

# H series

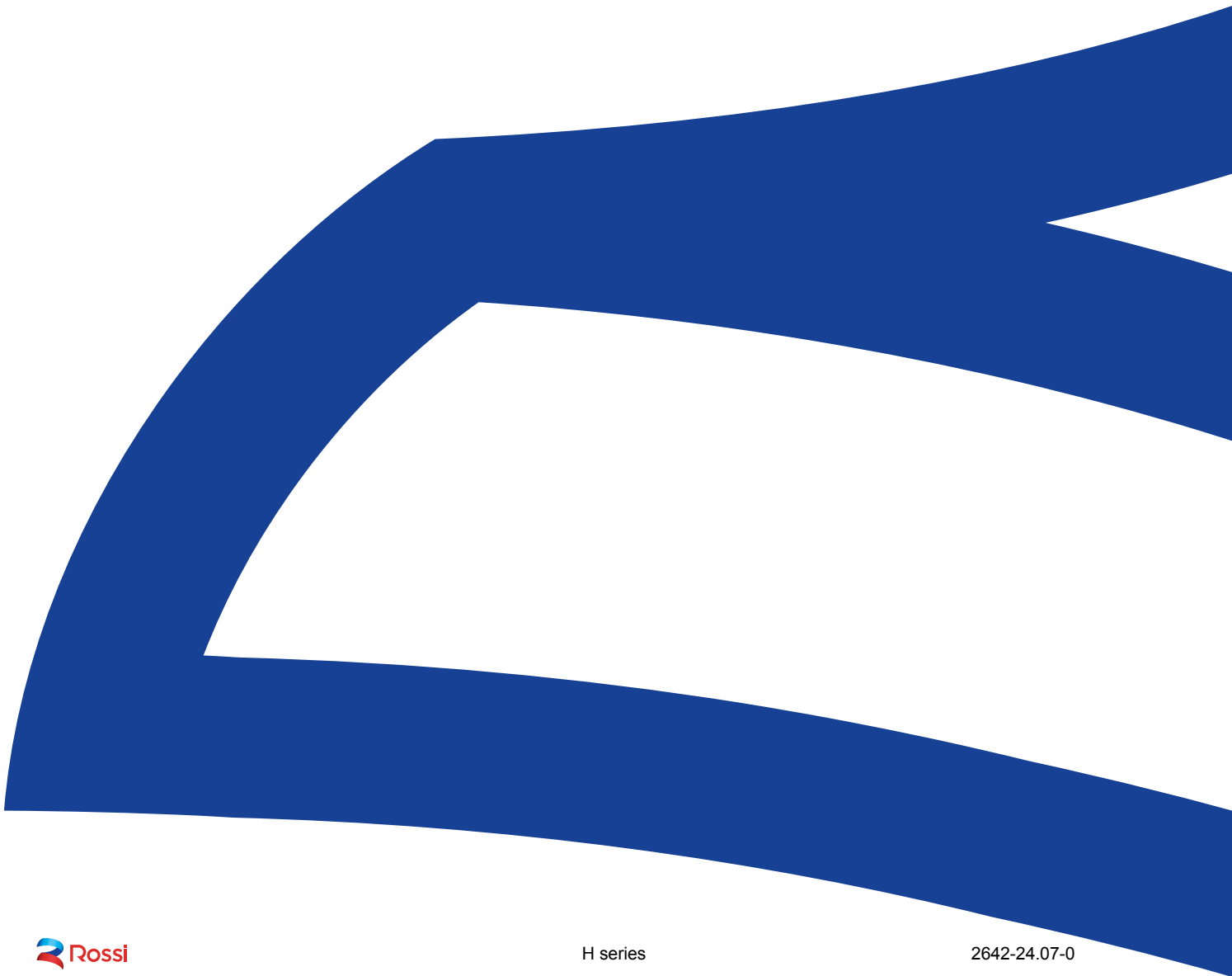


**Helical and bevel helical gear reducers**

[rossi.com](http://rossi.com)







# Contents

Overview.....	4
1 - General specifications.....	11
02 - Designation.....	15
03 - Service factor fs.....	19
04 - Thermal power Pt [hp].....	23
05 - Selection.....	27
06 - Structural and operational details.....	33
07 - Helical gear reducer selection tables.....	41
08 - Dimensions, designs, mounting positions (helical gear reducers).....	49
09 - Bevel helical gear reducer selection tables.....	63
10 - Dimensions, designs, mounting positions (bevel helical gear reducers).....	71
11 - Radial loads.....	85
12 - Accessories and non-standard designs.....	103
13 - Installation and maintenance.....	127
Technical formulae.....	133



# Rossi for You



## Innovation

Rossi S.p.A. offers a wide range of solutions for an evolving industry, flexible and innovative gear reducers and gearmotors for customer tailored solutions to maximize performances and minimize the Total Cost of Ownership (TCO).



## High quality, 3 years warranty

Our drive is to innovate and boost operations by manufacturing performing, precise, reliable and high-quality products all over the world. We are always one step forward in offering and developing solutions that can satisfy an unlimited number of application needs, even in the most demanding conditions.



## Reliability

We are a reliable company with the right flexibility and know-how to respond to worldwide market requests, in all application fields, without leaving aside our commitment for the environment and value on human safety, to protect everyone's future.



## Tools and processes

We continue to invest in new tools and processes, so our highly skilled specialist team in different fields are supporting you to find the best solution suitable for your demands, always by your side on every step of the project.



## After-sale service

Highly trained mechanics and support teams can ensure a fast and efficient after-sale service providing support worldwide.



## Digital support

Alongside our 24/7 Rossi for You portal you have a suite of digital support tools enabling real time access to your order tracking, invoices, spare part tables download and contact to our service.

**70**  
YEARS

## Experience

Shaped by 70 years of history Rossi meets your unique needs whether you need a standard design or a customized solution.



# Global presence local service



## Local support

Sales, customer service,  
technical support, spare parts



17 branches\*




Worldwide distribution network\*


A global network of subsidiaries and dealers.  
From design and execution to after sales service.  
Rossi S.p.A. is always close to you, a local reliable and  
flexible partner.

Alongside our 24/7 **Rossi for You** portal you have a suite  
of digital support tools enabling real time access to your  
order tracking, invoices, spare part tables download and  
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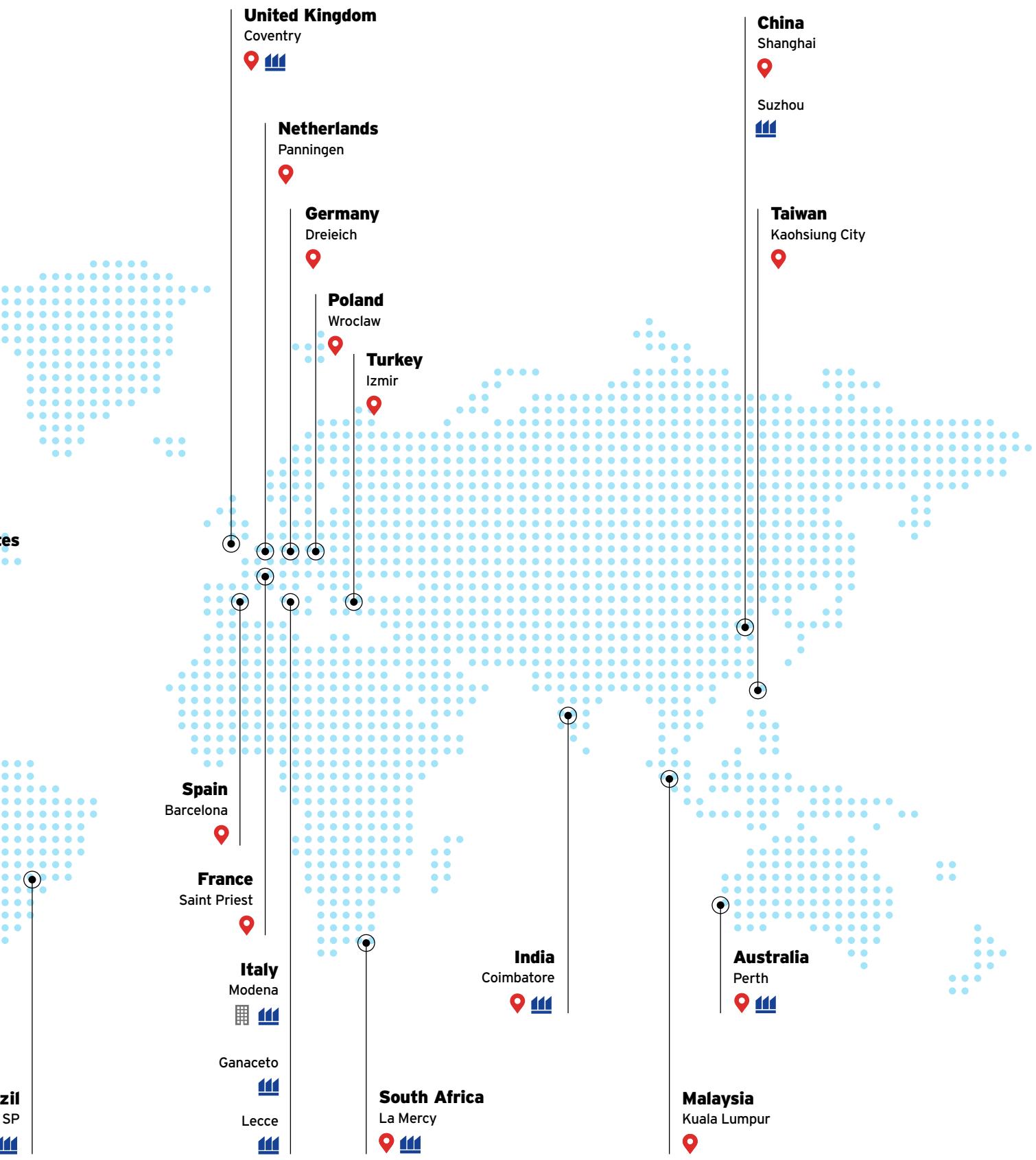


\*All contacts available on [www.rossi.com](http://www.rossi.com)

 Main offices

 Affiliated companies

 Production facilities/Assembly plants



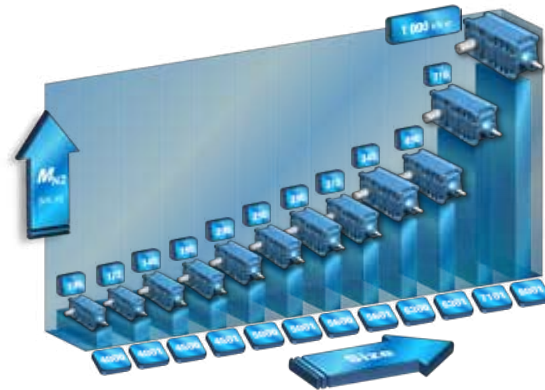
# Features and Benefits

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**



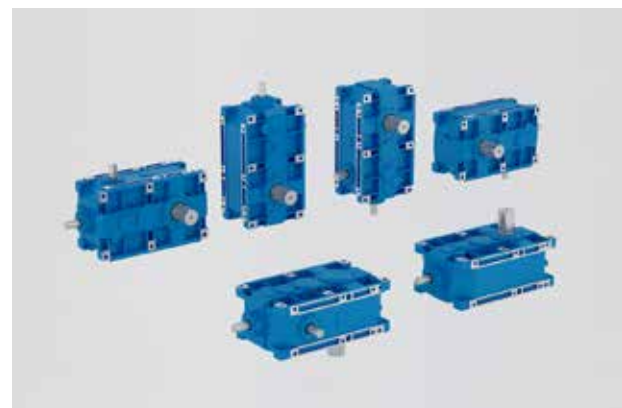
Horizontal center split housing cast in two halves from spheroidal cast iron (UNI ISO 1083) with reinforced stiffening ribs

- **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-H (ISO 12944-2 and ISO 12944-1)

- **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**



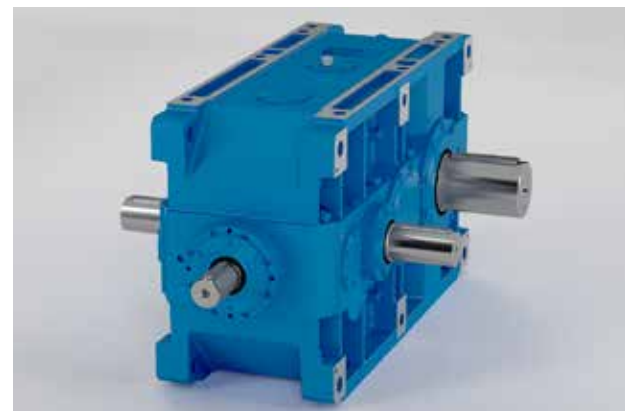
Several non-standard designs for all sizes:

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

All dimensions in the catalog are expressed in mm except where otherwise stated

Symbol	Description	Unit	Symbol	Description	Unit
$f$	frequency	Hz	$T_2$	gear reducer output torque (low speed shaft), derived from input power and speed	lb in
$F$	force	lb	$T_{2eq}$	load cycle equivalent torque	lb in
$F_r, F_a$	radial (overhung) loads, axial (thrust) loads	lb	$T_{N2}$	gear reducer nominal output torque (low speed shaft)	lb in
$f_s$	service factor	–	$T_{2i}$	gear reducer output torque (low speed shaft), during load cycle interval $i$	lb in
$f_t$	thermal factor	–	$T_S$	screw tightening torque	N m
$G$	weight (weight force)	lb	$T_{start}$	motor starting torque	lb in
$i$	transmission ratio	–	$T_{brake}$	motor braking torque	lb in
$i_N$	nominal transmission ratio	–	$T_{ambient}$	ambient temperature	°F
$L_h$	total duration of load cycle	h	$T_{oil}$	oil temperature	°F
$L_{WA}$	sound power level	dB(A)	$t$	time	s
$m$	mass	lb	$t_a$	starting time	s
$M_b$	bending moment	lb in	$t_b$	braking time	s
$n$	angular speed	rpm	$U$	voltage	V
$n_1$	gear reducer input speed (high speed)	rpm	$W$	work, energy	10 <sup>6</sup> lb in
$n_2$	gear reducer output speed (low speed)	rpm	$WK$	moment of inertia	lb ft <sup>2</sup>
$n_{2eq}$	load cycle equivalent speed	rpm	$WK_0^2$	moment of inertia (of mass) of the motor	lb ft <sup>2</sup>
$n_{N2}$	gear reducer nominal output speed	rpm	$WK_1^2$	moment of inertia (of mass) of the gear reducer referred to high speed shaft	lb ft <sup>2</sup>
$n_{2i}$	gear reducer output speed during load cycle interval $i$	rpm	$WK_R^2$	external (gear reducer, coupling, driven machine) moment of inertia (of mass) referred to to high speed shaft	lb ft <sup>2</sup>
$P$	power	hp	$z$	starting frequency	starts/h
$P_1$	gear reducer input power (high speed shaft), motor power	hp	$z_0$	no load starting frequency	starts/h
$P_2$	gear reducer output power (low speed shaft)	hp		angular acceleration	rad/s <sup>2</sup>
$P_{N2}$	gear reducer nominal output power (low speed shaft)	hp		efficiency	–
$P_t$	thermal power	hp	$\varphi$	plane angle	rad
$P_{tN}$	gear reducer nominal thermal power	hp	$\varphi_{a1}$	revolution of motor shaft during acceleration	rad
$P_{tth}$	gear reducer equivalent thermal power	hp	$\varphi_{d1}$	revolution of motor shaft during deceleration	rad
$T$	torque	lb in	$\omega$	angular velocity	rad/s

## Additional indexes (subscripts) and other symbols

Index	Description	Index	Description
N	nominal	th	thermal
1	relating to high speed shaft (input)	c	cycle
2	relating to low speed shaft (input)	–	from ... to
max	maximum	≈	approximately equal to
min	minimum	≥	greater than or equal to
eq	equivalent	≤	less than or equal to

## Unit conversion table

Description	Imperial units		International System of Units (SI), Technical System (metric)		
<b>Length, Distance</b>	1 inch	[in]	= 0.0254	meter	[m]
	1 foot	[ft]	= 0.3048		
<b>Mass</b>	1 pound	[lb]	= 0.4536	kilogram	[kg]
	1 ounce	[oz]	= 0.0283		
<b>Volume</b>	1 US liquid gallon	[gal]	= 3.7854	liter	[l]
<b>Temperature</b>	1 Fahrenheit degree	[°F]	= 1.8 · °C + 32	Celsius degree	[°C]
<b>Force</b>	1 pound-force	[lb <sub>(f)</sub> ]	= 4.4482	newton	[N]
		= 0.4536	kilogram force	[kg <sub>(f)</sub> ]	
<b>Power</b>	1 horse power	[hp]	= 0.7457	kilowatt	[kW]
<b>Torque, Work</b>	1 pound-force inch	[lb <sub>(f)</sub> in]	= 0.1130	newton meter, joule	[N m], [J]
		= 0.0115	kilogram-force meter	[kg <sub>(f)</sub> m]	
	1 pound-force foot	[lb <sub>(f)</sub> ft]	= 1.3560	newton meter, joule	[N m], [J]
<b>Pressure</b>	1 pound-force per square inch (psi)	[lb <sub>(f)</sub> /in <sup>2</sup> ]	= 0.1383	kilogram-force meter	[kg <sub>(f)</sub> m]
		= 0.0689	bar	[bar]	
<b>Moment of inertia</b>	1 WK <sup>2</sup>	[lb <sub>(f)</sub> ft <sup>2</sup> ]	= 0.0421	kilogram square-meter	[kg m <sup>2</sup> ]

# 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, CI, C2I, C3I and intermediate train of gears CI 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 polyacrylic 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).

