,2	115 100 (175)	129 112 (200)	144 125 (243)	161 140 (280)	218 190 (355)	244 212 (400)	279 243 (487)	322 280 (560)	406 355 (690)	463 412 (800)	753▲ 650 (1250)	1020▲ 925 (1800)
	200	9	90,3 100 (175)	101 112 (200)	113 125 (243)	127 140 (280)	177 190 (355)	198 212 (400)	227 243 (487)	261 280 (560)	322 355 (670)	370 412 (750)	597 650 (1250)	812▲ 925 (1800)
	250	7,1	71,2 100 (175)	79,8 112 (200)	89,2 125 (243)	99,9 140 (280)	140 190 (355)	156 212 (400)	179 243 (487)	206 280 (560)	258 355 (690)	294 412 (800)	471 650 (1250)	641▲ 925 (1800)
	315	5,6	57,9 100 (175)	64,9 112 (200)	72,6 125 (243)	81,3 140 (280)	110 190 (355)	123 212 (400)	141 243 (487)	162 280 (560)	203 355 (690)	225 400 (800)	371 650 (1250)	505▲ 925 (1800)

▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



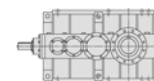
9 - Selection tables (bevel helical gear reducers)



$n_1 = 1\ 500\ \text{min}^{-1}$

Train of gears	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size												
		$P_{N2}$ [kW]												
		$M_{N2}$ ( $M_{2max}$ ) [kN m]												
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
C1	8	190	1520▲ 75 (145)	1670▲ 82 (160)	1920▲ 99 (200)	-	-	-	-	-	-	-	-	
	9	170	1510▲ 85 (150)	1670▲ 94 (175)	1780▲ 106 (195)	1890▲ 113 (224)	-	-	-	-	-	-	-	
	10	150	1310▲ 85 (150)	1470▲ 95 (175)	1640▲ 106 (212)	1800▲ 118 (212)	-	-	-	-	-	-	-	
	11,2	132	1190▲ 85 (155)	1330▲ 95 (175)	1430▲ 106 (200)	1590▲ 118 (230)	-	-	-	-	-	-	-	
	12,5	118	1040 85 (155)	1130 92 (175)	1290▲ 106 (200)	1440▲ 118 (200)	-	-	-	-	-	-	-	
	14	106	941 85 (145)	1050 95 (165)	1130 106 (206)	1220 114 (230)	-	-	-	-	-	-	-	
	16	95	773 80 (150)	826 86 (170)	1030 106 (190)	1130 117 (218)	-	-	-	-	-	-	-	
	18	85	742 85 (150)	826 95 (170)	839 100 (200)	-	-	-	-	-	-	-	-	
	C2I	20	75	796▲ 100 (170)	860▲ 108 (195)	809 106 (190)	839 110 (218)	-	-	-	-	-	-	-
22,4		67	743▲ 106 (170)	799▲ 114 (195)	829▲ 120 (230)	884▲ 128 (257)	1410▲ 200 (335)	1580▲ 224 (387)	-	-	-	-	-	
25		60	644▲ 106 (165)	717▲ 118 (185)	768▲ 126 (230)	853▲ 140 (265)	1240▲ 200 (325)	1350▲ 218 (375)	1590▲ 257 (450)	1790▲ 290 (530)	-	-	-	
28		53	594 106 (165)	661 118 (190)	699▲ 132 (218)	779▲ 147 (250)	1130▲ 200 (335)	1270▲ 224 (375)	1390▲ 257 (425)	1540▲ 285 (500)	1730▲ 315 (615)	1880▲ 344 (690)	-	
31,5		47,5	516 106 (165)	574 118 (190)	643 132 (230)	731 150 (265)	989▲ 200 (335)	1110▲ 224 (375)	1270▲ 257 (462)	1430▲ 290 (530)	1620▲ 340 (650)	1780▲ 380 (750)	-	
35,5		42,5	472 106 (170)	525 118 (195)	559 132 (218)	636 150 (250)	898▲ 200 (335)	1010▲ 224 (387)	1110▲ 257 (437)	1240▲ 286 (500)	1530▲ 355 (650)	1720▲ 400 (730)	-	
40		37,5	409 106 (170)	456 118 (195)	511 132 (236)	580 150 (272)	785▲ 200 (335)	880▲ 224 (387)	1010▲ 257 (475)	1130▲ 287 (545)	1390▲ 365 (670)	1550▲ 415 (775)	-	
45		33,5	374 106 (170)	416 118 (195)	444 132 (224)	505 150 (257)	711 200 (345)	797 224 (400)	885▲ 257 (450)	986▲ 286 (515)	1260▲ 365 (670)	1460▲ 425 (670)	2360▲ 670 (1220)	3250▲ 950 (1750)
50		30	325 106 (170)	361 118 (195)	405 132 (243)	460 150 (272)	623 200 (345)	697 224 (400)	800 257 (475)	899 289 (545)	1100▲ 365 (670)	1260▲ 425 (775)	2050▲ 670 (1250)	2820▲ 950 (1750)
56		26,5	295 106 (175)	328 118 (200)	352 132 (224)	400 150 (257)	561 200 (355)	628 224 (400)	701 257 (450)	783 287 (515)	1000 365 (670)	1150▲ 425 (670)	1850▲ 670 (1180)	2550▲ 950 (1650)
63		23,6	256 106 (175)	285 118 (200)	319 132 (243)	363 150 (280)	491 200 (355)	550 224 (400)	631 257 (487)	712 290 (560)	871 365 (690)	996 425 (775)	1640▲ 670 (1250)	2320▲ 950 (1800)
71		21,2	236 106 (175)	263 118 (200)	278 132 (230)	316 150 (265)	449 200 (355)	503 224 (400)	553 257 (462)	619 288 (530)	785 365 (670)	915 425 (670)	1480▲ 670 (1220)	2100▲ 950 (1700)
80		19	205 106 (175)	228 118 (200)	252 132 (243)	286 150 (280)	393 200 (355)	440 224 (400)	505 257 (487)	569 290 (545)	687 365 (690)	785 425 (775)	-	-
90		17	189 106 (175)	210 118 (200)	222 132 (230)	252 150 (265)	359 200 (355)	402 224 (400)	442 257 (462)	496 288 (530)	619 365 (650)	721 425 (750)	-	-
100		15	164 106 (175)	182 118 (200)	202 132 (243)	229 150 (280)	314 200 (355)	352 224 (400)	404 257 (487)	455 290 (560)	565 365 (615)	659 425 (710)	916▲ 595 (1180)	1390▲ 950 (1800)
125	11,8	-	-	161 132 (212)	183 150 (243)	-	-	323 257 (425)	364 290 (487)	-	-	-	-	
C3I	125	11,8	128 106 (175)	142 118 (200)	160 132 (243)	169 140 (280)	242 200 (355)	271 224 (400)	294 243 (487)	338 280 (560)	435 365 (690)	469 401 (775)	809▲ 670 (1250)	1100▲ 950 (1800)
	160	9,5	101 106 (175)	113 118 (200)	127 132 (243)	141 147 (280)	192 200 (355)	215 224 (400)	246 257 (487)	268 280 (560)	348 365 (690)	398 425 (800)	647 670 (1250)	877▲ 950 (1800)
	200	7,5	79,8 106 (175)	88,8 118 (200)	99,6 132 (243)	113 150 (280)	156 200 (355)	174 224 (400)	200 257 (487)	218 280 (560)	276 365 (690)	318 425 (775)	513 670 (1250)	695 950 (1800)
	250	6	62,9 106 (175)	70 118 (200)	78,5 132 (243)	89,2 150 (280)	123 200 (355)	137 224 (400)	158 257 (487)	178 290 (560)	221 365 (690)	252 425 (800)	404 670 (1250)	548 950 (1800)
	315	4,75	51,2 106 (175)	57 118 (200)	63,9 132 (243)	72,6 150 (280)	96,7 200 (355)	108 224 (400)	124 257 (487)	140 290 (560)	174 365 (690)	188 403 (800)	319 670 (1250)	432 950 (1800)

▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).

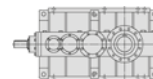


$n_1 = 1\ 200\ \text{min}^{-1}$

Train of gears	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size												
		$P_{N2}$ [kW]												
		$M_{N2}$ ( $M_{2\text{max}}$ ) [kN m]												
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
CI	8	150	1260 <b>78</b> (145)	1330 <b>82</b> (165)	1550▲ <b>100</b> (200)	-	-	-	-	-	-	-	-	
	9	132	1220 <b>85</b> (150)	1330 <b>94</b> (175)	1430▲ <b>106</b> (200)	1530▲ <b>114</b> (230)	-	-	-	-	-	-	-	
	10	118	1060 <b>85</b> (150)	1180 <b>95</b> (175)	1320 <b>106</b> (212)	1450▲ <b>119</b> (212)	-	-	-	-	-	-	-	
	11,2	106	954 <b>85</b> (155)	1070 <b>95</b> (175)	1150 <b>106</b> (200)	1280 <b>119</b> (230)	-	-	-	-	-	-	-	
	12,5	95	837 <b>85</b> (155)	935 <b>95</b> (180)	1040 <b>106</b> (200)	1160 <b>119</b> (200)	-	-	-	-	-	-	-	
	14	85	756 <b>85</b> (145)	845 <b>95</b> (170)	909 <b>106</b> (206)	986 <b>115</b> (230)	-	-	-	-	-	-	-	
	16	75	639 <b>83</b> (155)	662 <b>86</b> (170)	825 <b>106</b> (190)	919 <b>119</b> (218)	-	-	-	-	-	-	-	
	18	67	596 <b>85</b> (150)	662 <b>95</b> (170)	677 <b>101</b> (200)	-	-	-	-	-	-	-	-	
C2I	20	60	639 <b>100</b> (170)	692 <b>109</b> (195)	650 <b>106</b> (195)	677 <b>111</b> (224)	-	-	-	-	-	-	-	
	22,4	53	595 <b>106</b> (170)	641 <b>114</b> (195)	666 <b>120</b> (230)	712 <b>129</b> (257)	1130▲ <b>200</b> (335)	1270▲ <b>225</b> (387)	-	-	-	2850▲ <b>530</b> (1030)	4740▲ <b>905</b> (1500)	
	25	47,5	516 <b>106</b> (165)	575 <b>118</b> (190)	617 <b>127</b> (230)	686 <b>141</b> (265)	990▲ <b>200</b> (325)	1110▲ <b>225</b> (375)	1280▲ <b>258</b> (462)	1440▲ <b>290</b> (530)	-	2850▲ <b>585</b> (1150)	4500▲ <b>950</b> (1650)	
	28	42,5	476 <b>106</b> (165)	530 <b>118</b> (190)	561 <b>132</b> (218)	625 <b>148</b> (250)	905 <b>200</b> (335)	1020 <b>225</b> (387)	1120▲ <b>258</b> (437)	1240▲ <b>285</b> (500)	1390▲ <b>317</b> (615)	1520▲ <b>346</b> (690)	2850▲ <b>670</b> (1180)	3910▲ <b>950</b> (1700)
	31,5	37,5	413 <b>106</b> (165)	460 <b>118</b> (190)	516 <b>132</b> (236)	586 <b>150</b> (272)	792 <b>200</b> (335)	890 <b>225</b> (387)	1020 <b>258</b> (462)	1150 <b>291</b> (530)	1300▲ <b>342</b> (670)	1430▲ <b>382</b> (775)	2570▲ <b>670</b> (1150)	3540▲ <b>950</b> (1600)
	35,5	33,5	378 <b>106</b> (170)	421 <b>118</b> (195)	449 <b>132</b> (218)	510 <b>150</b> (250)	719 <b>200</b> (345)	808 <b>225</b> (387)	895 <b>258</b> (437)	992 <b>286</b> (515)	1230▲ <b>357</b> (650)	1380▲ <b>402</b> (730)	2280▲ <b>670</b> (1150)	3220▲ <b>950</b> (1600)
	40	30	328 <b>106</b> (170)	365 <b>118</b> (195)	410 <b>132</b> (236)	466 <b>150</b> (272)	629 <b>200</b> (345)	707 <b>225</b> (387)	810 <b>258</b> (475)	904 <b>288</b> (545)	1120 <b>366</b> (670)	1250 <b>416</b> (775)	2060▲ <b>670</b> (1120)	2910▲ <b>950</b> (1650)
	45	26,5	299 <b>106</b> (175)	333 <b>118</b> (200)	356 <b>132</b> (224)	405 <b>150</b> (257)	570 <b>200</b> (345)	641 <b>225</b> (400)	710 <b>258</b> (450)	790 <b>287</b> (515)	1020 <b>366</b> (670)	1170 <b>426</b> (670)	1900▲ <b>670</b> (1250)	2600▲ <b>950</b> (1800)
	50	23,6	260 <b>106</b> (175)	289 <b>118</b> (200)	325 <b>132</b> (243)	369 <b>150</b> (280)	499 <b>200</b> (345)	560 <b>225</b> (400)	642 <b>258</b> (487)	722 <b>290</b> (560)	882 <b>366</b> (690)	1010 <b>426</b> (775)	1650▲ <b>670</b> (1250)	2260▲ <b>950</b> (1800)
	56	21,2	236 <b>106</b> (175)	263 <b>118</b> (200)	282 <b>132</b> (230)	321 <b>150</b> (265)	449 <b>200</b> (355)	505 <b>225</b> (400)	563 <b>258</b> (462)	627 <b>287</b> (530)	805 <b>366</b> (670)	925 <b>426</b> (670)	1490▲ <b>670</b> (1180)	2040▲ <b>950</b> (1700)
	63	19	205 <b>106</b> (175)	228 <b>118</b> (200)	256 <b>132</b> (243)	291 <b>150</b> (280)	393 <b>200</b> (355)	442 <b>225</b> (400)	506 <b>258</b> (487)	571 <b>291</b> (560)	699 <b>366</b> (690)	799 <b>426</b> (775)	1320▲ <b>670</b> (1250)	1860▲ <b>950</b> (1800)
	71	17	189 <b>106</b> (175)	210 <b>118</b> (200)	223 <b>132</b> (230)	253 <b>150</b> (265)	359 <b>200</b> (355)	404 <b>225</b> (400)	444 <b>258</b> (462)	496 <b>288</b> (530)	631 <b>366</b> (670)	733 <b>426</b> (670)	1190▲ <b>670</b> (1220)	1680▲ <b>950</b> (1700)
	80	15	164 <b>106</b> (175)	183 <b>118</b> (200)	202 <b>132</b> (243)	230 <b>150</b> (280)	315 <b>200</b> (355)	354 <b>225</b> (400)	405 <b>258</b> (487)	457 <b>291</b> (560)	551 <b>366</b> (690)	630 <b>426</b> (775)	-	-
	90	13,2	151 <b>106</b> (175)	168 <b>118</b> (200)	178 <b>132</b> (230)	203 <b>150</b> (265)	288 <b>200</b> (355)	323 <b>225</b> (400)	355 <b>258</b> (462)	398 <b>289</b> (530)	497 <b>366</b> (650)	578 <b>426</b> (750)	-	-
	100	11,8	131 <b>106</b> (175)	146 <b>118</b> (200)	162 <b>132</b> (243)	184 <b>150</b> (280)	252 <b>200</b> (355)	283 <b>225</b> (400)	324 <b>258</b> (487)	366 <b>291</b> (560)	454 <b>366</b> (630)	529 <b>426</b> (710)	758 <b>615</b> (1220)	1120▲ <b>950</b> (1800)
125	9,5	-	-	129 <b>132</b> (212)	147 <b>150</b> (243)	-	-	259 <b>258</b> (425)	293 <b>291</b> (487)	-	-	-	-	
C3I	125	9,5	102 <b>106</b> (175)	114 <b>118</b> (200)	128 <b>132</b> (243)	136 <b>141</b> (280)	194 <b>200</b> (355)	218 <b>225</b> (400)	237 <b>245</b> (487)	271 <b>280</b> (560)	349 <b>366</b> (690)	388 <b>415</b> (800)	649 <b>670</b> (1250)	878▲ <b>950</b> (1800)
	160	7,5	81,2 <b>106</b> (175)	90,4 <b>118</b> (200)	101 <b>132</b> (243)	115 <b>150</b> (280)	153 <b>200</b> (355)	172 <b>225</b> (400)	198 <b>258</b> (487)	215 <b>280</b> (560)	280 <b>366</b> (690)	319 <b>426</b> (800)	519 <b>670</b> (1250)	703 <b>950</b> (1800)
	200	6	63,9 <b>106</b> (175)	71,2 <b>118</b> (200)	79,9 <b>132</b> (243)	90,8 <b>150</b> (280)	125 <b>200</b> (355)	140 <b>225</b> (400)	161 <b>258</b> (487)	180 <b>289</b> (560)	222 <b>366</b> (690)	255 <b>426</b> (800)	411 <b>670</b> (1250)	557 <b>950</b> (1800)
	250	4,75	50,4 <b>106</b> (175)	56,1 <b>118</b> (200)	63 <b>132</b> (243)	71,6 <b>150</b> (280)	98,3 <b>200</b> (355)	110 <b>225</b> (400)	127 <b>258</b> (487)	143 <b>291</b> (560)	177 <b>366</b> (690)	202 <b>426</b> (800)	324 <b>670</b> (1250)	440 <b>950</b> (1800)
	315	3,75	41 <b>106</b> (175)	45,6 <b>118</b> (200)	51,2 <b>132</b> (243)	58,2 <b>150</b> (280)	77,4 <b>200</b> (355)	87 <b>225</b> (400)	99,8 <b>258</b> (487)	113 <b>291</b> (560)	140 <b>366</b> (690)	156 <b>416</b> (800)	256 <b>670</b> (1250)	347 <b>950</b> (1800)

▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).

9 - Selection tables (bevel helical gear reducers)

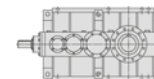


$n_1 = 1\ 000\ \text{min}^{-1}$

Train of gears $\nu$	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size												
		$P_{N2}$ [kW]												
		$M_{N2}$ ( $M_{2max}$ ) [kN m]												
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
CI	8	125	1110 <b>83</b> (150)	1120 <b>83</b> (165)	1320 <b>102</b> (206)	-	-	-	-	-	-	-	-	
	9	112	1020 <b>86</b> (155)	1110 <b>94</b> (180)	1210 <b>107</b> (200)	1300 <b>116</b> (230)	-	-	-	-	-	-	-	
	10	100	888 <b>86</b> (155)	992 <b>96</b> (180)	1110 <b>107</b> (212)	1220 <b>120</b> (218)	-	-	-	-	-	-	-	
	11,2	90	803 <b>86</b> (160)	897 <b>96</b> (180)	965 <b>107</b> (206)	1070 <b>120</b> (236)	-	-	-	-	-	-	-	
	12,5	80	704 <b>86</b> (160)	787 <b>96</b> (180)	875 <b>107</b> (206)	975 <b>120</b> (206)	-	-	-	-	-	-	-	
	14	71	636 <b>86</b> (150)	711 <b>96</b> (170)	765 <b>107</b> (212)	837 <b>118</b> (236)	-	-	-	-	-	-	-	
	16	63	553 <b>86</b> (155)	559 <b>87</b> (175)	694 <b>107</b> (195)	773 <b>120</b> (224)	-	-	-	-	-	-	-	
	18	56	502 <b>86</b> (150)	553 <b>95</b> (175)	575 <b>103</b> (206)	-	-	-	-	-	-	-	-	
	C2I	20	50	537 <b>101</b> (170)	582 <b>110</b> (200)	547 <b>107</b> (195)	575 <b>113</b> (224)	-	-	-	-	-	-	-
22,4		45	497 <b>106</b> (170)	537 <b>115</b> (200)	559 <b>121</b> (236)	602 <b>131</b> (257)	945 <b>201</b> (345)	1070 <b>227</b> (400)	-	-	-	-	2540▲ <b>565</b> (1060)	4150▲ <b>950</b> (1550)
25		40	431 <b>106</b> (165)	480 <b>118</b> (190)	519 <b>128</b> (236)	578 <b>142</b> (272)	827 <b>201</b> (335)	936 <b>227</b> (387)	1070 <b>260</b> (462)	1200 <b>291</b> (530)	-	-	2540▲ <b>625</b> (1150)	3770▲ <b>955</b> (1700)
28		35,5	397 <b>106</b> (170)	443 <b>118</b> (195)	470 <b>133</b> (218)	525 <b>149</b> (250)	756 <b>201</b> (345)	856 <b>227</b> (387)	939 <b>260</b> (437)	1030 <b>286</b> (515)	1180 <b>322</b> (630)	1280 <b>349</b> (690)	2380▲ <b>675</b> (1220)	3270▲ <b>955</b> (1750)
31,5		31,5	345 <b>106</b> (170)	384 <b>118</b> (195)	432 <b>133</b> (236)	491 <b>151</b> (272)	662 <b>201</b> (345)	749 <b>227</b> (387)	856 <b>260</b> (475)	961 <b>292</b> (545)	1100 <b>346</b> (670)	1200 <b>385</b> (775)	2150▲ <b>675</b> (1150)	2960▲ <b>955</b> (1650)
35,5		28	316 <b>106</b> (175)	352 <b>118</b> (200)	376 <b>133</b> (224)	427 <b>151</b> (257)	601 <b>201</b> (345)	680 <b>227</b> (400)	751 <b>260</b> (450)	829 <b>287</b> (515)	1030 <b>361</b> (670)	1160 <b>406</b> (750)	1910▲ <b>675</b> (1150)	2690▲ <b>955</b> (1650)
40		25	274 <b>106</b> (175)	305 <b>118</b> (200)	343 <b>133</b> (243)	390 <b>151</b> (280)	525 <b>201</b> (345)	595 <b>227</b> (400)	680 <b>260</b> (487)	758 <b>290</b> (560)	939 <b>369</b> (690)	1050 <b>419</b> (800)	1720▲ <b>675</b> (1150)	2430▲ <b>955</b> (1650)
45		22,4	250 <b>106</b> (175)	279 <b>118</b> (200)	298 <b>133</b> (230)	339 <b>151</b> (265)	476 <b>201</b> (355)	539 <b>227</b> (400)	596 <b>260</b> (462)	660 <b>287</b> (530)	853 <b>369</b> (670)	982 <b>428</b> (670)	1590 <b>675</b> (1250)	2180▲ <b>955</b> (1800)
50		20	217 <b>106</b> (175)	242 <b>118</b> (200)	272 <b>133</b> (243)	309 <b>151</b> (280)	417 <b>201</b> (355)	471 <b>227</b> (400)	539 <b>260</b> (487)	606 <b>292</b> (560)	741 <b>369</b> (690)	843 <b>428</b> (775)	1380 <b>675</b> (1250)	1890▲ <b>955</b> (1800)
56		18	197 <b>106</b> (175)	220 <b>118</b> (200)	237 <b>133</b> (230)	269 <b>151</b> (265)	375 <b>201</b> (355)	425 <b>227</b> (400)	473 <b>260</b> (462)	524 <b>288</b> (530)	676 <b>369</b> (670)	775 <b>428</b> (690)	1240 <b>675</b> (1220)	1710▲ <b>955</b> (1700)
63		16	171 <b>106</b> (175)	191 <b>118</b> (200)	214 <b>133</b> (243)	244 <b>151</b> (280)	328 <b>201</b> (355)	372 <b>227</b> (400)	425 <b>260</b> (487)	479 <b>293</b> (560)	587 <b>369</b> (690)	669 <b>428</b> (775)	1100 <b>675</b> (1250)	1560▲ <b>955</b> (1800)
71		14	158 <b>106</b> (175)	176 <b>118</b> (200)	186 <b>133</b> (230)	212 <b>151</b> (265)	300 <b>201</b> (355)	340 <b>227</b> (400)	373 <b>260</b> (462)	414 <b>289</b> (530)	530 <b>369</b> (690)	614 <b>428</b> (670)	996 <b>675</b> (1220)	1410▲ <b>955</b> (1700)
80		12,5	137 <b>106</b> (175)	153 <b>118</b> (200)	169 <b>133</b> (243)	192 <b>151</b> (280)	263 <b>201</b> (355)	297 <b>227</b> (400)	340 <b>260</b> (487)	384 <b>293</b> (560)	463 <b>369</b> (690)	527 <b>428</b> (800)	-	-
90		11,2	126 <b>106</b> (175)	141 <b>118</b> (200)	149 <b>133</b> (230)	170 <b>151</b> (265)	240 <b>201</b> (355)	272 <b>227</b> (400)	298 <b>260</b> (462)	332 <b>289</b> (530)	418 <b>369</b> (650)	484 <b>428</b> (750)	-	-
100		10	110 <b>106</b> (175)	122 <b>118</b> (200)	135 <b>133</b> (243)	154 <b>151</b> (280)	210 <b>201</b> (355)	238 <b>227</b> (400)	272 <b>260</b> (487)	307 <b>293</b> (560)	381 <b>369</b> (650)	443 <b>428</b> (730)	676 <b>660</b> (1250)	935 <b>955</b> (1800)
125	8	-	-	108 <b>133</b> (212)	123 <b>151</b> (243)	-	-	218 <b>260</b> (425)	245 <b>293</b> (487)	-	-	-	-	
C3I	125	8	85,6 <b>106</b> (175)	95,3 <b>118</b> (200)	107 <b>133</b> (243)	121 <b>151</b> (280)	162 <b>201</b> (355)	183 <b>227</b> (400)	209 <b>260</b> (487)	226 <b>280</b> (560)	293 <b>369</b> (690)	327 <b>419</b> (800)	543 <b>675</b> (1250)	735 <b>955</b> (1800)
	160	6,3	67,8 <b>106</b> (175)	75,6 <b>118</b> (200)	85 <b>133</b> (243)	96,6 <b>151</b> (280)	128 <b>201</b> (355)	145 <b>227</b> (400)	166 <b>260</b> (487)	181 <b>284</b> (560)	235 <b>369</b> (690)	267 <b>428</b> (800)	434 <b>675</b> (1250)	588 <b>955</b> (1800)
	200	5	53,4 <b>106</b> (175)	59,5 <b>118</b> (200)	66,9 <b>133</b> (243)	76 <b>151</b> (280)	104 <b>201</b> (355)	118 <b>227</b> (400)	135 <b>260</b> (487)	152 <b>293</b> (560)	186 <b>369</b> (690)	214 <b>428</b> (800)	344 <b>675</b> (1250)	466 <b>955</b> (1800)
	250	4	42,1 <b>106</b> (175)	46,9 <b>118</b> (200)	52,7 <b>133</b> (243)	60 <b>151</b> (280)	82,1 <b>201</b> (355)	92,9 <b>227</b> (400)	106 <b>260</b> (487)	120 <b>293</b> (560)	149 <b>369</b> (690)	169 <b>428</b> (800)	272 <b>675</b> (1250)	368 <b>955</b> (1800)
	315	3,15	34,2 <b>106</b> (175)	38,1 <b>118</b> (200)	42,9 <b>133</b> (243)	48,8 <b>151</b> (280)	64,7 <b>201</b> (355)	73,2 <b>227</b> (400)	83,7 <b>260</b> (487)	94,4 <b>293</b> (560)	117 <b>369</b> (690)	134 <b>428</b> (800)	214 <b>675</b> (1250)	290 <b>955</b> (1800)

9

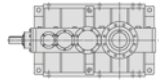
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 750 \text{ min}^{-1}$

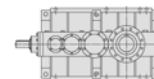
Train of gears	$n_{N2}$ $\text{min}^{-1}$	Gear reducer size												
		$P_{N2}$ [kW]												
		$M_{N2}$ ( $M_{2max}$ ) [kN m]												
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
C1	8	95	839 <b>83</b> (150)	869 <b>86</b> (170)	1020 <b>105</b> (212)	—	—	—	—	—	—	—	—	
	9	85	779 <b>87</b> (160)	839 <b>94</b> (185)	917 <b>109</b> (206)	1000 <b>119</b> (236)	—	—	—	—	—	—	—	
	10	75	676 <b>87</b> (160)	755 <b>98</b> (185)	843 <b>109</b> (218)	927 <b>121</b> (224)	—	—	—	—	—	—	—	
	11,2	67	611 <b>87</b> (165)	682 <b>98</b> (185)	734 <b>109</b> (212)	818 <b>121</b> (243)	—	—	—	—	—	—	—	
	12,5	60	536 <b>87</b> (165)	598 <b>98</b> (185)	666 <b>109</b> (212)	742 <b>121</b> (212)	—	—	—	—	—	—	—	
	14	53	484 <b>87</b> (155)	541 <b>98</b> (175)	581 <b>109</b> (212)	646 <b>121</b> (243)	—	—	—	—	—	—	—	
	16	47,5	416 <b>86</b> (160)	431 <b>89</b> (180)	528 <b>109</b> (200)	588 <b>121</b> (230)	—	—	—	—	—	—	—	
	18	42,5	382 <b>87</b> (155)	416 <b>95</b> (180)	443 <b>105</b> (212)	—	—	—	—	—	—	—	—	
	C2I	20	37,5	407 <b>102</b> (175)	444 <b>111</b> (200)	416 <b>109</b> (200)	443 <b>116</b> (230)	—	—	—	—	—	—	—
22,4		33,5	374 <b>107</b> (175)	406 <b>116</b> (200)	425 <b>123</b> (243)	461 <b>133</b> (265)	712 <b>201</b> (355)	814 <b>230</b> (400)	—	—	—	2110 <b>625</b> (1090)	3120 <b>955</b> (1550)	
25		30	324 <b>107</b> (170)	362 <b>119</b> (195)	394 <b>129</b> (243)	441 <b>145</b> (272)	623 <b>201</b> (345)	712 <b>230</b> (400)	812 <b>263</b> (475)	902 <b>292</b> (545)	—	2070 <b>680</b> (1180)	2850 <b>960</b> (1750)	
28		26,5	299 <b>107</b> (175)	333 <b>119</b> (200)	355 <b>134</b> (224)	398 <b>150</b> (257)	569 <b>201</b> (355)	651 <b>230</b> (400)	712 <b>263</b> (450)	778 <b>287</b> (515)	905 <b>330</b> (650)	971 <b>354</b> (710)	1800 <b>680</b> (1250)	2460 <b>960</b> (1800)
31,5		23,6	260 <b>107</b> (175)	289 <b>119</b> (200)	326 <b>134</b> (243)	372 <b>152</b> (280)	498 <b>201</b> (355)	570 <b>230</b> (400)	649 <b>263</b> (487)	723 <b>293</b> (560)	838 <b>352</b> (690)	913 <b>390</b> (775)	1630 <b>680</b> (1180)	2230 <b>960</b> (1700)
35,5		21,2	238 <b>107</b> (175)	265 <b>119</b> (200)	284 <b>134</b> (230)	323 <b>152</b> (265)	452 <b>201</b> (355)	517 <b>230</b> (400)	569 <b>263</b> (462)	624 <b>288</b> (530)	787 <b>366</b> (690)	887 <b>412</b> (775)	1440 <b>680</b> (1180)	2030 <b>960</b> (1700)
40		19	206 <b>107</b> (175)	230 <b>119</b> (200)	259 <b>134</b> (243)	295 <b>152</b> (280)	396 <b>201</b> (355)	452 <b>230</b> (400)	516 <b>263</b> (487)	575 <b>293</b> (560)	713 <b>374</b> (690)	793 <b>424</b> (800)	1300 <b>680</b> (1180)	1840 <b>960</b> (1700)
45		17	188 <b>107</b> (175)	210 <b>119</b> (200)	225 <b>134</b> (230)	257 <b>152</b> (265)	358 <b>201</b> (355)	410 <b>230</b> (400)	452 <b>263</b> (462)	496 <b>288</b> (530)	646 <b>373</b> (690)	742 <b>431</b> (690)	1200 <b>680</b> (1250)	1650 <b>960</b> (1800)
50		15	163 <b>107</b> (175)	182 <b>119</b> (200)	205 <b>134</b> (243)	234 <b>152</b> (280)	314 <b>201</b> (355)	359 <b>230</b> (400)	409 <b>263</b> (487)	458 <b>294</b> (560)	562 <b>374</b> (690)	637 <b>431</b> (775)	1040 <b>680</b> (1250)	1430 <b>960</b> (1800)
56		13,2	148 <b>107</b> (175)	165 <b>119</b> (200)	179 <b>134</b> (230)	203 <b>152</b> (265)	283 <b>201</b> (355)	323 <b>230</b> (400)	358 <b>263</b> (462)	394 <b>289</b> (530)	513 <b>374</b> (690)	585 <b>431</b> (690)	941 <b>680</b> (1220)	1290 <b>960</b> (1700)
63		11,8	129 <b>107</b> (175)	144 <b>119</b> (200)	162 <b>134</b> (243)	184 <b>152</b> (280)	247 <b>201</b> (355)	283 <b>230</b> (400)	322 <b>263</b> (487)	362 <b>295</b> (560)	446 <b>374</b> (690)	505 <b>431</b> (800)	833 <b>680</b> (1250)	1180 <b>960</b> (1800)
71		10,6	119 <b>107</b> (175)	132 <b>119</b> (200)	141 <b>134</b> (230)	160 <b>152</b> (265)	226 <b>201</b> (355)	259 <b>230</b> (400)	283 <b>263</b> (462)	312 <b>290</b> (530)	402 <b>374</b> (690)	464 <b>431</b> (690)	752 <b>680</b> (1220)	1060 <b>960</b> (1700)
80		9,5	103 <b>107</b> (175)	115 <b>119</b> (200)	128 <b>134</b> (243)	146 <b>152</b> (280)	198 <b>201</b> (355)	226 <b>230</b> (400)	258 <b>263</b> (487)	291 <b>296</b> (560)	351 <b>374</b> (690)	398 <b>431</b> (800)	—	—
90		8,5	95 <b>107</b> (175)	106 <b>119</b> (200)	113 <b>134</b> (230)	128 <b>152</b> (265)	181 <b>201</b> (355)	207 <b>230</b> (400)	226 <b>263</b> (462)	250 <b>290</b> (530)	317 <b>374</b> (650)	366 <b>431</b> (750)	—	—
100		7,5	82,5 <b>107</b> (175)	91,9 <b>119</b> (200)	102 <b>134</b> (243)	116 <b>152</b> (280)	158 <b>201</b> (355)	181 <b>230</b> (400)	206 <b>263</b> (487)	233 <b>296</b> (560)	289 <b>374</b> (670)	334 <b>431</b> (750)	523 <b>680</b> (1250)	706 <b>960</b> (1800)
125	6	—	—	81,8 <b>134</b> (212)	93,1 <b>152</b> (243)	—	—	165 <b>263</b> (425)	186 <b>296</b> (487)	—	—	—	—	
C3I	125	6	64,4 <b>107</b> (175)	71,8 <b>119</b> (200)	81 <b>134</b> (243)	92,2 <b>152</b> (280)	122 <b>201</b> (355)	139 <b>230</b> (400)	159 <b>263</b> (487)	176 <b>291</b> (560)	223 <b>374</b> (690)	246 <b>420</b> (800)	410 <b>680</b> (1250)	555 <b>960</b> (1800)
	160	4,75	51,1 <b>107</b> (175)	56,9 <b>119</b> (200)	64,2 <b>134</b> (243)	73,1 <b>152</b> (280)	96,5 <b>201</b> (355)	110 <b>230</b> (400)	126 <b>263</b> (487)	142 <b>296</b> (560)	178 <b>374</b> (690)	202 <b>431</b> (800)	328 <b>680</b> (1250)	444 <b>960</b> (1800)
	200	3,75	40,2 <b>107</b> (175)	44,8 <b>119</b> (200)	50,5 <b>134</b> (243)	57,5 <b>152</b> (280)	78,4 <b>201</b> (355)	89,7 <b>230</b> (400)	102 <b>263</b> (487)	115 <b>296</b> (560)	141 <b>374</b> (690)	161 <b>431</b> (800)	260 <b>680</b> (1250)	352 <b>960</b> (1800)
	250	3	31,7 <b>107</b> (175)	35,3 <b>119</b> (200)	39,8 <b>134</b> (243)	45,3 <b>152</b> (280)	61,8 <b>201</b> (355)	70,7 <b>230</b> (400)	80,6 <b>263</b> (487)	90,9 <b>296</b> (560)	113 <b>374</b> (690)	128 <b>431</b> (800)	205 <b>680</b> (1250)	278 <b>960</b> (1800)
	315	2,36	25,8 <b>107</b> (175)	28,7 <b>119</b> (200)	32,4 <b>134</b> (243)	36,9 <b>152</b> (280)	48,7 <b>201</b> (355)	55,7 <b>230</b> (400)	63,5 <b>263</b> (487)	71,6 <b>296</b> (560)	89,1 <b>374</b> (690)	101 <b>431</b> (800)	162 <b>680</b> (1250)	219 <b>960</b> (1800)