## 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 2l ( $i_N = 10 \dots 25$ ); 3l ( $i_N = 25 \dots 125$ , excluding  $i_N = 112$ ), Cl ( $i_N = 8 \dots 20$ ) and C2l ( $i_N = 20 \dots 125$ , excluding  $i_N = 112$ ); to R 10 series for 4l ( $i_N = 125 \dots 315$ ) and C3l ( $i_N = 125 \dots 315$ );
- 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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# Designation

## Designation code

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

2

INPUT SPEED  
(see page 18)

MOUNTING POSITION  
(see page 17)

TRANSMISSION RATIO  
(see pages 7, 9)

DESIGN  
**A** standard  
... others (see ch. 8, 10)

MODEL  
**1**

SHAFT POSITIONS  
**P** helical  
**O** bevel-helical

MOUNTING  
**U** universal

SIZE  
**4000 ... 8001**

TRAIN OF GEARS  
Helical  
**2I** 2 helical gear pairs  
**3I** 3 helical gear pairs  
**4I** 4 helical gear pairs

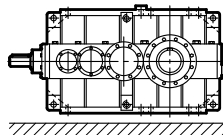
Bevel-helical  
**C1** 1 bevel and 1 helical gear pair  
**C2I** 1 bevel and 2 helical gear pairs  
**C3I** 1 bevel and 3 helical gear pairs

MACHINE  
**R** gear reducer

## Gear reducer mounting position

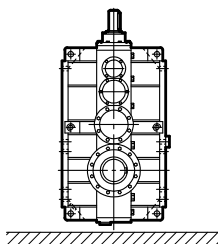
Mounting positions of gear reducers and gearmotors are stated at ch. 8, 10. Here following see some designation examples of important mounting positions.

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).

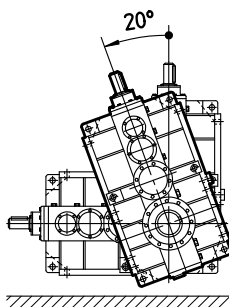


2. **Non-standard** mounting positions

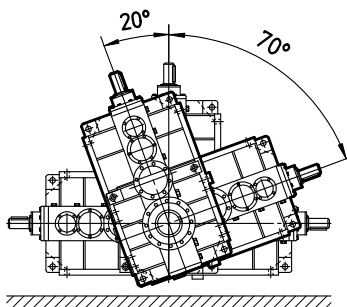
- 2a. Mounting position to catalog (see ch. 8, 10), **one only** and **fixed**, differing from B3; e.g.: mounting position **B6**



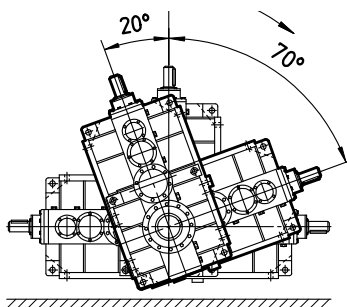
- 2b. **Inclined** and **fixed** mounting position ; e.g.: mounting position **B6 - 20° B3**



- 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**



## 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** rpm (4 poles 60 Hz), **1 500** rpm (4 poles 50 Hz), **1 200** rpm (6 poles 60 Hz), **1 000** rpm (6 poles 50 Hz), **750** rpm (8 poles 50 Hz), **90** rpm (applications at low input speed).

Example:

R C2I 4501 UO1H-81,2 B3  $n_1 = 1\ 800$  rpm

R 3I 5600 UP1A-127 B3  $n_1 = 1\ 000$  rpm

## 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).

# Service factor *fs*

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
a	<b>Uniform</b>	1	1	1	1.18	1.32
b	<b>Moderate overloads</b> (1.6 times the normal load)	1.12	1.18	1.25	1.5	1.7
c	<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
a	<b>Uniform</b>	1	1.06	1.12	1.18	1.25	1.5
b	<b>Moderate overloads</b> (1.6 times the normal load)	1	1	1.06	1.12	1.18	1.4
c	<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	– 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	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 a, b c	barkers: – mechanical and hydraulic – drum	b 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
<b>Compressors</b> centrifugal (single-stage, multi-stage) rotary (vane, lobe, screw) axial reciprocating: – multi-cylinder – single-cylinder	a b b b c	<b>Oil industry</b> paraffin filter presses, chillers rotary drilling equipment pumping equipment	b c b c	<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	c c a, b a b b
<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	<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>Rotating drums</b> dryers, chillers, rotary kilns, washing machines tumblers, cement kilns	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	a, b b c b c	<b>Clay working machinery</b> pug mills, extruders, rotary deslimers brick and tile presses	a, b 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	b c a b b
<b>Crushers and granulators</b> sugar cane, rubber, plastics minerals, stone	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 b c	<b>Sewage treatment</b> biological tanks (revolving disk) dewatering screws, collectors, rotary screens, thickeners, vacuum filters, anaerobic digestion tanks aerators, rotary breakers	b c 4)
<b>Cranes, winches and travelling lifts</b> travel (bridge, trolley, forks) <sup>1)</sup> slewing hoist <sup>2)</sup>	a a, b	<b>Wrapping and stacking machinery</b> wrapping (film, cardboard), binding, strapping and labelling equipment palletizing/depalletizing and stacking/unstacking machinery, palletizing robots	b c	<b>Screen and riddles</b> air washing, travelling water intake rotary (stone, gravel, cereals) vibrating screens, riddles, jigs	b b c
<b>Food</b> cookers (cereals and malt), mash tubs slicers, dough mixers, meat grinders, beet slicers, centrifuges, peelers, winemaking plant, bottle/bin/crate washers, rinsers, filters, corkers, cappers, extruders, crate filling and emptying equipment	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>Fans</b> small diameter (centrifugal, axial-flow) large diameter (mines, furnaces, etc.) cooling towers (inducted or forced draft), ducted, piston	a 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	b c		
<b>Lumber and woodworking industries</b> mechanical loaders, pallet stackers conveyors for:					

\* 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  $fs > 1.6$  and in the storeyard cranes  $fs > 2$  (container handling).

2) For selection of  $fs$  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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# Thermal power $P_t$ [hp]

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 203 °F<sup>1)</sup> (95 °C) approximately oil temperature when operating in following running conditions:

- input speed  $n_1 = 1\ 500$  rpm
- mounting position B3;
- continuous duty S1;
- maximum ambient temperature 68 °F (20° C) (in the table the values referred to 104 °F (40° C) are stated);
- maximum altitude 3300 ft above sea level;
- air speed  $\geq 4$  ft/s (typical value in presence of a self-cooled motor).

Nominal thermal power  $P_{tN}$

$T_{amb}$	Train of gears	Gear reducer size						
		$P_{tN}$ [hp]						
		4000, 4001	4500, 4501	5000, 5001	5600, 5601	6300, 6301	7101	8001
52 °F (20° C)	2I	425	475	670	750	950	1120	1600
	3I	315	355	500	560	710	850	1180
	4I	236	265	375	425	530	630	900
	C1	400	560	—	—	—	—	—
	C2I	315	355	500	560	710	850	1180
	C3I	236	265	375	425	530	630	900
104 °F (40° C)	2I	315	355	500	560	710	850	1180
	3I	236	265	375	425	530	630	900
	4I	180	200	280	315	400	475	670
	C1	300	425	—	—	—	—	—
	C2I	236	265	375	425	530	630	900
	C3I	180	200	280	315	400	475	670

Always verify that the power applied  $P_1$  is lower than or equal to gear reducer thermal power  $P_{tN}$  multiplied by correction coefficients  $f_{t1}$ ,  $f_{t2}$ ,  $f_{t3}$ ,  $f_{t4}$ ,  $f_{t5}$  (stated in the following tables) considering the various operating conditions:

$$P_1 \leq P_{tN} \cdot f_{t1} \cdot f_{t2} \cdot f_{t3} \cdot f_{t4} \cdot f_{t5}$$

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);

$P_{2i}$  [hp] 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  $f_{t2}$  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 122 °F (50° C) or lower than 32 °F (0° C) consult us.

1) Corresponding to an average temperature of the external housing surface of approximately 185 °F; 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 [%].

Thermal factor  $f_{t1}$  ( $= f_{t1a} \cdot f_{t1b}$ ) according to **cooling system** and **input speed  $n_1$**

Cooling system		$f_{t1a} \cdot f_{t1b}$						
		input speed $n_1$ [rpm] $\geq$						
		750	1 000	1 200	1 500	1 800		
$f_{t1a}$	Natural convection	train of gears	2l. C1 3l. 4l. C2l. C3l	1.18 1.06	1.12 1.06	1.06 1.03	1 1	0.85 0.95
	$f_{t1b}$	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) with 1 radial fan (bevel helical gear units)			1.25	1.4	1.6	1.8 <sup>5)</sup>	2	
with water coil <sup>4)</sup>		2						

Thermal factor  $f_{t2}$  according to **ambient temperature** and **service**

Maximum ambient temperature °F (°C)	Continuous duty <b>S1</b>	$f_{t2}$			
		Intermittent duty <b>S3 ... S6</b>			
		Cyclic duration factor [%] for 60 min running <sup>7)</sup>			
		60	40	25	15
<b>122 (50)</b>	0.6	0.71	0.8	0.95	1
<b>104 (40)</b>	0.75	0.9	1	1.12	1.25
<b>86 (30)</b>	0.9	1.06	1.18	1.32	1.5
<b>68 (20)</b>	<b>1</b>	1.18	1.32	1.5	1.7
$\leq$ <b>50 (10)</b>	1.12	1.32	1.5	1.7	1.9

Thermal factor  $f_{t4}$  according to **altitude of installation**

Altitude a.s.l. [ft]	$f_{t4}$
$\leq$ <b>3300</b>	<b>1</b>
<b>3300 – 6600</b>	0.95
<b>6562 – 9843</b>	0.9
<b>9843 – 13123</b>	0.85
$\geq$ <b>13123</b>	0.8

Thermal factor  $f_{t3}$  according to **mounting position** (see also ch. 8, 10): where it is not specified  $f_{t3} = 1$

Train of gears	$f_{t3}$				
	mounting position				
	B3	B6	B7	V5	V6
<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 low speed wheel on the bottom 0.71 low speed wheel on the top
	UO1H, UO1H sin, UO1G, UO1G sin, UO1M, UO1M sin	0.85	0.71	0.6	0.71 low speed wheel on the bottom 0.6 low speed wheel on the top
<b>C2I</b>	UO1A, UO1A sin, UO1F, UO1F sin, UO1N, UO1N sin UO1V, UO1V sin, UO1S, UO1S sin, UO1L, UO1L sin	1	0.9	0.8	0.9 low speed wheel on the top 0.8 low speed wheel on the bottom
	UO1H, UO1H sin, UO1G, UO1G sin, UO1M, UO1M sin	0.9	0.8	0.71	0.8 low speed wheel on the top 0.71 low speed wheel on the bottom
<b>C3I</b>		1	0.9	0.8	0.9 low speed wheel on the bottom 0.8 low speed wheel on the top

Thermal factor  $f_{t5}$  according to cooling air speed on housing

Air speed ft/s	Installation environment	$f_{t5}$
<b>&lt; 2.07</b>	very small environment or without air movements or with protected gear reducer	consult us
<b>2.07</b>	small environment and with limited air movements	0.71
<b>3.28</b>	wide environment without air movements	0.9
<b>4.10</b>	wide environment with light air movements (e.g. gearmotor with self-cooled motor)	<b>1</b>
<b>8.2</b>	open and cooled	1.18
<b>13.12</b>	with heavy air movements	1.32

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# Selection

5.1 - Preliminary considerations.....	28
5.2 - Determining the gear reducer size .....	29
5.3 - Verifications .....	30
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 ( $\cos\phi$ ) 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 rpm, unless conditions make it necessary; better to take advantage of the transmission, and use an input speed lower than 900 rpm.

Size	Train of gears																	
	2I			3I			4I			CI			C2I			C3I		
	$\dot{n}$	$n_{1max}$	$n_{1peak}$	$\dot{n}$	$n_{1max}$	$n_{1peak}$	$\dot{n}$	$n_{1max}$	$n_{1peak}$	$\dot{n}$	$n_{1max}$	$n_{1peak}$	$\dot{n}$	$n_{1max}$	$n_{1peak}$	$\dot{n}$	$n_{1max}$	$n_{1peak}$
	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm	rpm
<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	1 850	≤ 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).

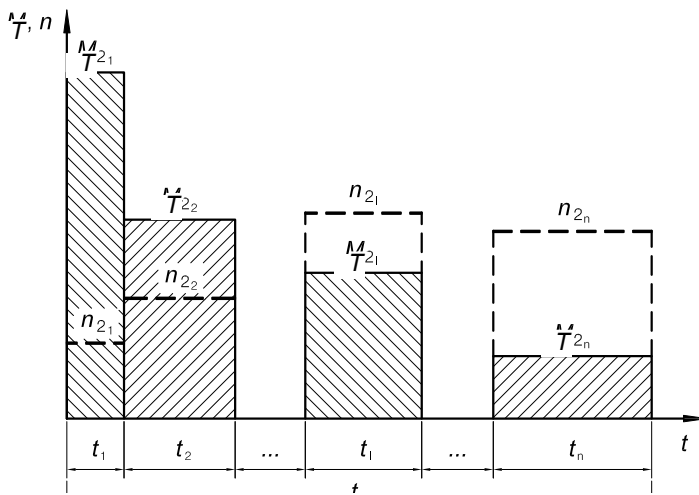
When for reasons of motor standardization, power  $P_1$  applied at input side of gear reducer turns out to be higher than the power required (considering motor/gear reducer efficiency), it must be certain that this excess power applied will never be required, and frequency of starting z is so low as 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  $T_2$  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  $T_2$  and angular speed  $n_2$  variable in time, according to a given load cycle, calculate the equivalent torque  $T_{2eq}$  and angular speed  $n_{2eq}$  with the following formulae:



$$T_{2eq} = \sqrt[p]{\frac{T_{21}^p \cdot n_{21} \cdot L_{h1} + T_{22}^p \cdot n_{22} \cdot L_{h2} + \dots + T_{2i}^p \cdot n_{2i} \cdot L_{hi} + \dots + T_{2n}^p \cdot n_{2n} \cdot L_{hn}}{n_{2eq} \cdot L_h}}$$

$$n_{2eq} = \frac{n_{21} \cdot L_{h1} + n_{22} \cdot L_{h2} + \dots + n_{2i} \cdot L_{hi} + \dots + n_{2n} \cdot L_{hn}}{L_h}$$

where:

- $T_{2eq}$  [N·m] is the equivalent torque of load cycle
- $T_{2i}$  [N·m] is the torque required (constant) of load level i
- $n_{2eq}$  [rpm] is the equivalent speed in the load cycle
- $n_{2i}$  [rpm] 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  $T_{2max}$  (see ch. 7, 9), if higher or if it cannot be evaluated in the above cases, install a safety device so that  $T_{2max}$  **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  $T_{2i}$  is lower than  $T_{2max}$  and that input speed (relevant to output shaft speed  $n_2$ ) 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.

## 1 Application conditions

Application / Industry sector

Type of machine to be driven

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

Ambient temperature [°F]

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 ( $v_{air} < 2.07$  ft/s)
- wide environment with free air movement ( $v_{air} \geq 4.10$  ft/s)
- open space, prot. against extremes of weather and solar radiance

## 2 Load data

Required output speed [rpm]

min      nominal      max

Torque required at low speed shaft [lbf in]

min      nominal      max

Required output power [hp]

min      nominal      max

Input speed (gear reducers) [rpm]

min      nominal      max

Nature of load:

- uniform
- moderate overloads
- heavy overloads

Frequency of starting [starts/h]

Machine moment of inertia [lb ft<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  $P_1$  [hp]

min      nominal      max

Nominal speed  $n_1$  [rpm]

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 [lbf in]

Starting torque [lbf in]

Moment of inertia [lb ft<sup>2</sup>]

Electric motor design (a.c. and d.c.):

- with independent cooling fan
- with encoder:
- with tachogenerator

System of motor-gear reducer mounting:

- with coupling
- with trapezoidal belts

section	No.	$d_m$ [in]	$d_1$ [in]
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

- with timing belt

section	No.	$d_m$ [in]
<input type="text"/>	<input type="text"/>	<input type="text"/>

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

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Type of machine coupling

- shaft mounting
- with fluid / flexible coupling
- with cardan joint
- with toothed belt drive

pitch	$d_m$	$d_1$	$\varphi$
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

- with chain

pitch	No.	$z_2$	$z_3$	overhang [in]	$\varphi$
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

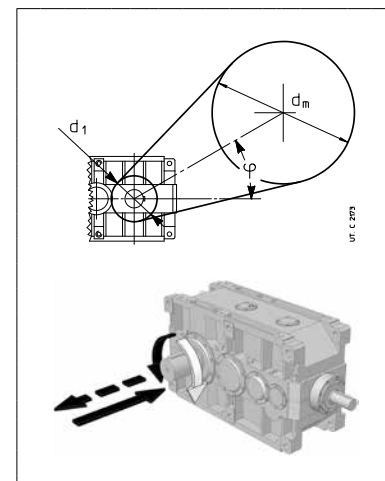
- straight tooth cylindrical gear

pitch	No.	$z_2$	$z_3$	overhang [in]	$\varphi$
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Eventual axial load  $F_a$  [lbf]

Eventual limit to drive dimensions

H series



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# Structural and operational details

Sound levels $L_{WA}$ and $L_{pA}$ .....	34
Efficiency.....	34
Overloads.....	34
Moment of inertia (of mass) $J_1$ [lb ft <sup>2</sup> ].....	35
High and low speed shaft end.....	36
Plug dimensions.....	36
Side-cover dimensions.....	37
Direction of rotation .....	37
Forced bearing and/or gear lubrication or with independent cooling unit.....	38

## 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  $n_1 = 1\ 500$ <sup>3)</sup> rpm. 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 8579-1.

2) Mean value of measurement at 3.18 ft from external profile of gear reducer standing in free field on a reflecting surface.

3) In the speed range  $n_1$  750 1 800 min<sup>-1</sup>, sum to the table values: -3 dB(A) for 750 rpm; -2 dB(A) for 1000 rpm; -1 dB(A) for  $n_1 = 1\ 200$  rpm; +2 dB(A) for  $n_1 = 1\ 800$  rpm.

## 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  $T_2 \ll T_{N2}$ .

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  $T_{2max}$  (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  $T_{2max}$ .

## Starting torque

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

$$T_2 \text{ start} = \left( \frac{T_{\text{start}}}{T_N} \cdot T_2 \text{ available} - T_2 \text{ required} \right) \frac{WK_R^2}{WK_R^2 + WK_0^2} + T_2 \text{ required}$$

where:

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

$T_2$  required is the torque absorbed by the machine through work and frictions;

$T_2$  available is the output torque due to motor nominal power;

$WK_0^2$  is the moment of inertia (of mass) of the motor;

$WK_R^2$  is the external moment of inertia (of mass); 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  $T_2$  required.

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

$$\left( \frac{T_{\text{brake}}}{\eta} \cdot i + T_2 \text{ required} \right) \frac{WK_R^2}{WK_R^2 + WK_0^2} - T_2 \text{ required} < 1.6 \cdot T_{N2}$$

where:

$T_{\text{brake}}$  is the braking torque applied on high speed shaft; for other symbols see above and ch. 1.

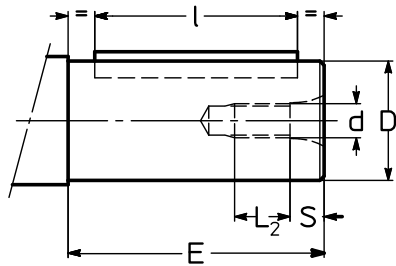
## Moment of inertia (of mass) $WK_1^2$ [lb ft<sup>2</sup>]

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:  $WK_2^2 = WK_1^2 \cdot i^2$ .

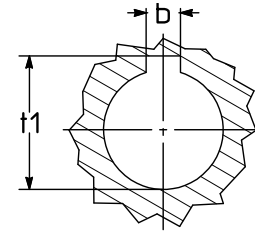
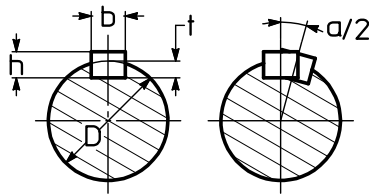
Train of gears	$i_n$	Gear reducer size <sup>1)</sup>									
		Moment of inertia of mass $WK_1$ [lb ft <sup>2</sup> ]									
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301
2I	10	16.92	17.37	–	–	–	–	–	–	–	–
	11.2	16.23	16.61	18.98	19.29	–	–	–	–	–	–
	12.5	11.08	11.34	17.96	18.25	–	–	–	–	–	–
	14	10.63	10.87	12.36	12.58	33.06	33.91	38.18	38.75	85.26	86.45
	16	10.23	10.44	11.75	11.91	31.63	32.34	36.12	36.62	80.97	81.35
	18	7.048	7.190	11.13	11.27	23.59	24.13	34.15	34.58	78.22	79.07
	20	6.787	6.906	10.68	10.80	22.69	23.14	32.99	33.36	56.72	56.95
3I	22.4	6.621	6.739	7.356	7.451	19.17	19.53	24.28	24.56	55.01	55.53
	25	4.983	5.055	7.072	7.143	18.75	19.06	20.46	20.67	–	–
	28	4.888	4.936	5.316	5.363	14.29	14.50	15.50	15.64	36.21	36.52
	31.5	4.794	4.841	5.149	5.197	13.95	14.12	15.02	15.14	35.03	35.14
	35.5	3.536	3.560	5.007	5.031	9.919	10.04	14.55	14.64	23.64	23.83
	40	3.465	3.488	3.702	3.726	9.706	9.801	14.26	14.36	22.92	22.99
	45	3.156	3.180	3.607	3.631	8.590	8.662	10.09	10.13	19.79	22.62
	50	3.109	3.132	3.251	3.275	8.448	8.519	8.875	8.923	19.36	19.41
	56	1.780	1.804	3.204	3.204	5.719	5.766	8.685	8.733	13.17	14.95
	63	1.756	1.780	1.851	1.875	5.624	5.672	5.909	5.933	12.89	12.91
	71	1.281	1.281	1.827	1.827	3.892	3.916	5.790	5.814	8.614	12.77
	80	1.258	1.258	1.329	1.329	3.844	3.868	4.010	4.034	8.448	8.472
	90	1.139	1.139	1.281	1.305	3.512	3.536	3.939	3.963	8.353	8.377
	100	1.115	1.115	1.281	1.281	3.488	3.512	3.892	3.916	7.523	7.523
	125	–	–	1.139	1.139	–	–	–	–	–	–
4I	125	1.044	1.044	1.068	1.068	3.037	3.061	3.109	3.109	6.526	6.550
	160	0.831	0.831	0.831	0.831	2.515	2.515	2.563	2.563	5.885	5.885
	200	0.498	0.498	0.522	0.522	1.187	1.187	1.210	1.210	2.658	2.658
	250	0.403	0.403	0.427	0.427	0.997	0.997	0.997	0.997	2.397	2.397
	315	0.356	0.356	0.403	0.403	0.854	0.854	0.997	0.997	1.993	1.993
CI	8	22.88	23.56	32.91	–	–	–	–	–	–	–
	9	21.74	22.38	30.47	31.06	–	–	–	–	–	–
	10	20.69	21.21	24.56	29.16	–	–	–	–	–	–
	11.2	20.05	20.55	22.99	23.37	–	–	–	–	–	–
	12.5	13.57	13.93	21.86	22.16	–	–	–	–	–	–
	14	13.19	13.50	15.05	15.28	–	–	–	–	–	–
	16	9.207	9.421	14.31	14.52	–	–	–	–	–	–
	18	8.970	9.160	10.11	–	–	–	–	–	–	–
C2I	20	9.445	9.563	9.682	9.801	–	–	–	–	–	–
	22.4	9.279	9.373	9.967	10.04	29.90	30.23	–	–	–	–
	25	9.112	9.207	9.706	9.777	29.33	29.62	31.11	31.30	–	–
	28	7.072	7.119	9.468	9.540	22.62	22.83	30.33	30.49	38.97	39.27
	31.5	6.953	7.024	7.356	7.380	22.26	22.45	23.40	23.54	37.90	37.99
	35.5	6.455	6.502	7.190	7.238	20.38	20.50	22.90	23.02	37.21	37.42
	40	6.383	6.431	6.621	6.668	20.15	20.27	20.86	20.95	27.74	27.81
	45	4.295	4.319	6.526	6.550	13.38	13.48	20.55	20.62	24.39	27.43
	50	4.248	4.271	4.414	4.414	13.24	13.31	13.69	13.74	23.97	24.02
	56	2.943	2.943	4.343	4.366	9.089	9.160	13.50	13.55	15.92	23.78
	63	2.895	2.919	2.990	3.014	9.018	9.041	9.279	9.326	15.66	15.69
	71	2.705	2.705	2.966	2.966	8.495	8.519	9.160	9.184	15.47	15.54
	80	2.682	2.705	2.943	2.943	8.448	8.472	9.089	9.112	10.51	10.51
	100	1.614	1.637	1.780	1.780	5.244	5.268	5.672	5.695	10.39	10.39
	125	–	–	1.637	1.637	–	–	5.292	5.292	–	–
C3I	125	1.210	1.234	1.234	1.258	3.868	3.868	3.939	3.939	7.570	7.570
	160	0.807	0.807	0.807	0.807	2.468	2.492	2.515	2.515	5.102	5.102
	200	0.641	0.641	0.641	0.641	2.065	2.065	2.088	2.088	3.251	4.010
	250	0.380	0.380	0.380	0.380	1.234	1.234	1.258	1.258	2.563	2.563
	315	0.308	0.308	0.308	0.308	1.044	1.044	1.068	1.068	1.542	1.542

1) For sizes 7101 and 8001, consult us.

## High and low speed shaft end



Gear reducer



UT.C. 2099

(Hollow) machine shaft

D Ø	E	Shaft end				$\alpha/2_{\max}$ arc min 1)	Key			Keyway		
		d Ø	S	L <sub>2</sub>	b h9		h h11	l	b h9 hub N9 shaft	t shaft	t <sub>1</sub> shaft	
<b>38</b> k6	80	M10	7.6	18.4	3.27	10	8	70	10	5	41.3	
<b>48</b> k6	110	M12	9.5	22.5	3.08	14	9	90	14	5.5	51.8	
<b>55</b> m6	110	M12	9.5	22.5	2.75	16	10	90	16	6	59.3	
<b>60</b> m6	140	M16	12.7	27.3	2.46	18	11	110	18	7	64.4	
<b>65</b> m6	140	M16	12.7	27.3	2.33	18	11	110	18	7	69.4	
<b>70</b> m6	140	M16	12.7	27.3	2.55	20	12	125	20	7.5	74.9	
<b>75</b> m6	140	M16	12.7	27.3	2.38	20	12	125	20	7.5	79.9	
<b>80</b> m6	170	M20	16	34	2.23	22	14	140	22	9	85.4	
<b>90</b> m6	170	M20	16	34	1.99	25	14	140	25	9	95.4	
<b>100</b> m6	210	M24	19	41	1.79	28	16	180	28	10	106.4	
<b>110</b> m6	210	M24	19	41	1.63	28	16	180	28	10	116.4	
<b>120</b> m6	210	M30	22	45	1.78	B32	18	170	32	11	127.4	
<b>125</b> m6	210	M30	22	45	1.71	32	18	180	32	11	132.4	
<b>140</b> m6	250	M30	22	45	1.52	36	20	180	36	12	148.4	
<b>150</b> m6	245	M36	27	54	1.42	36	20	220	36	12	158.4	
<b>150</b> m6	250	M36	27	54	1.42	B36	20	210	36	12	158.4	
<b>180</b> m6	300	M36	27	54	1.18	45	25	250	45	15	190.4	
<b>190</b> m6	280	M36	27	54	1.12	B45	25	230	45	15	200.4	
<b>200</b> m6	280	M36	27	54	1.07	B45	25	230	45	15	210.4	
<b>200</b> m6	350	M36	27	54	1.07	45	25	320	45	15	210.4	
<b>210</b> m6	300	M36	27	54	1.02	B50	28	250	50	17	221.4	
<b>220</b> m6	300	M36	27	54	0.97	B50	28	250	50	17	231.4	
<b>240</b> m6	330	M45	33	67	1.06	B56	32	270	56	20	252.4	
<b>250</b> m6	330	M45	33	67	1.02	B56	32	270	56	20	262.4	
<b>270</b> m6	380	M45	33	67	0.94	B63	32	320	63	20	282.4	
<b>280</b> m6	380	M45	33	67	0.91	B63	32	320	63	20	292.4	
<b>300</b> m6	430	M45	33	67	0.85	B70	36	355	70	22	314.4	
<b>320</b> m6	430	M45	33	67	0.80	B70	36	355	70	22	334.4	
<b>360</b> m6	590	M45	33	67	1.45	B80	40	550	90	25	375.4	
<b>400</b> m6	660	M45	33	67	1.50	B90	45	610	90	28	417.4	

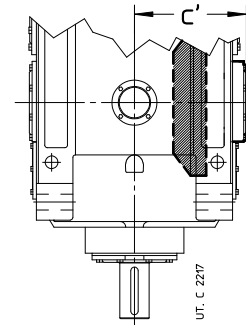
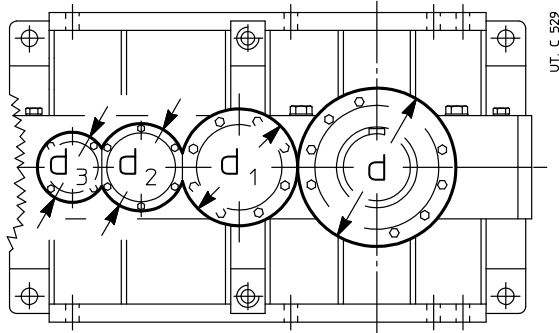
1) Maximum angular disalignment of keyways on double extension shafts.