9 - Selection tables (bevel helical gear reducers)



$n_1 \leq 90 \text{ min}^{-1}$

Train of gears	$n_{N2}$ min <sup>-1</sup>	Gear reducer size												
		$P_{N2}$ [kW]												
		$M_{N2}$ ( $M_{2max}$ ) [kN m]												
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
CI	8	11,2	103 85 (180)	111 91 (185)	129 111 (224)	-	-	-	-	-	-	-	-	
	9	10	101 95 (175)	107 100 (200)	118 117 (230)	129 128 (257)	-	-	-	-	-	-	-	
	10	9	88,1 95 (175)	98,3 106 (200)	110 118 (236)	118 129 (236)	-	-	-	-	-	-	-	
	11,2	8	79,6 95 (175)	88,8 106 (195)	95,3 118 (230)	107 132 (265)	-	-	-	-	-	-	-	
	12,5	7,1	69,8 95 (175)	77,7 106 (200)	86,5 118 (224)	96,8 132 (224)	-	-	-	-	-	-	-	
	14	6,3	63,1 95 (165)	70,4 106 (190)	75,6 118 (230)	82 128 (257)	-	-	-	-	-	-	-	
	16	5,6	51 88 (170)	54,5 94 (190)	68,6 118 (212)	76,7 132 (243)	-	-	-	-	-	-	-	
	18	5	49,7 95 (165)	51 97 (190)	56,1 111 (224)	-	-	-	-	-	-	-	-	
C2I	20	4,5	52,1 109 (180)	58,3 122 (206)	51 111 (212)	55,9 122 (243)	-	-	-	-	-	-	-	
	22,4	4	45,8 109 (180)	51,3 122 (206)	54,7 132 (243)	60,9 147 (280)	87,3 206 (365)	106 250 (412)	-	-	-	-	288 710 (1150)	386 985 (1650)
	25	3,55	39,8 109 (175)	44,5 122 (200)	51,2 140 (243)	58,5 160 (280)	76,4 206 (355)	92,7 250 (400)	104 280 (487)	112 303 (560)	-	-	260 710 (1250)	355 1000 (1800)
	28	3,15	36,7 109 (175)	41 122 (200)	44,5 140 (230)	50,9 160 (265)	69,8 206 (355)	84,8 250 (400)	91 280 (462)	98,3 302 (530)	116 353 (690)	127 385 (775)	226 710 (1250)	308 1000 (1800)
	31,5	2,8	31,8 109 (175)	35,6 122 (200)	40,9 140 (243)	46,8 160 (280)	61,1 206 (355)	74,2 250 (400)	83,1 280 (487)	92,5 312 (560)	111 387 (690)	116 414 (800)	204 710 (1220)	279 1000 (1700)
	35,5	2,5	29,1 109 (175)	32,6 122 (200)	35,6 140 (230)	40,7 160 (265)	55,5 206 (355)	67,3 250 (400)	72,8 280 (462)	81 311 (530)	103 400 (690)	116 450 (800)	180 710 (1220)	253 1000 (1700)
	40	2,24	25,3 109 (175)	28,3 122 (200)	32,5 140 (243)	37,2 160 (280)	48,5 206 (355)	58,9 250 (400)	66 280 (487)	74,2 315 (560)	91,5 400 (690)	101 450 (800)	163 710 (1250)	229 1000 (1800)
	45	2	23,1 109 (175)	25,8 122 (200)	28,3 140 (230)	32,3 160 (265)	44 206 (355)	53,4 250 (400)	57,8 280 (462)	65,1 315 (530)	83,1 400 (690)	92,9 450 (800)	150 710 (1250)	205 1000 (1800)
	50	1,8	20 109 (175)	22,4 122 (200)	25,8 140 (243)	29,4 160 (280)	38,5 206 (355)	46,7 250 (400)	52,3 280 (487)	58,8 315 (560)	72,2 400 (690)	79,8 450 (800)	130 710 (1250)	178 1000 (1800)
	56	1,6	18,2 109 (175)	20,4 122 (200)	22,4 140 (230)	25,6 160 (265)	34,7 206 (355)	42,1 250 (400)	45,8 280 (462)	51,6 315 (530)	65,9 400 (690)	73,3 450 (800)	118 710 (1220)	161 1000 (1700)
	63	1,4	15,8 109 (175)	17,7 122 (200)	20,3 140 (243)	23,2 160 (280)	30,3 206 (355)	36,8 250 (400)	41,2 280 (487)	46,4 315 (560)	57,3 400 (690)	63,3 450 (800)	104 710 (1250)	147 1000 (1800)
	71	1,25	14,6 109 (175)	16,3 122 (200)	17,7 140 (230)	20,2 160 (265)	27,7 206 (355)	33,7 250 (400)	36,1 280 (462)	40,7 315 (530)	51,6 400 (690)	58,1 450 (800)	94,3 710 (1220)	132 1000 (1700)
	80	1,12	12,6 109 (175)	14,1 122 (200)	16 140 (243)	18,3 160 (280)	24,3 206 (355)	29,5 250 (400)	33 280 (487)	37,1 315 (560)	45,1 400 (690)	49,9 450 (800)	-	-
	90	1	11,6 109 (175)	13 122 (200)	14,1 140 (230)	16,2 160 (265)	22,2 206 (355)	26,9 250 (400)	28,9 280 (462)	32,5 315 (530)	40,7 400 (650)	45,8 450 (750)	-	-
	100	0,9	10,1 109 (175)	11,3 122 (200)	12,8 140 (243)	14,7 160 (280)	19,4 206 (355)	23,6 250 (400)	26,4 280 (487)	29,7 315 (560)	37,1 400 (690)	41,9 450 (775)	65,6 710 (1250)	88 1000 (1800)
	125	0,71	-	-	10,3 140 (212)	11,7 160 (243)	-	-	21,1 280 (425)	23,7 315 (487)	-	-	-	-
C3I	125	0,71	7,89 109 (175)	8,84 122 (200)	10,2 140 (243)	11,6 160 (280)	14,9 206 (355)	18,1 250 (400)	20,3 280 (487)	22,8 315 (560)	28,6 400 (690)	30,1 429 (800)	51,4 710 (1250)	69,2 1000 (1800)
	160	0,56	6,26 109 (175)	7 122 (200)	8,05 140 (243)	9,2 160 (280)	11,8 206 (355)	14,4 250 (400)	16,1 280 (487)	18,1 315 (560)	22,9 400 (690)	25,3 450 (800)	41,1 710 (1250)	55,4 1000 (1800)
	200	0,45	4,92 109 (175)	5,51 122 (200)	6,34 140 (243)	7,24 160 (280)	9,62 206 (355)	11,7 250 (400)	13,1 280 (487)	14,7 315 (560)	18,1 400 (690)	20,2 450 (800)	32,6 710 (1250)	43,9 1000 (1800)
	250	0,36	3,88 109 (175)	4,35 122 (200)	5 140 (243)	5,71 160 (280)	7,58 206 (355)	9,2 250 (400)	10,3 280 (487)	11,6 315 (560)	14,5 400 (690)	16 450 (800)	25,7 710 (1250)	34,6 1000 (1800)
	315	0,28	3,16 109 (175)	3,53 122 (200)	4,06 140 (243)	4,64 160 (280)	5,97 206 (355)	7,25 250 (400)	8,12 280 (487)	9,14 315 (560)	11,4 400 (690)	12,6 450 (800)	20,3 710 (1250)	27,3 1000 (1800)

Summary of transmission ratios  $i$ 

Train of gears	$i_N$	Gear reducer size											
		$i$											
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
C1	8	7,76	7,76	8,12	–	–	–	–	–	–	–	–	–
	9	8,82	8,82	9,33	9,33	–	–	–	–	–	–	–	–
	10	10,2	10,2	10,1	10,3	–	–	–	–	–	–	–	–
	11,2	11,3	11,3	11,7	11,7	–	–	–	–	–	–	–	–
	12,5	12,8	12,8	12,9	12,9	–	–	–	–	–	–	–	–
	14	14,2	14,2	14,7	14,7	–	–	–	–	–	–	–	–
	16	16,3	16,3	16,2	16,2	–	–	–	–	–	–	–	–
	18	18*	18*	18,7	–	–	–	–	–	–	–	–	–
C21	20	19,7	19,7	20,6	20,6	–	–	–	–	–	–	–	–
	22,4	22,4	22,4	22,7	22,7	22,2	22,2	–	–	–	–	23,3	24
	25	25,8	25,8	25,8	25,8	25,4	25,4	25,4	25,4	–	–	25,7	26,6
	28	28	28	29,6	29,6	27,8	27,8	29	29	28,6	28,7	29,7	30,6
	31,5	32,3	32,3	32,2	32,2	31,8	31,8	31,8	31,8	32,9	33,6	32,8	33,8
	35,5	35,3	35,3	37,1	37,1	35*	35*	36,2	36,2	36,5	36,5	37,1	37,2
	40	40,7	40,7	40,6	40,6	40*	40*	40*	40*	41,2	41,9	41	41,1
	45	44,5	44,5	46,7	46,7	44,2	44,2	45,6	45,6	45,3	45,7	44,5	45,9
	50	51,3	51,3	51,2	51,2	50,5	50,5	50,5	50,5	52,2	53,1	51,3	52,9
	56	56,5	56,5	58,9	58,9	56*	56*	57,6	57,6	57,2	57,9	56,8	58,5
	63	65,1	65,1	64,9	64,9	64*	64*	64*	64*	65,8	67	64,1	64,3
	71	70,6	70,6	74,7	74,7	70*	70*	73*	73*	73	73	71	71,1
	80	81,3	81,3	82,3	82,3	80*	80*	80*	80*	83,5	85	–	–
	90	88,2	88,2	93,3	93,3	87,5*	87,5*	91,3	91,3	92,6	92,6	–	–
	100	102	102	103	103	100*	100*	100*	100*	101	101	102	107
125	–	–	129	129	–	–	125*	125*	–	–	–	–	
C31	125	130	130	130	130	130*	130*	130*	130*	132	134	130	136
	160	164	164	164	164	164*	164*	164*	164*	165	168	163	170
	200	209	209	208	208	202	202	202	202	208	210	205	215
	250	265	265	264	264	256*	256*	256*	256*	260	265	260	272
	315	325	325	325	325	325	325	325	325	329	336	330	345

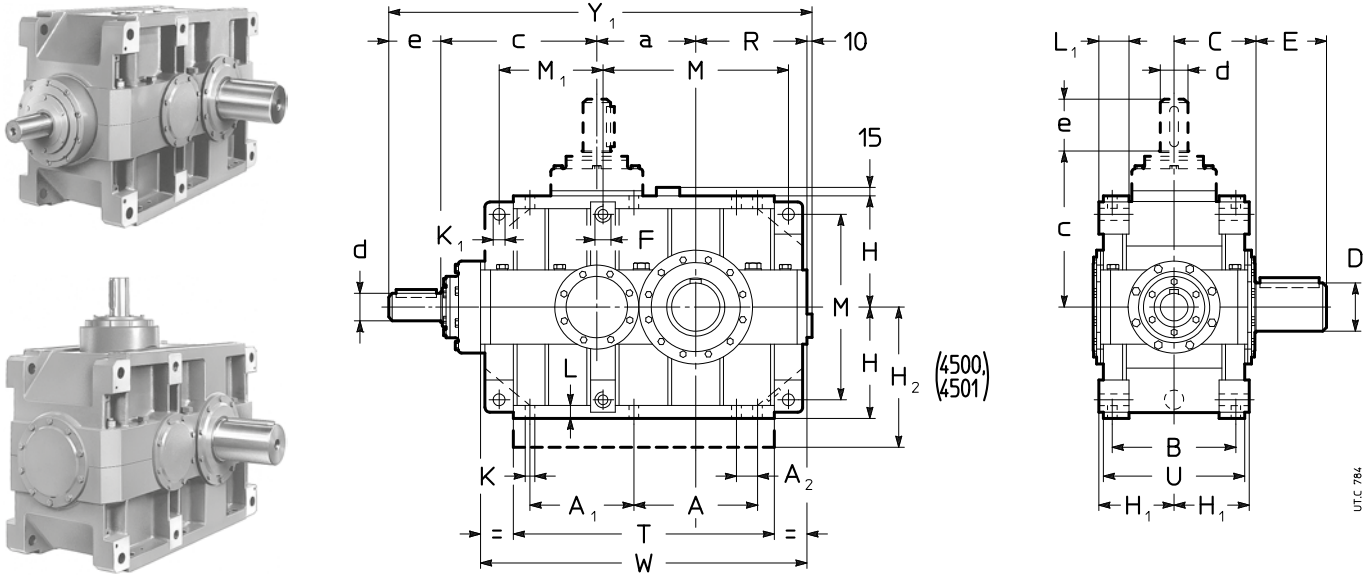
\* Finite transmission ratio.

# 10 - Dimensions, designs, mounting positions (bevel helical gear reducers)

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Mounting positions.....	82
Lubrication - Plug position and oil quantity .....	83

## 10.1 - Gear reducers R CI

### Dimensions



Size	a	A	A <sub>1</sub> M <sub>1</sub>	A <sub>2</sub>	B	C	c	F	H h <sub>11</sub>	H <sub>1</sub> h <sub>12</sub>	H <sub>2</sub> h <sub>11</sub>	K ∅	K <sub>1</sub> ∅ H <sub>11</sub>	L	L <sub>1</sub>	M	T	U	W	kg	
						3)		1)	R												4)
<b>4000</b> <b>4001</b>	400	505	420	90	500	330	605	M45	450	296	-	39	48	52	116	750	1055	580	1320	2240 2310	2310 2390
<b>4500</b> <b>4501</b>	450	505	470	90	500	358	605	M45	450	296	560	39	48	52	116	750	1105	580	1370	2750 2830	2840 2940

Size	D ∅	E	d ∅	e	Y <sub>1</sub>	d ∅	e	Y <sub>1</sub>
					2)			2)
<b>4000</b> <b>4001</b>	190 200	280	$i_N \leq 11,2$ 110   210   1675			$i_N \geq 12,5$ 90   170   1635		
<b>4500</b> <b>4501</b>	210 220	300	$i_N \leq 12,5$ 110   210   1725			$i_N \geq 14$ 90   170   1685		

1) Working length of thread  $1,7 \cdot F$ .

2) For mounting positions B6, B7, V5, V6, dimension  $Y_1$  increases by approx. 20 for filler plug overall dimensions.

3) The cover on bevel wheel side overhangs from **C** dimension (see ch. 6) by 33 mm for sizes 4000, 4001 and 5 mm for sizes 5000, 5001.

4) Values valid for double extension low speed shaft.

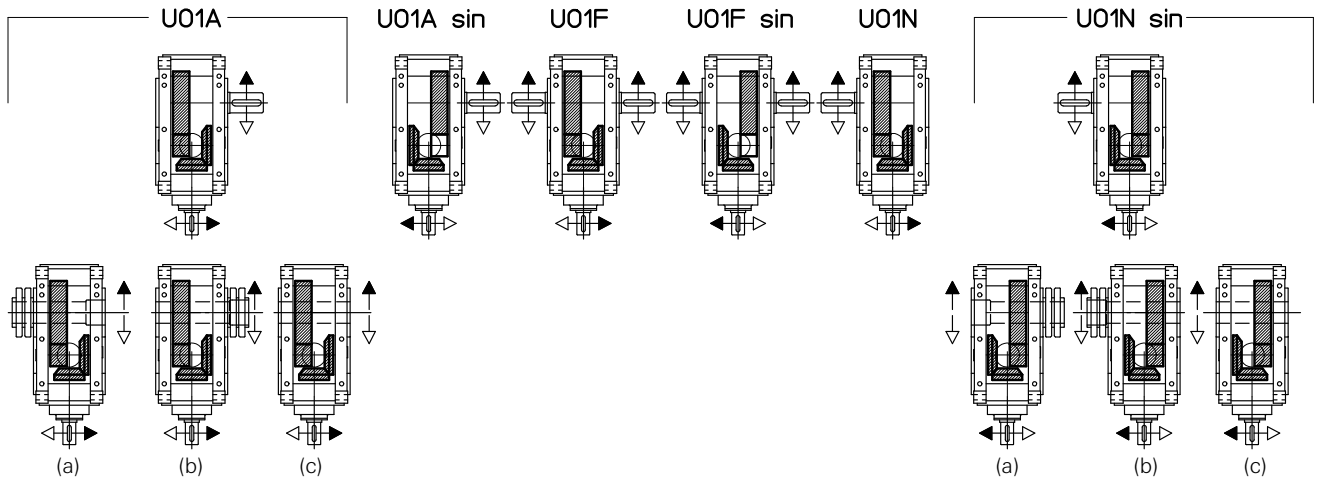


# 10 - Dimensions, designs, mounting positions (bevel helical gear reducers)

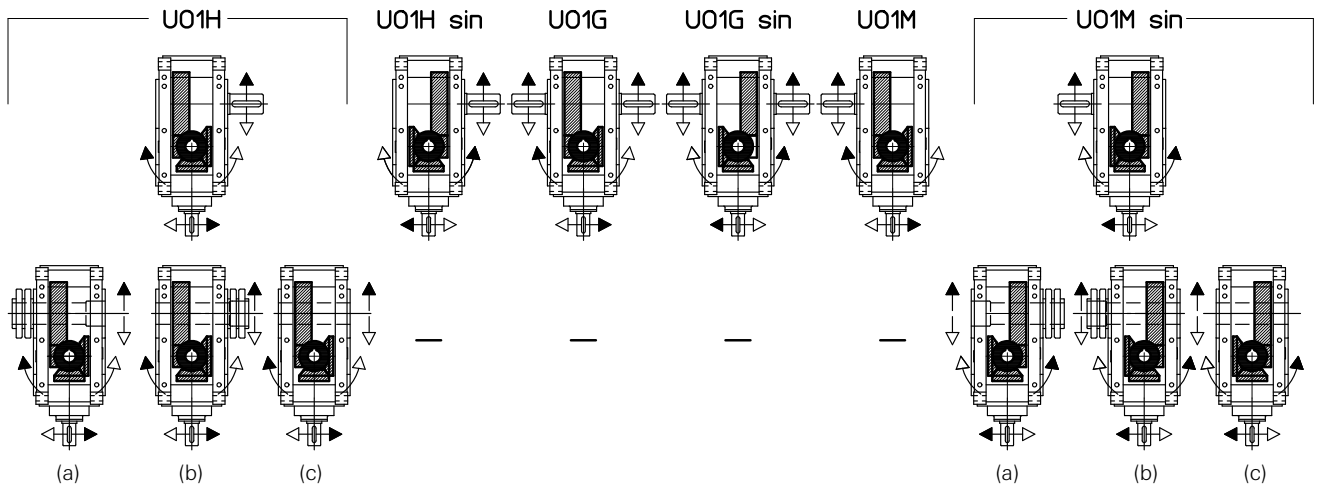
## 10.1 - Gear reducers R CI

### Designs<sup>1) 2)</sup> (direction of rotation)

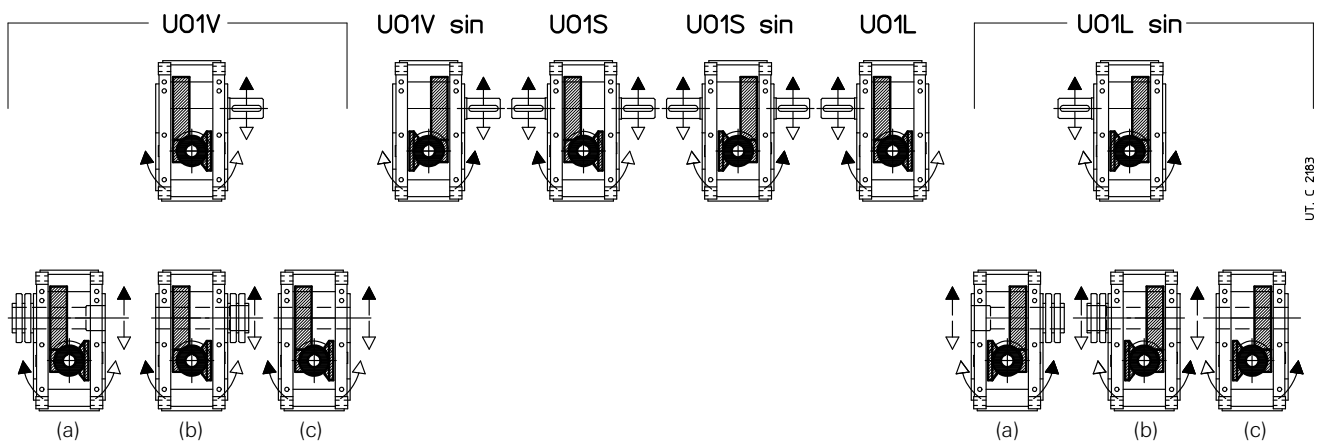
Solid low speed shaft (standard)



Solid low speed shaft (standard)



Solid low speed shaft (standard)



(a) Hollow low speed shaft **with shrink disc on machine opposite side** (on request, see ch. 12).

(b) Hollow low speed shaft **with shrink disc on machine side** (on request, see ch. 12).

(c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

1) The housing of designs U01A ... U01N sin is not prearranged for other designs (U01H ... U01L sin).

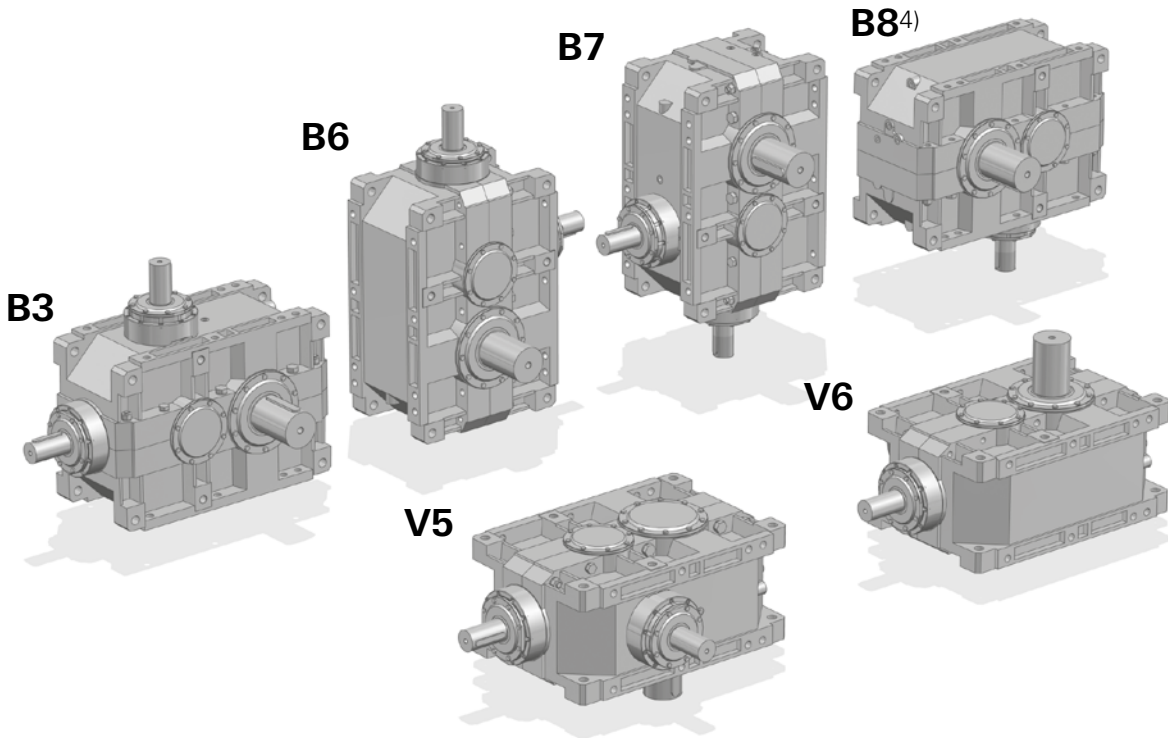
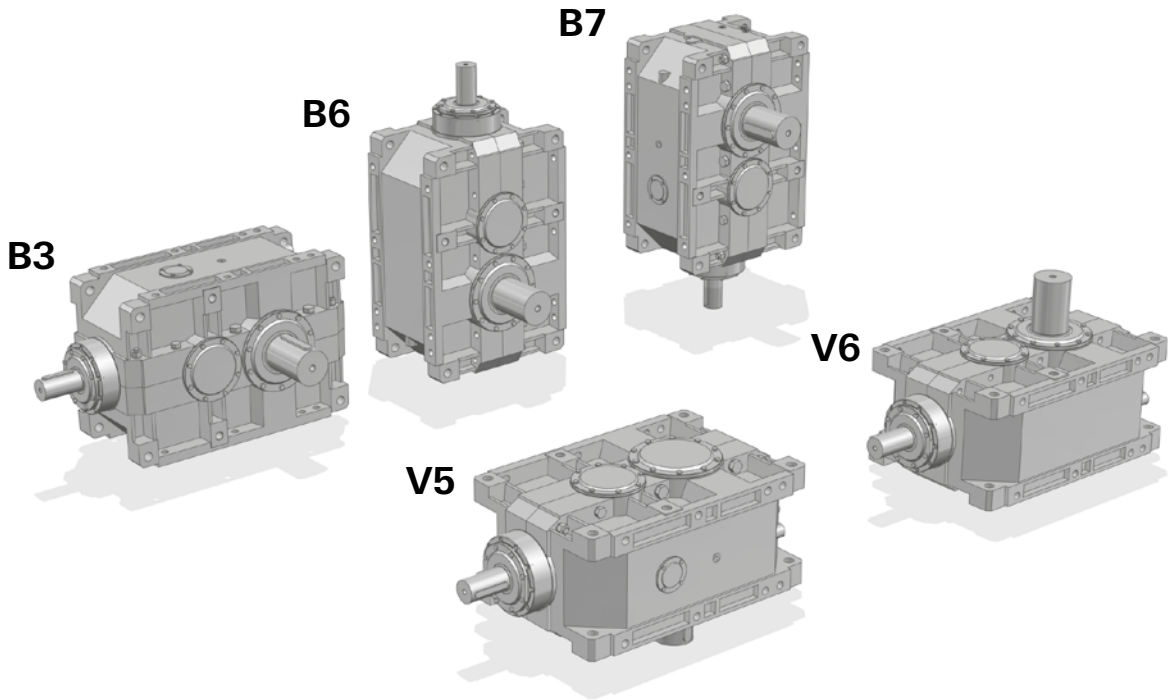
2) For U01A, U01H, U01V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for U01A sin, U01H sin, U01V sin designs and derivatives, the white arrow direction of rotation. If it is not possible, consult us.

## 10 - Dimensions, designs, mounting positions (bevel helical gear reducers)

### 10.1 - Gear reducers R CI

#### Mounting positions

Except specific needs, prefer mounting position B3 (see ch. 2).



✓ Possible high oil splash: for the corrective factor  $f_{ts}$  of nominal thermal power  $P_{Tn}$  see ch. 4.

⚙ Possible bearing lubrication pump: consult us for verification.

1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).

2) ⚙ for designs UO1H ... UO1M sin, UO1V ... UO1L sin.

3) ⚙ for designs UO1A ... UO1N sin, UO1H ... UO1M sin.

4) Mounting position B8 available only for designs UO1V ... UO1L sin.

\* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

▼ Oil filler plug

● Oil level plug

■ Oil drain plug

▼ Oil filler plug on opposite side (not in view)

▣ Oil level plug on opposite side (not in view)

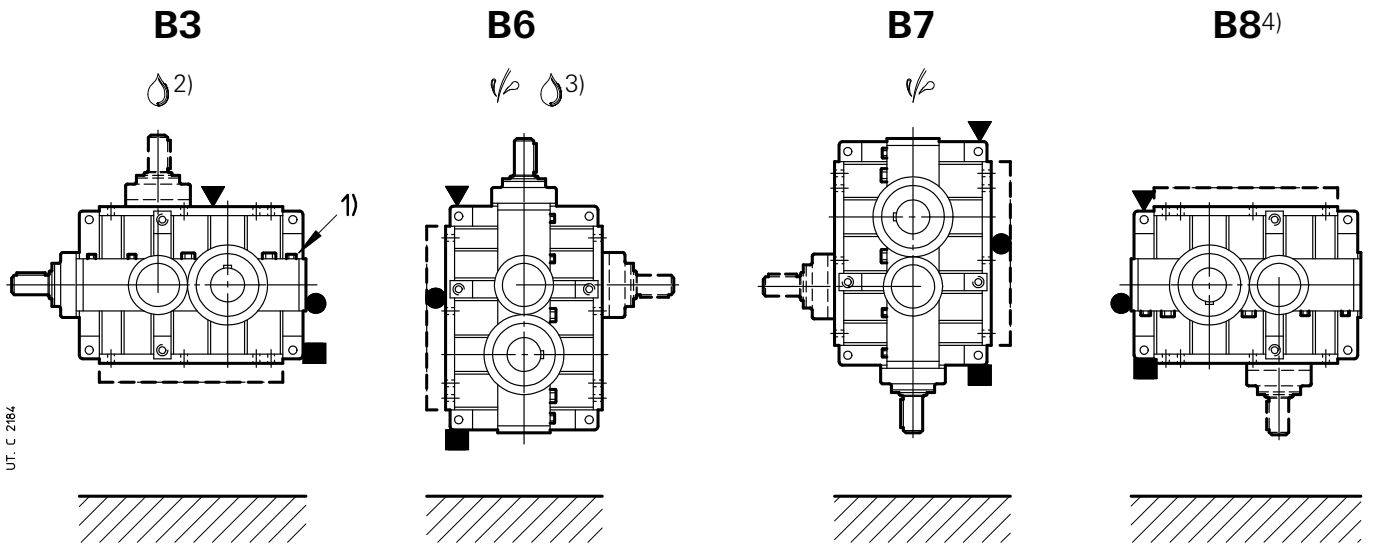
⊗ Oil drain plug on opposite side (not in view)

# 10 - Dimensions, designs, mounting positions (bevel helical gear reducers)

## 10.1 - Gear reducers R CI

### Lubrication - Plug position and oil quantity

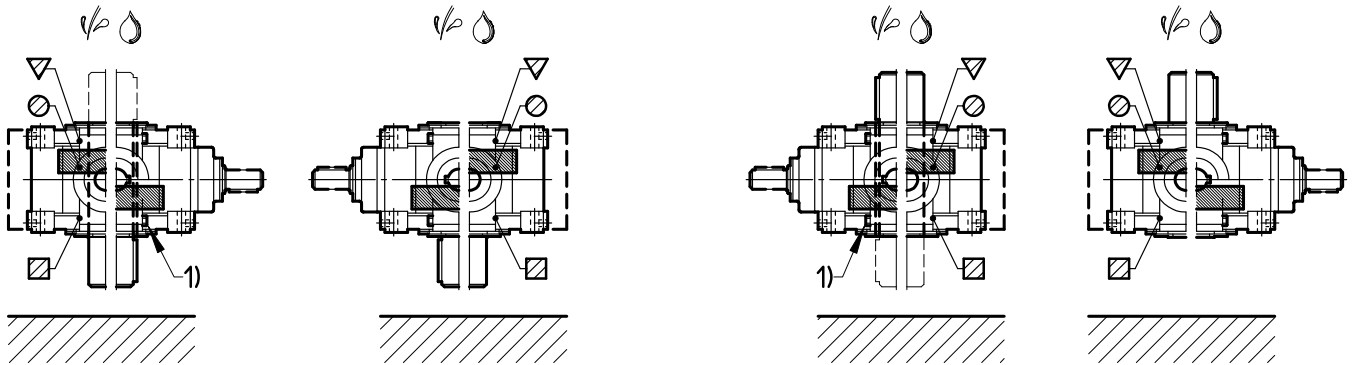
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



UT. C 2184

### V5

### V6



10

UO1A	UO1A sin
UO1F	UO1F sin
UO1H	UO1H sin
UO1G	UO1G sin
UO1V	UO1V sin
UO1S	UO1S sin
UO1A*	UO1N sin*
UO1H*	UO1M sin*
UO1V	UO1L sin*

UO1N	UO1N sin
UO1M	UO1M sin
UO1L	UO1L sin

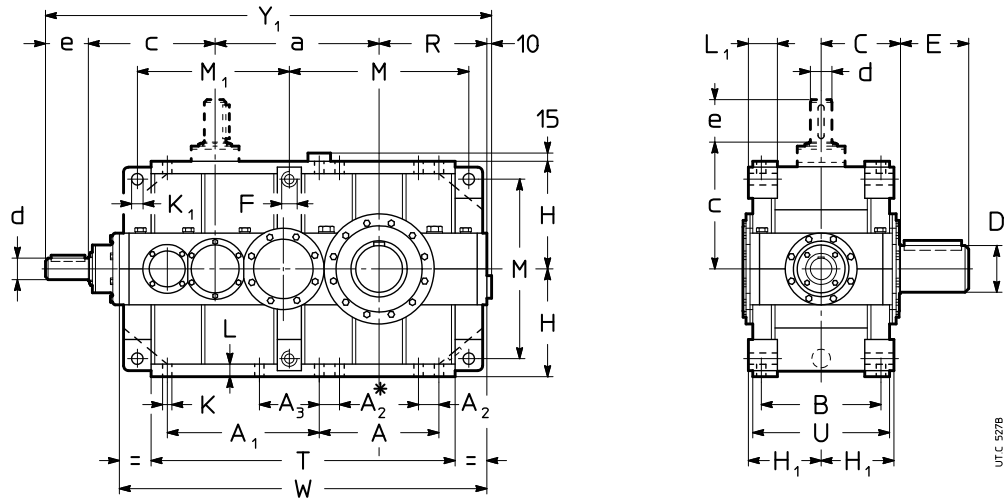
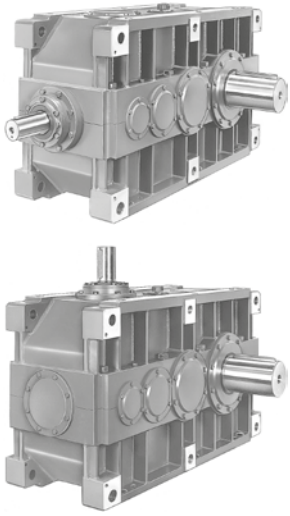
UO1A	UO1A sin
UO1F	UO1F sin
UO1H	UO1H sin
UO1G	UO1G sin
UO1V	UO1V sin
UO1S	UO1S sin
UO1A*	UO1N sin*
UO1H*	UO1M sin*
UO1V	UO1L sin*

UO1N	UO1N sin
UO1M	UO1M sin
UO1L	UO1L sin

Size	Oil quantity [l]				
	B3	B6	B7	B8 <sup>4)</sup>	V5, V6
					with low speed shaft on bottom   with low speed wheel on top
<b>4000, 4001</b>	100	150	160	100	112   118
<b>4500, 4501</b>	132	190	212	132	140   170

## 10.2 - Gear reducers R C2I

### Dimensions



\* For sizes  $\geq 6300$ , only.