## Plug dimensions

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

## Side-cover dimensions

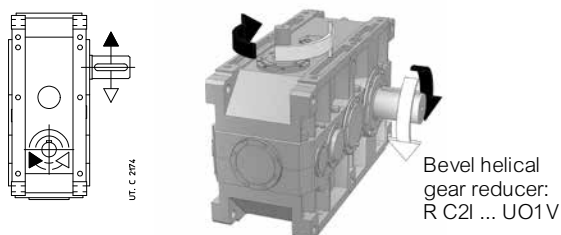
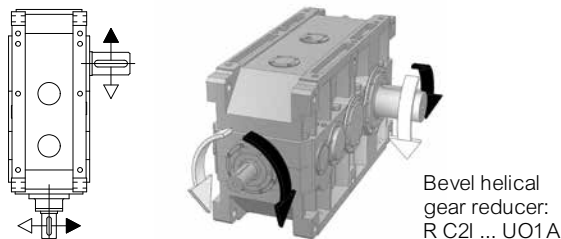
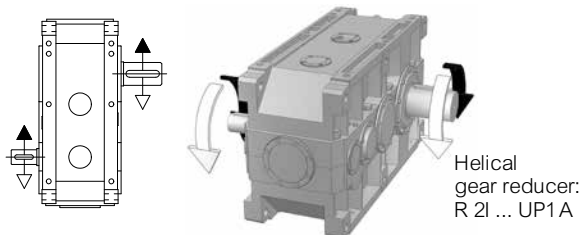
The low speed shaft covers are machined for spigot. For cover height, consider the difference  $C - H_1$  (ch. 8 and 10); for trains of gears CI and C2I the cover dimensions on bevel wheel side are stated in the table. Diameter tolerance  $\pm 0.5$  (excluding  $d$  dimension).



Size	Train of gears									
	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>	$i_N \leq 11.2$	$i_N \geq 12.5$	$i_N \leq 11.2$	$i_N \geq 12.5$	190	248	318	340	363 <sup>1)</sup>	432
	170	190	259	248						
<b>4500, 4501</b>	$i_N \leq 12.5$	$i_N \geq 14$	$i_N \leq 12.5$	$i_N \geq 14$	190	248	318	340	363 <sup>1)</sup>	472
	170	190	259	248						
<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).

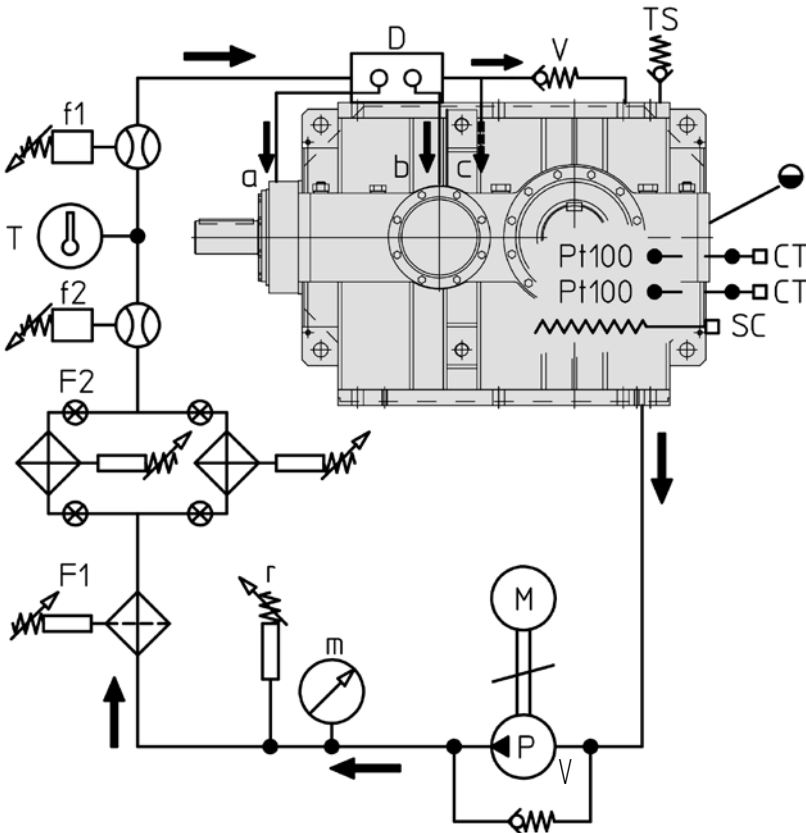
## Direction of rotation



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 (0-230 psi)
M	Motor pump (2 hp)
P	Pump (1.27 ft <sup>3</sup> /min)
T	Thermometer 32-248 °F (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*

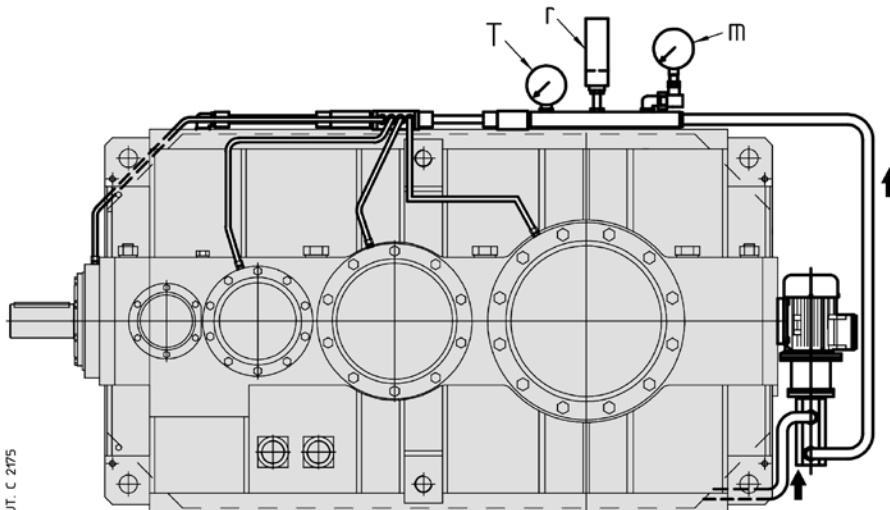
\*On request, but necessary for gear reducer starting at  $T_{ambient} (= T_{oil}) \leq 77\text{ °F (25 °C)}$ ; pre-heat the oil with the heater.

## Starting at low temperature ( $T_{oil} = T_{ambient} \leq 77\text{ °F (25 °C)}$ ) 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 122 °F (50 °C) (stopping the heater supply) and the reset threshold at 86 °F (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 86 °F (30 °C) to start the gear reducer and the motor pump, the reset threshold at 50 °F (10 °C) and the safety threshold at 194 °F (90 °C).

For starting at  $T_{oil} (= T_{ambient}) \leq 32\text{ °F (0 °C)}$  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)).

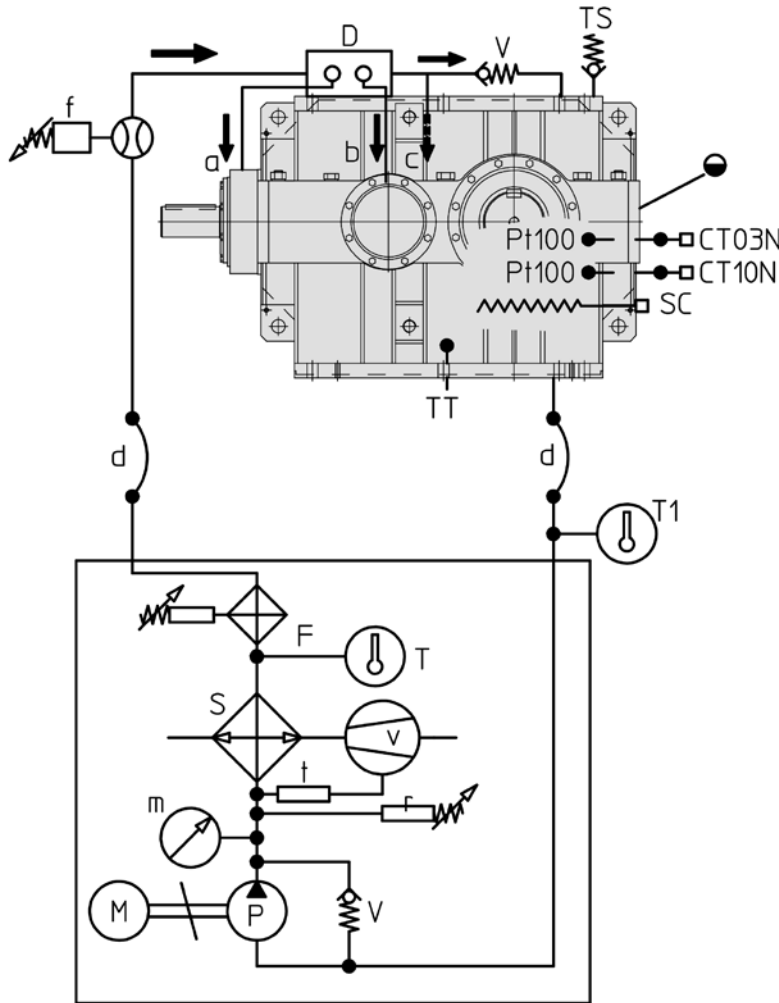


**Example of forced lubrication with motor pump;** the exact position of motor pump depends on the gear reducer size, train of gears, mounting position and available dimensions: for this reason, on request, a drawing of the specific solution will be supplied; pipes are usually realized with suction and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

UT. C 2175

## 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

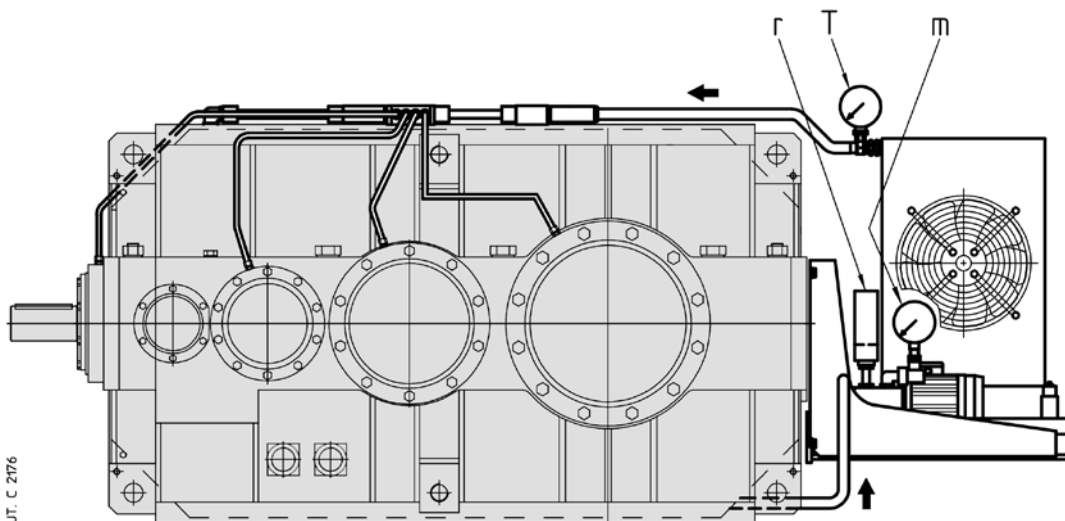
a, b, c	Gear pair/bearing pipes
d	Flexible connection (by Customer)
m	Pressure gauge (0 - 230 psi)
M	Motor pump (ch. 12 (10))
P	Pump (ch. 12 (10))
S	Oil/air or oil/water exchanger
v	Motor fan (UR O/A)
t	Fan thermostat 32÷ 194 °F (0 - 90 °C) (UR O/A)
T	Thermometer 32 - 248 °F (0 - 120 °C)
V	Safety valve
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 32 - 248 °F (0 - 120 °C)
TT	Bi-metal type thermostat
SC*	Oil heater*

\* On request, but necessary for gear reducer starting at  $T_{ambient} (= T_{oil}) \leq 77 \text{ °F} (25 \text{ °C})$ : pre-heat the oil with the heater.

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



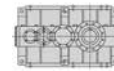
**Example of forced lubrication with cooling unit** the exact position of cooling unit depends on the gear reducer size, on train of gears, mounting position and available dimensions: for this reason, on request, a drawing of specific solution is supplied; the pipes are usually realized with suction/delivery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

UT. C 2176

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# Selection tables (helical gear reducers)

# Selection tables (helical gear reducers)

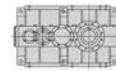


$n_1 = 1\ 800\ \text{rpm}$

rain of ears	$i_N$	$n_{N2}$ rpm	Gear reducer size													
			Nominal output power						Nominal output torque							
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001		
$P_{N2}$ [hp]						$T_{N2} (T_{2max})$ [ $10^3$ lb in]										
2I	10	180	2430 ▲ 840 (1360)	2680 ▲ 925 (1600)	-	-	-	-	-	-	-	-	-	-	-	-
	11,2	160	2140 ▲ 840 (1360)	2390 ▲ 940 (1600)	2540 ▲ 1010 (1850)	2740 ▲ 1090 (2180)	-	-	-	-	-	-	-	-	-	-
	12,5	140	1930 ▲ 840 (1400)	2160 ▲ 940 (1600)	2270 ▲ 1025 (1850)	2400 ▲ 1080 (2120)	-	-	-	-	-	-	-	-	-	-
	14	132	1700 ▲ 840 (1400)	1900 ▲ 940 (1600)	2080 ▲ 1045 (1900)	2290 ▲ 1150 (2180)	2890 ▲ 1415 (2800)	3250 ▲ 1595 (3150)	3990 ▲ 1985 (3750)	4510 ▲ 2245 (4250)	5920 ▲ 2965 (5300)	6470 ▲ 3245 (6150)	-	-	-	-
	16	112	1480 ▲ 840 (1360)	1590 ▲ 905 (1550)	1840 ▲ 1045 (1900)	2030 ▲ 1155 (2180)	2530 ▲ 1415 (2720)	2790 ▲ 1565 (3150)	3540 ▲ 1985 (3750)	4030 ▲ 2260 (4370)	5140 ▲ 2965 (5300)	5650 ▲ 3320 (6150)	-	-	-	-
	18	100	1360 ▲ 840 (1400)	1520 ▲ 940 (1600)	1590 ▲ 1035 (1800)	1670 ▲ 1095 (2060)	2310 ▲ 1415 (2720)	2600 ▲ 1595 (3150)	3100 ▲ 1985 (3650)	3450 ▲ 2200 (4120)	4640 ▲ 2965 (5000)	5160 ▲ 3300 (5800)	-	-	-	-
	20	90	1180 ▲ 840 (1400)	1310 ▲ 935 (1600)	1450 ▲ 1045 (1950)	1620 ▲ 1170 (2240)	2020 ▲ 1415 (2720)	2270 ▲ 1595 (3150)	2830 ▲ 1985 (3870)	3250 ▲ 2275 (4500)	4060 ▲ 2965 (5450)	4460 ▲ 3320 (6300)	-	-	-	-
	22,4	80	1070 ▲ 840 (1320)	1190 ▲ 940 (1500)	1280 ▲ 1045 (1850)	1390 ▲ 1135 (2120)	1800 ▲ 1415 (2800)	2020 ▲ 1595 (3150)	2480 ▲ 1985 (3650)	2850 ▲ 2275 (4250)	3660 ▲ 2965 (5150)	4100 ▲ 3320 (6000)	-	-	-	-
3I	25	71	953 840 (1500)	1010 890 (1700)	1160 ▲ 1045 (1700)	1300 ▲ 1170 (1950)	1630 ▲ 1415 (2650)	1840 ▲ 1595 (3070)	2210 ▲ 1985 (3750)	2530 ▲ 2275 (4250)	-	-	4540 ▲ 4085 (8250)	-	-	-
	28	63	882 885 (1500)	944 945 (1700)	1000 1020 (1950)	1080 1095 (2180)	1670 ▲ 1680 (3000)	1860 ▲ 1865 (3450)	1980 ▲ 2015 (4000)	2130 ▲ 2170 (4370)	2950 ▲ 2830 (5600)	3410 ▲ 3280 (6500)	4540 ▲ 4400 (8750)	-	-	-
	31,5	56	766 885 (1500)	858 990 (1750)	936 1080 (2000)	1000 1160 (2300)	1460 ▲ 1680 (2900)	1640 ▲ 1875 (3350)	1860 ▲ 2130 (4000)	2020 ▲ 2315 (4620)	2560 ▲ 2830 (5600)	2910 ▲ 3280 (6500)	4540 ▲ 5070 (10000)	-	-	-
	35,5	50	705 885 (1500)	774 970 (1750)	834 1105 (2060)	889 1180 (2240)	1330 1680 (2900)	1480 1875 (3350)	1640 ▲ 2150 (3870)	1860 ▲ 2430 (4370)	2340 ▲ 2890 (5800)	2720 ▲ 3350 (6700)	4510 ▲ 5580 (9750)	-	-	-
	40	45	611 885 (1450)	685 990 (1700)	766 1105 (2060)	817 1180 (2360)	1160 1680 (2900)	1300 1875 (3350)	1500 ▲ 2150 (4120)	1730 ▲ 2480 (4750)	2040 ▲ 2890 (5800)	2320 ▲ 3350 (6700)	3920 ▲ 5580 (10600)	-	-	-
	45	40	559 885 (1500)	627 990 (1700)	666 1105 (1950)	746 1240 (2240)	1060 1680 (3000)	1180 1875 (3450)	1300 2150 (3870)	1500 2480 (4500)	1850 ▲ 2950 (6000)	2170 ▲ 3420 (6900)	3450 ▲ 5540 (10900)	-	-	-
	50	35,5	486 885 (1500)	544 990 (1700)	608 1105 (2060)	681 1240 (2430)	924 1680 (3000)	1030 1875 (3450)	1180 2150 (4120)	1360 2480 (4750)	1700 ▲ 3115 (6000)	1830 ▲ 3420 (6900)	3010 ▲ 5580 (10900)	-	-	-
	56	31,5	440 885 (1500)	493 990 (1750)	529 1105 (1950)	592 1240 (2240)	858 1680 (3070)	957 1875 (3450)	1040 2150 (4000)	1190 2480 (4500)	1560 3135 (6000)	1760 3485 (6900)	2820 ▲ 5580 (10900)	3850 ▲ 7970 (15500)	-	-
	63	28	382 885 (1500)	428 990 (1750)	479 1105 (2120)	536 1240 (2430)	750 1680 (3070)	837 1875 (3450)	960 2150 (4250)	1110 2480 (4870)	1360 3140 (6000)	1550 3645 (6900)	2450 ▲ 5580 (10900)	3340 ▲ 7970 (15500)	-	-
	71	25	358 885 (1550)	401 990 (1750)	416 1105 (2000)	466 1240 (2300)	676 1680 (3070)	754 1875 (3550)	841 2150 (4000)	969 2480 (4620)	1250 3140 (6150)	1430 3645 (7100)	2220 ▲ 5580 (11200)	3040 ▲ 7970 (16000)	-	-
	80	22,4	311 885 (1550)	348 990 (1750)	389 1105 (2180)	436 1240 (2500)	591 1680 (3070)	660 1875 (3550)	756 2150 (4250)	871 2480 (5000)	1090 3140 (6150)	1240 3645 (7100)	1930 ▲ 5580 (11200)	2640 ▲ 7970 (16000)	-	-
	90	20	286 885 (1550)	321 990 (1750)	339 1105 (2060)	379 1240 (2360)	541 1680 (3070)	603 1875 (3550)	663 2150 (4120)	764 2480 (4750)	983 3140 (5800)	1140 3645 (6700)	1780 ▲ 5580 (11200)	2500 ▲ 7970 (16000)	-	-
	100	18	249 885 (1550)	278 990 (1750)	307 1105 (2180)	344 1240 (2500)	473 1680 (3070)	528 1875 (3550)	605 2150 (4250)	697 2480 (4870)	860 3140 (6150)	980 3645 (7100)	1540 ▲ 5580 (11200)	2170 ▲ 7970 (16000)	-	-
	125	14	-	-	246 1105 (1900)	275 1240 (2180)	-	-	484 2150 (3750)	558 2480 (4250)	-	-	-	-	-	-
	4I	125	14	191 840 (1600)	214 940 (1800)	248 1105 (2240)	284 1265 (2500)	373 1680 (3150)	404 1825 (3650)	470 2150 (4250)	534 2445 (4870)	652 3055 (6150)	742 3540 (7100)	1210 ▲ 5750 (11200)	1810 ▲ 8190 (16000)	-
160		11,2	158 885 (1600)	178 990 (1800)	195 1105 (2240)	226 1280 (2570)	303 1680 (3150)	333 1850 (3650)	382 2150 (4250)	437 2465 (4870)	530 3130 (6150)	590 3540 (7100)	979 ▲ 5750 (11200)	1400 ▲ 8190 (16000)	-	-
200		9	132 885 (1600)	148 990 (1800)	163 1105 (2240)	188 1280 (2570)	226 1680 (3150)	252 1875 (3650)	285 2150 (4250)	327 2465 (4870)	403 3055 (6150)	459 3540 (7100)	777 5750 (11200)	1090 ▲ 8190 (16000)	-	-
250		7,1	104 885 (1600)	117 990 (1800)	128 1105 (2240)	148 1280 (2570)	184 1680 (3150)	205 1875 (3650)	232 2150 (4250)	265 2465 (4870)	329 3140 (6150)	375 3645 (7100)	631 5750 (11200)	844 ▲ 8190 (16000)	-	-
315		5,6	84,6 885 (1600)	94,8 990 (1800)	98,4 1105 (2060)	114 1285 (2360)	145 1680 (3150)	162 1875 (3650)	180 2150 (4120)	208 2480 (4750)	264 3140 (6150)	300 3645 (7100)	498 5750 (11200)	666 ▲ 8190 (16000)	-	-

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

# Selection tables (helical gear reducers)

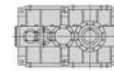


$n_1 = 1\ 500\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power $P_{N2}$ [hp]											
			Nominal output torque $T_{N2} (T_{2max})$ [ $10^3$ lb in]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	150	2140 885 (1400)	2390 990 (1600)	-	-	-	-	-	-	-	-	-	-
	11,2	132	1880 885 (1400)	2100 990 (1600)	2280 1090 (1900)	2410 1150 (2180)	-	-	-	-	-	-	-	-
	12,5	118	1700 885 (1450)	1900 990 (1650)	2040 1105 (1900)	2150 1165 (2180)	-	-	-	-	-	-	-	-
	14	106	1490 885 (1450)	1670 990 (1650)	1840 1105 (1950)	1980 1190 (2180)	2560▲ 1505 (2800)	2840▲ 1670 (3250)	3600▲ 2150 (3870)	4030▲ 2405 (4370)	5220▲ 3140 (5450)	5770▲ 3475 (6300)	-	-
	16	95	1290 885 (1400)	1420 975 (1600)	1620 1105 (1950)	1820 1240 (2240)	2240▲ 1505 (2720)	2440▲ 1640 (3150)	3200▲ 2150 (3870)	3580▲ 2405 (4500)	4540▲ 3140 (5450)	5020▲ 3540 (6300)	-	-
	18	85	1190 885 (1400)	1340 990 (1600)	1410 1105 (1850)	1500 1180 (2120)	2050▲ 1505 (2800)	2290▲ 1680 (3250)	2800▲ 2150 (3650)	3100▲ 2375 (4250)	4090▲ 3140 (5150)	4610▲ 3540 (6000)	-	-
	20	75	1040 885 (1400)	1160 990 (1600)	1280 1105 (2000)	1430 1240 (2300)	1790▲ 1505 (2800)	2000▲ 1680 (3250)	2560▲ 2150 (4000)	2860▲ 2405 (4500)	3580▲ 3140 (5600)	3960▲ 3540 (6500)	-	-
	22,4	67	936 885 (1320)	1050 990 (1550)	1130 1105 (1850)	1250 1225 (2120)	1590▲ 1505 (2800)	1780▲ 1680 (3250)	2240▲ 2150 (3750)	2510▲ 2405 (4250)	3230▲ 3140 (5300)	3640▲ 3540 (6150)	-	-
3I	25	60	837 885 (1500)	907 960 (1750)	1020 1105 (1700)	1150 1240 (2000)	1450▲ 1505 (2650)	1620▲ 1680 (3070)	1990▲ 2150 (3750)	2230▲ 2405 (4370)	-	-	4080▲ 4405 (8750)	7860▲ 8390 (15000)
	28	53	779 940 (1500)	837 1005 (1750)	867 1060 (2000)	910 1110 (2240)	1470 1770 (3000)	1580 1910 (3450)	1680 2050 (4120)	1800 2205 (4370)	2510▲ 2890 (5800)	2900▲ 3350 (6700)	4080▲ 4745 (9500)	6940▲ 8410 (15000)
	31,5	47,5	676 940 (1550)	753 1045 (1750)	804 1115 (2060)	881 1220 (2360)	1290 1770 (2900)	1440 1985 (3350)	1600 2205 (4120)	1720 2360 (4750)	2180▲ 2890 (5800)	2480▲ 3350 (6700)	4080▲ 5470 (10600)	6020▲ 8410 (15000)
	35,5	42,5	622 940 (1550)	693 1045 (1750)	734 1170 (2120)	799 1270 (2300)	1170 1770 (3000)	1310 1985 (3450)	1450 2275 (3870)	1610 2530 (4500)	1990 2950 (5800)	2310 3420 (6900)	4000▲ 5930 (10000)	5440▲ 8410 (14500)
	40	37,5	540 940 (1500)	601 1045 (1700)	674 1170 (2120)	734 1275 (2430)	1020 1770 (3000)	1140 1985 (3450)	1320 2275 (4120)	1490 2565 (4750)	1730 2950 (5800)	1970 3420 (6900)	3470▲ 5930 (10900)	4730▲ 8410 (15500)
	45	33,5	494 940 (1550)	550 1045 (1750)	586 1170 (1950)	666 1330 (2240)	926 1770 (3070)	1040 1985 (3450)	1150 2275 (4000)	1280 2535 (4500)	1580 3010 (6000)	1850 3490 (6900)	3080▲ 5930 (10900)	4370▲ 8410 (15500)
	50	30	429 940 (1550)	477 1045 (1750)	535 1170 (2120)	608 1330 (2430)	810 1770 (3070)	907 1985 (3450)	1040 2275 (4250)	1170 2560 (4870)	1470 3230 (6000)	1560 3490 (6900)	2670▲ 5930 (10900)	3800▲ 8410 (15500)
	56	26,5	389 940 (1550)	433 1045 (1750)	465 1170 (2000)	529 1330 (2300)	752 1770 (3070)	843 1985 (3550)	913 2275 (4000)	1020 2540 (4620)	1340 3230 (6150)	1490 3535 (7100)	2500 5930 (11200)	3390▲ 8410 (16000)
	63	23,6	338 940 (1550)	376 1045 (1750)	421 1170 (2180)	479 1330 (2500)	658 1770 (3070)	737 1985 (3550)	846 2275 (4250)	954 2565 (5000)	1170 3230 (6150)	1330 3760 (7100)	2170 5930 (11200)	2940▲ 8410 (16000)
	71	21,2	316 940 (1550)	352 1045 (1750)	366 1170 (2060)	416 1330 (2360)	593 1770 (3070)	664 1985 (3550)	742 2275 (4120)	830 2545 (4750)	1070 3230 (6150)	1230 3760 (7100)	1970 5930 (11200)	2670▲ 8410 (16000)
	80	19	275 940 (1550)	306 1045 (1750)	343 1170 (2180)	389 1330 (2500)	519 1770 (3070)	581 1985 (3550)	666 2275 (4250)	752 2565 (5000)	933 3230 (6150)	1070 3760 (7100)	1710 5930 (11200)	2320▲ 8410 (16000)
	90	17	253 940 (1550)	282 1045 (1750)	298 1170 (2060)	339 1330 (2360)	474 1770 (3070)	531 1985 (3550)	584 2275 (4120)	656 2555 (4750)	842 3230 (5800)	980 3760 (6700)	1580 5930 (11200)	2200▲ 8410 (16000)
	100	15	220 940 (1550)	244 1045 (1750)	270 1170 (2180)	307 1330 (2500)	415 1770 (3070)	465 1985 (3550)	533 2275 (4250)	602 2565 (5000)	737 3230 (6150)	842 3760 (7100)	1370 5930 (11200)	1910▲ 8410 (16000)
	125	11,8	-	-	216 1170 (1900)	246 1330 (2180)	-	-	426 2275 (3750)	481 2565 (4250)	-	-	-	-
	4I	125	11,8	164 865 (1600)	183 965 (1800)	207 1105 (2240)	239 1280 (2570)	327 1770 (3150)	353 1910 (3650)	391 2150 (4250)	448 2465 (4870)	546 3070 (6150)	619 3540 (7100)	1040 5930 (11200)
160		9,5	140 940 (1600)	156 1045 (1800)	172 1165 (2240)	188 1280 (2570)	266 1770 (3150)	297 1985 (3650)	327 2215 (4250)	364 2465 (4870)	457 3230 (6150)	491 3540 (7100)	841 5930 (11200)	1200▲ 8410 (16000)
200		7,5	117 940 (1600)	130 1045 (1800)	143 1170 (2240)	157 1280 (2570)	198 1770 (3150)	222 1985 (3650)	250 2265 (4250)	272 2465 (4870)	349 3170 (6150)	383 3540 (7100)	667 5930 (11200)	933 8410 (16000)
250		6	91,9 940 (1600)	102 1045 (1800)	113 1170 (2240)	124 1280 (2570)	161 1770 (3150)	181 1985 (3650)	204 2275 (4250)	221 2465 (4870)	282 3230 (6150)	323 3760 (7100)	542 5930 (11200)	723 8410 (16000)
315		4,75	74,8 940 (1600)	83,2 1045 (1800)	86,6 1170 (2060)	98,4 1330 (2360)	127 1770 (3150)	142 1985 (3650)	159 2275 (4120)	179 2565 (4750)	226 3230 (6150)	258 3760 (7100)	428 5930 (11200)	570 8410 (16000)