Size	a	A	A <sub>1</sub> M <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	c	F 1)	H h <sub>11</sub> R	H <sub>1</sub> h <sub>12</sub>	K ∅	K <sub>1</sub> ∅ H <sub>11</sub>	L	L <sub>1</sub>	M	T	U	W	kg 3)	
<b>4000</b> <b>4001</b>	700	505	625	90	-	500	330	480	M45	450	296	39	48	52	116	750	1260	580	1525	2440 2520	2510 2600
<b>4500</b> <b>4501</b>	750	505	675	90	-	500	358	480	M45	450	296	39	48	52	116	750	1310	580	1575	2780 2850	2870 2960
<b>5000</b> <b>5001</b>	875	630	785	115	-	625	410 <sup>4)</sup>	605	M56	560	370	48	60	65	148	930	1575	725	1905	4790 4910	4930 5070
<b>5600</b> <b>5601</b>	935	630	845	115	-	625	445	605	M56	560	370	48	60	65	148	930	1635	725	1965	5680 5800	5880 6020
<b>6300</b> <b>6301</b>	1080	770	970	115	-	695	490	605 <sup>5)</sup>	M56	630	406	48	60	65	148	1070	1900	795	2230	7950 8060	8230 8390
<b>7101</b>	1270	930	1228	115	590	843	601	833	M56	710	481	48	66	71	185	1230	2279	943	2648	13350	13850
<b>8001</b>	1430	1008	1286	145	596	944	682	934	M90	900	544	60	95	85	250	1574	2590	1064	3086	20550	21270

Size	D ∅	E	d ∅	e	Y <sub>1</sub> 2)	d ∅	e	Y <sub>1</sub> 2)
<b>4000</b> <b>4001</b>	190 200	280	90	$i_N \leq 40$ 170	1810	70	$i_N \geq 45$ 140	1780
<b>4500</b> <b>4501</b>	210 220	300	90	$i_N \leq 45$ 170	1860	70	$i_N \geq 50$ 140	1830
<b>5000</b> <b>5001</b>	240 250	330	110	$i_N \leq 40$ 210	2260	90	$i_N \geq 45$ 170	2220
<b>5600</b> <b>5601</b>	270 280	380	110	$i_N \leq 45$ 210	2320	90	$i_N \geq 50$ 170	2280
<b>6300</b> <b>6301</b>	300 320	430	110	$i_N \leq 50^{6)}$ 210	2535	90	$i_N \geq 56^{6)}$ 170	2495
<b>7101</b>	360	590	140	$i_N \leq 31,5$ 250	3073	110	$i_N \geq 35,5$ 210	3033
<b>8001</b>	400	660	150	245	3519	125	210	3474

1) Working length of thread  $1,7 \cdot F$ .

2) For mounting positions B6, B7, V5, V6 dimension Y<sub>1</sub> increases by 20 for overall dimensions of filler plug.

3) Values valid for double extension low speed shaft.

4) The cover on bevel wheel side overhangs from C dimension (see ch. 6) by 13 mm.

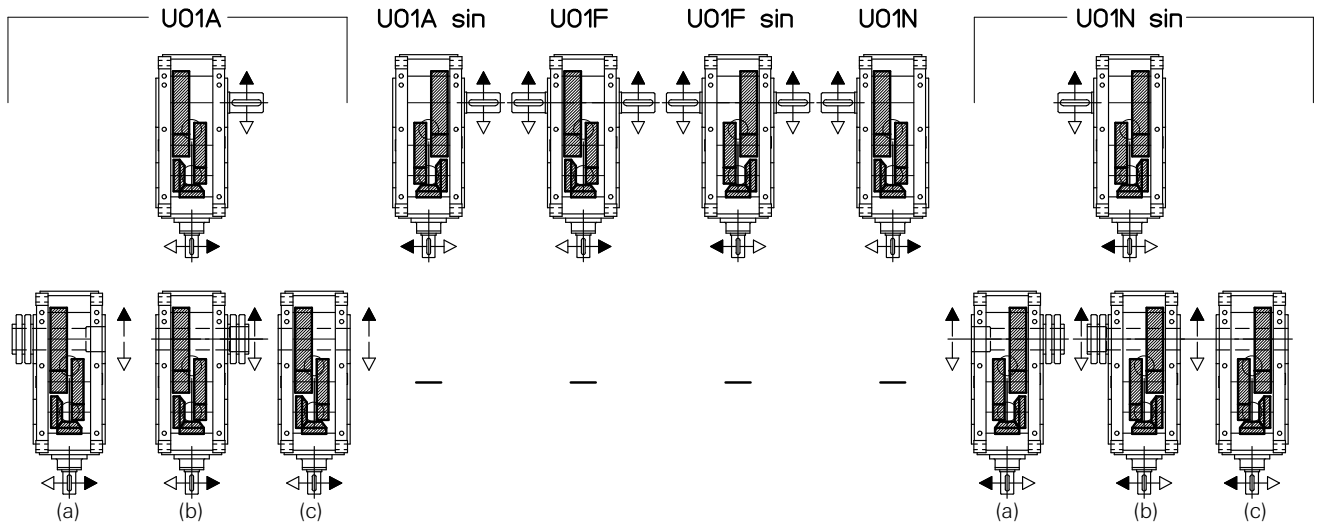
5) The high speed shaft end shoulder is within dimension H.

6) For size 6301:  $i_N \leq 56$  and  $i_N \geq 63$ , respectively.

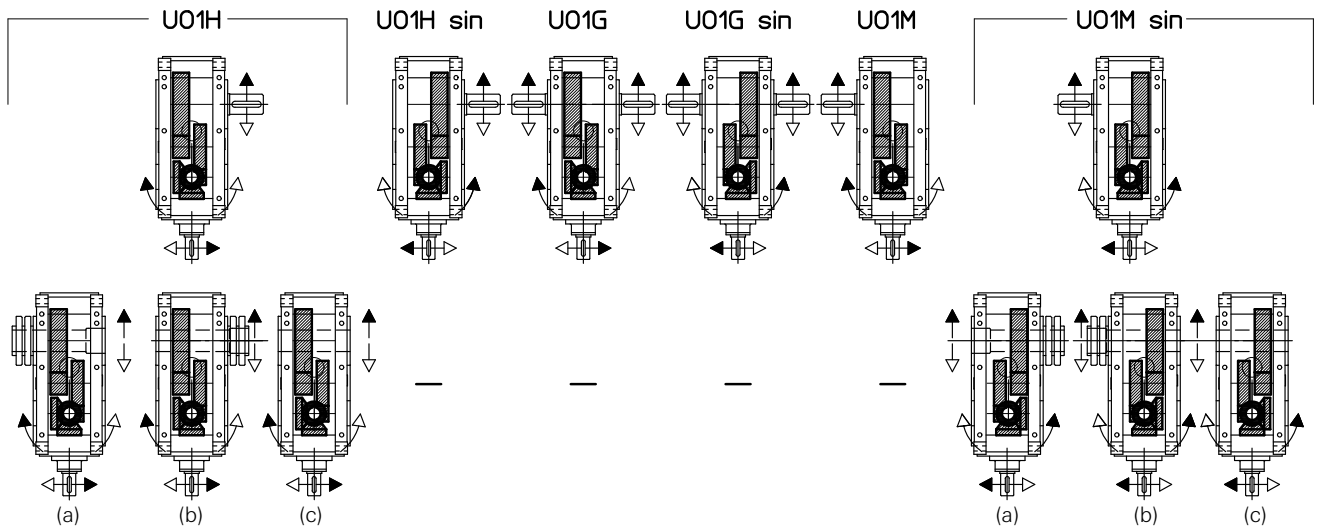
10.2 - Gear reducers R C2I

**Designs<sup>1) 2)</sup>** (direction of rotation)

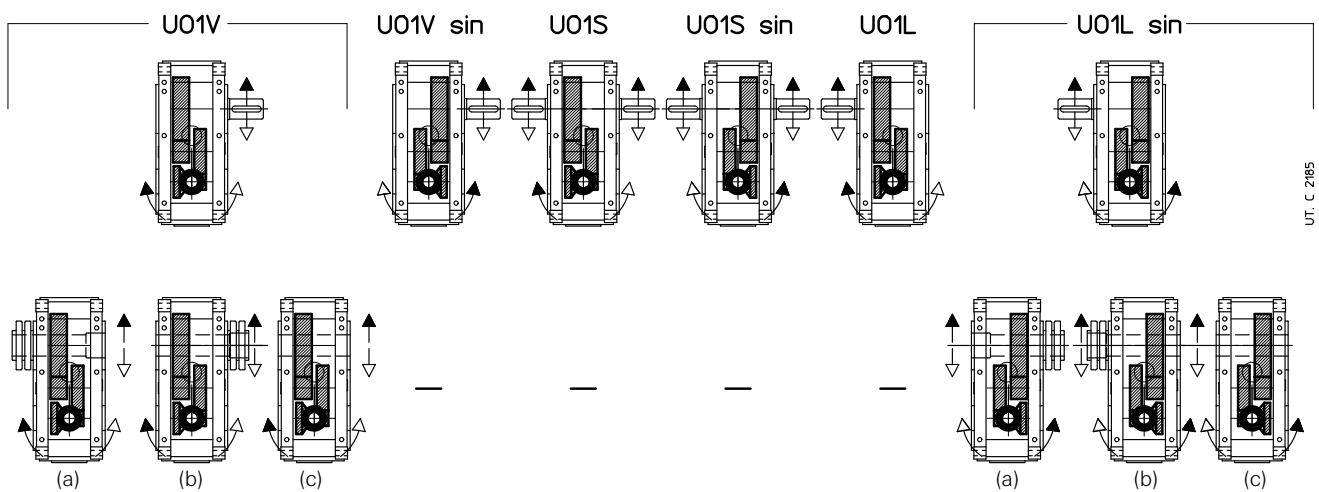
Solid low speed shaft (standard)



Solid low speed shaft (standard)



Solid low speed shaft (standard)



(a) Hollow low speed shaft **with shrink disc on machine opposite side** (on request, see ch. 12).

(b) Hollow low speed shaft **with shrink disc on machine side** (on request, see ch. 12).

(c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

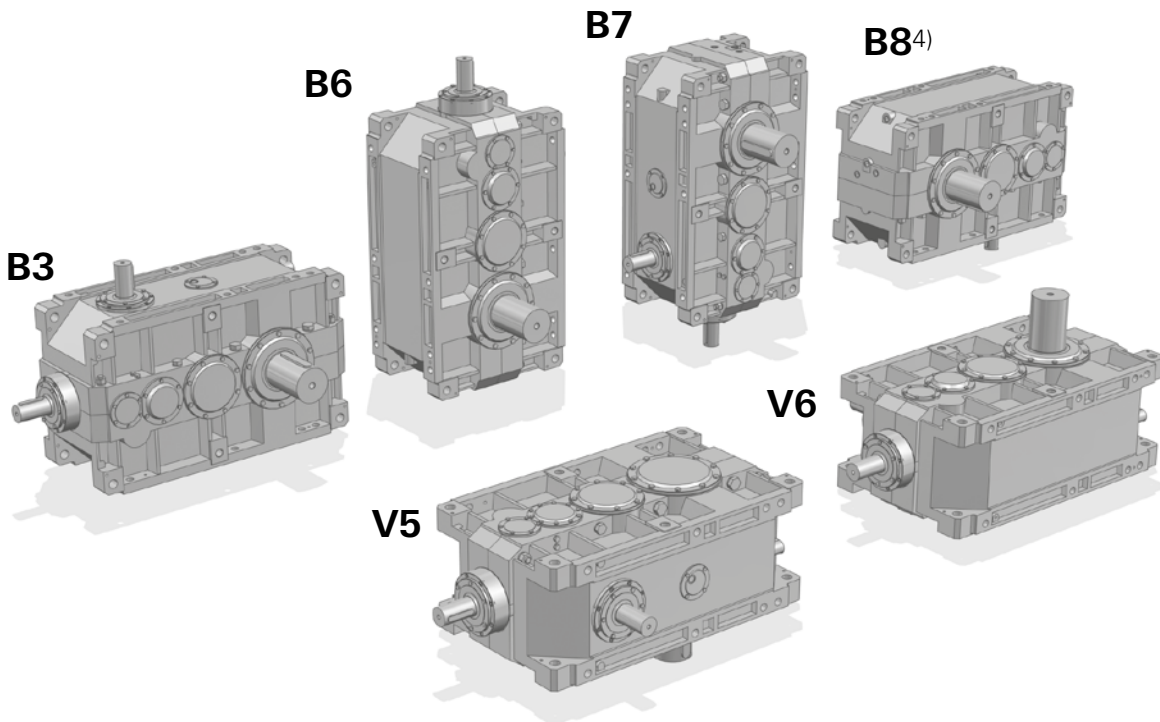
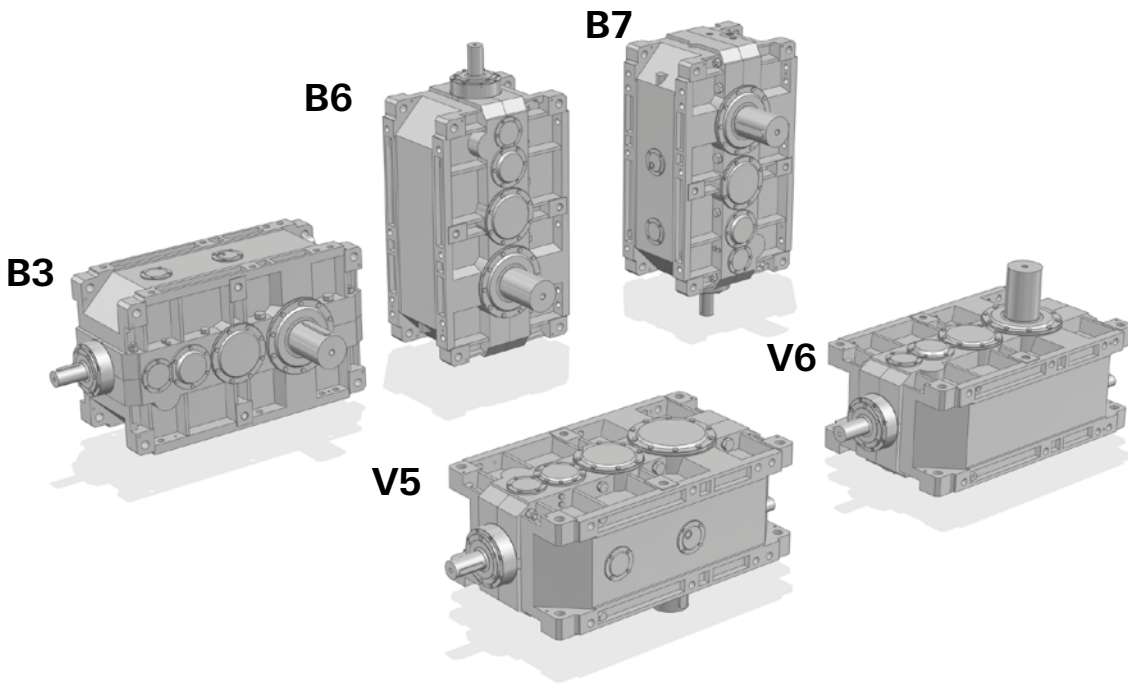
1) The housing of designs U01A ... U01N sin is not prearranged for other designs (U01H ... U01L sin).

2) For U01A, U01H, U01V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for U01A sin, U01H sin, U01V sin designs and derivatives, the white arrow direction of rotation. If it is not possible, consult us.

10.2 - Gear reducers R C2I

**Mounting positions**

Except specific needs, prefer mounting position B3 (see ch. 2).



▼ Possible high oil splash: for the corrective factor  $f_{ts}$  of nominal thermal power  $P_{Tn}$  see ch. 4.

⚠ Possible bearing lubrication pump: consult us for verification.

1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).

2) ⚠ for designs UO1H ... UO1M sin, UO1V ... UO1L sin.

3) ⚠ for designs UO1A ... UO1N sin, UO1H ... UO1M sin.

4) Mounting position B8 available only for designs UO1V ... UO1L sin.

\* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

▼ Oil filler plug

● Oil level plug

■ Oil drain plug

▽ Oil filler plug on opposite side (not in view)

▣ Oil level plug on opposite side (not in view)

⊗ Oil drain plug on opposite side (not in view)

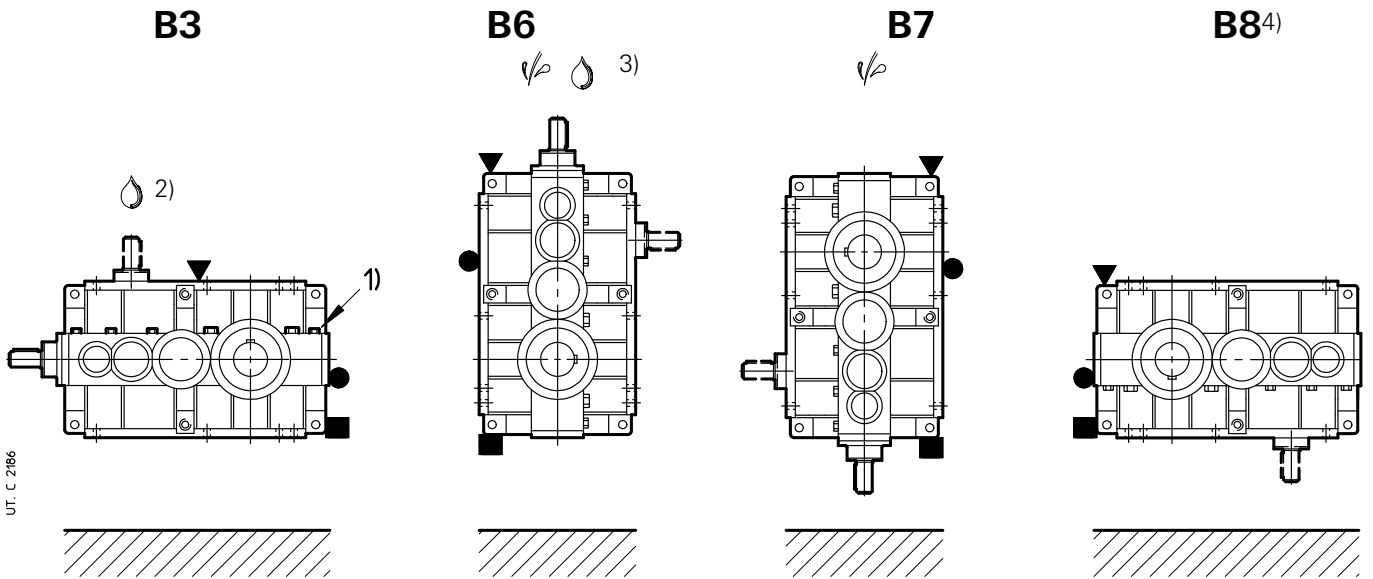


# 10 - Dimensions, designs, mounting positions (bevel helical gear reducers)

## 10.2 - Gear reducers R C2I

### Lubrication - Plug position and oil quantity

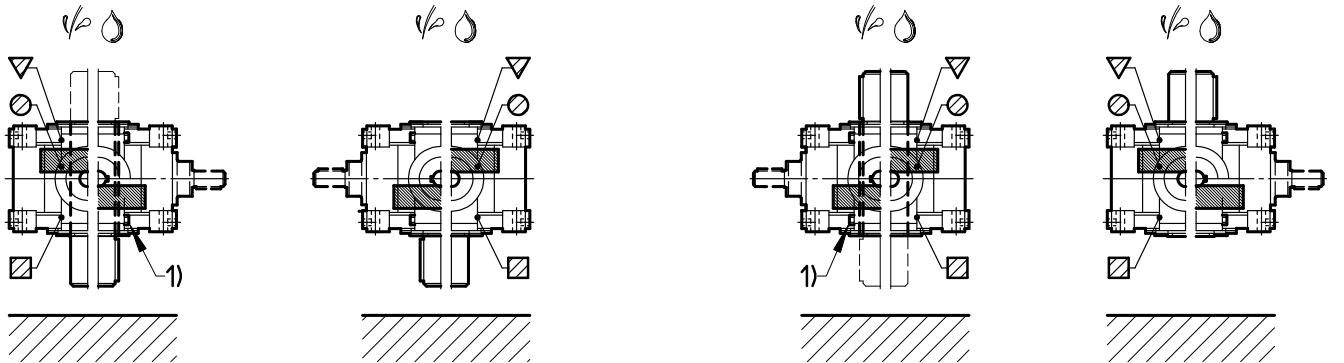
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



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### V5

### V6



10

U01A	U01A sin
U01F	U01F sin
U01H	U01H sin
U01G	U01G sin
U01V	U01V sin
U01S	U01S sin
U01A*	U01N sin*
U01H*	U01M sin*
U01V	U01L sin*

U01N	U01N sin
U01M	U01M sin
U01L	U01L sin

U01A	U01A sin
U01F	U01F sin
U01H	U01H sin
U01G	U01G sin
U01V	U01V sin
U01S	U01S sin
U01A*	U01N sin*
U01H*	U01M sin*
U01V	U01L sin*

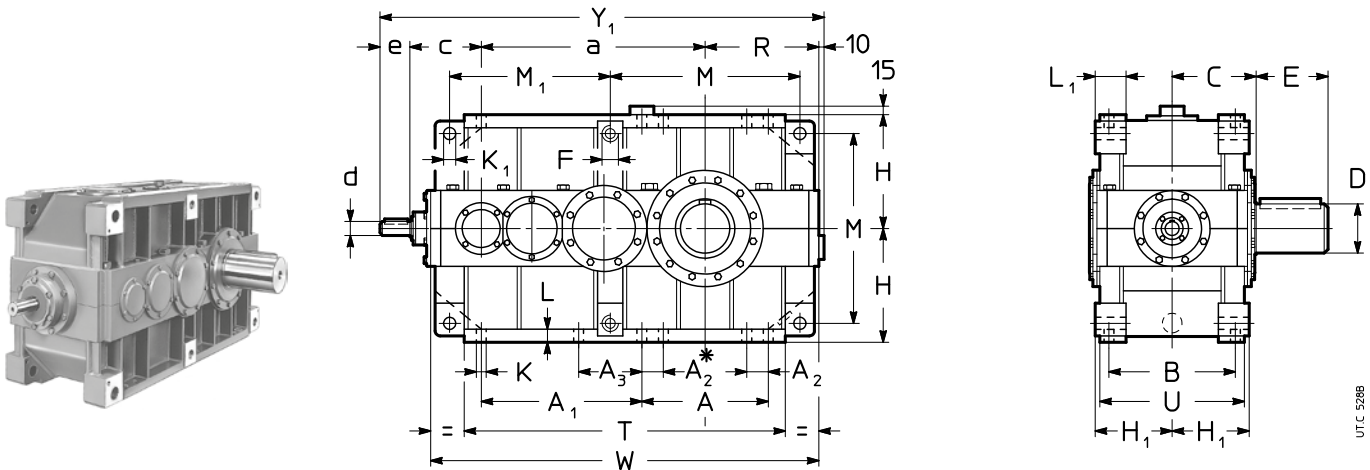
U01N	U01N sin
U01M	U01M sin
U01L	U01L sin

Size	Oil quantity [l]				V5, V6	
	B3	B6	B7	B8 <sup>4)</sup>	with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	132	224	224	132	224	250
<b>4500, 4501</b>	132	224	224	132	224	250
<b>5000, 5001</b>	265	450	425	265	450	475
<b>5600, 5601</b>	265	450	425	265	450	475
<b>6300, 6301</b>	375	630	630	375	630	710
<b>7001</b>	600	950	1060	600	950	1060
<b>8001</b>	1000	1700	1700	1000	1700	1800

Notes at previous page.

### 10.3 - Gear reducers R C3I

#### Dimensions



\* For sizes  $\geq 6300$ , only.

Size	a	A	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	F	H <sub>h11</sub>	H <sub>h12</sub>	K $\emptyset$	K <sub>1</sub> $\emptyset$ H11	L	L <sub>1</sub>	M	T	U	W	kg	
			M <sub>1</sub>					1)	R											3)
<b>4000</b> <b>4001</b>	900	505	625	90	-	500	330	M45	450	296	39	48	52	116	750	1260	580	1525	2440 2520	2510 2600
<b>4500</b> <b>4501</b>	950	505	675	90	-	500	358	M45	450	296	39	48	52	116	750	1310	580	1575	2780 2850	2870 2960
<b>5000</b> <b>5001</b>	1125	630	785	115	-	625	410	M56	560	370	48	60	65	148	930	1575	725	1905	4790 4910	4930 5070
<b>5600</b> <b>5601</b>	1185	630	845	115	-	625	445	M56	560	370	48	60	65	148	930	1635	725	1965	5680 5800	5880 6020
<b>6300</b> <b>6301</b>	1380	770	970	115	-	695	490	M56	630	406	48	60	65	148	1070	1900	795	2230	7950 8060	8230 8390
<b>7101</b>	1630	930	1228	115	590	843	601	M56	710	481	48	66	71	185	1230	2279	943	2648	13260	13760
<b>8001</b>	1880	1008	1286	145	596	944	682	M90	900	544	60	95	85	250	1574	2590	1064	3086	20450	21170

Size	D $\emptyset$	E	c	d $\emptyset$	e	Y <sub>1</sub>	c	d $\emptyset$	e	Y <sub>1</sub>	c	d $\emptyset$	e	Y <sub>1</sub>
						2)				2)				2)
<b>4000</b> <b>4001</b>	190 200	280	282	$i_N \leq 125$ 48	110	1752	282	$i_N = 160, 200$ 48	110	1752	282	$i_N \geq 250$ 38	80	1722
<b>4500</b> <b>4501</b>	210 220	300	282	$i_N \leq 125$ 48	110	1802	282	$i_N = 160, 200$ 48	110	1802	282	$i_N \geq 250$ 38	80	1772
<b>5000</b> <b>5001</b>	240 250	330	380	$i_N \leq 125$ 70	140	2215	357	$i_N = 160, 200$ 55	110	2162	357	$i_N \geq 250$ 48	110	2162
<b>5600</b> <b>5601</b>	270 280	380	380	$i_N \leq 125$ 70	140	2275	357	$i_N = 160, 200$ 55	110	2222	357	$i_N \geq 250$ 48	110	2222
<b>6300</b> <b>6301</b>	300 320	430	380	$i_N \leq 160^{4)}$ 70	140	2540	357	$i_N = 200, 250^{4)}$ 55	110	2487	357	$i_N = 315$ 48	110	2487
<b>7101</b>	360	590	480	$i_N \leq 160$ 90	170	3000	480	$i_N = 200, 250$ 70	140	2970	480	$i_N = 315$ 70	140	2970
<b>8001</b>	400	660	605	$i_N \leq 160$ 110	210	3605	605	$i_N = 200, 250$ 90	170	3565	605	$i_N = 315$ 90	170	3565

1) Working length of thread  $1,7 \cdot F$ .

2) For mounting positions B6, B7, V5, V6 dimension Y<sub>1</sub> increases by approx. 20 for overall dimensions of filler plug.

3) Values valid for double extension low speed shaft end.

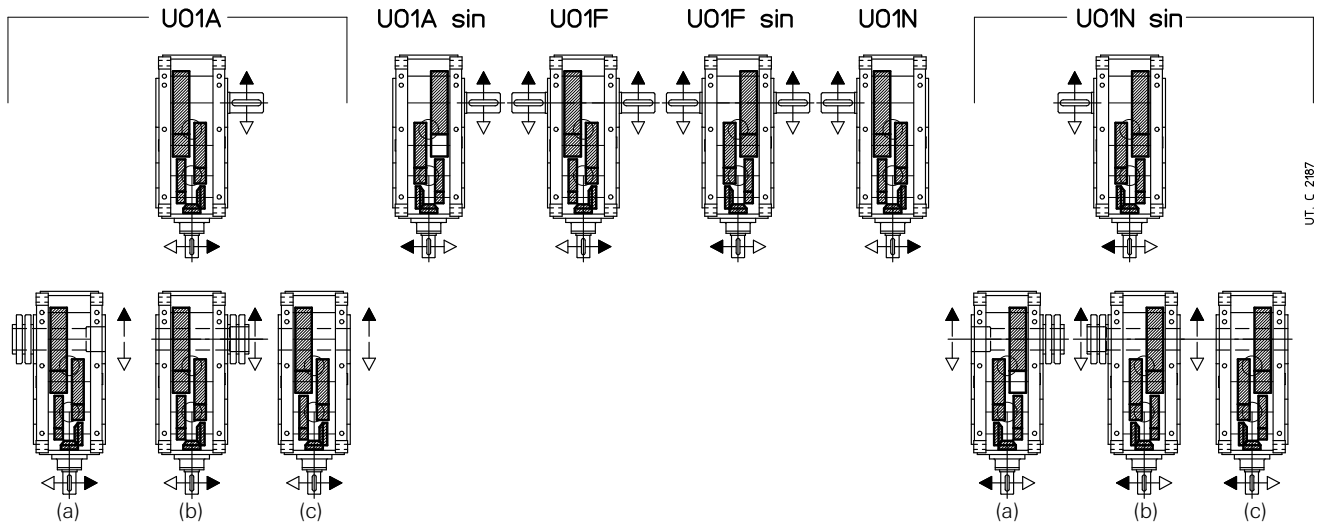
4) For size 6301:  $i_N \leq 200$  and  $i_N = 250$ , respectively.



10.3 - Gear reducers R C3I

**Designs**<sup>1) 2)</sup> (direction of rotation)

Solid low speed shaft (standard)



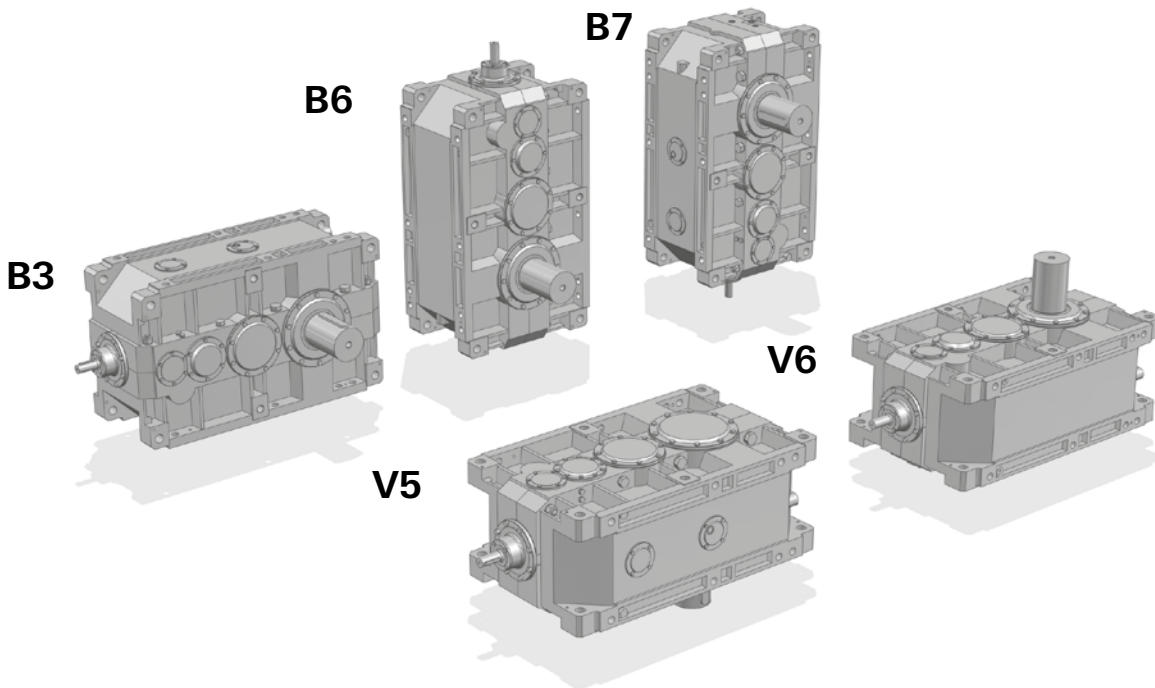
- (a) Hollow low speed shaft **with shrink disc on machine opposite side** (on request, see ch. 12).
- (b) Hollow low speed shaft **with shrink disc on machine side** (on request, see ch. 12).
- (c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

1) The housing of designs U01A ... U01N sin is not prearranged for other designs (U01H ... U01L sin).  
 2) For U01A, U01H, U01V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for U01A sin, U01H sin, U01V sin designs and derivatives, the white arrow direction of rotation. If it is not possible, consult us.

10.3 - Gear reducers R C3I

**Mounting positions**

Except specific needs, prefer mounting position B3 (see ch. 2).



10

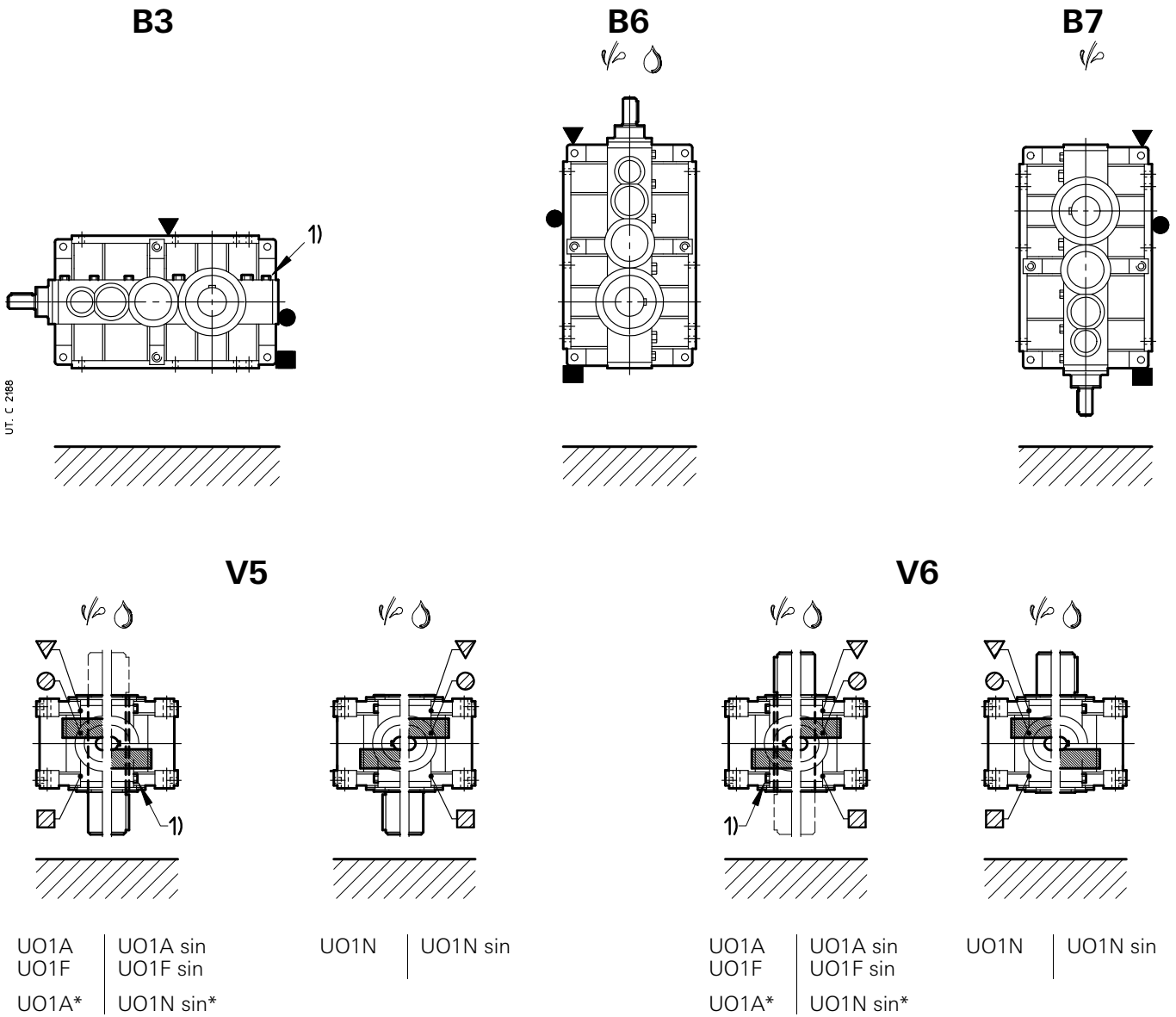
- Possible high oil splash: for the corrective factor  $f_{ts}$  of nominal thermal power  $P_{tN}$  see ch. 4.
- Possible bearing lubrication pump: consult us for verification.
- 1) Mounting position **B3** may be identified from the position of the screw-heads as arrowed. The same is valid for mounting positions V5 and V6 with double extension or hollow low speed shaft: in these cases, consider the **position of low speed wheel**, for the identification of correct mounting position (see also «Designs» at the previous page).
- \* Valid in case of **hollow low speed shaft** (with shrink disc or keyway).

- Oil filler plug
- Oil level plug
- Oil drain plug
- Oil filler plug on opposite side (not in view)
- Oil level plug on opposite side (not in view)
- Oil drain plug on opposite side (not in view)

10.3 - Gear reducers R C3I

**Lubrication - Plug position and oil quantity**

Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



Size	Oil quantity [l]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	150	280	224	250	265
<b>4500, 4501</b>	150	280	224	250	265
<b>5000, 5001</b>	300	560	450	500	530
<b>5600, 5601</b>	300	560	450	500	530
<b>6300, 6301</b>	425	850	630	710	750
<b>7001</b>	710	1320	1000	1060	1120
<b>8001</b>	1120	2240	1700	1800	1900

Notes at previous page.

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# 11 - Radial loads

<b>11.1 - Radial loads <math>F_{r1}</math> [kN]</b> .....	<b>86</b>
V-belt drives .....	87
<b>11.2 - Axial loads <math>F_{a2}</math> [kN] or radial loads <math>F_{r2}</math> [kN] on low speed shaft end</b> .....	<b>88</b>
Axial loads $F_{a2}$ .....	88
Radial loads $F_{r2}$ .....	88

## 11.1 - Radial loads $F_{r1}$ [kN] on high speed shaft

Radial loads generated on the shaft end by a drive connecting gear reducer and motor must be less than or equal to those given in the relevant table.

$n_1$ min <sup>-1</sup>	$F_{r1}$ [kN]																	
	4000 ... 4501			5000 ... 5601			6300 ... 6301					7101			8001			
	2I CI	3I C2I	4I C3I	2I	3I C2I	4I C3I	2I	3I	4I	C2I	C3I	2I	3I C2I	4I C3I	2I	3I C2I	4I C3I	
<b>1 800</b>	20	12,5	5	31,5	20	8	40	25	10	20	8	63	40	12,5	80	50	20	
<b>1 500</b>	21,2	13,2	5,3	33,5	21,2	8,5	42,5	26,5	10,6	21,2	8,5	67	42,5	13,2	85	53	21,2	
<b>1 200</b>	22,4	14	5,6	35,5	22,4	9	45	28	11,2	22,4	9	71	45	14	90	56	22,4	
<b>1 000</b>	23,6	15	6	37,5	23,6	9,5	47,5	30	11,8	23,6	9,5	75	47,5	15	95	60	23,6	
<b>710</b>	26,5	17	6,7	42,5	26,5	10,6	53	33,5	13,2	26,5	10,6	85	53	17	106	67	26,5	
<b>560</b>	28	18	7,1	45	28	11,2	56	35,5	14	28	11,2	90	56	18	112	71	28	
<b>450</b>	30	19	7,5	47,5	30	11,8	60	37,5	15	30	11,8	95	60	19	118	75	30	
<b>355</b>	33,5	21,2	8,5	53	33,5	13,2	67	42,5	17	33,5	13,2	106	67	21,2	132	85	33,5	
$F_{r1max}$	<b>33,5</b>	<b>21,2</b>	<b>8,5</b>	<b>53</b>	<b>33,5</b>	<b>13,2</b>	<b>67</b>	<b>42,5</b>	<b>17</b>	<b>33,5</b>	<b>13,2</b>	<b>106</b>	<b>67</b>	<b>21,2</b>	<b>132</b>	<b>85</b>	<b>33,5</b>	

The radial load  $F_{r1}$  given by the following formula refers to most common drives:

$$F_{r1} = \frac{28,65 \cdot P_1}{d \cdot n_1} \text{ [kN]} \quad \text{for timing belt drive}$$

$$F_{r1} = \frac{47,75 \cdot P_1}{d \cdot n_1} \text{ [kN]} \quad \text{for V-belt drive}$$

where:

$P_1$  [kW] is the power required at the input side of gear reducer;

$n_1$  [min<sup>-1</sup>] is the angular velocity of gear reducer

$d$  [m] is the pitch diameter of pulley keyed on gear reducer high speed shaft

Radial loads given in the table are valid for overhung loads on centre line of high speed shaft end, i.e. operating at a distance of  $0,5 \cdot e$  ( $e$  = shaft end length) from the shoulder. If radial loads are in a different position, i.e. at a distance differing from  $0,5 \cdot e$  from shoulder, multiply the admissible radial load value by 1,25 (without exceeding the maximum value  $F_{r1max}$ , stated in the table) if acting at  $0,315 \cdot e$ , by 0,8 if acting at  $0,8 \cdot e$ .

It is always advisable **to mount the pulley against the shaft shoulder** and in any case to avoid that the pulley exceeds the shaft end.

An **axial load** of up to 0,2 times the value in the table is permissible, simultaneously with the radial load.

In absence of the radial load, an axial load may be acting on center line, not higher than 0,5 times the stated radial load.

**IMPORTANT:** tabulated values for radial load  $F_{r1}$  can increase considerably in certain instances (direction of rotation, angular position of load, etc.). If necessary and/or in presence of **misaligned** axial loads, consult us.

## 11.1 - Radial loads $F_{r1}$ [kN] on high speed shaft end

### V-belt drives

See the table for the driving pulleys advised for the various powers and motor polarities and the radial loads resulting on motor and gear reducer shaft ends.

The transmissions have been calculated with a service factor  $\geq 1,4$ ; replace section SPA with SPB, section SPB with SPC, section SPC with 8V.in order to increase the service factor with the same d and belt number.

The radial loads have been calculated according to the formula:  $(47\,750 \cdot P_1) / (d \cdot n_1)$ .

The radial load  $F_{r1}$ , referring to the selected motor pulley, must be lower than or equal to the one admitted by gear reducer.

**IMPORTANT.** For the good running of drive and in order not to overload motor and gear reducer bearings, reduce the overhung to a minimum and do not stress belts excessively. Pulleys with  $d \geq 400$  must be dynamically balanced.

$P_1$ kW	Motor Size pole number		Driving pulley: belt number and section, pitch diameter d [mm]						Radial load $F_{r1}$ [N]								
			d	$F_{r1}$	d	$F_{r1}$	d	$F_{r1}$	d	$F_{r1}$	d	$F_{r1}$					
<b>1,1</b>	80B	2	2 Z	<b>71</b>	265	2 Z	<b>80</b>	236	2 Z	<b>90</b>	212	1 Z	<b>100</b>	190	1 Z	<b>112</b>	170
	90S	4	2 A	<b>90</b>	425	2 A	<b>100</b>	375	2 A	<b>112</b>	335	1 A	<b>125</b>	300	1 A	<b>140</b>	265
	90L	6	2 A	<b>90</b>	670	2 A	<b>100</b>	600	2 A	<b>112</b>	530	2 A	<b>125</b>	475	1 A	<b>140</b>	425
<b>1,5</b>	90S	2	2 A	<b>90</b>	280	2 A	<b>100</b>	250	1 A	<b>112</b>	224	1 A	<b>125</b>	200	1 A	<b>140</b>	180
	90L	4	2 A	<b>90</b>	560	2 A	<b>100</b>	500	2 A	<b>112</b>	450	2 A	<b>125</b>	400	1 A	<b>140</b>	355
	100LA	6	3 A	<b>90</b>	900	3 A	<b>100</b>	800	2 A	<b>112</b>	710	2 A	<b>125</b>	630	2 A	<b>140</b>	560
<b>2,2</b>	90LA	2	2 A	<b>90</b>	425	2 A	<b>100</b>	375	2 A	<b>112</b>	335	2 A	<b>125</b>	300	1 A	<b>140</b>	265
	100LA	4	3 A	<b>90</b>	850	3 A	<b>100</b>	750	3 A	<b>112</b>	670	2 A	<b>125</b>	600	2 A	<b>140</b>	530
	112M	6	3 A	<b>112</b>	1060	3 A	<b>125</b>	950	3 A	<b>140</b>	850	2 A	<b>160</b>	750	2 A	<b>180</b>	670
<b>3</b>	100LA	2	3 A	<b>90</b>	560	3 A	<b>100</b>	500	2 A	<b>112</b>	450	2 A	<b>125</b>	400	2 A	<b>140</b>	355
	100LB	4	3 A	<b>112</b>	900	3 A	<b>125</b>	800	2 A	<b>140</b>	710	2 A	<b>160</b>	630	2 A	<b>180</b>	560
	132S	6	3 SPA	<b>100</b>	1600	3 SPA	<b>112</b>	1400	2 SPA	<b>125</b>	1250	2 SPA	<b>140</b>	1120	2 SPA	<b>160</b>	1000
<b>4</b>	112M	2	3 A	<b>100</b>	670	3 A	<b>112</b>	600	2 A	<b>125</b>	530	2 A	<b>140</b>	475	2 A	<b>160</b>	425
	112M	4	3 A	<b>125</b>	1060	3 A	<b>140</b>	950	3 A	<b>160</b>	850	2 A	<b>180</b>	750	2 A	<b>200</b>	670
	132M	6	3 SPA	<b>112</b>	1900	3 SPA	<b>125</b>	1700	2 SPA	<b>140</b>	1500	2 SPA	<b>160</b>	1320	2 SPA	<b>180</b>	1180
<b>5,5</b>	132S	2	3 SPA	<b>100</b>	950	3 SPA	<b>112</b>	850	2 SPA	<b>125</b>	750	2 SPA	<b>140</b>	670	2 SPA	<b>160</b>	600
	132S	4	3 SPA	<b>112</b>	1700	3 SPA	<b>125</b>	1500	2 SPA	<b>140</b>	1320	2 SPA	<b>160</b>	1180	2 SPA	<b>180</b>	1060
	132MB	6	3 SPA	<b>140</b>	2120	3 SPA	<b>160</b>	1900	2 SPA	<b>180</b>	1700	2 SPA	<b>200</b>	1500	2 SPA	<b>224</b>	1320
<b>7,5</b> <b>(9,2)</b>	132SB (SC)	2	3 SPA	<b>112</b>	1120	3 SPA	<b>125</b>	1000	2 SPA	<b>140</b>	900	2 SPA	<b>160</b>	800	2 SPA	<b>180</b>	710
	132M (MB)	4	3 SPA	<b>125<sup>1)</sup></b>	2000	3 SPA	<b>140</b>	1800	2 SPA	<b>160</b>	1600	2 SPA	<b>180</b>	1400	2 SPA	<b>200</b>	1250
	160M	6	3 SPA	<b>160</b>	2500	3 SPA	<b>180</b>	2240	3 SPA	<b>200</b>	2000	2 SPA	<b>224</b>	1800	2 SPA	<b>250</b>	1600
<b>11</b>	160MR	2	3 SPA	<b>125</b>	1500	3 SPA	<b>140</b>	1320	2 SPA	<b>160</b>	1180	2 SPA	<b>180</b>	1060	2 SPA	<b>200</b>	950
	160M	4	3 SPA	<b>160</b>	2360	3 SPA	<b>180</b>	2120	3 SPA	<b>200</b>	1900	2 SPA	<b>224</b>	1700	2 SPA	<b>250</b>	1500
	160L	6	3 SPA	<b>200</b>	3000	3 SPA	<b>224</b>	2650	3 SPA	<b>250</b>	2360	2 SPA	<b>280</b>	2120	2 SPA	<b>315</b>	1900
<b>15</b>	160M	2	3 SPA	<b>140</b>	1800	3 SPA	<b>160</b>	1600	3 SPA	<b>180</b>	1400	2 SPA	<b>200</b>	1250	2 SPA	<b>224</b>	1120
	160L	4	3 SPA	<b>180</b>	2800	3 SPA	<b>200</b>	2500	3 SPA	<b>224</b>	2240	3 SPA	<b>250</b>	2000	2 SPA	<b>280</b>	1800
	180L	6	4 SPA	<b>200</b>	4000	4 SPA	<b>224</b>	3550	4 SPA	<b>250</b>	3150	3 SPA	<b>280</b>	2800	3 SPA	<b>315</b>	2500
<b>18,5</b>	160L	2	3 SPA	<b>160</b>	2000	3 SPA	<b>180</b>	1800	3 SPA	<b>200</b>	1600	3 SPA	<b>224</b>	1400	2 SPA	<b>250</b>	1250
	180M	4	4 SPA	<b>180</b>	3550	4 SPA	<b>200</b>	3150	4 SPA	<b>224</b>	2800	3 SPA	<b>250</b>	2500	3 SPA	<b>280</b>	2240
	200LR	6	4 SPB	<b>200</b>	5000	4 SPB	<b>224</b>	4500	3 SPB	<b>250</b>	4000	3 SPB	<b>280</b>	3550	3 SPB	<b>315</b>	3150
<b>22</b>	180L	4	4 SPA	<b>200</b>	3750	4 SPA	<b>224</b>	3550	4 SPA	<b>250</b>	3000	3 SPA	<b>280</b>	2650	3 SPA	<b>315</b>	2360
	200L	6	4 SPB	<b>224</b>	5300	4 SPB	<b>250</b>	4750	3 SPB	<b>280</b>	4250	3 SPB	<b>315</b>	3750	3 SPB	<b>355</b>	3550
<b>30</b>	200L	4	4 SPB	<b>224</b>	4500	4 SPB	<b>250</b>	4000	3 SPB	<b>280</b>	3550	3 SPB	<b>315</b>	3150	3 SPB	<b>355</b>	2800
	225M	6	5 SPB	<b>250</b>	6300	5 SPB	<b>280</b>	5600	4 SPB	<b>315</b>	5000	4 SPB	<b>355</b>	4500	4 SPB	<b>400</b>	4000
<b>37</b>	225S	4	5 SPB	<b>224</b>	5600	5 SPB	<b>250</b>	5000	4 SPB	<b>280</b>	4500	4 SPB	<b>315</b>	4000	4 SPB	<b>355</b>	3550
	250M	6	6 SPB	<b>250</b>	8000	6 SPB	<b>280</b>	7100	5 SPB	<b>315</b>	6300	5 SPB	<b>355</b>	5600	5 SPB	<b>400</b>	5000
<b>45</b>	225M	4	5 SPB	<b>250</b>	6000	5 SPB	<b>280</b>	5300	4 SPB	<b>315</b>	4750	4 SPB	<b>355</b>	4250	4 SPB	<b>400</b>	3750
<b>55</b>	250M	4	6 SPB	<b>250</b>	7500	6 SPB	<b>280</b>	6700	5 SPB	<b>315</b>	6000	5 SPB	<b>355</b>	5300	5 SPB	<b>400</b>	4750
<b>75</b>	280S	4	6 SPB	<b>280</b>	9000	5 SPB	<b>315</b>	8000	5 SPB	<b>355</b>	7100	5 SPB	<b>400</b>	6400	-	-	-
<b>90</b>	280M	4	6 SPB	<b>315</b>	9000	5 SPC	<b>315</b>	9000	5 SPC	<b>355</b>	8000	4 SPC	<b>400</b>	7100	-	-	-
<b>110</b>	315S	4	6 SPC	<b>315</b>	11000	5 SPC	<b>355</b>	10000	4 SPC	<b>400</b>	8800	-	-	-	-	-	-
<b>132</b>	315M	4	6 SPC	<b>355</b>	12000	5 SPC	<b>400</b>	10600	4 SPC	<b>450</b>	10600	-	-	-	-	-	-
<b>160</b>	315MC	4	6 SPC	<b>400</b>	13000	6 SPC	<b>450</b>	11500	5 8V	<b>450</b>	11500	-	-	-	-	-	-

1) Not valid for power 9,2 kW:  $d \geq 140$  mm.

Note: Pulley face width: **1 Z** 16, **2 Z** 28, **1 A** 20, **2 A-2 SPA** 35, **3 A-3 SPA** 50, **4 SPA** 65, **3 SPB** 63, **4 SPB** 82, **5 SPB** 101, **6 SPB** 120, **4 SPC** 110, **5 SPC** 136, **6 SPC** 162, **5 8V** 152.

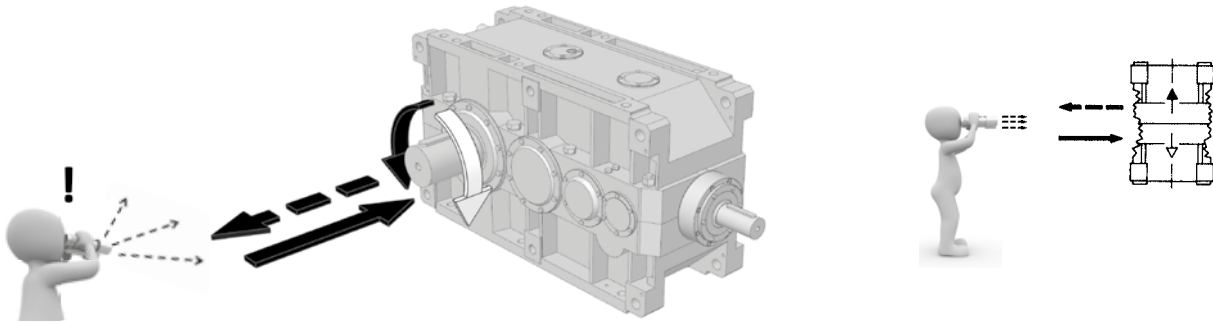
## 11.2 - Axial loads $F_{a2}$ [kN] or radial loads $F_{r2}$ [kN] on low speed shaft end

### Axial loads $F_{a2}$

Permissible  $F_{a2}$  is shown in the column where direction of rotation of low speed shaft (black or white arrow) and direction of the axial force (solid or broken arrow) correspond to those of the gear reducer in question. Direction of rotation and direction of axial force may be established viewing the gear reducer from any point of the two output sides of low speed shaft, providing the same point is adopted for rotation and axial load (see fig. below).

Notes:

- white and black arrows of present chapter do not refer to the ones stating the correspondence of direction of rotation for the different designs (see ch. 8, 10, 12, 14);
- wherever possible, choose the load conditions corresponding to the column with highest admissible values.
- values stated in the table are valid for the center line axial load; in the event of a misaligned axial load, consult us.



### Radial loads $F_{r2}$

Radial loads generated on the shaft end by a drive connecting gear reducer and motor must be less than or equal to those given in the relevant tables in the following pages.

Normally, radial loads on low speed shaft ends are considerable: in fact there is a tendency to connect the gear reducer to the machine by means of a transmission with high transmission ratio (economizing on the gear reducer) and with small diameters (economizing on the drive, and for requirements dictated by overall dimensions). Bearing life and wear (which also affect gears unfavorably) and low speed shaft strength, clearly impose limits on permissible radial load.

Permissible radial loads given in the tables are therefore based on: the low speed shaft side where radial load is applied according to the design (see ch. 8 and 10), the product of speed  $n_2$  [ $\text{min}^{-1}$ ] for the bearing duration  $L_h$  [h] required, the direction of rotation, the angular position  $\varphi$  [ $^\circ$ ] the load and torque  $M_2$  [kN m] required.

Permissible radial loads given in the tables are valid for overhung loads on center line of high speed shaft end, i.e. operating at a distance of  $0,5 \cdot E$  (E = shaft end length) from the shoulder. If radial loads are in a different position, i.e. at a distance differing from  $0,5 E$  from shoulder, re-calculate the permissible value of radial load according to the following formula, trying not to exceed the maximum value  $F_{r2\text{max}}$ , stated in the tables:

**For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.**

$$F_{r2}' = F_{r2} \cdot \frac{E/2 + y}{x + y} \text{ [kN]}$$

where:

- $F_{r2}'$  [N] is the permissible radial load acting at the distance x from shaft shoulder;  
 $F_{r2}$  [N] is the permissible radial load acting on center line of high speed shaft end (see table on next page);  
 E [mm] is the shaft end length (see ch. 7, 9);  
 y [mm] is given in the table;  
 x [mm] is the distance between the shaft shoulder and the load application point.

	Gear reducer size											
	4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
y	561	554	612	594	700	694	765	742	823	823	1010	1142

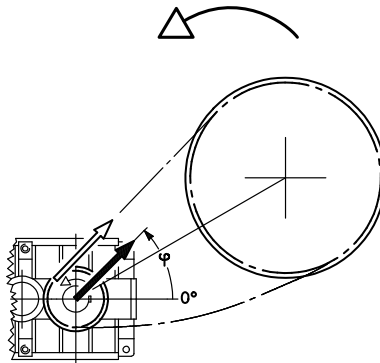


## 11.2 - Axial loads $F_{a2}$ [kN] or radial loads $F_{r2}$ [kN] on low speed shaft end

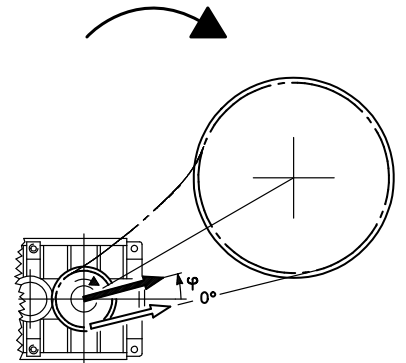
Radial load  $F_{r2}$  for most common drives has the following value and angular position:

$$F_{r2} = \frac{19,1 \cdot P_2}{d \cdot n_2} \text{ [kN]}$$

for chain drive (lifting in general);  
for chain drive replace  
19,1 with 28,65

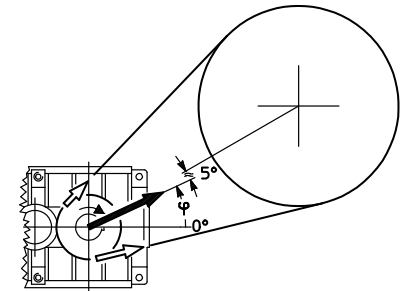
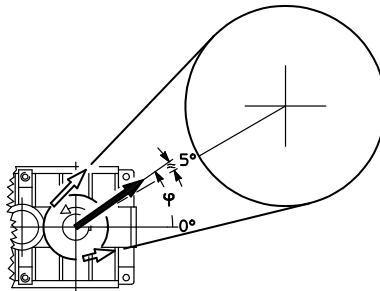


ROTATION



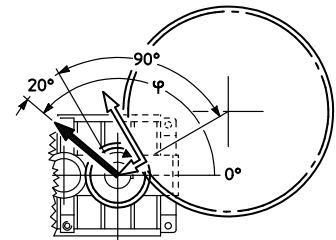
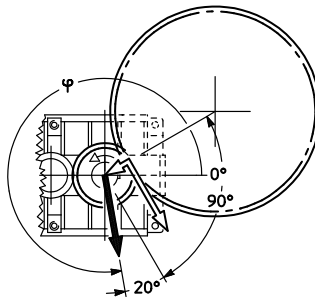
$$F_{r2} = \frac{47,75 \cdot P_2}{d \cdot n_2} \text{ [kN]}$$

for V-belt drive



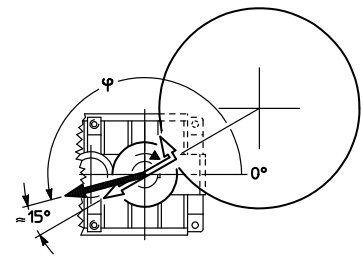
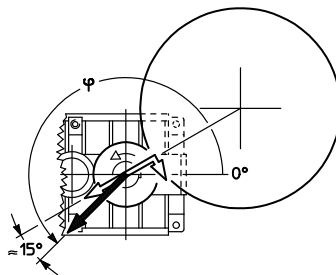
$$F_{r2} = \frac{20,32 \cdot P_2}{d \cdot n_2} \text{ [kN]}$$

for spur gear pair drive



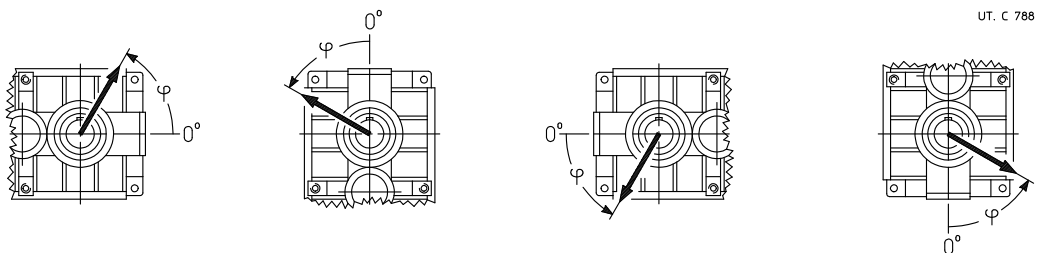
$$F_{r2} = \frac{67,81 \cdot P_2}{d \cdot n_2} \text{ [kN]}$$

for friction wheel drive (rubber-on-metal)



where:  $P_2$  [kW] is power required at the output side of the gear reducer,  $n_2$  [ $\text{min}^{-1}$ ] is the speed,  $d$  [m] is the pitch diameter.

**IMPORTANT:**  $0^\circ$  coincides with a straight line concurrent with the axis of the last reduction and orientated as shown above, and therefore it follows the rotation of the housing, as shown below.



UT. C 788















## 11.2 - Axial loads $F_{a2}$ [kN] or radial loads $F_{r2}$ [kN] on low speed shaft end

Radial load on **opposite low speed wheel end**<sup>3)</sup>

size **5600**

$n_2 \cdot L_h$ min <sup>-1</sup> ·h	$M_2$ kN m	$F_{r2}$ <sup>1) 2)</sup>														$F_{a2}$ <sup>1)</sup>			
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355 000</b>	224	400	400	400	400	400	400	400	400	280	236	265	355	400	400	400	375	47,5	160
	160	400	400	400	400	400	400	400	400	375	355	375	400	400	400	400	400	80	160
<b>450 000</b>	224	400	400	355	335	400	400	400	400	236	200	224	300	400	400	400	335	35,5	160
	160	400	400	400	400	400	400	400	400	335	300	315	400	400	400	400	400	75	160
<b>560 000</b>	224	400	400	250	224	335	400	400	400	200	160	180	265	400	400	400	300	23,6	160
	160	400	400	400	400	400	400	400	400	300	265	280	355	400	400	400	375	63	160
<b>710 000</b>	224	400	200	80	71	118	400	375	400	140	112	132	200	355	400	375	250	17	160
	160	400	400	400	400	400	400	400	400	265	236	250	315	400	400	400	335	53	160
<b>900 000</b>	224	-	-	-	-	-	-	-	-	85	63	75	140	280	375	335	180	-	160
	160	400	400	400	400	400	400	375	400	224	200	212	280	375	400	400	300	42,5	160
	112	400	400	400	400	400	400	400	400	300	280	280	335	400	400	400	355	71	160
<b>1 120 000</b>	160	400	400	335	315	400	355	335	375	200	170	180	250	335	400	375	280	33,5	160
	112	400	400	400	400	400	375	375	375	280	250	265	315	375	400	400	335	63	160
<b>1 400 000</b>	160	400	400	250	236	335	335	315	335	170	140	150	212	315	375	335	236	23,6	160
	112	400	400	400	400	400	355	335	355	250	224	236	280	355	375	355	300	53	150
<b>1 800 000</b>	160	375	300	160	140	212	300	280	315	132	112	125	180	280	335	315	212	15	150
	112	375	400	400	400	375	335	315	335	212	190	200	250	315	355	335	265	45	140
<b>2 240 000</b>	160	335	112	-	-	63	280	265	280	100	75	90	140	250	315	265	170	-	140
	112	355	400	400	375	335	300	280	315	190	170	180	224	280	335	315	250	37,5	132
<b>2 800 000</b>	112	335	375	315	300	315	280	265	280	170	140	160	200	265	315	280	224	31,5	125
	80	335	355	375	355	315	300	280	300	212	200	212	236	280	315	300	250	50	118
<b>3 550 000</b>	112	300	355	250	236	300	250	250	265	140	118	132	180	250	280	265	200	23,6	118
	80	300	335	355	335	300	265	265	280	190	170	180	224	265	280	280	236	45	112
<b>4 500 000</b>	112	280	315	180	170	236	236	224	236	118	100	112	150	224	265	236	170	17	112
	80	280	315	335	315	280	250	236	250	170	150	160	200	236	265	250	212	37,5	106
max <b>400</b>																	max <b>80</b>	max <b>160</b>	

size **5601**

<b>355 000</b>	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
	190	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>450 000</b>	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
	190	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>560 000</b>	265	400	400	400	400	400	400	400	400	400	335	355	400	400	400	400	400	80	160
	190	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>710 000</b>	265	400	400	400	400	400	400	400	400	355	300	315	400	400	400	400	400	80	160
	190	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>900 000</b>	265	400	400	400	400	400	400	400	400	300	236	265	355	400	400	400	400	63	160
	190	400	400	400	400	400	400	400	400	400	355	375	400	400	400	400	400	80	160
	132	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>1 120 000</b>	190	400	400	400	400	400	400	400	400	375	315	335	400	400	400	400	400	80	160
	132	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	80	160
<b>1 400 000</b>	190	400	400	400	400	400	400	400	400	335	280	300	375	400	400	400	400	80	160
	132	400	400	400	400	400	400	400	400	400	375	375	400	400	400	400	400	80	160
<b>1 800 000</b>	190	400	400	400	400	400	400	400	400	280	236	250	335	400	400	400	400	67	160
	132	400	400	400	400	400	400	400	400	355	335	335	400	400	400	400	400	80	160
<b>2 240 000</b>	190	400	400	400	400	400	400	375	400	250	200	212	300	400	400	400	355	56	160
	132	400	400	400	400	400	400	400	400	335	300	300	355	400	400	400	400	80	160
<b>2 800 000</b>	132	400	400	400	400	400	400	375	400	300	265	280	335	400	400	400	375	80	160
	95	400	400	400	400	400	400	400	400	355	315	335	375	400	400	400	400	80	160
<b>3 550 000</b>	132	400	400	400	400	400	375	335	355	265	224	236	300	375	400	400	335	67	160
	95	400	400	400	400	400	400	375	375	315	280	300	335	400	400	400	375	80	160
<b>4 500 000</b>	132	375	400	400	400	400	335	315	335	236	200	212	265	355	400	400	315	60	160
	95	400	400	400	400	400	355	335	355	280	250	265	315	375	400	400	335	80	160
max <b>400</b>																	max <b>80</b>	max <b>160</b>	

1) An axial load of up to 0,2 times the value in the table is permissible, simultaneously with the radial load. If exceeded consult us.