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

# Selection tables (helical gear reducers)

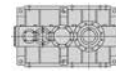


$n_1 = 1\ 200\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power $P_{N2}$ [hp]											
			Nominal output torque $T_{N2} (T_{2max})$ [ $10^3$ lb in]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	118	1710 885 (1400)	1920 995 (1650)	-	-	-	-	-	-	-	-	-	-
	11,2	106	1510 885 (1400)	1690 995 (1650)	1860 1110 (1950)	2000 1190 (2240)	-	-	-	-	-	-	-	-
	12,5	95	1360 885 (1450)	1520 995 (1650)	1640 1110 (1950)	1780 1205 (2240)	-	-	-	-	-	-	-	-
	14	85	1200 885 (1450)	1340 995 (1650)	1470 1110 (1950)	1590 1195 (2240)	2060 1515 (2900)	2310 1700 (3350)	2900 2160 (3870)	3240 2420 (4370)	4200▲ 3160 (5600)	4620▲ 3480 (6500)	7540▲ 5590 (9500)	10420▲ 7980 (13200)
	16	75	1040 885 (1400)	1160 995 (1600)	1300 1110 (1950)	1460 1245 (2240)	1800 1515 (2800)	2020 1695 (3250)	2570 2160 (3870)	2880 2420 (4500)	3650▲ 3160 (5600)	4040▲ 3560 (6500)	6540▲ 5590 (10000)	9060▲ 7980 (14500)
	18	67	957 885 (1450)	1070 995 (1650)	1130 1110 (1850)	1250 1220 (2120)	1650 1515 (2800)	1850 1700 (3250)	2250 2160 (3750)	2520 2420 (4250)	3290▲ 3160 (5150)	3710▲ 3560 (6000)	5910▲ 5590 (9500)	8190▲ 7980 (13600)
	20	60	831 885 (1450)	930 995 (1650)	1030 1110 (2000)	1150 1245 (2300)	1440 1515 (2800)	1620 1700 (3250)	2060 2160 (4000)	2300 2420 (4500)	2880▲ 3160 (5600)	3190▲ 3560 (6500)	5230▲ 5590 (10300)	7450▲ 7980 (14500)
	22,4	53	751 885 (1360)	841 995 (1550)	905 1110 (1900)	1010 1245 (2180)	1280 1515 (2900)	1440 1700 (3350)	1800 2160 (3750)	2020 2420 (4370)	2600▲ 3160 (5300)	2930▲ 3560 (6150)	4730▲ 5590 (9750)	6740▲ 7980 (14000)
	3I	25	47,5	692 915 (1550)	751 995 (1750)	821 1110 (1750)	920 1245 (2000)	1170 1515 (2720)	1310 1700 (3150)	1600 2160 (3750)	1800 2420 (4370)	-	-	3380▲ 4560 (9000)
28		42,5	624 940 (1550)	692 1040 (1750)	717 1095 (2000)	732 1120 (2240)	1180 1770 (3070)	1310 1975 (3550)	1380 2110 (4120)	1450 2220 (4500)	2020 2915 (5800)	2340 3380 (6700)	3380▲ 4910 (9750)	5560▲ 8430 (15500)
31,5		37,5	542 940 (1550)	603 1045 (1800)	665 1150 (2060)	729 1260 (2360)	1030 1770 (3000)	1160 1990 (3450)	1320 2280 (4120)	1380 2385 (4750)	1760 2915 (5800)	2000 3380 (6700)	3380▲ 5660 (10600)	4830▲ 8430 (15500)
35,5		33,5	498 940 (1550)	555 1045 (1800)	589 1170 (2120)	661 1315 (2300)	934 1770 (3000)	1050 1990 (3450)	1160 2285 (3870)	1290 2535 (4500)	1610 2975 (6000)	1860 3450 (6900)	3210▲ 5940 (10300)	4360▲ 8430 (14500)
40		30	433 940 (1500)	482 1045 (1750)	540 1170 (2120)	608 1315 (2430)	817 1770 (3000)	918 1990 (3450)	1060 2285 (4250)	1200 2575 (4870)	1400 2975 (6000)	1590 3450 (6900)	2780 5940 (10900)	3790▲ 8430 (15500)
45		26,5	396 940 (1550)	441 1045 (1750)	470 1170 (2000)	534 1330 (2300)	742 1770 (3070)	834 1990 (3550)	923 2285 (4000)	1030 2540 (4620)	1270 3035 (6000)	1490 3520 (7100)	2470 5940 (11200)	3500▲ 8430 (16000)
50		23,6	344 940 (1550)	383 1045 (1750)	429 1170 (2120)	488 1330 (2430)	649 1770 (3070)	729 1990 (3550)	836 2285 (4250)	940 2565 (4870)	1180 3245 (6000)	1260 3540 (7100)	2140 5940 (11200)	3040▲ 8430 (16000)
56		21,2	311 940 (1550)	347 1045 (1750)	373 1170 (2000)	424 1330 (2300)	603 1770 (3070)	677 1990 (3550)	733 2285 (4000)	817 2545 (4620)	1080 3245 (6150)	1190 3540 (7100)	2000 5940 (11200)	2710 8430 (16000)
63		19	270 940 (1550)	301 1045 (1750)	338 1170 (2180)	384 1330 (2500)	527 1770 (3070)	593 1990 (3550)	679 2285 (4250)	766 2575 (5000)	937 3245 (6150)	1070 3770 (7100)	1740 5940 (11200)	2360 8430 (16000)
71		17	253 940 (1550)	282 1045 (1750)	294 1170 (2060)	334 1330 (2360)	475 1770 (3070)	534 1990 (3550)	595 2285 (4120)	665 2550 (4750)	863 3245 (6150)	983 3770 (7100)	1580 5940 (11200)	2140 8430 (16000)
80		15	220 940 (1550)	245 1045 (1750)	275 1170 (2180)	312 1330 (2500)	415 1770 (3070)	467 1990 (3550)	535 2285 (4250)	604 2575 (5000)	750 3245 (6150)	856 3770 (7100)	1370 5940 (11200)	1860 8430 (16000)
90		13,2	203 940 (1550)	226 1045 (1750)	239 1170 (2060)	272 1330 (2360)	380 1770 (3070)	427 1990 (3550)	469 2285 (4120)	525 2555 (4750)	676 3245 (5800)	786 3770 (6700)	1260 5940 (11200)	1760 8430 (16000)
100		11,8	176 940 (1550)	196 1045 (1750)	217 1170 (2180)	246 1330 (2500)	332 1770 (3070)	374 1990 (3550)	428 2285 (4250)	483 2575 (5000)	592 3245 (6150)	675 3770 (7100)	1100 5940 (11200)	1530 8430 (16000)
125		9,5	-	-	173 1170 (1900)	197 1330 (2180)	-	-	342 2285 (3750)	386 2575 (4250)	-	-	-	-
4I		125	9,5	135 895 (1600)	151 1000 (1800)	166 1105 (2240)	191 1280 (2570)	262 1770 (3150)	292 1980 (3650)	313 2150 (4250)	359 2465 (4870)	452 3175 (6150)	495 3540 (7100)	830 5940 (11200)
	160	7,5	112 940 (1600)	125 1045 (1800)	138 1170 (2240)	151 1280 (2570)	213 1770 (3150)	239 1990 (3650)	270 2285 (4250)	291 2465 (4870)	367 3245 (6150)	394 3555 (7100)	674 5940 (11200)	964 8430 (16000)
	200	6	93,6 940 (1600)	104 1045 (1800)	115 1170 (2240)	126 1280 (2570)	159 1770 (3150)	179 1990 (3650)	202 2285 (4250)	218 2465 (4870)	285 3245 (6150)	306 3540 (7100)	535 5940 (11200)	748 8430 (16000)
	250	4,75	73,6 940 (1600)	82 1045 (1800)	90,5 1170 (2240)	98,9 1280 (2570)	129 1770 (3150)	145 1990 (3650)	164 2285 (4250)	177 2465 (4870)	227 3245 (6150)	259 3770 (7100)	435 5940 (11200)	579 8430 (16000)
	315	3,75	59,9	66,7	69,4	78,9	102	114	128	144	181	207	343	457

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

# Selection tables (helical gear reducers)

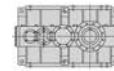


$n_1 = 1\ 000\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power					$P_{N2}$ [hp]		Nominal output torque				$T_{N2} (T_{2max})$ [ $10^3$ lb in]
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	100	1430 890 (1450)	1600 1000 (1650)	-	-	-	-	-	-	-	-	-	-
	11,2	90	1260 890 (1450)	1410 1000 (1650)	1550 1115 (1950)	1740 1250 (2240)	-	-	-	-	-	-	-	-
	12,5	80	1140 890 (1450)	1270 1000 (1700)	1370 1115 (1950)	1540 1250 (2240)	-	-	-	-	-	-	-	-
	14	71	1000 890 (1450)	1120 1000 (1700)	1230 1115 (2000)	1330 1195 (2240)	1740 1535 (2900)	1960 1730 (3350)	2440 2180 (4000)	2710 2425 (4500)	3540 3190 (5600)	3860 3485 (6500)	6320▲ 5620 (9500)	8720▲ 8020 (13600)
	16	63	870 890 (1450)	973 1000 (1650)	1090 1115 (2000)	1220 1250 (2300)	1520 1535 (2800)	1720 1730 (3250)	2160 2180 (4000)	2420 2445 (4620)	3070 3190 (5600)	3400 3595 (6500)	5480 5620 (10300)	7580▲ 8020 (14500)
	18	56	802 890 (1450)	897 1000 (1650)	947 1115 (1900)	1060 1250 (2180)	1390 1535 (2900)	1570 1730 (3350)	1900 2180 (3750)	2130 2445 (4370)	2770 3190 (5300)	3120 3595 (6150)	4950 5620 (9750)	6860▲ 8020 (14000)
	20	50	696 890 (1450)	779 1000 (1650)	859 1115 (2060)	964 1250 (2360)	1220 1535 (2900)	1370 1730 (3350)	1730 2180 (4000)	1940 2445 (4620)	2430 3190 (5800)	2680 3595 (6700)	4380 5620 (10600)	6240▲ 8020 (15000)
	22,4	45	629 890 (1360)	704 1000 (1600)	757 1115 (1900)	850 1250 (2180)	1080 1535 (2900)	1220 1730 (3350)	1520 2180 (3870)	1700 2445 (4370)	2190 3190 (5450)	2460 3595 (6300)	3960 5620 (10000)	5640▲ 8020 (14000)
3I	25	40	593 940 (1550)	660 1050 (1800)	687 1115 (1750)	771 1250 (2060)	985 1535 (2720)	1110 1730 (3150)	1350 2180 (3870)	1510 2440 (4500)	-	-	3010 4875 (9750)	5290▲ 8460 (15500)
	28	35,5	521 940 (1550)	581 1050 (1800)	638 1170 (2060)	649 1190 (2240)	983 1775 (3070)	1110 2010 (3550)	1230 2255 (4250)	1230 2255 (4500)	1720 2970 (6000)	1990 3445 (6900)	3010 5250 (10600)	4650▲ 8460 (15500)
	31,5	31,5	452 940 (1600)	504 1050 (1800)	567 1175 (2120)	645 1340 (2430)	860 1775 (3000)	974 2010 (3450)	1110 2300 (4250)	1230 2540 (4870)	1490 2970 (6000)	1700 3445 (6900)	2970 5970 (10900)	4040▲ 8460 (15500)
	35,5	28	416 940 (1600)	464 1050 (1800)	493 1175 (2120)	561 1340 (2300)	780 1775 (3070)	883 2010 (3550)	976 2300 (4000)	1080 2540 (4620)	1360 3030 (6000)	1580 3510 (7100)	2690 5970 (10300)	3650▲ 8460 (14500)
	40	25	361 940 (1550)	403 1050 (1750)	453 1175 (2120)	515 1340 (2430)	683 1775 (3070)	773 2010 (3550)	891 2300 (4250)	1000 2595 (4870)	1190 3030 (6000)	1350 3510 (7100)	2330 5970 (11200)	3180 8460 (16000)
	45	22,4	331 940 (1550)	368 1050 (1750)	394 1175 (2000)	448 1340 (2300)	620 1775 (3070)	701 2010 (3550)	775 2300 (4000)	857 2545 (4620)	1130 3230 (6150)	1250 3540 (7100)	2070 5970 (11200)	2930 8460 (16000)
	50	20	287 940 (1550)	320 1050 (1750)	359 1175 (2180)	409 1340 (2500)	542 1775 (3070)	613 2010 (3550)	702 2300 (4250)	789 2585 (5000)	991 3270 (6150)	1130 3785 (7100)	1790 5970 (11200)	2550 8460 (16000)
	56	18	260 940 (1550)	290 1050 (1750)	313 1175 (2060)	356 1340 (2360)	503 1775 (3070)	570 2010 (3550)	615 2300 (4120)	682 2550 (4750)	906 3270 (6150)	1040 3695 (7100)	1680 5970 (11200)	2270 8460 (16000)
	63	16	226 940 (1550)	252 1050 (1750)	283 1175 (2180)	322 1340 (2500)	440 1775 (3070)	498 2010 (3550)	570 2300 (4250)	643 2595 (5000)	787 3270 (6150)	896 3790 (7100)	1460 5970 (11200)	1970 8460 (16000)
	71	14	212 940 (1550)	236 1050 (1750)	246 1175 (2060)	280 1340 (2360)	397 1775 (3070)	449 2010 (3550)	500 2300 (4120)	555 2555 (4750)	725 3270 (6150)	823 3790 (7100)	1320 5970 (11200)	1790 8460 (16000)
	80	12,5	184 940 (1550)	205 1050 (1750)	230 1175 (2180)	262 1340 (2500)	347 1775 (3070)	393 2010 (3550)	449 2300 (4250)	507 2595 (5000)	630 3270 (6150)	717 3790 (7100)	1150 5970 (11200)	1560 8460 (16000)
	90	11,2	169 940 (1550)	189 1050 (1750)	200 1175 (2060)	228 1340 (2360)	317 1775 (3070)	359 2010 (3550)	394 2300 (4120)	439 2560 (4750)	568 3270 (5800)	658 3790 (6700)	1060 5970 (11200)	1470 8460 (16000)
	100	10	147 940 (1550)	164 1050 (1750)	182 1175 (2180)	206 1340 (2500)	278 1775 (3070)	314 2010 (3550)	359 2300 (4250)	405 2595 (5000)	497 3270 (6150)	566 3790 (7100)	919 5970 (11200)	1280 8460 (16000)
125	8	-	-	145 1175 (1900)	165 1340 (2180)	-	-	287 2300 (3750)	324 2595 (4250)	-	-	-	-	
4I	125	8	119 940 (1600)	133 1050 (1800)	138 1105 (2240)	159 1280 (2570)	219 1775 (3150)	247 2010 (3650)	261 2150 (4250)	299 2485 (4870)	388 3270 (6150)	412 3540 (7100)	695 5970 (11200)	1040 8460 (16000)
	160	6,3	93,7 940 (1600)	104 1050 (1800)	115 1175 (2240)	125 1280 (2570)	178 1775 (3150)	201 2010 (3650)	227 2300 (4250)	243 2485 (4870)	308 3270 (6150)	351 3790 (7100)	565 5970 (11200)	807 8460 (16000)
	200	5	78,1 940 (1600)	87,1 1050 (1800)	96,3 1175 (2240)	105 1280 (2570)	133 1775 (3150)	150 2010 (3650)	169 2300 (4250)	181 2485 (4870)	240 3270 (6150)	257 3570 (7100)	448 5970 (11200)	626 8460 (16000)
	250	4	61,5 940 (1600)	68,5 1050 (1800)	75,8 1175 (2240)	82,4 1280 (2570)	108 1775 (3150)	122 2010 (3650)	138 2300 (4250)	148 2480 (4870)	190 3270 (6150)	217 3790 (7100)	364 5970 (11200)	485 8460 (16000)
	315	3,15	50 940 (1600)	55,7 1050 (1800)	58,1 1175 (2060)	66,1 1340 (2360)	85 1775 (3150)	96,2 2010 (3650)	107 2300 (4120)	121 2595 (4750)	152 3270 (6150)	173 3790 (7100)	287 5970 (11200)	383 8460 (16000)