2) An unfavorable direction of load can limit  $F_{r2}$  to  $0,71 \cdot F_{r2max}$

3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.





# 11.2 - Axial loads $F_{a2}$ [kN] or radial loads $F_{r2}$ [kN] on low speed shaft end

Radial load on **opposite low speed wheel end**<sup>3)</sup>

size **6300**

$n_2 \cdot L_h$ min <sup>-1</sup> ·h	$M_2$ kN m	$F_{r2}^{1) 2)}$																$F_{a2}^{1)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315	←	→
355 000	315	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160
450 000	315	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
560 000	315	400	400	375	355	400	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
710 000	315	400	400	335	300	355	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
900 000	315	400	375	265	250	300	400	400	400	400	335	375	400	400	400	400	400	160	63
	224	400	400	375	355	400	300	400	400	400	400	400	400	400	400	400	400	160	80
	160	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 120 000	224	400	400	355	315	355	400	400	400	400	400	400	400	400	400	400	400	160	80
	160	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 400 000	224	400	375	300	280	315	400	400	400	400	400	400	400	400	400	400	400	160	80
	160	400	400	375	355	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 800 000	224	400	335	265	250	280	375	400	400	400	400	400	400	400	400	400	400	160	71
	160	400	400	335	315	355	400	400	400	400	400	400	400	400	400	400	400	160	80
2 240 000	224	400	300	236	212	250	335	400	400	400	335	355	400	400	400	375	400	160	56
	160	400	355	300	280	315	375	400	400	400	400	400	400	400	400	400	400	160	80
2 800 000	160	400	335	280	265	280	355	400	400	400	400	400	400	400	400	375	400	160	80
	112	400	375	335	315	335	375	400	400	400	400	400	400	400	400	400	400	160	80
3 550 000	160	375	300	236	224	250	315	400	400	400	400	400	400	375	355	355	355	160	71
	112	400	335	300	280	300	355	400	400	400	400	400	400	375	375	375	375	160	80
4 500 000	160	335	265	212	200	224	280	355	400	375	355	400	400	400	335	315	335	160	60
	112	355	315	265	250	280	315	375	400	375	400	400	400	400	355	335	355	160	80
max <b>400</b>																		max <b>160</b>	max <b>80</b>

size **6301**

355 000	375	400	400	400	375	400	400	400	400	400	400	400	400	400	400	400	400	160	80
	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
450 000	375	400	400	355	335	375	400	400	400	400	400	400	400	400	400	400	400	160	80
	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
560 000	375	400	400	315	280	335	400	400	400	400	335	375	400	400	400	400	400	160	67
	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
710 000	375	400	375	250	224	280	400	400	400	315	200	224	400	400	400	400	400	160	45
	265	400	400	375	355	400	400	400	400	400	400	400	400	400	400	400	400	160	80
900 000	375	400	315	200	180	224	355	400	400	112	67	75	200	400	400	400	400	160	28
	265	400	400	335	315	355	400	400	400	400	400	400	400	400	400	400	400	160	80
	190	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 120 000	265	400	375	280	280	315	400	400	400	400	400	400	400	400	400	400	400	160	75
	190	400	400	375	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 400 000	265	400	335	265	236	280	375	400	400	400	355	375	400	400	400	400	400	160	60
	190	400	400	355	335	355	400	400	400	400	400	400	400	400	400	400	400	160	80
1 800 000	265	400	300	212	190	236	335	400	400	355	236	265	400	400	400	400	400	160	45
	190	400	375	300	280	315	400	400	400	400	400	400	400	400	400	400	400	160	80
2 240 000	265	400	265	180	160	200	300	400	400	224	140	160	335	400	400	355	375	160	33,5
	190	400	335	265	250	280	355	400	400	400	400	400	400	400	400	400	400	160	75
2 800 000	190	400	300	236	224	250	335	400	400	400	400	400	400	400	400	355	375	160	63
	132	400	355	300	300	315	375	400	400	400	400	400	400	400	400	400	400	160	80
3 550 000	190	355	265	212	190	224	300	375	400	400	315	335	400	400	355	335	355	160	53
	132	375	315	280	265	280	335	400	400	400	400	400	400	400	375	355	375	160	80
4 500 000	190	335	236	180	160	190	265	355	400	335	236	250	400	400	335	300	315	160	40
	132	355	300	250	236	250	315	375	400	375	400	400	400	400	355	335	335	160	75
max <b>400</b>																		max <b>160</b>	max <b>80</b>

- 1) An axial load of up to 0,2 times the value in the table is permissible, simultaneously with the radial load. If exceeded consult us.
- 2) An unfavorable direction of load can limit  $F_{r2}$  to  $0,71 \cdot F_{r2max}$
- 3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.

## 11.2 - Axial loads $F_{a2}$ [kN] or radial loads $F_{r2}$ [kN] on low speed shaft end

Radial load on **low speed wheel end**<sup>3)</sup>

size **6300**

$n_2 \cdot L_h$ min <sup>-1</sup> ·h	$M_2$ kN m	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355 000	315	400	400	355	355	400	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160
450 000	315	400	400	300	280	355	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
560 000	315	400	355	236	224	300	400	400	400	400	400	400	400	400	400	400	400	160	80
	224	400	400	400	375	400	400	400	400	400	400	400	400	400	400	400	400	160	80
710 000	315	400	300	190	170	236	400	400	400	400	400	400	400	400	400	400	400	160	71
	224	400	400	335	315	400	400	400	400	400	400	400	400	400	400	400	400	160	80
900 000	315	400	236	132	125	180	400	400	400	400	400	400	400	400	400	355	400	160	50
	224	400	400	280	280	335	400	400	400	400	400	400	400	400	400	400	400	160	80
	160	400	400	400	375	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 120 000	224	400	355	250	236	300	400	400	400	400	400	400	400	400	400	400	400	160	80
	160	400	400	355	335	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 400 000	224	400	300	212	190	250	400	400	400	400	400	400	400	400	400	355	400	160	75
	160	400	400	315	300	355	400	400	400	400	400	400	400	400	400	400	400	160	80
1 800 000	224	400	250	160	150	200	355	400	400	400	400	400	400	355	315	375	400	160	60
	160	400	355	265	265	315	400	400	400	400	400	400	400	400	400	375	400	160	80
2 240 000	224	400	212	132	118	170	315	400	400	400	400	400	400	315	280	335	400	160	47,5
	160	400	315	236	224	280	400	400	400	400	400	400	400	355	335	375	400	160	80
2 800 000	160	400	280	200	190	236	355	400	400	400	400	400	400	335	315	355	400	160	75
	112	400	335	280	265	315	400	400	400	400	400	400	400	375	355	375	400	160	80
3 550 000	160	375	236	170	160	212	315	400	400	400	400	400	375	300	280	315	400	160	63
	112	400	315	250	236	280	355	400	400	400	400	400	400	335	315	355	400	160	80
4 500 000	160	335	212	140	132	170	280	400	400	400	400	355	280	250	300	400	160	53	
	112	375	280	224	212	250	335	400	400	400	400	375	315	300	315	400	160	80	
max <b>400</b>																		max <b>160</b>	max <b>80</b>

size **6301**

**11**

355 000	375	400	400	250	236	315	400	400	400	400	400	400	400	400	400	400	400	160	80
	265	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	160	80
450 000	375	400	315	190	170	250	400	400	400	400	400	400	400	400	400	400	400	160	71
	265	400	400	375	355	400	400	400	400	400	400	400	400	400	400	400	400	160	80
560 000	375	400	250	132	125	180	400	400	400	400	400	400	400	400	400	400	400	160	53
	265	400	400	315	300	375	400	400	400	400	400	400	400	400	400	400	400	160	80
710 000	375	400	170	80	71	112	355	400	400	400	400	400	400	400	355	400	400	160	31,5
	265	400	375	265	250	335	400	400	400	400	400	400	400	400	400	400	400	160	80
900 000	375	400	71	-	-	40	250	400	400	400	400	400	400	335	315	375	400	160	13,2
	265	400	335	224	200	280	400	400	400	400	400	400	400	400	400	400	400	160	80
	190	400	400	335	335	400	400	400	400	400	400	400	400	400	400	400	400	160	80
1 120 000	265	400	280	180	170	224	400	400	400	400	400	400	400	400	355	400	400	160	67
	190	400	400	300	280	355	400	400	400	400	400	400	400	400	400	400	400	160	80
1 400 000	265	400	224	140	125	180	355	400	400	400	400	400	400	355	335	375	400	160	53
	190	400	355	265	250	315	400	400	400	400	400	400	400	400	400	400	400	160	80
1 800 000	265	400	170	95	85	125	300	400	400	400	400	400	400	315	280	335	400	160	35,5
	190	400	300	224	212	265	400	400	400	400	400	400	400	375	355	400	400	160	80
2 240 000	265	355	118	56	53	80	250	400	400	400	400	400	400	280	250	300	400	160	23,6
	190	400	265	190	180	224	355	400	400	400	400	400	400	335	315	355	400	160	71
2 800 000	190	400	236	150	140	190	315	400	400	400	400	400	400	315	280	335	400	160	56
	132	400	315	250	236	280	375	400	400	400	400	400	400	355	335	375	400	160	80
3 550 000	190	355	190	125	112	150	280	400	400	400	400	355	280	250	300	400	160	45	
	132	400	280	212	212	250	355	400	400	400	400	400	315	300	335	400	160	80	
4 500 000	190	315	160	90	85	118	250	400	400	400	400	335	250	224	265	400	160	33,5	
	132	355	250	190	180	224	315	400	400	400	400	355	300	280	315	400	160	71	
max <b>400</b>																		max <b>160</b>	max <b>80</b>

1) An axial load of up to 0,2 times the value in the table is permissible, simultaneously with the radial load. If exceeded consult us.

2) An unfavorable direction of load can limit  $F_{r2}$  to  $0,71 \cdot F_{r2max}$

3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.





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# 12 - Accessories and non-standard designs

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**ATTENTION.** The simultaneous presence on the same gear reducer of two or more accessories or non-standard designs is not always possible: consult us for verification.

**(1) Hollow low speed shaft with shrink disc**

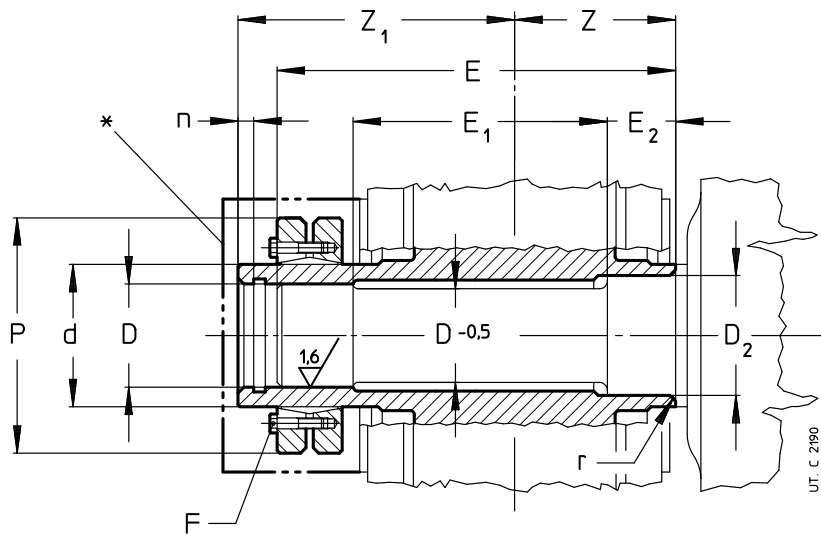
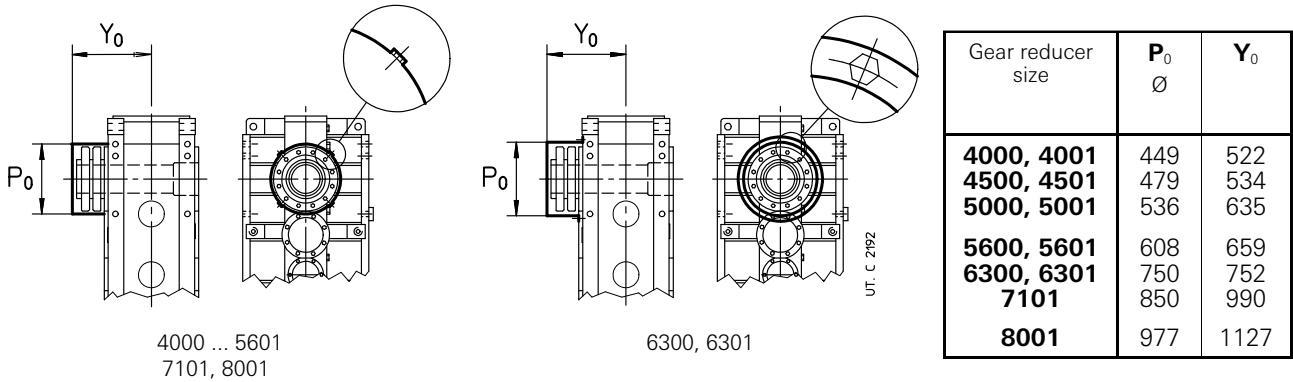
**Opposite side to machine**

**Stepped** hollow low speed shaft with shrink disc on **machine opposite side**; this design **facilitates** installation and removal and **affords a notable increase in rigidity** of keying and resistance to bending and torsional-stresses at the shaft end of driven machine.

**Safety** guards made of steel for shrink disc, supplied **as standard**.

**IMPORTANT.** The shoulder diameter of the driven machine shaft end abutting with the gear reducer must be at least  $(1,12 - 1,18) \cdot D$  (with stepped hollow shaft  $(1,18 - 1,25) \cdot D$ ).

Possible gear reducer designs are given at ch. 7 and 9.



Gear reducer size	D Ø	D <sub>2</sub> <sup>**</sup> Ø	E	E <sub>1</sub>	E <sub>2</sub>	F	M <sub>S</sub>	n	d Ø	P Ø	r	Z	Z <sub>1</sub>	M <sub>2SD</sub>	Δm	
	H7 / h6, j6				1)	2)	3)							4)	kg	
							N m							kN m		
<b>4000, 4001</b>	210	220	788	480	165	130	M20 n. 14	490	14	260	430	5	330	497	254	-70
<b>4500, 4501</b>	230	240	799	465	180	130	M20 n. 16	490	14	280	460	5	330	508	327	-140
<b>5000, 5001</b>	260	270	970	600	200	165	M20 n. 20	490	16	320	520	6	410	605	457	-160
<b>5600, 5601</b>	290	300	992	572	225	180	M20 n. 24	490	16	360	590	6	410	627	606	-270
<b>6300, 6301</b>	325	335	1 110	650	250	200	M24 n. 21	840	18	400	660	7	460	700	872	-410
<b>7101</b>	360	370	1 394	782	280	225	M27 n.28	1 250	20	460	770	7	551	899	1 650	-440
<b>8001</b>	400	410	1 606	886	315	250	M27 n. 34	1 250	20	530	910	8	626	1036	2 120	-360

- 1) Values valid for **R 41**.
- 2) Screws UNI 5737-88 class 10.9
- 3) Screw tightening torque.
- 4) Maximum torque value transmissible by shrink disc.
- 5) In presence of «Labyrinth seal and low speed shaft greaser» (ch. 12.(12), it is necessary to increase E dimension (E<sub>2</sub>) by the A quantity stated in the table at ch. 12.(12).

\* Protection for hollow low speed shaft with shrink disc, as standard.

\*\* Each hollow shaft type (standard, stepped, with shrink disc) has a slightly oversized diameter **D** at the input to facilitate the assembly of gear reducer on machine shaft end: this, however, does not affect the connection reliability.

Supplementary description when ordering by **designation: hollow low speed shaft with shrink disc, on machine opposite side.**



**Side to machine**

Stepped hollow low speed shaft with shrink disc on **machine side** (interposed between gear reducer and machine); this design **facilitates** installation and removal and **affords** a notable increase in rigidity of keying, **reduces** the deformations of machine shaft end, **avoiding** the necessity of safety guards on the unit itself. Moreover, since deformability of keying area is greater ( $d - D_2 < d - D$ ) and friction area acts on a greater diameter ( $D_2 > D$ ), maximum transmissible torque increases by 18 – 25% compared to the solution with shrink disc on opposite side to machine.

For the shaft end of driven machine on which gear reducer stepped hollow low speed shaft must be keyed, it is possible to adopt both «long» and «short» shaft end of driven machine: dimensions as per table.

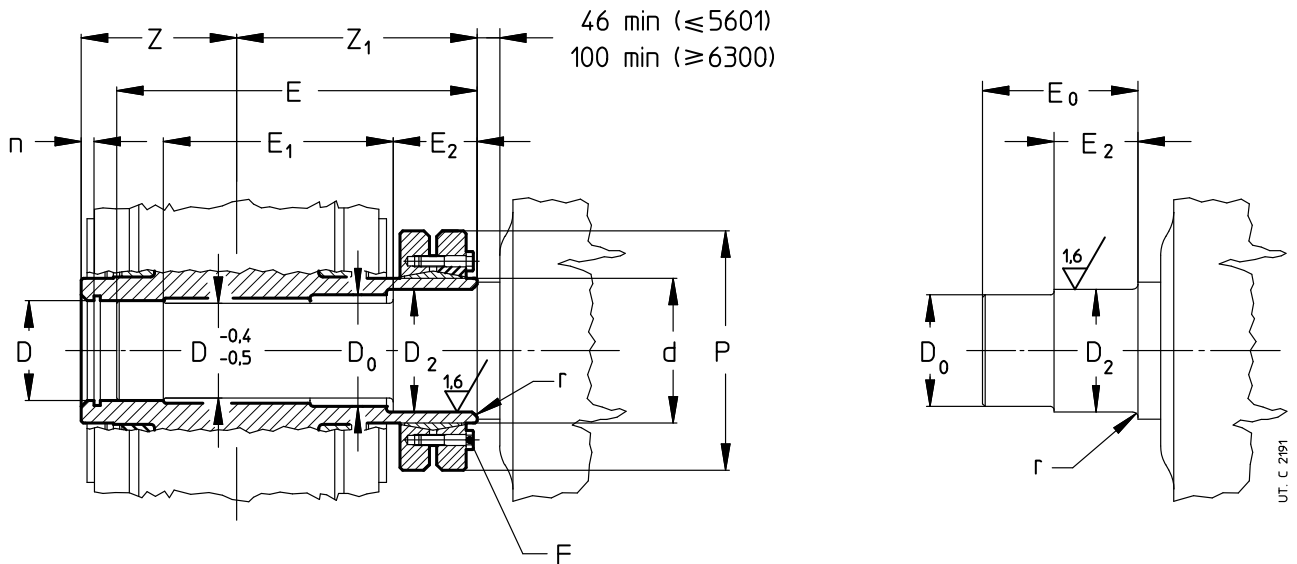
In the first case (fig. a), where the «long» shaft end of driven machine acts as a guide, mounting operations are facilitated.

In the second case (fig. b), the reduced axial dimension of the «short» shaft end of driven machine, limits the mounting and removing overall dimensions at the very least (consult us).

In both cases the rigidity and the resistance to bending and torsional stresses at the shaft end of driven machine do not change, since the only surface through which torque transmission occurs is the  $D_2$  one.

**IMPORTANT.** The shoulder diameter of the driven machine shaft end abutting with the gear reducer must be at least  $(1,18 - 1,25) \cdot D$ .

Possible gear reducer designs are given at ch. 8 and 10.



(a) Stepped hollow low speed shaft with locking assembly and «long» machine shaft end

(b) «Short» shaft end of driven machine (excluding sizes 7101, 8001)

Gear reducer size	D	D <sub>2</sub> **	D <sub>0</sub>	E	E <sub>0</sub>	E <sub>1</sub>	E <sub>2</sub>	F	M <sub>S</sub>	n	d	P	r	Z	Z <sub>1</sub>	M <sub>2SD</sub>	Δm	
	∅	∅	∅				1)	2)	3)		∅	∅				4)	kg	
	H7 / h6, j6								N m									
<b>4000, 4001</b>	210	220	215	754	307	446	165	130	M20 n. 14	490	14	260	430	5	330	463	285	-80
<b>4500, 4501</b>	230	240	232	768	342	434	180	130	M20 n. 14	490	14	280	460	5	330	477	363	-150
<b>5000, 5001</b>	260	270	265	935	380	565	200	165	M20 n. 16	490	16	320	520	6	410	570	501	-190
<b>5600, 5601</b>	290	300	295	958	428	538	225	180	M20 n. 16	490	16	360	590	6	410	593	658	-300
<b>6300, 6301</b>	325	335	330	1 063	475	603	250	200	M24 n. 18	840	18	400	660	7	460	653	938	-460
<b>7101</b>	360	370	-	1 335	-	774	327	327	M27 n. 28	1 250	20	460	770	7	551	840	1 700	-460
<b>8001</b>	400	410	-	1 548	-	879	400	400	M27 n. 34	1 250	20	530	910	8	626	978	2 160	-400

1) Values valid for **R 41**.

2) Screws UNI 5737-88 class 10.9.

3) Screw tightening torque.

4) Maximum torque value transmissible by shrink disc.

\*\* Each hollow shaft type (standard, stepped, with shrink disc) has a slightly oversized diameter **D** at the input to facilitate the assembly of gear reducer on machine shaft end: this, however, does not affect the connection reliability.

Supplementary description when ordering by **designation: hollow low speed shaft with shrink disc, on machine side.**

**(2) Hollow low speed shaft with keyway** (sizes 4000 ... 6301)

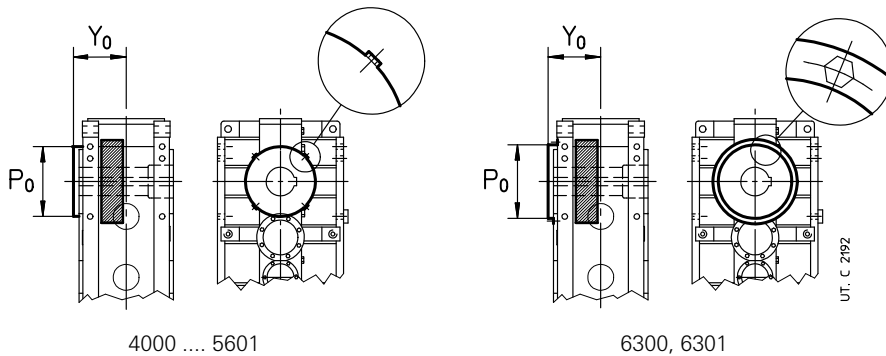
Hollow low speed shaft, normal (fig. a) or stepped (fig. b), with keyway. With required torque higher than table values, two keyways at 120° are necessary.

**Safety guards** made of steel on the area not used by hollow low speed shaft with keyway, supplied **as standard**. The safety guard is to be mounted on low speed wheel side (wheel opposite side for R 41; see also ch. 8 and 10).

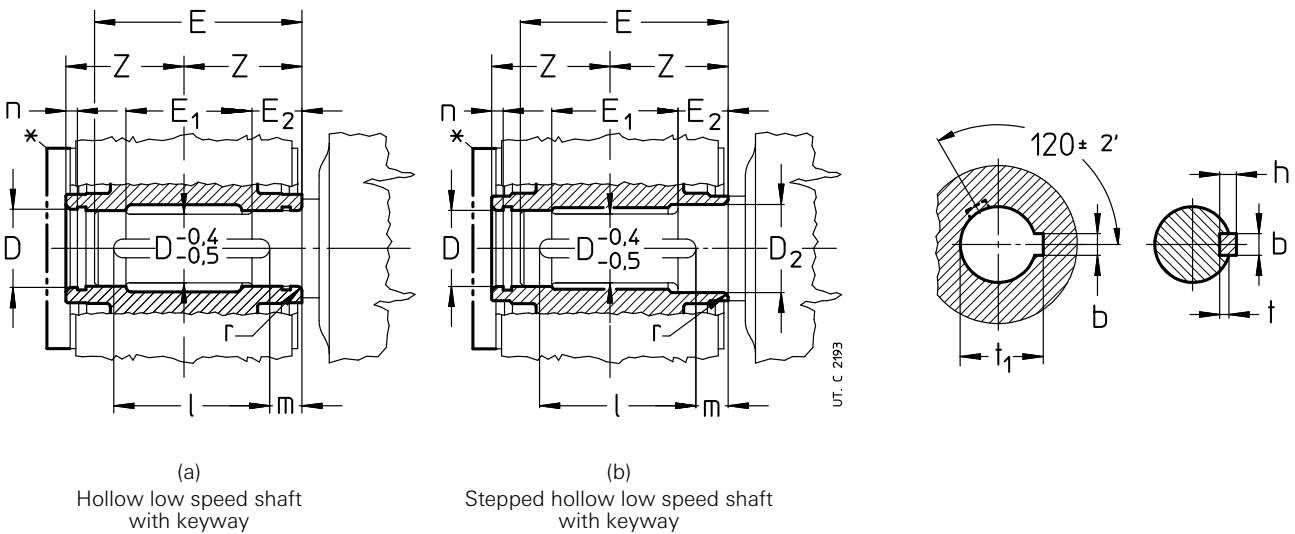
Hollow low speed shaft washer (see ch. 12 (5), available on request.

**Important:** the shoulder diameter of the driven machine shaft end abutting with the gear reducer must be at least  $(1,12 \div 1,18) \cdot D$  (with stepped hollow shaft  $(1,18 \div 1,25) \cdot D$ ).

Design not possible for sizes 7101 and 8001.



Gear reducer size	P <sub>0</sub> ∅	Y <sub>0</sub> ≈
<b>4000, 4001</b>	437	359
<b>4500, 4501</b>	479	362
<b>5000, 5001</b>	536	445
<b>5600, 5601</b>	598	445
<b>6300, 6301</b>	657	620



Gear reducer size	Hollow shaft				Shaft end of driven machine					Parallel key			Keyway			M <sub>2</sub> 2) kN m	Δm kg
	D** ∅ H7 / h6, j6	D <sub>2</sub> ** ∅	n	Z	E 3)	E <sub>1</sub> 3)	E <sub>2</sub> 1) 3)	m	r	b × h × l h9 h11	b H9 <sub>hub</sub> N9 <sub>shaft</sub>	t shaft	t <sub>1</sub> hub				
<b>4000, 4001</b>	200	210	14	330	620	300	165	130	10	5	45 × 25 × 600	45	15	210,4	<b>112</b>	-150	
<b>4500, 4501</b>	220	230	14	330	620	300	180	130	10	5	50 × 28 × 600	50	17	231,4	<b>140</b>	-240	
<b>5000, 5001</b>	250	260	16	410	775	400	200	165	13	6	56 × 32 × 750	56	20	262,4	<b>224</b>	-300	
<b>5600, 5601</b>	280	290	16	410	775	400	225	180	13	6	63 × 32 × 750	63	20	292,4	<b>250</b>	-420	
<b>6300, 6301</b>	310	320	18	460	870	400	250	200	15	7	70 × 36 × 840	70	22	324,4	<b>355</b>	-670	

1) Values valid for **R 41**.

2) Value of transmissible torque with keyway. For higher values, two keyways at 120° are necessary.

3) In presence of «Labyrinth seal and low speed shaft greaser» (ch. 12.(12)), it is necessary to increase E dimension (E<sub>2</sub>) by the A quantity stated in the table at ch. 12.(12).

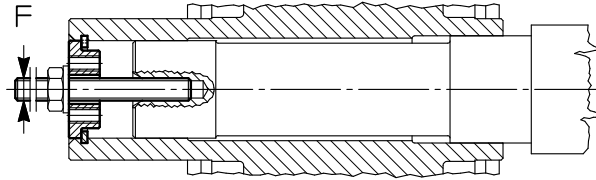
\* Hollow low speed shaft protection with keyway, as standard.

\*\* Each hollow shaft type (standard, stepped, with shrink disc) has a slightly oversized diameter **D** at the input to facilitate the assembly of gear reducer on machine shaft end: this, however, does not affect the connection reliability.

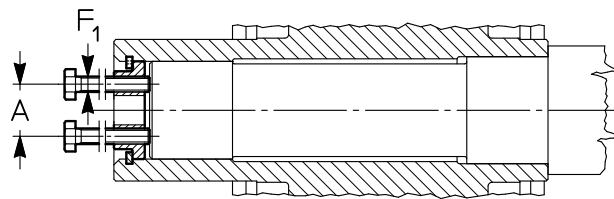
Supplementary description when ordering by **designation: hollow low speed shaft with keyway, hollow low speed shaft with two keyways, stepped hollow low speed shaft with keyway, stepped hollow low speed shaft with two keyways.**

**(3) Hollow low speed shaft washer**

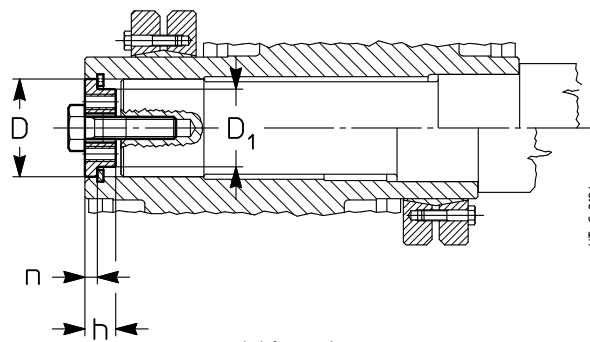
Washer, retaining ring and screw for axial fastening of gear reducer with hollow low speed shaft with shrink disc or with keyway.



installing



removing



axial fastening

Grandezza riduttore	A		D		D <sub>1</sub>		F	F <sub>1</sub>	h	n	Vite fissaggio assiale UNI 5737-88
		1)	∅	∅ 1)	∅	1)					
<b>4000, 4001</b>	144	134	210	200	180	170	M30	M24	34	14	M30 × 90
<b>4500, 4501</b>	164	144	230	220	200	190	M30	M24	34	14	M30 × 90
<b>5000, 5001</b>	178	168	260	250	225	215	M36	M30	40	16	M36 × 110
<b>5600, 5601</b>	208	198	290	280	255	245	M36	M30	40	16	M36 × 110
<b>6300, 6301</b>	228	218	325	310	285	270	M36	M30	45	18	M36 × 110
<b>7101</b>	228	–	360	–	319	–	M45	M36	50	20	M45 × 150
<b>8001</b>	268	–	400	–	359	–	M45	M36	50	20	M45 × 150

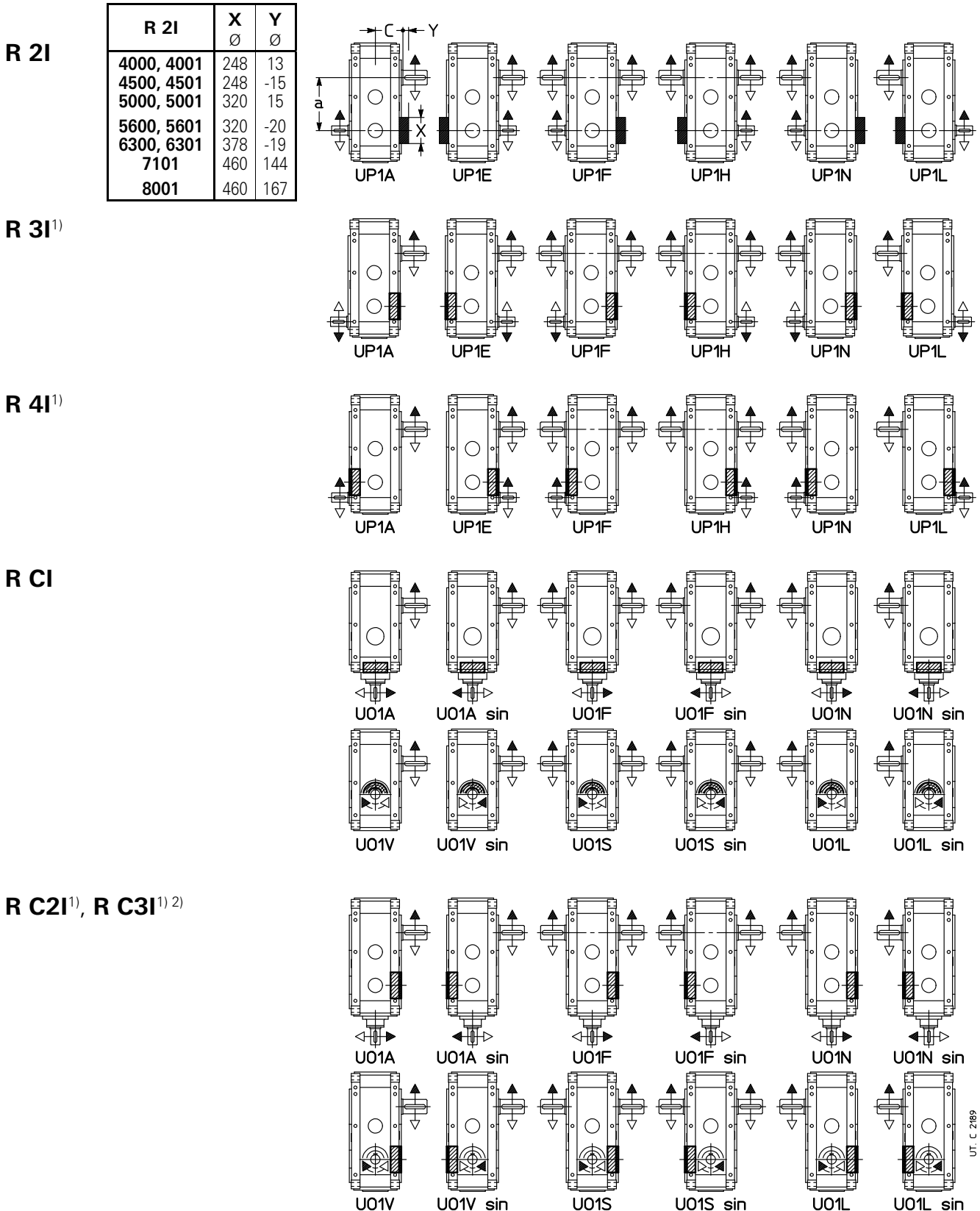
1) Dimension valid for design with hollow low speed shaft with keyway.

Supplementary description when ordering by **designation: hollow low speed shaft washer with shrink disc** or **hollow low speed shaft washer with keyway**.

**(4) Backstop device**

Backstop device (with centrifugal disjunction for size  $\geq 5000$ ) available for helical gear reducers with  $i_N \geq 12,5$  ( $i_N \geq 14$  for sizes 4500, 4501) and bevel helical gear reducers with  $i_N \geq 12,5$  ( $i_N \geq 14$  for sizes 4500, 4501). The maximum overload capacity of device is equal to  $2 \cdot M_{2BS}$  (see table).

Possible configurations and designs are stated in the following figures.



1) Backstop device does not project from dimension **C**.

2) Designs U01V ... U01L sin not possible for train of gears C3I.

## 12 - Accessories and non-standard designs

### Backstop device load capacity

Low speed shaft nominal torque of backstop device when this is lower than  $M_{N2}$  of gear reducer (see ch. 7, 9). Maximum permissible overload equal to  $1,7 \cdot M_{2BS}$ .

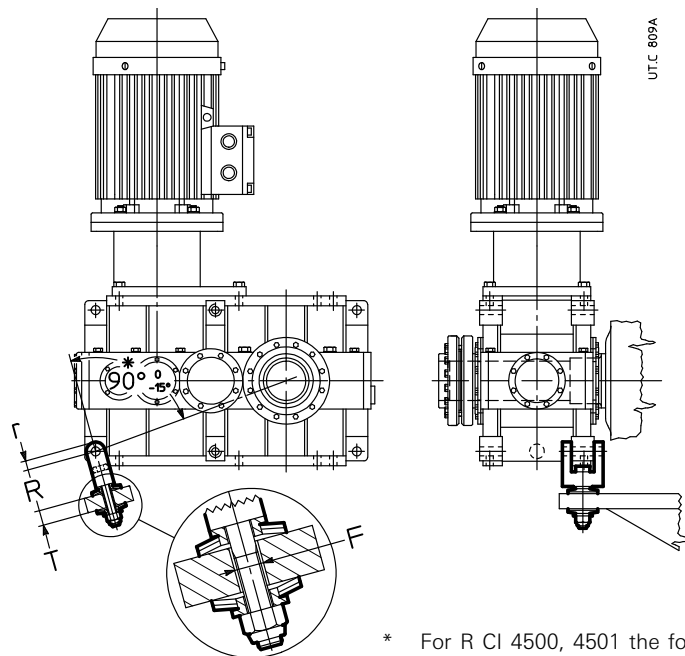
Rotismo	$i_N$	$M_{2BS}$ [kN m]					
		4001	4501	5001	5601	6301	7101
<b>3I</b>	25	95	–	–	–	–	630
	28	112	112	224	224	335	–
	31,5	–	125	–	250	375	–
	35,5	112	140	224	280	335	–
	40	–	125	–	–	375	–
	45	–	140	–	280	–	–
<b>4I</b>	$\leq 250$	–	140	–	280	–	–
<b>C2I</b>	20	95	–	–	–	–	–
	22,4	112	112	224	–	–	–
	25	–	125	–	250	–	–
	28	112	140	224	–	–	–
	31,5	–	125	–	250	–	–
	35,5	–	140	–	280	–	–

Supplementary description when ordering by **designation: backstop device, white or black arrow free-rotation.**

### (5) Reaction bolt using disc springs (sizes 4000 ... 6301)

Reaction bolt using disc springs with fork for shaft mounting of motor - coupling - gear reducer group (see ch. 13); available also the only reaction bolt using disc springs: consult us.

Design not possible for sizes 7101 and 8001.



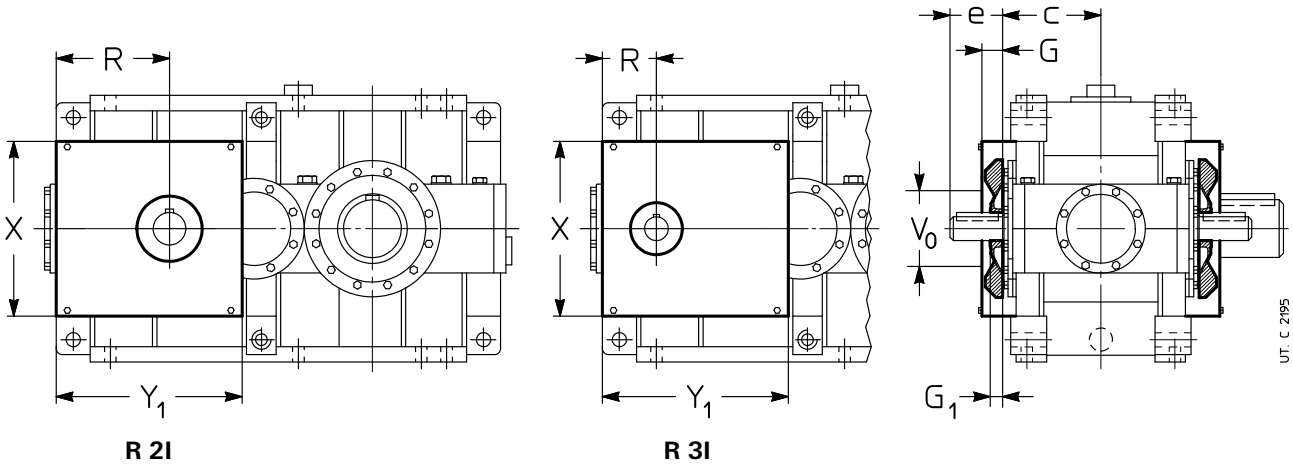
\* For R CI 4500, 4501 the fork axes is perpendicular to the housing split plane.

Gear reducer size	Screw UNI 5737-88	Disc spring DIN 2093	T	F Ø	R	r
<b>4000 ... 4501</b>	M45 × 260	A 125 n. 2	55	50	211	50
<b>5000 ... 5601</b>	M56 × 300	A 160 n. 2	70	62	274	60
<b>6300, 6301</b>	M56 × 300	A 160 n. 3	70	62	284	60

Supplementary description when ordering by **designation: reaction bolt using disc springs and fork.**

**(6) Fan cooling**

The **helical** gear reducers **R 2I 4000 ... 5601** and **R 3I 4000 ... 6301** can be supplied with **one** or **two** cooling fans keyed on high speed shafts. For dimensions **e**, and **c** see ch. 8.  
For sizes 7101 and 8001, consult us.

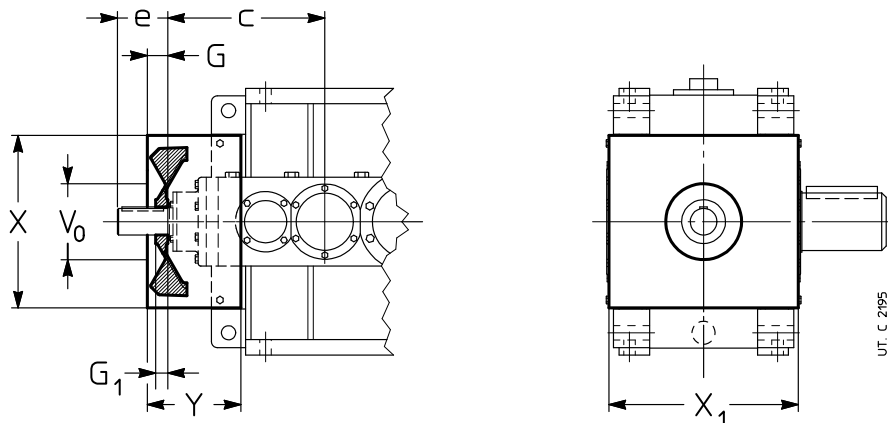


Gear reducer size	2I		3I			X	Y <sub>1</sub>
	G 1)	G <sub>1</sub> 2)	R	V <sub>0</sub> ∅	G <sub>1</sub> 2)		
<b>4000 ... 4501</b>	63	50	363	220	40	590	633
<b>5000 ... 5001</b>	75	50	453	290	50	740	795
<b>6300, 6301</b>	75	—	—	—	50	880	980

- 1) Bolts projecting 6 mm from **G** dimension.
- 2) The high speed shaft end length is equal to **e - G<sub>1</sub>**.

The **bevel helical** gear reducers of size and train of gears **stated in the table** can be supplied fitted with **one** fan keyed on the high speed shaft. For dimensions **e** and **c** see ch. 10.  
For sizes 7101 and 8001, consult us.

**12**



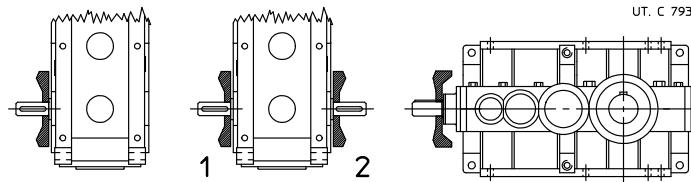
Gear reducer size		G	G <sub>1</sub>	V <sub>0</sub> ∅	X	X <sub>1</sub>	Y
<b>C1</b>	<b>4000 ... 4501</b>	80	40	280	590	640	345
	<b>4000 ... 4501</b>	72	47	220	590	640	310
<b>C2I</b>	<b>5000 ... 5601</b>	80	40	290	740	800	380
	<b>6300, 6301</b>	80	40	290	880	872	330
<b>C3I</b>	<b>6300, 6301</b>	<i>i<sub>N</sub> = 160</i>	57	32	220	880	872

- 1) Bolts projecting 6 mm from dimension **X<sub>1</sub>** each side.
- 2) The high speed shaft end length is equal to **e - G<sub>1</sub>**.

## 12 - Accessories and non-standard designs

With double extension high speed shaft designs both extensions are **accessible** even with fan: personnel safety-guards are the Buyer's responsibility (2006/42/EEC).

The possible designs and the position of fans are shown below.



Temperature of cooling air must not exceed ambient temperature.

Also available independent cooling unit with heat exchanger (see ch. 12 (10)); consult us for verification.

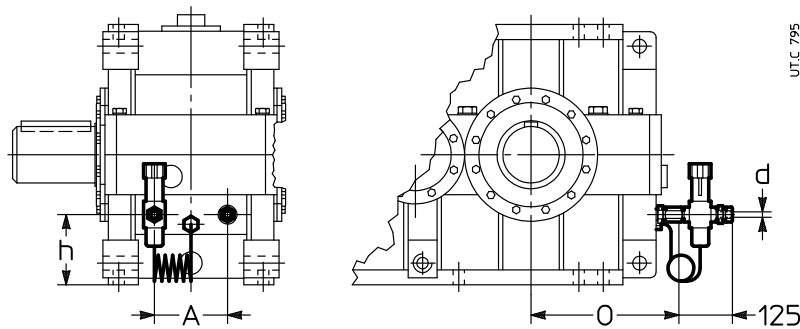
Supplementary description when ordering by **designation: fan cooling**; in designs with double extension high speed shaft state – only for helical gear reducers – if pos. **1** or **2** or ... **with 2 fans**

### (7) Water cooling by coil (sizes 4000 ... 6301)

Coil made of copper alloy for gear reducer water cooling. On request, available also stainless steel coil (AISI 316) or cupro-nickel, consult us.

Design not possible for vertical mounting positions (V5, V6) with low speed shaft wheel positioned on the bottom.

Design not possible for sizes 7101 and 8001.



Gear reducer size	A	d Ø	h	O
<b>4000 ... 4501</b>	180	16	250	472
<b>5000 ... 5601</b>	225	16	310	577
<b>6300, 6301</b>	280	16	320	647

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Cooling water specifications:

- be not too hard;
- be at max temperature 20 °C;
- capacity 10 – 20 dm<sup>3</sup>/min;
- pressure 0,2 – 0,4 MPa (2 – 4 bar).

A polished metallic pipe (with external diameter **d** stated on table) is sufficient for the connection.

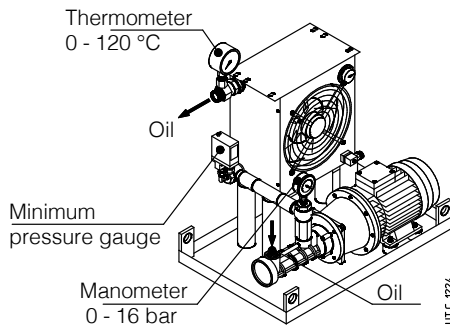
The load loss of coil, according to capacity and water pressure, is approximately 0,6 – 0,8 bar.

On request **thermostatic valve** which, automatically and without auxiliary supply need, permits water circulation when gear reducer oil reaches the set temperature; the valve sensor is equipped with immersion bulb. Mounting and setting, adjustable within 50 – 90 °C, are Buyer's responsibility.

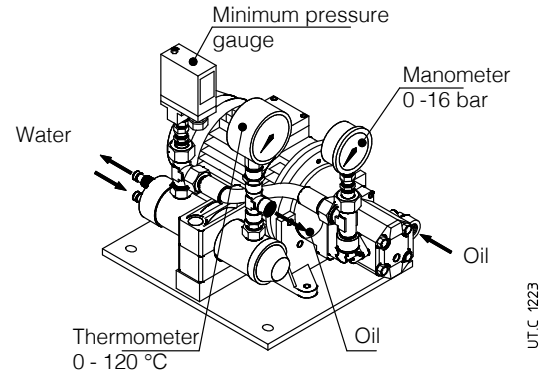
For ambient temperature lower than 0 °C consult us.

Supplementary description when ordering by **designation: water cooling by coil** or **water cooling by coil and thermostatic valve**.

**(8) Independent cooling unit**



**Oil/Air**



**Oil/Water**

Additional cooling device in the event that the other forced cooling systems are not sufficient anymore for the dissipation of thermal power produced by gear reducer during operation (see ch. 4).

Including:

- one **oil/air heat exchanger** (O/A; with thermostat and adjustable control knob 0 – 90 °C) or **oil/water heat exchanger** (O/W),
- one **motor pump**: screw pump with fluoro rubber seals (gear pump for UR O/W4 – UR O/W 21); 4 pole motor B3/B5 (three-phase Δ230 Y400 V 50 Hz); motor-pump connection with coupling;
- one **motor fan** (O/A) (three-phase supply Δ230 Y400 V 50 Hz or single phase supply 230 V 50, 60 Hz, see table on following page); 2 poles motor (UR O/A 5 and 7) and 4 poles motor (UR O/A 10 ... 46);
- one **analog manometer** (0 – 16 bar) mounted between pump and exchanger;
- one **analog thermometer** (0 – 120 °C) mounted at exchanger output;
- one **minimum pressure gauge** (with exchange contacts) mounted between pump and exchanger;
- one **supporting frame** with nameplate.

On request, several accessories are at disposal (supplied separately, assembly is Customer's responsibility) in order to satisfy all functionality and safety needs.

- **oil temperature probe Pt100**;
- **2-threshold signalling device CT03N** (necessary also the oil temperature probe Pt100) for the mounting on rail to DIN EN 50022;
- **3-threshold signalling device CT10N** (necessary also the oil temperature probe Pt100) for the mounting on rail to DIN EN 50022;
- **bi-metal type thermostat**;
- **flow gauge**;
- **filter** (with optical-electric blockage warning and one or two breathers M60).

Connections realized by flexible pipes (type SAE 100 R1, maximum length 2 m) between gear reducer and cooling unit and the assembly of accessories and signalling devices are Buyer's responsibility.

For the heat exchanger power required by the independent cooling unit:

$$P_s \geq (P_1 - P_{t_N} \cdot f_{t_1} \cdot f_{t_2} \cdot f_{t_3} \cdot f_{t_4}) \cdot (1 - \eta) \cdot K_1$$

where:

- $P_s$  nominal power of unit [kW], i.e. the power dissipated with hot oil at approx. 80 °C and cooling air at 40 °C (O/A) or cooling water at °C (O/W) with stated capacity (see following table);
- $P_1$  power at gear reducer input [kW] (consider the power installed when being uncertain about the power absorbed).
- $P_{t_N}$  nominal thermal power of gear reducer [kW] (see ch. 4);
- $f_{t_1}$  thermal factor according to input speed (see ch. 4);
- $f_{t_2}$  thermal factor according to ambient temperature (see ch. 4);
- $f_{t_3}$  thermal factor according to mounting position (see ch. 4);
- $f_{t_4}$  thermal factor according to altitude (see ch. 4); for UR O/A it is necessary to derate also the exchanger power: multiply  $P_s$  by 0,85 (by 1 000 – 2 500 m above sea level) or by 0,71 (by 2 500 – 5 000 m above sea level);
- $\eta$  gear reducer efficiency (see ch. 6);
- $K_1 = 1,18$  takes into account the decrease of the exchanger efficiency due to dirt on the external surface

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## 12 - Accessories and non-standard designs

Designation	Ps kW	Exchanger	Oil motor pump		Motor fan		Oil connections		Exchanger capacity dm <sup>3</sup>	Weight kg		
			motor 3~ kW	load dm <sup>3</sup> /min	motor kW	load m <sup>3</sup> /h	Intake	delivery				
UR O/A 5	5	AP 300E	1,5	30	0,12	1~	900	1" (1"1/4) <sup>2)</sup>	1" (1"1/4) <sup>2)</sup>	2	60	
UR O/A 7	7	AP 300/2E			0,12	1~				1300	3,6	65
UR O/A 10	10	AP 430E			0,21	3~				2750	3,6	70
UR O/A 13	13	AP 430/2E	2,2	56	0,18	3~	2700	1" 1/4	1" 1/2 (1") <sup>1)</sup>	5,5	75	
UR O/A 16	16	AP 580 EB			0,18	3~				3500	15	96
UR O/A 21	21	AP 680 EB			0,69	3~				6300	16	118
UR O/A 26	26	AP 730 EB			0,69	3~				7450	16	127
UR O/A 30	30				0,69	3~				7450		
UR O/A 40	40	AP 830 EB			0,81	3~				9500	20	140
UR O/A 46	46		3	80	0,81	3~	9500					

Designation	Ps kW	Exchanger	Oil motor pump		Water		Oil connections		Exchanger capacity dm <sup>3</sup>	Weight kg
			motor 3~ kW	load dm <sup>3</sup> /min	load dm <sup>3</sup> /min	connect.	Intake	delivery		
UR O/W 4	4	T60CB1	0,37	16	≥ 8 (≤ 30)	Ø 12	G 1/2"	G 1/2"	0,4	13
UR O/W 6	6	T60CB2	0,37	16	≥ 10 (≤ 30)	Ø 12			0,6	15
UR O/W 9	9	T80CB2	0,55	16	≥ 16 (≤ 30)	Ø 12			1	18
UR O/W 13	13	MS84P2	1,1	30	≥ 25 (≤ 45)	G 1/2"	G 3/4"	G 3/4"	1	31
UR O/W 21	21	MS134P1	1,5	30	≥ 40 (≤ 110)	G 1"			3	44
UR O/W 31	31	MS134P1	2,2	56	≥ 50 (≤ 110)	G 1"	G 1"1/4	G 1"1/4	3	55
UR O/W 50	50	MS134P2	3	80	≥ 80 (≤ 110)	G 1"			4,5	70

### Starting mode and necessary accessories

Ref.	Gear reducer lubrication systems	Gear reducer starting mode	T <sub>amb</sub> °C	Necessary accessories	Type of oil required	Description and notes
A1	Splash lubrication	Without oil pre-heating	-25 – 25	Pt100 + CT10N	Mineral oil or synthetic oil (to be preferred)	<b>Gear reducer starting and following warm oil motor pump starting</b> The motor pump is piloted by a <b>three threshold</b> signalling system of oil temperature (Pt100 + CT10N). Calibrate the three threshold device CT10N with: – switching threshold at 60 °C (motor pump starting); – reset threshold at 40 °C; – safety threshold at 90° C.
A2	Splash lubrication	Without oil pre-heating	> 25	–	Polyalphaolephine based synthetic oil	<b>Simultaneous starting of gear reducer and motor pump</b> Oil filter not possible <sup>4)</sup> .
B1	Forced lubrication (bearings and/or gears)	With oil pre-heating	-250 – 25	Pt100 + CT03N Pt100 + CT10N Heater	Mineral oil or synthetic oil (to be preferred)	<b>Simultaneous starting of gear reducer and motor pump after oil pre-heating</b> <sup>3)</sup> The heater is piloted by the <b>two threshold</b> oil temperature signalling system (Pt100 + CT03N). The motor pump and the gear reducer motor are piloted by a further <b>three threshold</b> oil temperature signalling device (Pt100 + CT10N). Calibrate the two threshold device CT03N with: – switching threshold at 50 °C (heater supply shut off); – reset threshold at 30 °C; Calibrate the three threshold device CT10N with: – operating threshold at 30 °C (motor pump and gear reducer starting); – reset threshold at 10 °C; – safety threshold at 90 °C.
B2	Force lubrication (bearings and/or gear units)	Without oil pre-heating	> 25	–	Polyalphaolephine based synthetic oil	<b>Simultaneous gear reducer and motor pump starting</b> <sup>3)</sup> Oil filter not possible <sup>4)</sup> .

1) Connection for UR O/A 16 delivery.

2) Connection for the delivery in case of filter.

3) It's advisable to delay the starting of gear reducer after the motor pump starting by 1 min at least.

4) The present of the oil filter requires that cooling unig starting is with warm oil: refer to cases A1 or B1.


Additional description when ordering by **designation**:

**independent oil-air cooling unit UR O/A ...** or **independent oil-air cooling unit UR O/W ...**, possibly integrated, when required by the application, with the description: «**Forced lubrication ...**» and the statement of bearings and/or gears to be lubricated.

For dimensions, accessories and further technical details, see specific literature.

**(9) Forced bearing lubrication**

All gear reducers according to train of gears, design, transmission ratio, mounting position, input speed and duty cycle can be equipped with a non-oil-bath forced bearing lubrication system through **internal piston pump** (size 4000 ... 4501) or external **lubrication system with motor pump** (see ch. 6).

The following table indicates the cases (see  at ch. 8, 10) where – **according to the only mounting position** and for continuous duty – it is necessary to foresee the bearing lubrication. For other operating conditions, consult us.

Train of gears	Performance	Presence of <b>lubrication pump</b>					
		Mounting position					
		<b>B3</b>	<b>B6</b>	<b>B7</b>	<b>B8</b>	<b>V5</b>	<b>V6</b>
<b>2I</b>	<b>all</b>	–	–	–	n.a.	P	P
<b>3I</b>	<b>all</b>	–	–	–	n.a.	P	P
<b>4I</b>	<b>all</b>	–	–	–	n.a.	P	P
<b>CI</b>	<b>U01A ... U01N sin</b>	–	P	–	n.a.	P	P
	<b>U01H ... U01M sin</b>	P	P	–	n.a.	P	P
	<b>U01V ... U01L sin</b>	P	–	–	–	P	P
<b>C2I</b>	<b>U01A ... U01N sin</b>	–	P	–	n.a.	P	P
	<b>U01H ... U01M sin</b>	P	P	–	n.a.	P	P
	<b>U01V ... U01L sin</b>	P	–	–	–	P	P
<b>C3I</b>	<b>all</b>	–	P	–	n.a.	P	P

- Forced bearing lubrication not necessary.
- P Forced bearing lubrication necessary (with pump or motor pump).
- n.a. Mounting position not foreseen.

For cases highlighted with **▲** ch. 7 and 9, foresee the lubrication with **motor pump** and possible heat exchanger (see ch. 4, 6, 12 (10)).

**IMPORTANT.** For the running at cold starting ( $T_{ambient} = T_{oil} \leq 25\text{ °C}$ ) and lubrication systems (see also ch. 6 and 12 (11)), **always foresee the oil heater** (see ch. 12 (12)).

In general, when the maximum system reliability is required, in presence of particularly heavy load cycles or hard ambient conditions, it is recommended to evaluate the possibility to install anyway the bearing lubrication motor pump; consult us.

Supplementary description when ordering by **designation: bearing lubrication pump** or **bearing lubrication motor pump**.

**12**

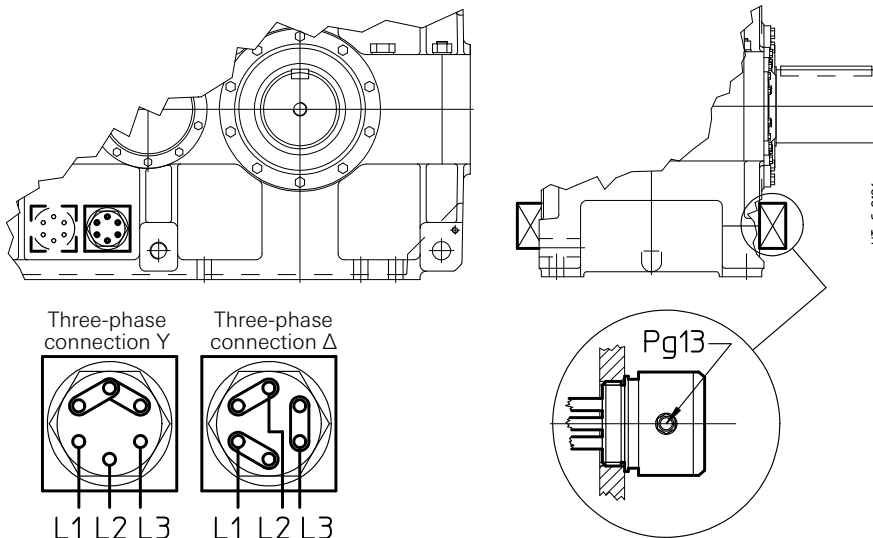
**(10) Oil heater**

Oil heater for gear reducer starting at low ambient temperature.

Specify the design «Oil temperature probe» together with this design.

The heater is piloted through proper control device (at customer's care e.g.: PLC or supplied by Rossi e.g. 2-threshold signalling device CT03N or three-threshold signalling device CT10N) releasing when achieving the pre-set oil temperature.

**IMPORTANT.** The data stated in the table refer to mounting positions **B3**; for other mounting positions, consult us.



Gear reducer size	<b>P</b> kW
<b>4000, 4001</b>	n. 2 × 1,5
<b>4500, 4501</b>	n. 2 × 1,5
<b>5000, 5001</b>	n. 2 × 3
<b>5600, 5601</b>	n. 2 × 3
<b>6300, 6301</b>	n. 2 × 3,5
<b>7101</b>	n. 2 × 7,5
<b>8001</b>	n. 2 × 9

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## 12 - Accessories and non-standard designs

The design can be not compatible with other designs, consult us.

Features:

- specific power 2W/cm<sup>2</sup>;
- three-phase supply Δ230 Y400 V 50-60 Hz;
- stainless steel resistors AISI 321;
- metallic terminal box; cable gland Pg13; protection IP 65;
- Horizontal mounting with oil bath lubrication;
- max oil temperature 90°C;
- threaded brass joint G 2"½;
- available also in explosion-proof design ATEX II 2G EExd IIC T4: consult us.

Available also in a version equipped with integrated thermostat.

Supplementary description when ordering by **designation: oil heater** or **oil heater with thermostat**.

### (11) Special painting cycles

Special painting cycles (base color blue RAL 5010), see following table, according to corrosivity class of operating environment. Other protections or colors on request: consult us.

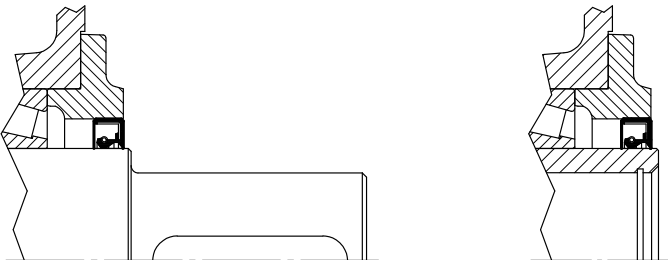
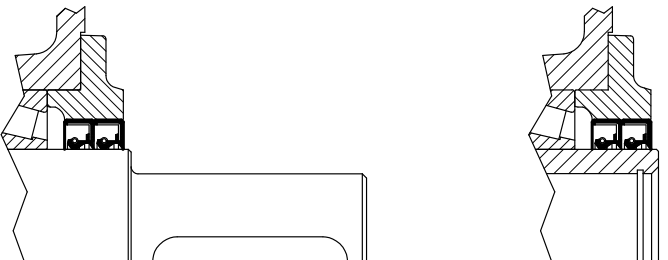

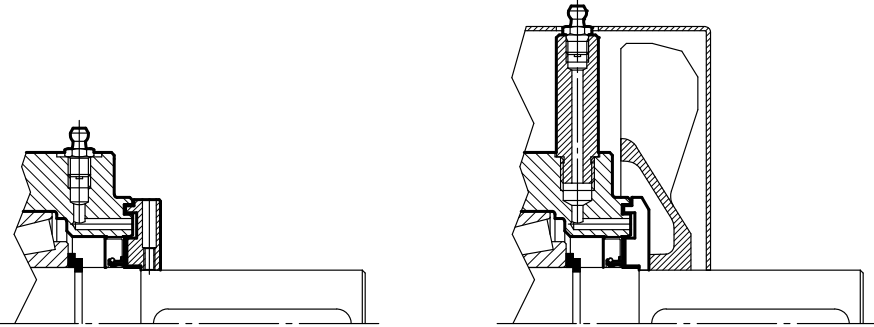
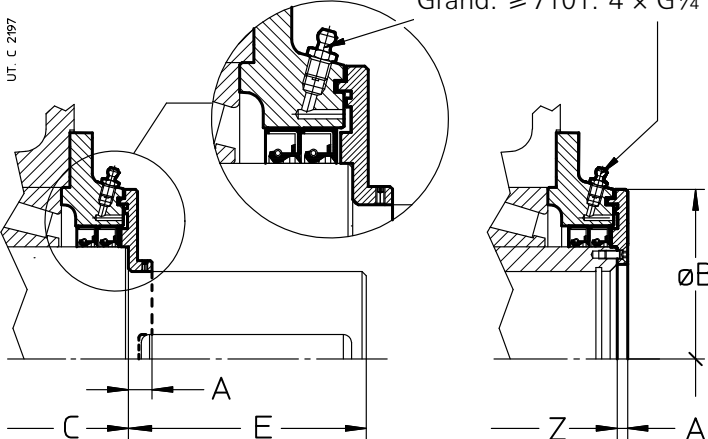
Application field	Features	Corrosivity class ISO 12944-2	Durability classes ISO 12944-2	Description	Average final thickness on machined parts µm	Code
<b>Applications in aggressive environments</b>	Good resistance to atmospheric and aggressive agents	C4	Low	Dual-compound epoxy primer + Water-soluble dual-compound enamel with acrylic-polyurethan resins	150	<b>1HRAL5010</b> (blue)
			Medium	Dual-compound epoxy primer (x 2) + Water-soluble dual-compound enamel with acrylic-polyurethan resins	200	<b>2HRAL5010</b> (blue)
			High	Dual-compound epoxy primer (x 4) + Water-soluble dual-compound enamel with acrylic-polyurethan resins	300	<b>3HRAL5010</b> (blue)
<b>Outdoor applications in saline environment</b>  1)	Excellent resistance to atmospheric and aggressive agents Outdoor applications in saline environment	C 5 - M	Medium	Sanding + Dual-compound antirust primer with zinc phosphates + Dual-compound epoxy primer + Water-soluble dual-compound enamel with acrylic-polyurethan resins	300	<b>2IRAL5010</b> (blue)
<b>Outdoor applications in chemically aggressive environment and high humidity industrial areas</b>  1)	Excellent resistance to atmospheric and aggressive agents Outdoor applications in chemically aggressive environment (fertilizers, etc.)	C 5 - I	Medium	Sanding + Dual-compound antirust primer with zinc phosphates + Dual-compound epoxy primer + Water-soluble dual-compound enamel with epoxy resins	300	<b>2LRAL5010</b> (blue)

1) In these cases, according to the application type, it is advised to adopt specific construction measures and accessories/components able to offer an adequate protection for the installation environment: consult us.