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

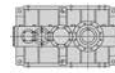
# Selection tables (helical gear reducers)



$n_1 = 750$  rpm

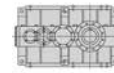
Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power $P_{N2}$ [hp]											
			Nominal output torque $T_{N2} (T_{2max})$ [ $10^3$ lb in]											
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
21	10	75	1080 900 (1500)	1210 1005 (1700)	-	-	-	-	-	-	-	-	-	-
	11,2	67	953 900 (1500)	1070 1005 (1700)	1170 1120 (2000)	1320 1260 (2300)	-	-	-	-	-	-	-	-
	12,5	60	860 900 (1500)	962 1005 (1750)	1040 1120 (2000)	1160 1260 (2300)	-	-	-	-	-	-	-	-
	14	53	757 900 (1500)	847 1005 (1750)	932 1120 (2060)	998 1200 (2300)	1330 1570 (3000)	1510 1780 (3450)	1860 2215 (4120)	2040 2430 (4500)	2690 3240 (5800)	2910 3500 (6700)	4770 5660 (10000)	6590 8080 (14000)
	16	47,5	657 900 (1450)	735 1005 (1700)	822 1120 (2060)	924 1260 (2360)	1170 1570 (2900)	1330 1780 (3350)	1650 2215 (4120)	1850 2485 (4750)	2340 3240 (5800)	2590 3650 (6700)	4140 5660 (10600)	5730 8080 (15000)
	18	42,5	606 900 (1500)	677 1005 (1700)	715 1120 (1950)	804 1260 (2240)	1070 1570 (3000)	1210 1780 (3450)	1440 2215 (3870)	1620 2485 (4500)	2110 3240 (5450)	2380 3650 (6300)	3740 5660 (10000)	5180 8080 (14500)
	20	37,5	526 900 (1500)	588 1005 (1700)	649 1120 (2060)	729 1260 (2360)	934 1570 (3000)	1060 1780 (3450)	1320 2215 (4120)	1480 2485 (4750)	1850 3240 (6000)	2040 3650 (6900)	3310 5660 (10900)	4710 8080 (15500)
	22,4	33,5	475 900 (1400)	531 1005 (1600)	572 1120 (1950)	643 1260 (2240)	830 1570 (3000)	943 1780 (3450)	1150 2215 (4000)	1300 2485 (4500)	1670 3240 (5600)	1880 3650 (6500)	3000 5660 (10300)	4260 8080 (14500)
31	25	30	446 945 (1600)	497 1055 (1800)	519 1120 (1800)	584 1260 (2060)	755 1570 (2800)	857 1780 (3250)	1030 2215 (4000)	1140 2470 (4620)	-	-	2500 5400 (10900)	3990 8520 (16000)
	28	26,5	392 945 (1600)	437 1055 (1800)	479 1170 (2060)	540 1320 (2300)	740 1785 (3150)	846 2040 (3650)	944 2305 (4250)	1020 2500 (4620)	1320 3050 (6150)	1530 3535 (7100)	2500 5820 (11200)	3510 8520 (16000)
	31,5	23,6	341 945 (1600)	380 1055 (1800)	428 1185 (2180)	487 1350 (2500)	648 1785 (3070)	741 2040 (3550)	844 2325 (4250)	941 2590 (5000)	1200 3180 (6150)	1310 3535 (7100)	2250 6020 (11200)	3040 8490 (16000)
	35,5	21,2	313 945 (1600)	349 1055 (1800)	372 1185 (2180)	424 1350 (2300)	587 1785 (3070)	672 2040 (3550)	740 2325 (4120)	811 2545 (4750)	1030 3055 (6150)	1200 3540 (7100)	2030 6020 (10600)	2760 8520 (15000)
	40	19	272 945 (1550)	303 1055 (1750)	342 1185 (2180)	389 1350 (2500)	514 1785 (3070)	588 2040 (3550)	675 2325 (4250)	762 2620 (5000)	937 3190 (6150)	1020 3540 (7100)	1760 6020 (11200)	2390 8510 (16000)
	45	17	249 945 (1550)	277 1055 (1750)	297 1185 (2060)	339 1350 (2360)	466 1785 (3070)	533 2040 (3550)	587 2325 (4120)	645 2555 (4750)	864 3300 (6150)	938 3540 (7100)	1560 6020 (11200)	2210 8520 (16000)
	50	15	216 945 (1550)	241 1055 (1750)	272 1185 (2180)	309 1350 (2500)	408 1785 (3070)	467 2040 (3550)	532 2325 (4250)	596 2605 (5000)	752 3305 (6150)	852 3815 (7100)	1350 6020 (11200)	1920 8520 (16000)
	56	13,2	196 945 (1550)	218 1055 (1750)	236 1185 (2060)	269 1350 (2360)	379 1785 (3070)	433 2040 (3550)	466 2325 (4120)	513 2560 (4750)	687 3305 (6150)	803 3815 (7100)	1270 6020 (11200)	1710 8520 (16000)
	63	11,8	170 945 (1550)	189 1055 (1750)	214 1185 (2180)	243 1350 (2500)	332 1785 (3070)	379 2040 (3550)	432 2325 (4250)	485 2610 (5000)	597 3305 (6150)	677 3815 (7100)	1100 6020 (11200)	1490 8520 (16000)
	71	10,6	159 945 (1550)	178 1055 (1750)	186 1185 (2060)	212 1350 (2360)	299 1785 (3070)	341 2040 (3550)	379 2325 (4120)	418 2565 (4750)	550 3305 (6150)	622 3815 (7100)	1000 6020 (11200)	1350 8520 (16000)
	80	9,5	138 945 (1550)	154 1055 (1750)	174 1185 (2180)	198 1350 (2500)	261 1785 (3070)	299 2040 (3550)	341 2325 (4250)	383 2615 (5000)	478 3305 (6150)	541 3815 (7100)	868 6020 (11200)	1170 8520 (16000)
	90	8,5	127 945 (1550)	142 1055 (1750)	151 1185 (2060)	172 1350 (2360)	239 1785 (3070)	273 2040 (3550)	299 2325 (4120)	330 2570 (4750)	431 3305 (5800)	497 3815 (6700)	800 6020 (11200)	1110 8520 (16000)
	100	7,5	111 945 (1550)	123 1055 (1750)	137 1185 (2180)	156 1350 (2500)	209 1785 (3070)	239 2040 (3550)	272 2325 (4250)	307 2620 (5000)	377 3305 (6150)	427 3815 (7100)	694 6020 (11200)	966 8520 (16000)
	125	6	-	-	110 1185 (1900)	125 1350 (2180)	-	-	218 2325 (3750)	246 2620 (4250)	-	-	-	-
	41	125	6	89,6 945 (1600)	99,9 1055 (1800)	105 1125 (2240)	120 1280 (2570)	165 1785 (3150)	188 2040 (3650)	212 2325 (4250)	224 2465 (4870)	294 3305 (6150)	333 3815 (7100)	525 6020 (11200)
160		4,75	70,5 945 (1600)	78,6 1055 (1800)	87,3 1185 (2240)	94,1 1280 (2570)	134 1785 (3150)	153 2040 (3650)	172 2325 (4250)	182 2465 (4870)	234 3305 (6150)	265 3815 (7100)	427 6020 (11200)	609 8520 (16000)
200		3,75	58,8 945 (1600)	65,6 1055 (1800)	72,8 1185 (2240)	78,5 1280 (2570)	99,9 1785 (3150)	114 2040 (3650)	128 2325 (4250)	138 2490 (4870)	182 3305 (6150)	206 3815 (7100)	339 6020 (11200)	473 8520 (16000)
250		3	46,3 945 (1600)	51,6 1055 (1800)	57,3 1185 (2240)	61,8 1280 (2570)	81,2 1785 (3150)	92,9 2040 (3650)	104 2325 (4250)	112 2495 (4870)	144 3305 (6150)	164 3815 (7100)	275 6020 (11200)	366 8520 (16000)
315		2,36	37,6 945 (1600)	42 1055 (1800)	43,9 1185 (2060)	50 1350 (2360)	64 1785 (3150)	73,2 2040 (3650)	81,2 2325 (4120)	91,6 2620 (4750)	116 3305 (6150)	131 3815 (7100)	217 6020 (11200)	289 8520 (16000)

# Selection tables (helical gear reducers)



$n_1 \leq 90$  rpm

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power						$P_{N2}$ [hp]					
			Nominal output torque						$T_{N2} (T_{2max})$ [ $10^3$ lb in]					
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	10	9	136 940 (1600)	151 1045 (1800)	-	-	-	-	-	-	-	-	-	-
	11.2	8	119 940 (1600)	133 1045 (1800)	147 1170 (2180)	167 1330 (2500)	-	-	-	-	-	-	-	-
	12.5	7,1	108 940 (1600)	120 1045 (1800)	129 1170 (2180)	147 1330 (2500)	-	-	-	-	-	-	-	-
	14	6,3	94,9 940 (1600)	106 1045 (1800)	117 1170 (2180)	124 1240 (2500)	181 1770 (3150)	213 2090 (3650)	242 2405 (4250)	250 2485 (4870)	332 3330 (6150)	356 3575 (7100)	600 5930 (10600)	823 8410 (15000)
	16	5,6	82,4 940 (1550)	91,7 1045 (1750)	103 1170 (2180)	117 1330 (2500)	158 1770 (3070)	186 2090 (3550)	215 2405 (4250)	234 2625 (5000)	295 3400 (6150)	339 3985 (7100)	521 5930 (11200)	716 8410 (16000)
	18	5	75,9 940 (1550)	84,5 1045 (1750)	89,4 1170 (2060)	102 1330 (2360)	144 1770 (3070)	170 2090 (3550)	188 2405 (4120)	202 2585 (4750)	277 3540 (5800)	311 3985 (6700)	470 5930 (10600)	647 8410 (15000)
	20	4,5	65,9 940 (1550)	73,3 1045 (1750)	81,1 1170 (2180)	92,2 1330 (2500)	126 1770 (3070)	149 2090 (3550)	172 2405 (4250)	191 2680 (5000)	233 3410 (6150)	268 3985 (7100)	416 5930 (11200)	589 8410 (16000)
	22.4	4	59,5 940 (1450)	66,3 1045 (1700)	71,5 1170 (2060)	81,2 1330 (2360)	112 1770 (3070)	133 2090 (3550)	151 2405 (4120)	162 2595 (4750)	218 3540 (5800)	246 3985 (6700)	376 5930 (10600)	532 8410 (15000)
3I	25	3,55	54,6 965 (1600)	61,2 1080 (1800)	64,9 1170 (1900)	73,7 1330 (2180)	102 1770 (2900)	121 2090 (3350)	134 2405 (4120)	147 2635 (4750)	-	-	349 6280 (11200)	498 8850 (16000)
	28	3,15	48,1 965 (1600)	53,8 1080 (1800)	57,4 1170 (2060)	65,3 1330 (2500)	90,8 1825 (3150)	110 2215 (3650)	118 2405 (4250)	130 2655 (4870)	179 3435 (6150)	207 3985 (7100)	324 6280 (11200)	438 8850 (16000)
	31,5	2,8	41,7 965 (1600)	46,7 1080 (1800)	53,7 1240 (2180)	61,4 1415 (2500)	79,5 1825 (3070)	96,4 2215 (3550)	108 2480 (4250)	121 2770 (5000)	160 3540 (6150)	177 3985 (7100)	281 6280 (11200)	380 8850 (16000)
	35.5	2,5	38,4 965 (1600)	43 1080 (1800)	46,7 1240 (2180)	53,4 1415 (2430)	72,1 1825 (3070)	87,4 2215 (3550)	94,7 2480 (4120)	106 2765 (4750)	144 3540 (6150)	161 3985 (7100)	254 6280 (10600)	344 8850 (15000)
	40	2,24	33,3 965 (1550)	37,3 1080 (1750)	42,9 1240 (2180)	49 1415 (2500)	63 1825 (3070)	76,5 2215 (3550)	86,4 2480 (4250)	97,2 2790 (5000)	125 3540 (6150)	138 3985 (7100)	221 6280 (11200)	299 8850 (16000)
	45	2	30,5 965 (1550)	34,1 1080 (1750)	37,3 1240 (2060)	42,6 1415 (2360)	57,2 1825 (3070)	69,4 2215 (3550)	75,1 2480 (4120)	84,5 2790 (4750)	111 3540 (6150)	127 3985 (7100)	196 6280 (11200)	276 8850 (16000)
	50	1,8	26,5 965 (1550)	29,6 1080 (1750)	34,1 1240 (2180)	38,9 1415 (2500)	50,1 1825 (3070)	60,8 2215 (3550)	68,1 2480 (4250)	76,6 2790 (5000)	96,6 3540 (6150)	107 3985 (7100)	170 6280 (11200)	240 8850 (16000)
	56	1,6	24 965 (1550)	26,9 1080 (1750)	29,6 1240 (2060)	33,9 1415 (2360)	46,5 1825 (3070)	56,4 2215 (3550)	59,7 2480 (4120)	67,1 2790 (4750)	88,3 3540 (6150)	101 3985 (7100)	159 6280 (11200)	214 8850 (16000)
	63	1,4	20,8 965 (1550)	23,3 1080 (1750)	26,8 1240 (2180)	30,6 1415 (2500)	40,7 1825 (3070)	49,4 2215 (3550)	55,3 2480 (4250)	62,2 2790 (5000)	76,7 3540 (6150)	84,7 3985 (7100)	138 6280 (11200)	186 8850 (16000)
	71	1,25	19,5 965 (1550)	21,8 1080 (1750)	23,3 1240 (2060)	26,6 1415 (2360)	36,6 1825 (3070)	44,5 2215 (3550)	48,5 2480 (4120)	54,5 2790 (4750)	70,6 3540 (6150)	77,8 3985 (7100)	125 6280 (11200)	169 8850 (16000)
	80	1,12	16,9 965 (1550)	19 1080 (1750)	21,8 1240 (2180)	24,9 1415 (2500)	32 1825 (3070)	38,9 2215 (3550)	43,6 2480 (4250)	49 2790 (5000)	61,4 3540 (6150)	67,8 3985 (7100)	109 6280 (11200)	146 8850 (16000)
	90	1	15,6 965 (1550)	17,5 1080 (1750)	19 1240 (2060)	21,7 1415 (2360)	29,3 1825 (3070)	35,6 2215 (3550)	38,2 2480 (4120)	43 2790 (4750)	55,4 3540 (5800)	62,3 3985 (6700)	100 6280 (11200)	139 8850 (16000)
	100	0,9	13,5 965 (1550)	15,2 1080 (1750)	17,2 1240 (2180)	19,7 1415 (2500)	25,6 1825 (3070)	31,1 2215 (3550)	34,8 2480 (4250)	39,2 2790 (5000)	48,4 3540 (6150)	53,5 3985 (7100)	87 6280 (11200)	121 8850 (16000)
125	0,71	-	-	13,8 1240 (1900)	15,7 1415 (2180)	-	-	27,9 2480 (3750)	31,4 2790 (4250)	-	-	-	-	
4I	125	0,71	11 965 (1600)	12,3 1080 (1800)	13,9 1240 (2240)	15,3 1365 (2570)	20,2 1825 (3150)	24,5 2215 (3650)	27,1 2480 (4250)	29,3 2680 (4870)	37,8 3540 (6150)	41,8 3985 (7100)	65,8 6280 (11200)	98,1 8850 (16000)
	160	0,56	8,64 965 (1600)	9,67 1080 (1800)	10,9 1240 (2240)	12,4 1405 (2570)	16,4 1825 (3150)	19,9 2215 (3650)	22 2480 (4250)	24,4 2750 (4870)	30 3540 (6150)	33,2 3985 (7100)	53,5 6280 (11200)	75,9 8850 (16000)
	200	0,45	7,21 965 (1600)	8,07 1080 (1800)	9,13 1240 (2240)	10,4 1415 (2570)	12,3 1825 (3150)	14,9 2215 (3650)	16,4 2480 (4250)	18,5 2790 (4870)	23,4 3540 (6150)	25,8 3985 (7100)	42,4 6280 (11200)	58,9 8850 (16000)
	250	0,355	5,67 965 (1600)	6,35 1080 (1800)	7,18 1240 (2240)	8,21 1415 (2570)	9,96 1825 (3150)	12,1 2215 (3650)	13,3 2480 (4250)	15 2790 (4870)	18,6 3540 (6150)	20,5 3985 (7100)	34,5 6280 (11200)	45,6 8850 (16000)
	315	0,28	4,61 965 (1600)	5,16 1080 (1800)	5,51 1240 (2060)	6,3 1415 (2360)	7,85 1825 (3150)	9,53 2215 (3650)	10,4 2480 (4120)	11,7 2790 (4750)	14,8 3540 (6150)	16,4 3985 (7100)	27,2 6280 (11200)	36 8850 (16000)