Supplementary description when ordering by **designation: special paint ...** (see code stated in the table; e.g.: «**special painting cycle 2HRAL5010**»).

**(12) High and low speed shaft seals**

Available seal types (standard and on request) on high and low speed shafts are stated in the following table.

Seal type	Scheme																																		
<p>Standard</p>																																			
<p><b>Double seal on high speed shaft</b> Quite polluting environment and/or outdoor</p>																																			
<p><b>Low speed shaft double seal</b> Quite polluting environment and/or outdoor</p>	 <p>Supplementary description when ordering by <b>designation:</b> <b>double seal on high speed shaft.</b> <b>double seal on low speed shaft.</b></p>																																		
<p><b>High speed shaft seal with labyrinth and grease feeder («taconite»)</b> Very polluting environment (e.g.: mining industry)</p>	 <p>Supplementary description when ordering by <b>designation:</b> <b>high speed shaft seal with labyrinth and grease feeder.</b></p>																																		
<p><b>Low speed shaft double seal with labyrinth and grease feeder («taconite»)</b> Very polluting environment (e.g.: mining industry)</p> <p>1)</p>	<p>Grand. <math>\leq 6301</math>: <math>2 \times G\frac{1}{4}</math>" Grand. <math>\geq 7101</math>: <math>4 \times G\frac{1}{4}</math>"</p>  <table border="1"> <thead> <tr> <th rowspan="2">Grandezza riduttore</th> <th colspan="2">A</th> <th rowspan="2">B Ø</th> </tr> <tr> <th>1)</th> <th>2)</th> </tr> </thead> <tbody> <tr> <td>4000, 4001</td> <td>19</td> <td>9</td> <td>328</td> </tr> <tr> <td>4500, 4501</td> <td>19</td> <td>9</td> <td>368</td> </tr> <tr> <td>5000, 5001</td> <td>19</td> <td>11</td> <td>402</td> </tr> <tr> <td>5600, 5601</td> <td>22</td> <td>11</td> <td>462</td> </tr> <tr> <td>6300, 6301</td> <td>24</td> <td>13</td> <td>496</td> </tr> <tr> <td>7101</td> <td>0</td> <td>10</td> <td>653</td> </tr> <tr> <td>8001</td> <td>0</td> <td>10</td> <td>759</td> </tr> </tbody> </table> <p>Supplementary description when ordering by <b>designation:</b> <b>low speed shaft seal with labyrinth and grease feeder.</b></p>	Grandezza riduttore	A		B Ø	1)	2)	4000, 4001	19	9	328	4500, 4501	19	9	368	5000, 5001	19	11	402	5600, 5601	22	11	462	6300, 6301	24	13	496	7101	0	10	653	8001	0	10	759
Grandezza riduttore	A		B Ø																																
	1)	2)																																	
4000, 4001	19	9	328																																
4500, 4501	19	9	368																																
5000, 5001	19	11	402																																
5600, 5601	22	11	462																																
6300, 6301	24	13	496																																
7101	0	10	653																																
8001	0	10	759																																

1) The labyrinth disc overhangs from A dimension and from shaft shoulder; the working length of low speed shaft end will be therefore equal to E - A (for dimension C and E see ch. 8 and 10); for dimension Z see ch. 12 (1), (3).  
2) Values valid for hollow shaft (with keyway or shrink disc).

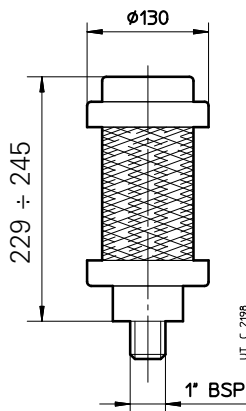
## 12 - Accessories and non-standard designs

Notes.

- Acrylonitrilic seal ring compound as standard; fluoro compound seal rings are available on request (e.g.: for high temperatures, for aggressive environments or for high rotation speeds, etc.); specify in the designation: **fluoro compound seal**.
- The **high speed shaft double seal** is usually **not advised** as the increased heating reduces the seal life.
- In case of **double seal**, the external seal ring can be mounted on the contrary (e.g. water jets); specify in the designation: **external ring mounted on the contrary**.
- The design **high speed shaft seal with labyrinth and greaser** can be supplied only after technical feasibility evaluation by Rossi: consult us.
- The **hollow shaft with shrink disc** (see ch. 12 (1)) can be supplied with **labyrinth seal** only on shrink disc **opposite side**.

For the supplementary description when ordering by **designation**, see table on the previous page.

### (13) Desiccant breather



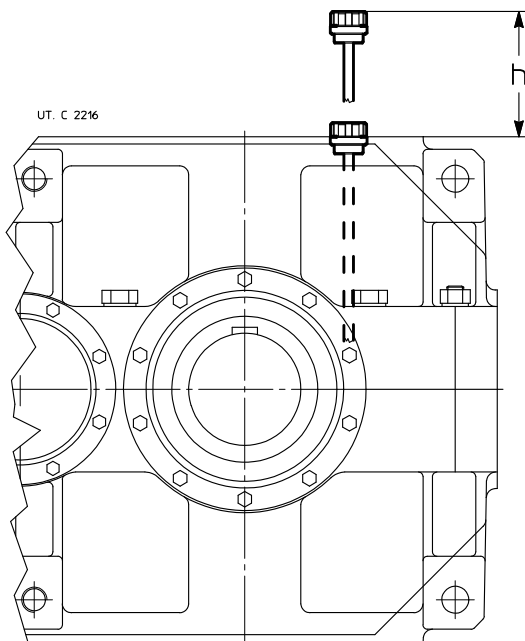
Desiccant breather with 3 stage filtration design: solid contaminant filter 2 µm, water vapor adsorbent bed in silica gel, activated carbon final filter. This filter traps water vapor and solid contaminant particles and keeps them from entering the gear box and simultaneously holds oil vapors inside the gear box.

Key features:

- replacement cartridge with true-life indicator of filter conditions
- alkali, oil, non-oxidizing acids, salt water and mineral and synthetic oils resistant;
- shock resistant cover and housing
- temperature range of application: -28 °C – +93 °C.

Supplementary description when ordering by **designation**: **Desiccant breather**

### (14) Oil level plug with dip stick

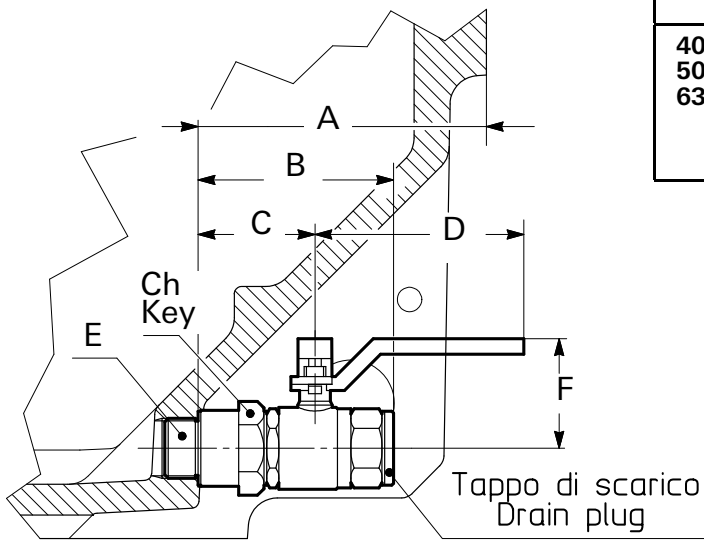


Grandezza riduttore	h ≈		
	2I, CI	3I, C2I	4I, C3I
<b>4000, 4001</b>	630	630	560
<b>4500, 4501</b>	710	630	560
<b>5000, 5001</b>	800	800	710
<b>5600, 5601</b>	900	800	710
<b>6300, 6301</b>	1000	900	800
<b>7101</b>	1120	1000	900
<b>8001</b>	1250	1120	1000

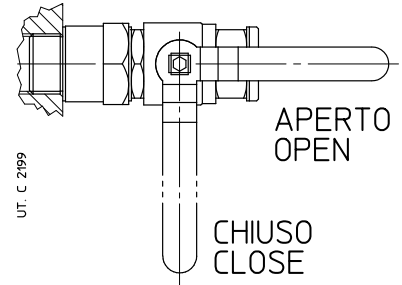
The data stated in the table refer to mounting position **B3** and **splash lubrication**. For further details about operating conditions, consult us.

Supplementary description when ordering by **designation**: **Oil level with dip stick**

**(15) Oil drain tap**

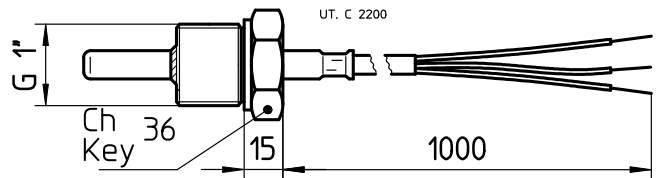
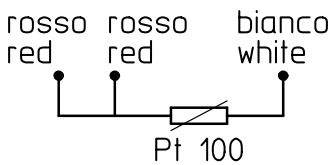


Gear reducer size	A	B	C	D	Ch Key	E	F
<b>4000, 4501</b>	158	106	66	115	46	G1"	60
<b>5000, 5601</b>	208	106	66	115	46	G1"	60
<b>6300, 6301</b>	190	106	66	115	46	G1"	60
<b>7101</b>	225	158	95	138	55	G1"¼	75
<b>8001</b>	280	170	102	158	60	G1"½	91



In a closed position, the tap lever does not overhang from gear reducer.  
 Additional description when ordering by **designation: oil drain tap**

**(16) Oil temperature probe**



Remote oil temperature gauge; installation instead of drain plug, or into a hole properly pre-arranged by the Buyer. The temperature gauge is realized with a thermo-resistor Pt100 having following features:

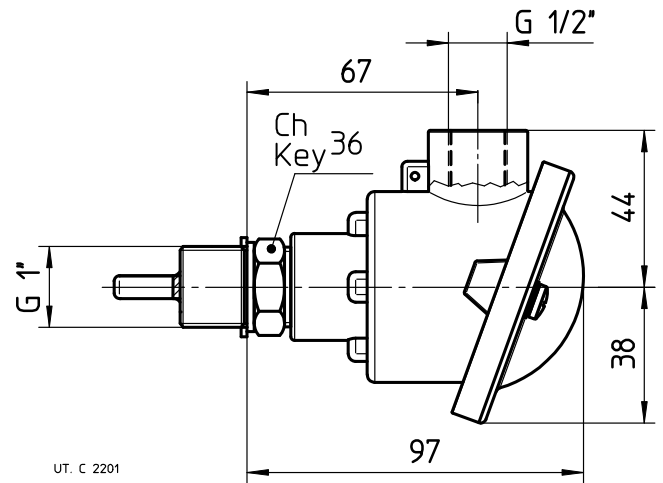
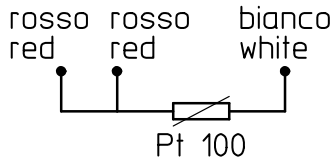
- platinum wire with 100 Ω at 0 °C according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °C – 200 °C;
- current max 3 mA;
- 3 wire connection according to IEC 751 (see fig. on the top);
- stainless steel probe AISI 316; diameter 6 mm;
- cable 1 m long with free end.

For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable ≥ 1,5 mm<sup>2</sup> positioned separately from power cables.

In case of gear reducer supplied **filled with oil** foresee the probe equipped with **immersion bulb** (pre-mounted in the factory), its position is to be agreed with Rossi; consult us.

Supplementary description when ordering by **designation: oil temperature probe**.

**(17) Oil temperature probe with terminal box and ammetric transducer 4 ÷ 20 mA**



Remote oil temperature gauge, with terminal box and ammetric transducer; installation instead of drain plug or in a hole properly prearranged, at Buyer's responsibility. The temperature gauge is realized with a thermo-resistor Pt100 having following features:

- platinum wire with 100  $\Omega$  at 0 °C according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °C – 200 °C;
- 3 wire connection according to IEC 751 (see fig. on the top);
- stainless steel probe AISI 316; diameter 6 mm;
- ammetric transducer with output signal 4 – 20 mA;
- aluminium terminal block (supplied without cable gland);
- IP65 protection;
- input cables G 1/2'';

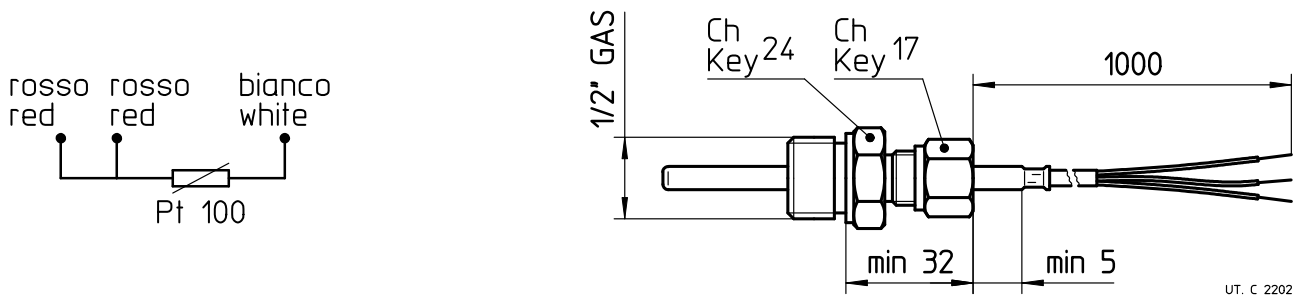
For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable  $\geq 1,5 \text{ mm}^2$  positioned separately from power cables.

**ATTENTION.** Accessory available only after technical feasibility evaluation by Rossi: consult us.

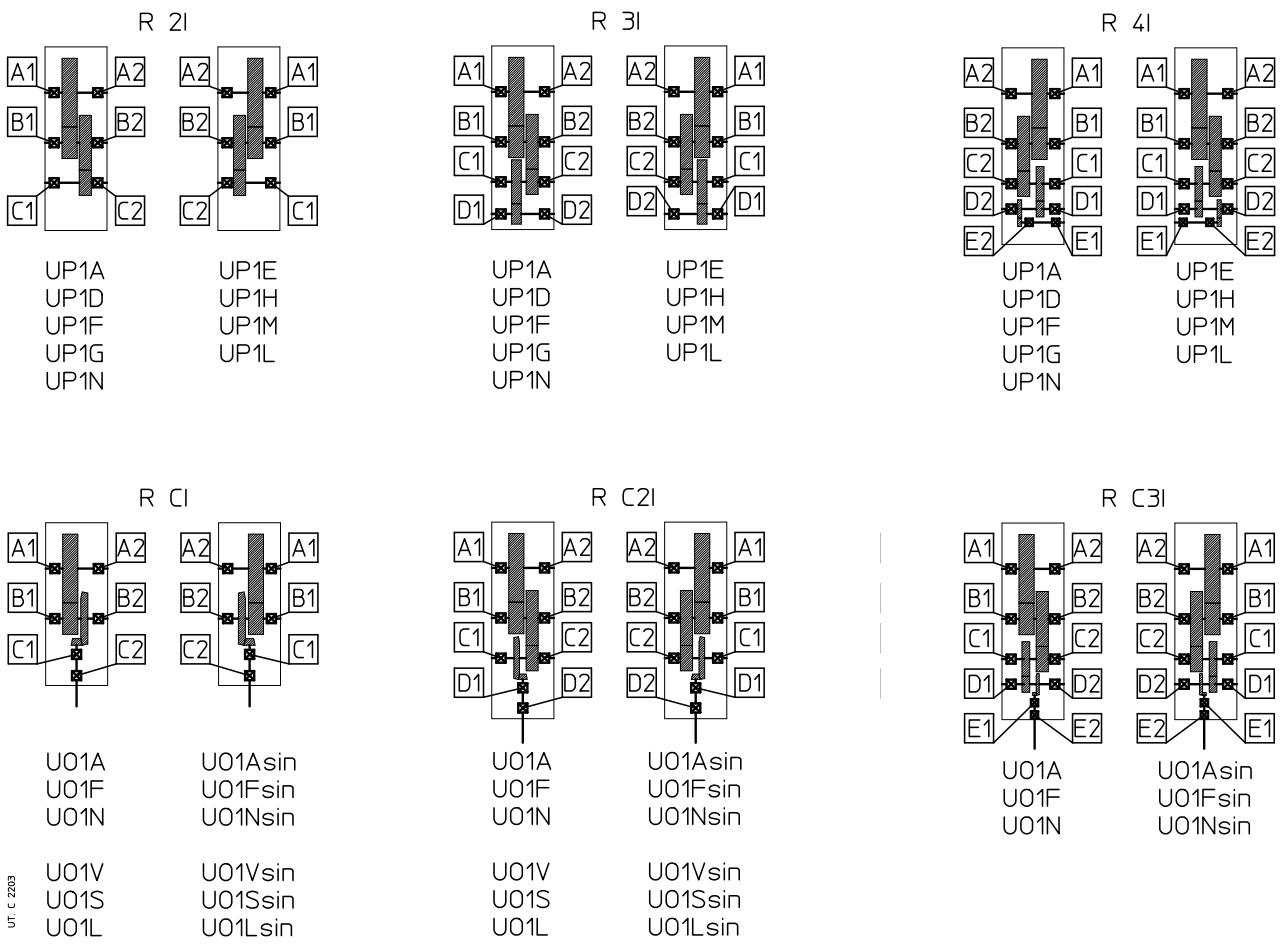
In case of gear reducer supplied **filled with oil** foresee the probe equipped with **immersion bulb** (pre-mounted in the factory), its position is to be agreed with Rossi; consult us.

Supplementary description when ordering by **designation: oil temperature probe with ammetric transducer.**

**(18) Bearing temperature probe**



UT. C 2202



UT. C 2203

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Probe for the remote monitoring of bearing temperature; installation (Buyer's responsibility) in a hole properly pre-arranged, next to a bearing **to be agreed during order phase** (for the most common cases, in order to facilitate the identification of bearing to be monitored, refer to following scheme).

The temperature gauge is realized with a thermo-resistor Pt100 having following features:

- platinum wire with 100 Ω at 0 °C according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °C – 200 °C;
- max current 40 mA;
- 3 wire connection according to IEC 751 (see fig. on the top);
- stainless steel AISI 316 flat probe; diameter 6 mm;
- stainless steel **sliding** steel;
- cable 1 m long with free end.

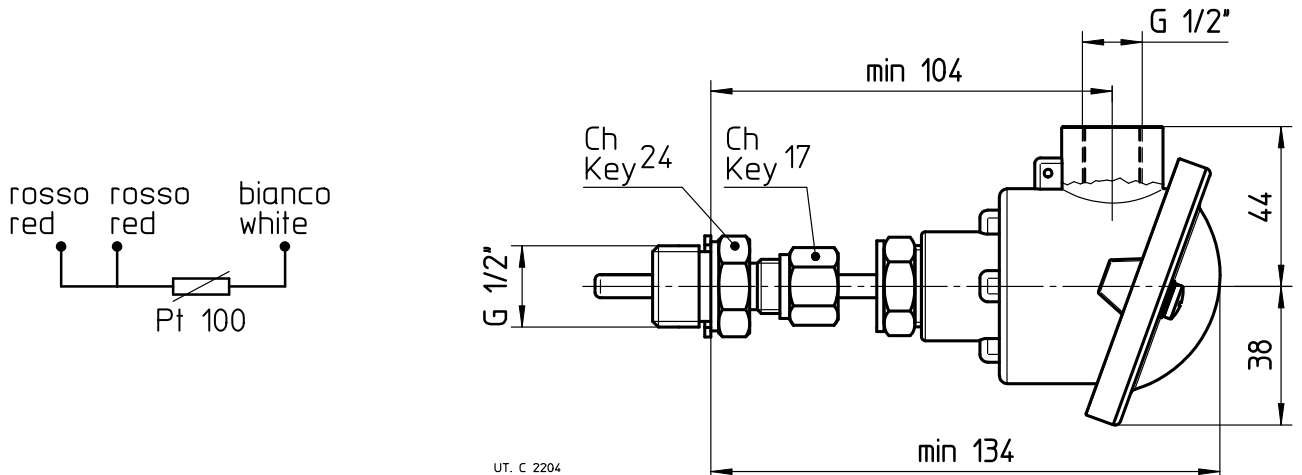
For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable ≥ 1,5 mm<sup>2</sup> positioned separately from power cables.

**ATTENTION.** Accessory available only after technical feasibility evaluation by Rossi: consult us.

Supplementary description when ordering by **designation: bearing temperature probe.**



**(19) Bearing temperature probe with terminal box and ammetric transducer**  
4 – 20 m



Probe for remote bearing temperature monitoring, with terminal box and ammetric transducer; installation (at Buyer's responsibility) in a threaded hole properly pre-arranged next to a bearing to be agreed when ordering (for the most common cases, in order to facilitate the identification of the bearing to be monitored, it is possible to refer to the scheme at point (18)).

The temperature gauge is realized with a thermo-resistor Pt100 having following features:

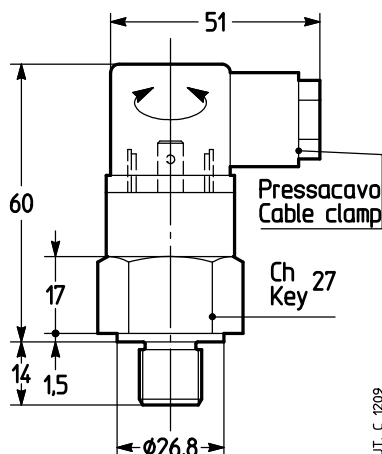
- platinum wire with 100  $\Omega$  at 0 °C according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °C – 200 °C;
- 3 wire connection according to IEC 751 (see fig. on the top);
- ammetric transducer with output signal 4 – 20 mA;
- aluminium terminal block (supplied without cable gland);
- IP65 protection;
- input cables G 1/2";
- stainless steel AISI 316 flat probe; diameter 6 mm;
- stainless steel **sliding** steel;
- cable 1 m long with free end.

For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable  $\geq 1,5 \text{ mm}^2$  positioned separately from power cables.

**ATTENTION.** Accessory available only after technical feasibility evaluation by Rossi: consult us.

Supplementary description when ordering by **designation**: bearing temperature probe with **ammetric transducer**.

**(20) Bi-metal type thermostat**



Bi-metal type thermostat for maximum oil temperature control.

Thermostat specifications:

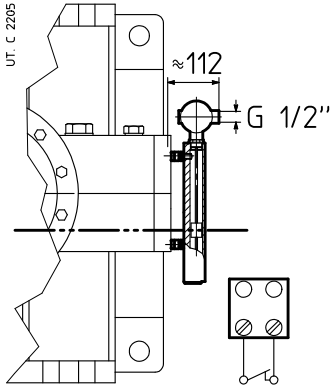
- NC contact with maximum current 10 A 240 V a.c. (5 A - 24 V c.c.);
- G 1/2" thread connection;
- cable gland Pg09 DIN 43650;
- protection IP65;
- operating temperature 90 °C  $\pm$  5 °C (further operating temperatures are available on request);
- differential temperature 15 °C.

Mounting into a threaded plug (position to be defined according to mounting position and mounting arrangement: consult us) and oil bath lubrication is Buyer's responsibility.

**ATTENTION.** Accessory available only after technical feasibility evaluation by Rossi: consult us.

Supplementary description when ordering by **designation**: **bi-metal type thermostat**.

**(21) Oil level switch with float**



It is a level control device with reed contacts in a supporting stem moved by the magnetic field activated by the magnets included in the float.

The float and the supporting stem are included in a hollow column of not magnetic material connected to the gear reducer housing through communicating vessels.

Connecting features:

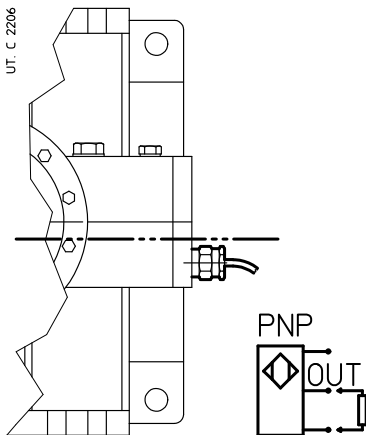
- 2 wires connection;
- max voltage: 350 V;
- maximum current: 1.5 A;
- 1 cable input 1/2" UNI 6125 – IP65;
- G 1" brass joint.

The switch is supplied ready for use; when level goes down approx 5 mm, the switch goes on and contact opens.

When filling oil in the gear reducer it is necessary to verify that device is properly calibrated. If any problems occur during this operation contact Rossi.

**ATTENTION.** Accessory available only after technical feasibility evaluation by Rossi: consult us.  
Supplementary description when ordering by **designation: oil level switch with float.**

**(22) Oil optical probe**



Optical scanner, without mobile parts, for the constant control of oil level, inside the gear reducer at rest (e.g. control before starting the machine or the plant).

Features:

- stainless steel probe;
- operation temperature range -40 °C – 125 °C;
- d.c. supply 12 – 28 V (other types on request; consult us);
- PNP output (other types on request, consult us), max 100 mA;
- G 1/2" thread connection.

Supplementary description when ordering by **designation: oil optical probe.**

12

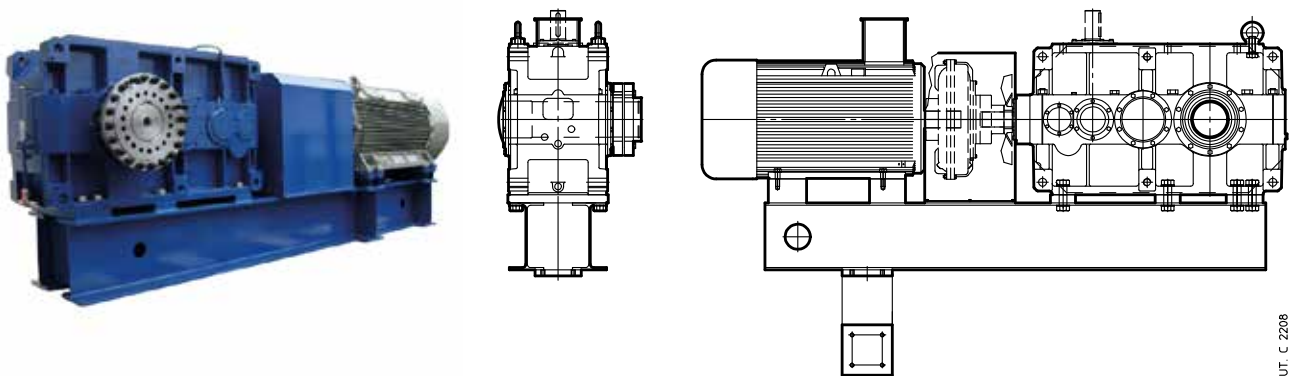
**(24) Remote temperature indicator instrument with set point**

Digital thermometer (dimensions 72×72×130 mm DIN 43700) to be used with oil or bearing temperature probe; moreover, it is equipped with switching contact (automatic reset) when reaching the (adjustable) temperature set point.

Supplementary description when ordering by **designation: remote temperature indicator instrument with set point.**

### Various

#### – Drive units



Drive units include an electric motor and a (helical or bevel helical) gear reducer, assembled on a swing base made of electrically-welded and annealed steel, properly sized, and connected through a coupling.

#### Swing base

The swing base structure is made of hollow profiles or beams properly combined, treated and machined. The project is made to maximize the swing base strength, in order to optimize costs and performance. All swing bases have been verified for bending, considering the highest load condition among the ones foreseen on this catalog.

On each swing plate there are machined surfaces for fitting and jacking screws for alignment of the components of the drive unit.

The matching point for the reaction arm has been defined in order to optimize the swing base fixing, so to minimize the stress on swing base and transmission components.

The standard supply includes the reaction point with elastic bush supplied separately (assembly is up to Customer). If necessary the complete reaction arm can be quoted and supplied, subject to agreement with Customer about characteristics and dimensions.

#### Gear reducer

The standard arrangement for this type of drive units is shaft mounted, with gearbox with hollow low speed shaft. Connection between gearbox and machine shaft is possible with keyway or shrink disc. On request it is possible to supply covers for rotating parts.

As alternative the option for shaft mounting with solid cylindrical low speed shaft, complete with rigid flanged coupling, is available.

#### Joint

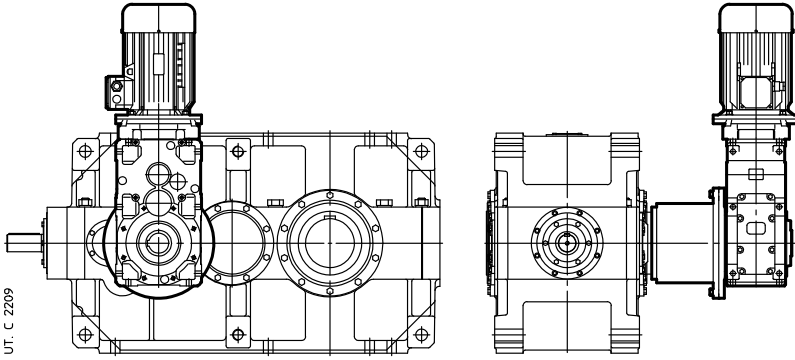
The coupling can be of different types: flexible, basic hydraulic, or hydraulic with simple or double delayed fill chamber. Both types of coupling can be supplied with drum pulley for failsafe shoe brake. On request the option with disc brake is also available.

Both the coupling and the safety or parking brake (if any) are protected with a steel guard fixed to the swing base.

For further details see cat. RE: consult us.

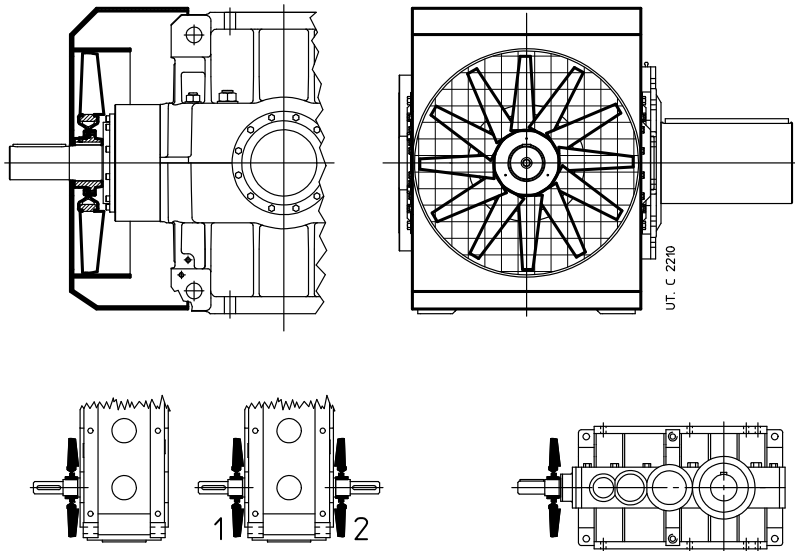
## 12 - Accessories and non-standard designs

### - Auxiliary drive



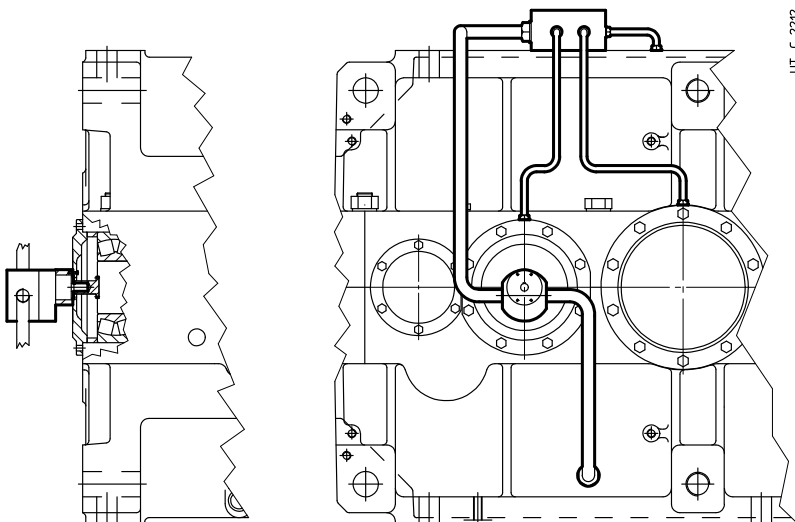
Additional motor drive with bevel helical gearmotor (cat. G, trains of gears C1, IC1, C21) connected with main gear reducer through bell coupling and free wheel.

### - Axial fan cooling



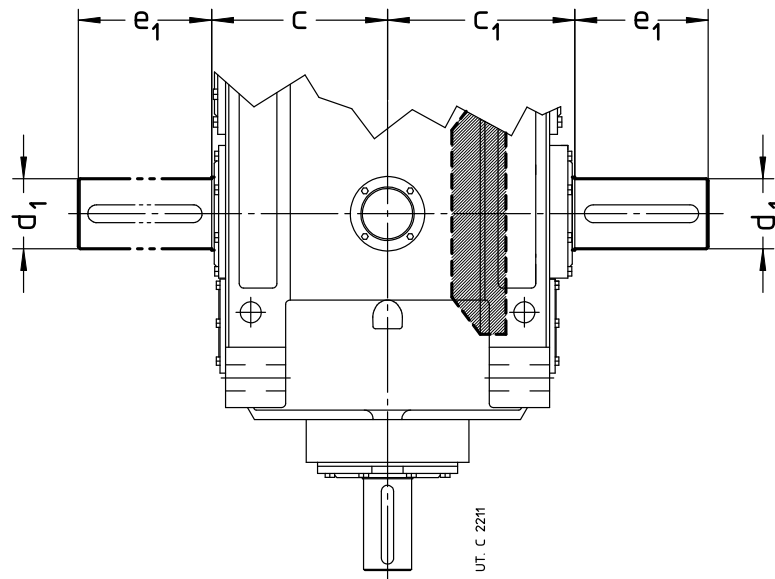
Forced cooling by axial fan for applications with one direction of rotation only (to be specified when ordering); for thermal factor values  $f_{t1b}$  see ch. 4. The possible designs are those illustrated below. Dimensions on request: consult us.

### - Pump driven by gear reducer



External gear pump driven directly by a gear reducer shaft for the forced lubrication of bearings and/or gears. Self-priming operation, with non-return valve, single acting (one-way applications) or double-acting (bidirectional applications); absence of electrical power; flow rate proportional to the shaft rotational speed of the gear unit.. Dimensions and other specifications, on request: consult us.

- **Additional intermediate shaft overhung for bevel helical gear reducers**



Additional (single or double) overhung of first reduction stage pinion shaft (bevel helical gear reducers' bevel wheel) for the realization of combined units or the application of auxiliary devices (e.g.: external backstop device). Main shaft end dimensions as per following table (for other dimensions see ch. 6). For sizes 7101 and 8001, consult us.

Size	R C1				R C2I				R C3I			
	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>
<b>4000 ... 4501</b>	330	370	120	210	335	335	90	170	325	325	65	140
<b>5000 ... 5601</b>	-	-	-	-	430	430	110	210	405	405	80	170
<b>6300, 6301</b>	-	-	-	-	475	475	125	210	435	435	90	170

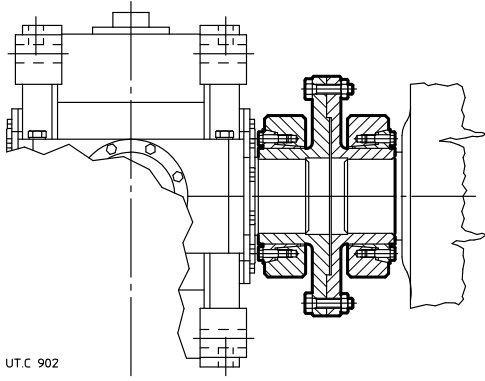
In the following table the first reduction stage transmission ratios are stated – according to total transmission ratios – thanks to which it is possible to calculate the rotation speed of auxiliary overhung.

Train of gears	Nominal transmission ratio $i_N$					$u_{N1}$ 1)
	4000, 4001	4500, 4501	5000, 5001	5600, 5601	6300, 6301	
<b>C1</b>	- $i_N \leq 11,2$ $12,5 \leq i_N \leq 14$ $i_N \geq 16$ -	$i_N \leq 9$ $10 \leq i_N \leq 12,5$ $14 \leq i_N \leq 16$ $i_N \geq 18$ -	-	-	-	2 2,5 3,15 4 5
<b>C2I</b>	$i_N \leq 25$ $28 \leq i_N \leq 40$ $45 \leq i_N \leq 50$ $56 \leq i_N \leq 80$ $i_N \geq 90$	$i_N \leq 28$ $31,5 \leq i_N \leq 45$ $50 \leq i_N \leq 56$ $63 \leq i_N \leq 90$ $i_N \geq 100$	$i_N \leq 25$ $28 \leq i_N \leq 40$ $45 \leq i_N \leq 50$ $56 \leq i_N \leq 80$ $i_N \geq 90$	$i_N \leq 28$ $31,5 \leq i_N \leq 45$ $50 \leq i_N \leq 56$ $63 \leq i_N \leq 90$ $i_N \geq 100$	$i_N \leq 31,5$ $40 \leq i_N \leq 50$ $56^{2)} \leq i_N \leq 71$ $i_N \geq 80$	2 2,5 3,15 4 5
<b>C3I</b>	- $i_N = 125$ $160 \leq i_N \leq 200$ $i_N \geq 250$ -	- $i_N = 125$ $160 \leq i_N \leq 200$ $i_N \geq 250$ -	- $i_N = 125$ $160 \leq i_N \leq 200$ $i_N \geq 250$ -	- $i_N = 125$ $160 \leq i_N \leq 200$ $i_N \geq 250$ -	$i_N = 125$ $i_N = 160$ $200^{3)} \leq i_N \leq 250$ $i_N \geq 315$	2 2,5 3,15 4 5

- 1) First reduction stage nominal transmission ratio.
- 2) For R C2I 6301 with  $i_N = 56$ :  $u_{N1} = 2,5$  instead of 3,15.
- 3) For R C3I 6301 with  $i_N = 200$ :  $u_{N1} = 2,5$  instead of 3,15.

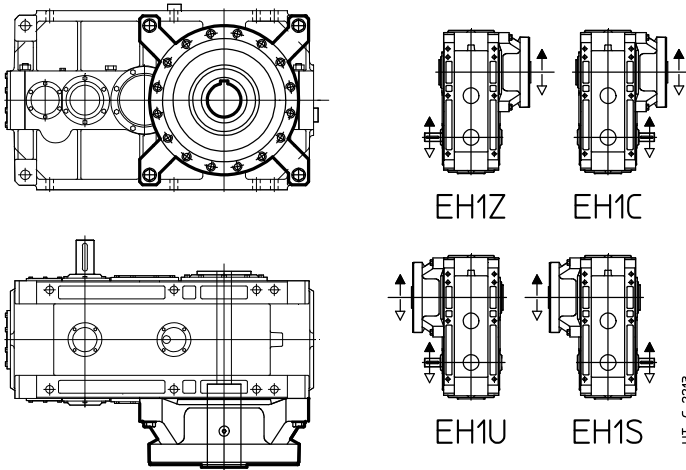
## 12 - Accessories and non-standard designs

### - Low speed shaft with flange coupling for shaft mounting arrangements



Low speed cylindrical shaft without keyway for application of a flange coupling for drive unit shaft mounting.

### - Design for extruders



Helical gear reducers sizes 4000 ... 4501 equipped with external auxiliary support to allow the coupling with single screw extruders (see ch. GX).

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### - Pre-arrangement for vibration monitoring devices

Position, number and dimension of holes to be agreed when ordering.

### - ATEX design

For the application in potentially explosive atmospheres to ATEX 2014/34/UE category 2 GD (zone 1 (gas) or 21 (dust)) or 3 GD (zone 2 (gas) or 22 (dust)), surface temperature T 135 °C (T4).

These are the main variations of the product:

- fluoro-rubber seal rings (double seal rings on low speed shaft for cat. 2 GD);
- metal plugs; filler plug with filter and valve;
- special name plate with ATEX mark and indication of application limits;
- external protection with water soluble dual compound polyurethane conductive enamel, color grey RAL 7040, corrosivity class C3 ISO 12944-2;
- oil temperature probe and eventual bearing temperature probe (cat. 2 GD).

# 13 - Installation and maintenance

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### 13.1 - Safety

**IMPORTANT:** gear reducers and gearmotors supplied by Rossi are **components** and must be incorporated into machinery and **should not be commissioned before the machinery in which the components have been incorporated conforms to:**

- **Machinery directive 2006/42/EC and subsequent updatings; in particular, possible safety guards for shaft ends not being used and for eventually accessible fan cover passages (or other) are the Buyer's responsibility;**
- **«Electromagnetic compatibility (EMC)» 2004/108/EC and subsequent updatings.**

**Attention!** It is recommended to pay attention to all instructions of present handbook, all existing safety laws and standards concerning correct installation. Whenever personal injury or property damage may occur, foresee adequate supplementary protection devices against:

- **release or breakage of fastening screws;**
- **rotation or unthreading of the gear reducer from shaft end of driven machine following to accidental breakage of the reaction arrangement;**
- **the accidental breakage of shaft end of driven machine.**

**If deviations from normal operation occur (temperature increase, unusual noise, etc.) immediately switch off the machine.**

#### Installation

An incorrect installation, an improper use, the removing or disconnection of protection devices, the lack of inspections and maintenance, improper connections may cause severe personal injury or property damage. Therefore the component must be moved, installed, commissioned, handled, controlled, serviced and re-paired **exclusively by responsible qualified personnel specifically instructed** and have the necessary experience to **recognize** any **risks** connected with present products avoiding any possible emergencies.

Gear reducers and gearmotors of present handbook are normally suitable for installations in **industrial areas**: additional protection measures, if necessary, must be adopted and assured by the personnel responsible for the installation.

**Attention!** Components in non-standard design or with special executions or with constructive variations may differ in the details from the ones described here following and may require additional information.

**Attention!** For the installation use and maintenance of the **electric motor** of the possible motor-variator and/or the electric supply device (frequency converter, soft-start, etc.), and/or any optional electric devices (e.g.: independent cooling unit, etc.), consult the specific attached documentation.

If necessary, require it.

#### Maintenance

When operating on gear reducer or on components connected to it the **machine must be at rest**: disconnect motor (including auxiliary equipments) from power supply, gear reducer from load, be sure that safety systems are on against any accidental starting and, if necessary, pre-arrange mechanical locking devices (to be removed before commissioning).

**Attention!** During the running the gear reducers could have **hot surfaces**; Always wait that the gear reducer or the gearmotor to cool before carrying out any operations.

Further technical documentation (e.g. catalogs) can be downloaded from our website [www.rossi-group.com](http://www.rossi-group.com).

## 13 13.2 - Application conditions and use limits

Gear reducers are designed **for industrial applications according to name plate data**, when no vibrations (permissible vibration velocity:  $v_{\text{eff}} < 3,5 \text{ mm/s}$  for  $P_1 \leq 15 \text{ kW}$ ,  $v_{\text{eff}} < 4,5 \text{ mm/s}$  for  $P_1 > 15 \text{ kW}$ ), no nuclear radiations and important magnetic fields, with ambient temperature  $-20 - +40 \text{ }^\circ\text{C}$  (with peaks at  $+50 \text{ }^\circ\text{C}$ ), with air velocity  $\geq 1,25 \text{ m/s}$ , maximum altitude 1 000 m, and max relative humidity 80 % .

For continuous ambient temperature higher than  $40 \text{ }^\circ\text{C}$  or lower than  $-20 \text{ }^\circ\text{C}$  consult us.

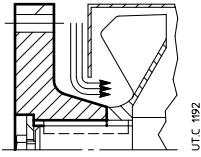
### 13.3 - General

Be sure that the structure on which gear reducer or gearmotor is fitted is plane, levelled and sufficiently dimensioned in order to assure fitting stability and vibration absence, keeping in mind all transmitted forces due to the masses, to the torque, to the radial and axial loads.

Position the gear reducer or gearmotor so as to allow a free passage of air for cooling both gear reducer and motor (especially at gear reducer and motor fan sides).



## 13 - Installation and maintenance



If there is fan on the gear reducer verify that there is sufficient space allowing for adequate circulation of cooling air also after fitting coupling protection. If a coupling protection is fitted smooth the coupling hub, if necessary.

Avoid: any obstruction to the air-flow; heat sources near the gear reducer that might affect the temperature of cooling-air and of gear reducer for radiation; insufficient air recycle or any other factor hindering the steady dissipation of heat.

Mount the gear reducer so as not to receive vibrations.

When external loads are present use pins or locking blocks, if necessary.

When fitting gear reducer and machine it is recommended to use **locking adhesives** such as LOCTITE on the fastening screws (also on flange mating surfaces).

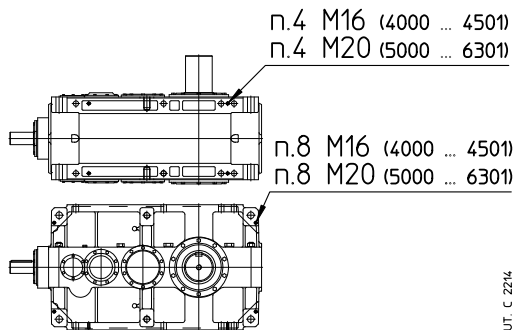
For outdoor installation or in a hostile environment protect the gear reducer or gearmotor with anticorrosion paint. Added protection may be afforded by water-repellent grease (especially around the rotary seating of seal rings and the accessible zones of shaft end).

Gear reducers should be protected wherever possible, and by whatever appropriate means, from solar radiation and extremes of weather; weather protection **becomes essential** when high or low speed shafts are vertically disposed.

For ambient temperatures greater than 40 °C or less than 0 °C, consult us.

If overloads are imposed for long periods or if shocks or danger of jamming are considered, then motor-protection, electronic torque limiters, fluid couplings, safety couplings, control units or other similar devices should be fitted.

**Attention! Bearing life, good shaft and coupling running depend on alignment precision between the shafts.** Carefully align the gear reducer with the motor and the driven machine (with the aid of shims if need be), interposing flexible couplings whenever possible.



Gear reducers sizes  $\leq 6301$  are equipped with **level threaded holes** on both feet surfaces and on the sides in order to permit an easy and precise positioning; after the adjustment, adequately shim.

Whenever a leakage of lubricant could cause heavy damages, increase the frequency of inspections and/or envisage appropriate control devices (e.g.: remote oil level gauge, lubricant for food industry, etc.).

In polluting surroundings, take suitable precautions against lubricant contamination through seal rings or other.

### 13.4 - Mounting of components on high and low speed shaft ends

Generally, it is recommended to machine the hole of parts keyed onto shaft end, tolerance H7. For high speed shaft end with  $D \geq 55$  mm tolerance can be G7, provided that load is uniform and light. Further data according to the table «High and low speed shaft end» (ch. 6).

Before mounting, thoroughly clean mating surfaces with proper antirust products and lubricate against seizure and fretting corrosion.

Installation and removal operations should be carried out with the aid of **jacking screws** and **pullers** using the tapped hole at the shaft butt-end (see table in fig. 2) taking care to avoid impacts and shocks which may irreparably damage the bearings, the circlips or other parts or cause sparks; for H7/m6 and K7/j6 fits it is advisable that the part to be keyed is preheated to a temperature of 80 – 100 °C.

The couplings having a tip speed on external diameter up to 20 m/s must be statically balanced; for higher tip speeds they must be dynamically balanced.

Where the transmission link between gear reducer and machine or motor generates shaft end loads, ensure that: loads do not rise above catalog values:

- loads do not rise above the values stated at ch. 11 and loads do not rise above the values of the application design;
- transmission overhang is kept to a minimum;
- drive-chains should not be tensioned (if necessary – alternating loads and/or motion – foresee suitable chain tighteners); if the peripheral speed of the chain is greater than 1 m/s it is necessary to install proper malfunction markers such as aligning sensors, etc;
- in the gear transmission there is an adequate gear mesh ( $\approx 0,03 - 0,04 \cdot m$ ) between pinion and rack (bushing);
- drive-belts should not be over-tensioned.

For splined couplings apply adequate products against oxydation.

**13.5 - Machine shaft end**

For the **shaft end** of **machine** where the hollow shaft of gear reducer is to be keyed (with shrink disc or with keyway, see ch. 12 (1) and (3)), are recommended h6 or j6 tolerances according to requirements. For dimensions see ch. 12 (1) and (3).

In order to have an easier installing and removing of gear reducers, use hollow shaft washer (on request, see ch. 12 (5)) offering a supplementary axial fastening beside the fastening of the shrink disc (if present). In these cases, when tightening the bolt, we recommend the use of a **locking adhesives** type LOCTITE 601. For vertical ceiling-type mounting, contact us. Parts in contact with the retaining ring must have sharp edges.

With hollow low speed shaft with shrink disc on machine opposite side, protect the cylindrical part of machine shaft end from shrink disc opposite side with proper products against fretting corrosion, see ch. 12.

Whenever **personal** injury or **property** damage may occur, foresee **adequate supplementary protection devices** against **rotation** or **unthreading** of the gear reducer from shaft end of driven machine following to accidental breakage of the reaction arrangements.

**13.6 - Lubrication**

Gear pairs are oil-bath lubricated.

Bearings are either oil-bathed or splashed with the exception of the top bearings which are lubricated with a pump (see ch. 12 (9)) or lubricated «for life» with grease (with or without NILOS ring according to speed).

Gear reducers are supplied **without oil**; before putting into service, fill to the specified level with **mineral oil** having the ISO viscosity grade given in the table, according to ambient temperature and output speed.

Under normal conditions the first and the second speed range are for trains of gears **2I** and **CI**, the third is for trains of gears **3I**, **4I**, **C2I** and **C3I**, while the fourth is for particular applications.

When it is required to increase oil change interval («long life»), the ambient temperature range, and/or to reduce oil temperature, use **synthetic oil** with **polyalphaolefines** basis having ISO viscosity grade as indicated in the table.

For continuous duty, the use of synthetic oil is recommended in the following case of gear reducers with size and mounting position marked with (see ch. 8, 10) and bevel helical gear reducers with double extension high speed shaft.


An overall guide to oil-change interval is given in the table, and assumes pollution-free surroundings. When heavy overloads are present, halve the values.

Apart from running hours:

- replace mineral oil at least each 3 years;
- replace or regenerate synthetic oil each 5 - 8 years according to gear reducer size, running and environmental conditions.

Never mix different makes of synthetic oil; if oil-change involves switching to a type different from that used hitherto, then give the gear reducer a through clean-out.

**Seal rings:** duration depends on several factors such as dragging speed, temperature, ambient conditions, etc.: as a rough guide, it can vary from 3 150 to 25 000 h.

**Warning:** before unscrewing the filler plug with valve (symbol ) wait until the unit has cooled and then open with caution.

ISO viscosity grade  
Mean kinematic viscosity [cSt] at 40 °C.

Speed $n_2$ min <sup>-1</sup>	Ambient temperature <sup>1)</sup> [°C]				
	mineral oil			synthetic oil	
	-20 - 0	0 - 20	20 - 40	-20 - 0	0 - 40
> <b>224</b>	150	150	150	150	150
<b>224 - 22,4</b>	150	150	220	150	220
<b>22,4 - 5,6</b>	150	220	320	220	320
< <b>5,6</b>	220	320	460	320	460

Oil temperature °C	Oil-change interval [h]	
	mineral oil	oil synthetic
≤ <b>65</b>	8 000	25 000
<b>65 - 80</b>	4 000	18 000
<b>80 - 95</b>	2 000	12 500
<b>95 - 110<sup>2)</sup></b>	-	9 000

Oil list table

Brand	PAO synthetic oil ISO VG 150 ... 460	Mineral Oil ISO VG 150 ... 460
ENI	Blasia SX	Blasia
ARAL	Degol PAS	Degol BG
BP	Energol EPX	Energol GR XP
CASTROL	Alphasyn EP	Alpha SP
FUCHS	Renolin Unisys CLP	Renolin CLP
KLÜBER	Klübersynth GEM 4	Klüberoil GEM 1
MOBIL	Mobil SHC Gear	Mobilgear 600 XP
SHELL	Omala S4 GX	Omala S2 G
TEXACO	Pinnacle	Meropa
TOTAL	Carter SH	Carter EP

1) Peaks of 10 °C below and 10 °C above the ambient temperature range are acceptable. For the running at **cold starting** ( $T_{amb} = T_{oil} \leq 25^\circ$ ) and **forced lubrication systems**, **always foresee the oil heater** (see ch. 13 (7)).

2) Values admissible for not continuous duty, only.

### 13.7 - Gear reducer starting at low ambient temperature ( $T_{amb} = T_{oil} \leq 25\text{ }^{\circ}\text{C}$ )

The **minimum** ambient temperature (equal to the oil one) to which it is allowed to start the gear reducer, depends on lubrication system and type of lubricant applied.

#### Gear reducers with splash lubrication

The gear reducer can be started with ambient/oil temperature  $\geq -20\text{ }^{\circ}\text{C}$ , keeping in mind to follow the lubricant viscosity instructions stated on ch. 13.6.

In presence of an eventual independent cooling unit with heat exchanger (but without forced lubrication, see also point A1 in table at ch. 12 (8)), it is necessary to drive the motorpump starting when achieving oil temperature of  $60\text{ }^{\circ}\text{C}$ .

#### Gear reducers with forced lubrication of bearings

In presence of forced lubrication systems of bearings (see ch. 6 and ch. 12 (8) and (9)), the gear reducer can be started only if oil temperature is  $\geq 25\text{ }^{\circ}\text{C}$ , following the lubricant viscosity instructions as per ch. 13.6.

Therefore, before gear reducer starting it is necessary to pre-heat the oil bath through the use of heaters (see ch. 12 (10)) up to a temperature of  $25\text{ }^{\circ}\text{C}$ .

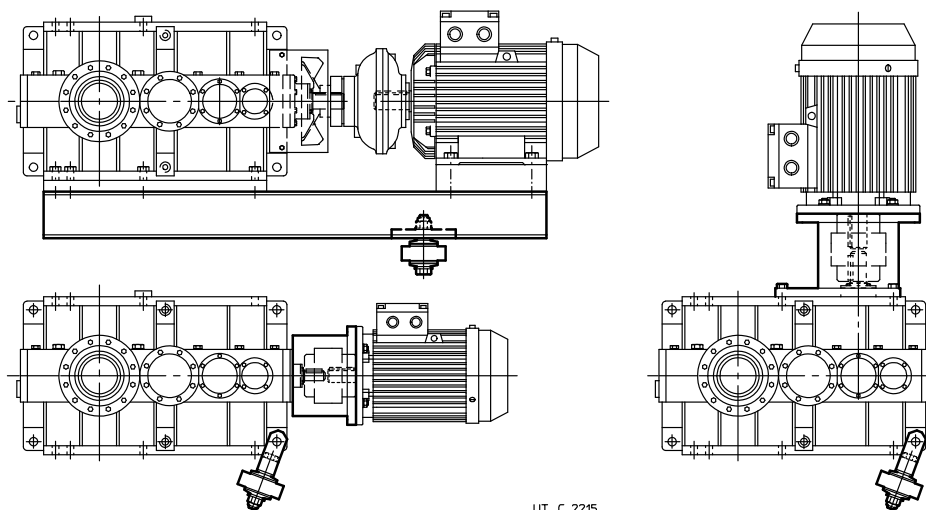
### 13.8 - Shaft mounting arrangements

The strength and shape of the housing offer advantageous possibilities for shaft mounting even – for instance – in the case of gearmotor with belt drive, hydraulic coupling, etc.

A few possible examples of shaft mounting arrangements are shown.

**IMPORTANT.** When shaft mounted, the gear reducer must be supported both axially and radially (also for mounting positions B3 ... B8) by the machine shaft end, as well as anchored against rotation only, by means of a reaction having **freedom of axial movement** and sufficient **clearance** in its couplings to permit minor oscillations always in evidence without provoking dangerous overloading on the gear reducer. Lubricate with proper products the hinges and the parts subject to sliding; when mounting the screws it is recommended to apply locking adhesives type LOCTITE 601.

In case of axial fastening with elastic constraint, in B3 or B8 mounting position, ensure that housing oscillation while running does not exceed the perfectly horizontal position.



UT. C 2215

Semi flexible and economic reaction arrangement (see ch. (ch. 12 (7)): with bolt using disc springs, with bolt and fork using disc springs.

**13.9 - Tightening torques**

Unless otherwise stated, usually it is sufficient to use screws in class 8.8.

Before tightening the bolt be sure that the eventual centering of flanges are inserted properly.

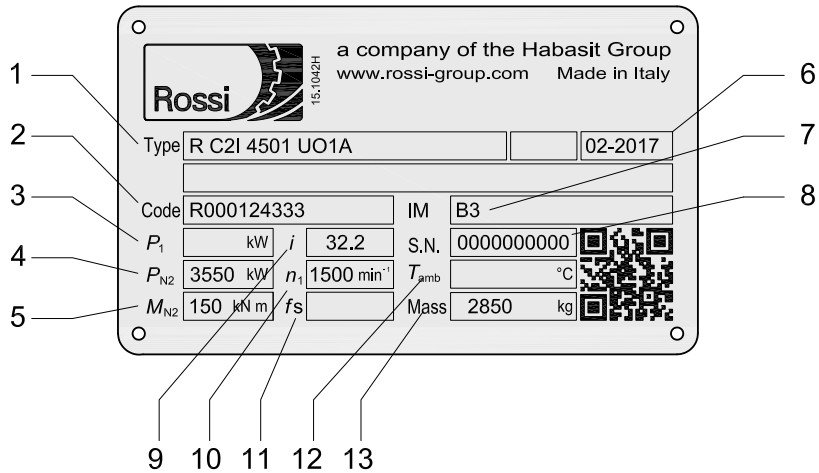
In general, the bolts are to be diagonally tightened with the maximum tightening torque.

The bolts of shrink disc must be gradually and uniformly tightened, with continuous sequence (not diagonally!) and in several phases up to the reaching of maximum tightening torque.

Before tightening, carefully degrease the screws; in the event of heavy vibrations, heavy duties, frequent drive inversions apply a proper thread-locking sealant Loxal 23-18 or equivalent.

Bolts UNI 5737-88 UNI 5931-84	Tightening torque $M_s$ [N m]			Shrink disc Class 10.9
	Feet, flanges and threaded holes at the shaft butt-end			
	Class 8.8	Class 10.9	Class 12.9	
<b>M10</b>	50	70	85	–
<b>M12</b>	85	120	145	–
<b>M16</b>	205	290	350	–
<b>M20</b>	400	560	680	490
<b>M24</b>	710	1 000	1 200	840
<b>M27</b>	1 010	1 400	1 700	1 250
<b>M30</b>	1 380	1 950	2 350	–
<b>M36</b>	2 500	3 550	4 200	–
<b>M45</b>	5 000	7 000	8 400	–
<b>M56</b>	9 800	13 800	16 500	–

**13.10 - Nameplate**



- 1 Designation
- 2 Manufacturing code
- 3 Installed power [kW]
- 4 Nominal power on low speed shaft [kW], at input speed  $n_1$
- 5 Nominal low speed shaft torque [kN m], at input speed  $n_1$
- 6 Month and year of production
- 7 Serial number
- 8 Mounting position
- 9 Transmission ratio
- 10 High speed shaft input speed [ $\text{min}^{-1}$ ]
- 11 Service factor
- 12 Ambient temperature if different from conditions stated on catalog [ $^{\circ}\text{C}$ ]
- 13 Approximative gear reducer weight [kg]

# Technical formulae

Main formulae concerning mechanical drives, according to the Technical System and International Unit System (SI).

## Size

starting or stopping **time** as a function of an acceleration or deceleration, of a starting or braking torque

$$t = \frac{v}{a} \text{ [s]}$$

$$t = \frac{Gd^2 \cdot n}{375 \cdot M} \text{ [s]}$$

## With SI units

$$t = \frac{J \cdot \omega}{M} \text{ [s]}$$

**velocity** in rotary motion

$$v = \frac{\pi \cdot d \cdot n}{60} = \frac{d \cdot n}{19.1} \text{ [m/s]}$$

$$v = \omega \cdot r \text{ [m/s]}$$

**angular velocity**

$$n = \frac{60 \cdot v}{\pi \cdot d} = \frac{19.1 \cdot v}{d} \text{ [min}^{-1}\text{]}$$

$$\omega = \frac{v}{r} \text{ [rad/s]}$$

**acceleration** or deceleration as a function of starting or stopping time

$$a = \frac{v}{t} \text{ [m/s}^2\text{]}$$

**angular acceleration** or deceleration as a function of a starting or stopping time, of a starting or braking torque

$$\alpha = \frac{n}{9.55 \cdot t} \text{ [rad/s}^2\text{]}$$

$$\alpha = \frac{\omega}{t} \text{ [rad/s}^2\text{]}$$

$$\alpha = \frac{39.2 \cdot M}{Gd^2} \text{ [rad/s}^2\text{]}$$

$$\alpha = \frac{M}{J} \text{ [rad/s}^2\text{]}$$

starting or stopping **distance** as a function of an acceleration or deceleration, of a final or initial velocity

$$s = \frac{a \cdot t^2}{2} \text{ [m]}$$

$$s = \frac{v \cdot t}{2} \text{ [m]}$$

starting or stopping **angle** as a function of an angular acceleration or deceleration, of a final or initial angular velocity

$$\varphi = \frac{\alpha \cdot t^2}{2} \text{ [rad]}$$

$$\varphi = \frac{n \cdot t}{19.1} \text{ [rad]}$$

$$\varphi = \frac{\omega \cdot t}{2} \text{ [rad]}$$

**mass**

$$m = \frac{G}{g} \left[ \frac{\text{kgf s}^2}{\text{m}} \right]$$

m is the unit of mass [kg]

**weight** (weight force)

G is the unit of weight (weight force) [kgf]

$$G = m \cdot g \text{ [N]}$$

**force** in vertical (lifting), horizontal, inclined motion of translation ( $\mu$  = coefficient of friction;  $\varphi$  = angle of inclination)

$$F = G \text{ [kgf]}$$

$$F = m \cdot g \text{ [N]}$$

$$F = \mu \cdot G \text{ [kgf]}$$

$$F = \mu \cdot m \cdot g \text{ [N]}$$

$$F = G (\mu \cdot \cos \varphi + \text{sen } \varphi) \text{ [kgf]}$$

$$F = m \cdot g (\mu \cdot \cos \varphi + \text{sen } \varphi) \text{ [N]}$$

**dynamic moment  $Gd^2$ , moment of inertia J** due to a motion of translation

(numerically  $J = \frac{Gd^2}{4}$ )

$$Gd^2 = \frac{365 \cdot G \cdot v^2}{n^2} \text{ [kgf m}^2\text{]}$$

$$J = \frac{m \cdot v^2}{\omega^2} \text{ [kg m}^2\text{]}$$

$$M = \frac{F \cdot d}{2} \text{ [kgf m]}$$

$$M = F \cdot r \text{ [N m]}$$

**torque** as a function of a force, of a dynamic moment or of a moment of inertia, of a power

$$M = \frac{Gd^2 \cdot n}{375 \cdot t} \text{ [kgf m]}$$

$$M = \frac{J \cdot \omega}{t} \text{ [N m]}$$

$$M = \frac{716 \cdot P}{n} \text{ [kgf m]}$$

$$M = \frac{P}{\omega} \text{ [N m]}$$

**work, energy** in motion of translation, in rotary motion

$$W = \frac{G \cdot v^2}{19.6} \text{ [kgf m]}$$

$$W = \frac{m \cdot v^2}{2} \text{ [J]}$$

$$W = \frac{Gd^2 \cdot n^2}{7160} \text{ [kgf m]}$$

$$W = \frac{J \cdot \omega^2}{2} \text{ [J]}$$

**power** in motion of translation, in rotary motion

$$P = \frac{F \cdot v}{75} \text{ [CV]}$$

$$P = F \cdot v \text{ [W]}$$

$$P = \frac{M \cdot n}{716} \text{ [CV]}$$

$$P = M \cdot \omega \text{ [W]}$$

**power** available at the shaft of a single-phase motor ( $\cos \varphi$  = power factor)

$$P = \frac{U \cdot I \cdot \eta \cdot \cos \varphi}{736} \text{ [CV]}$$

$$P = U \cdot I \cdot \eta \cdot \cos \varphi \text{ [W]}$$

**power** available at the shaft of a three-phase motor

$$P = \frac{U \cdot I \cdot \eta \cdot \cos \varphi}{425} \text{ [CV]}$$

$$P = 1.73 \cdot U \cdot I \cdot \eta \cdot \cos \varphi \text{ [W]}$$

Note. Acceleration or deceleration are understood constant; motion of translation and rotary motion are understood rectilinear and circular respectively.

## Index of revisions

List of updatings - Edition **June 2018** available on [rossi.com](http://rossi.com)

Page 36	Completed table with missing values
Page 52	Modified figures of mounting positions
Page 57	Modified figures of mounting positions
Page 61	Modified figures of mounting positions
Pages 64-69	New selection tables (bevel helical gear reducers)
Page 75	Modified figures of mounting positions
Page 79	Modified figures of mounting positions
Page 83	Modified figures of mounting positions
Page 88	Added note about radial and axial loads in case of hollow or double extension shafts
Page 102	Added note about machine shaft end dimension in case of design 12.(12)
Page 102	Added note about hollow low speed shaft tolerance
Page 104	Added note about machine shaft end dimension in case of design 12.(12)
Page 104	Added note about hollow low speed shaft tolerance
Page 104	Modified $M_2$ values in the table
Page 104	Added on machine shaft end diameter abutting with gear reducer
Page 106	Modified limit transmission ratios for design 12.(4)
Page 108	Amended value of X dimension (4000 ... 4501) in the table
Page 112	Updated table of design 12.(9)
Page 113	Updated table of design 12.(11)
Page 118	Updated bearing identification scheme 12.(18)
Page 120	Removed option 12.(23)

List of updatings - Edition **2586-01.01** available on [rossi.com](http://rossi.com)

	Range extension through the introduction of new sizes 7101 and 8001
Page 24	Updated table Nominal thermal power
Page 28	Updated table Input speed
Page 34	Updated table Sound levels
Page 36	Updated table Low and high speed shaft end
Page. 37	Updated table Side cover dimensions
ch. 7	Updated selection tables (parallel shaft gear reducers)
Page 50	Updated figures of mounting positions and dimensional tables
Page 53	Updated oil quantity table
Page 54	Updated figures of mounting positions and dimensional tables
Page 57	Updated oil quantity table
Page 58	Updated figures of mounting positions and dimensional tables
Page 61	Updated oil quantity table
ch. 9	Updated selection tables (right angle shaft gear reducers)
Page 76	Updated figures of mounting positions and dimensional tables
Page 79	Updated oil quantity table
Page 80	Updated figures of mounting positions and dimensional tables
Page 82	Updated figures of mounting positions
Page 83	Updated oil quantity table
Page 86	Modified radial loads table
Page 100	Added axial and radial loads table sizes 7101-8001
Page 101	Added axial and radial loads table sizes 7101-8001
Page 102	Updated tables
Page 103	Updated table
Page 105	Updated table
Page 115	Updated table
Page 116	Updated table
Page 130	Inserted new nameplate and updated table

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