## Summary of transmission ratios *i*

Train of gears	Nominal gear ratio $i_N$	Gear reducer size											
		Actual gear ratio <i>i</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

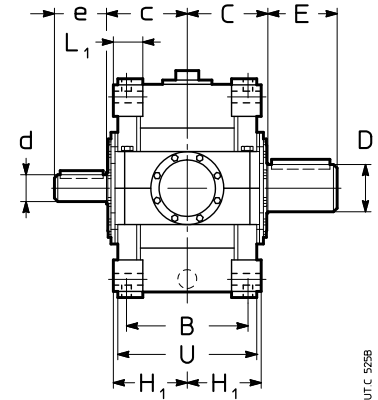
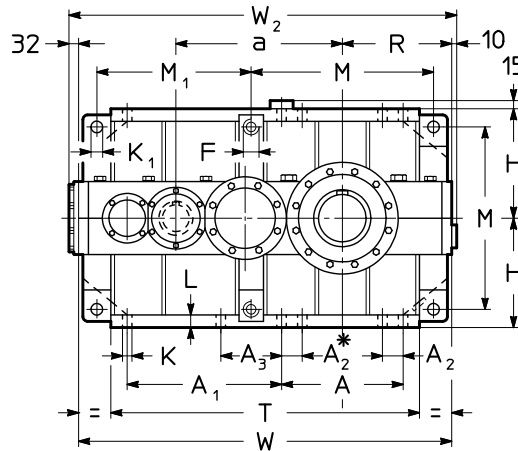
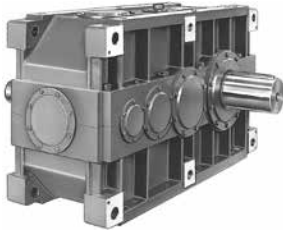
\* Finite transmission ratio.

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

<b>8.1 - Gear reducers R 2I .....</b>	<b>50</b>
Dimensions .....	50
Designs (direction of rotation).....	51
Mounting positions.....	52
Lubrication - Plug position and oil quantity.....	53
<b>8.2 - Gear reducers R 3I .....</b>	<b>54</b>
Dimensions .....	54
Designs (direction of rotation).....	55
Mounting positions.....	56
Lubrication - Plug position and oil quantity.....	57
<b>8.3 - Gear reducers R 4I .....</b>	<b>58</b>
Dimensions .....	58
Designs (direction of rotation).....	59
Mounting positions.....	60
Lubrication - Plug position and oil quantity.....	61

## 8.1 - Gear reducers R 2I

### Dimensions



\* For size  $\geq 6300$ .

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 Ø	K <sub>1</sub> Ø H <sub>11</sub>	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub> 2)	lb 4)	
<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	5110 5290	5270 5470
<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	5860 6020	6060 6260
<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	10010 10270	10320 10630
<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	11970 12240	12410 12720
<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	16870 17090	17480 17810
<b>7101</b>	1270	930	1228	115	590	843	601	537	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	28550	29650
<b>8001</b>	1430	1008	1286	145	596	944	682	600	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	43760	45350

Size	D Ø	E	d Ø	e	d Ø	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  $1,7 \cdot F$ .

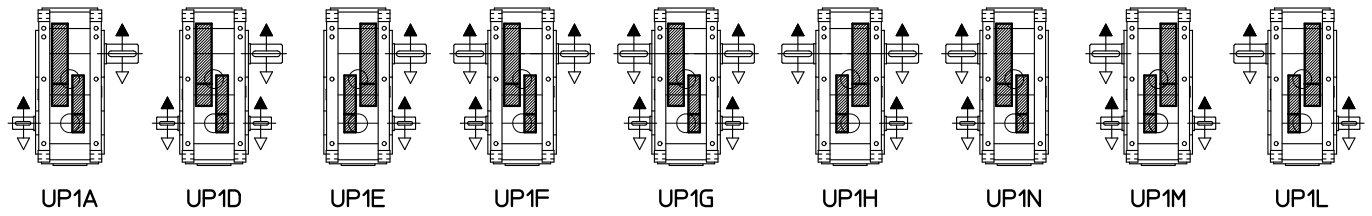
2) For mounting positions B6, B7, V5, V6, dimension  $W_2$  increases by approx. 20 for overall dimensions of filler plug.

3) **c** dimension overhangs from **C** dimension.

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

## 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)



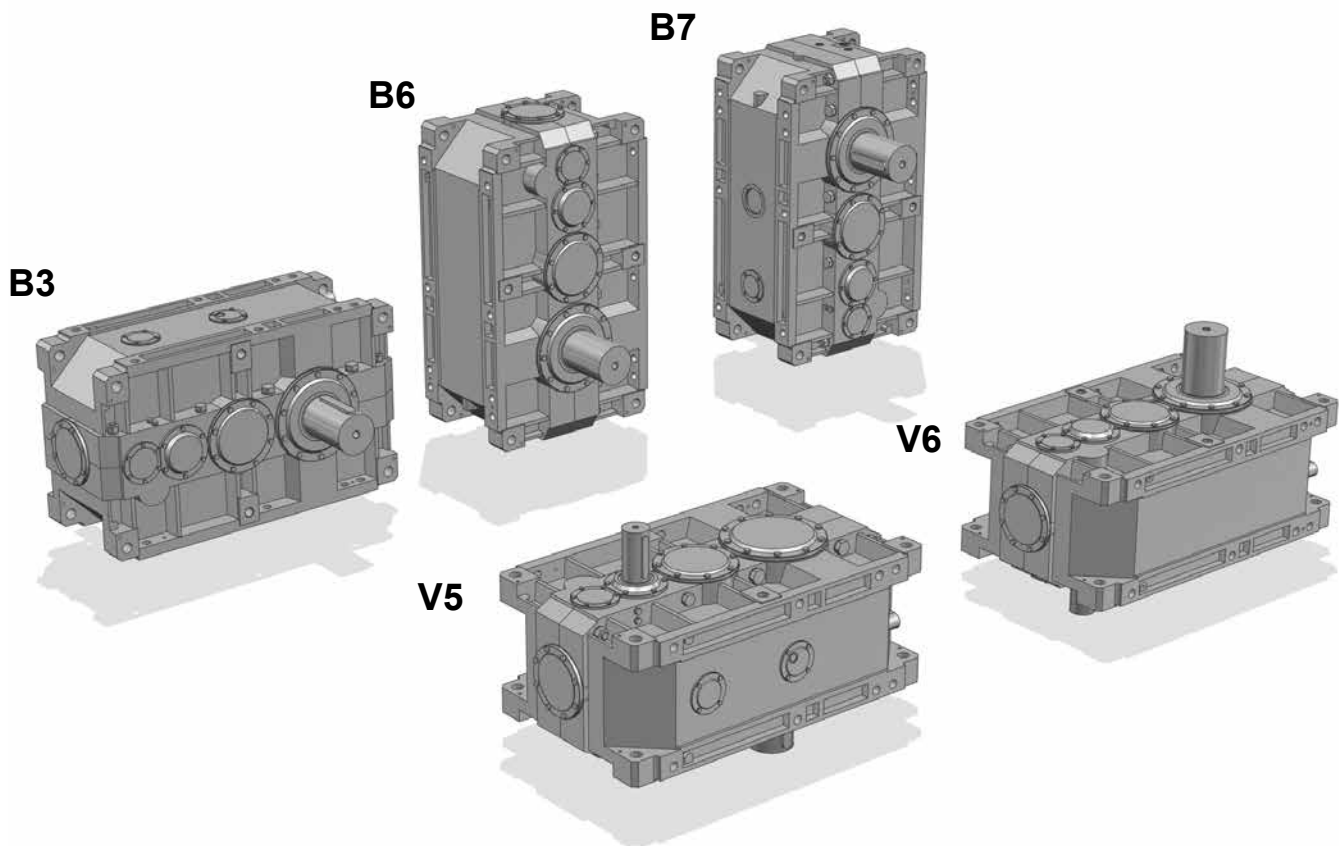
Hollow low speed shaft with keyway (on request)



UT. C. 2177

## Mounting positions

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



▼ Possible high oil splash: for the corrective factor  $f_t$  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).

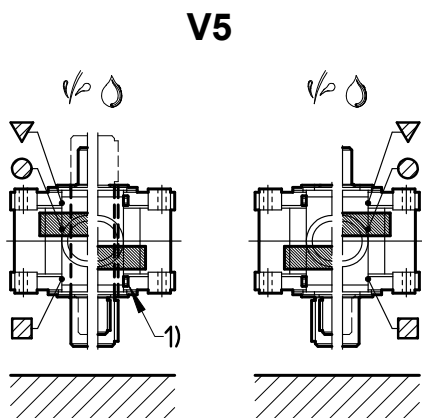
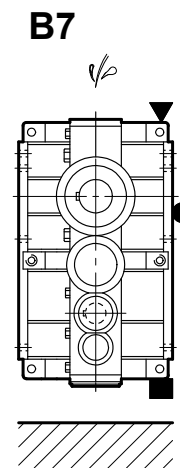
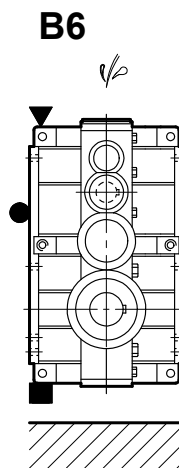
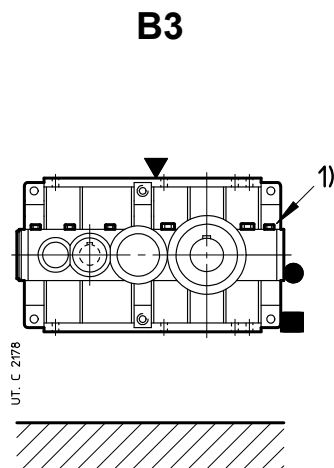
▼ Oil filler plug  
● Oil level plug  
■ Oil drain plug

▽ 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)

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

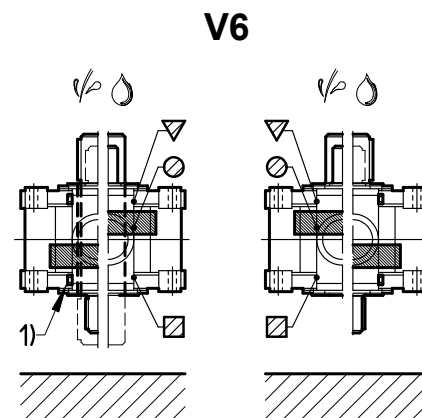
## Lubrication - Plug position and oil quantity

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.



UP1A	UP1E
UP1D	UP1H
UP1F	
UP1G	
UP1A*	UP1M*
UP1D*	UP1L*

UP1N	UP1M
	UP1L



UP1A	UP1E
UP1D	UP1H
UP1F	
UP1G	
UP1A*	UP1M*
UP1D*	UP1L*

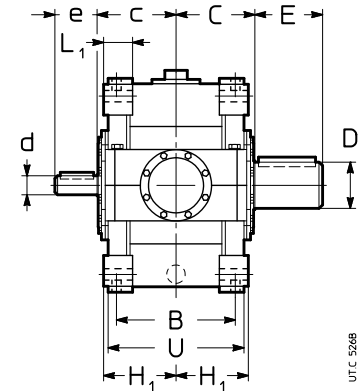
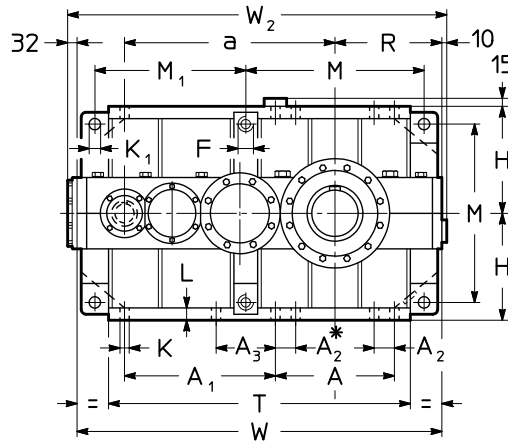
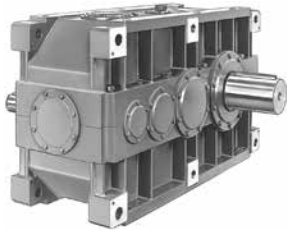
UP1N	UP1M
	UP1L

Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	31	40	59	62	66
<b>4500, 4501</b>	30	37	62	59	66
<b>5000, 5001</b>	62	79	119	125	132
<b>5600, 5601</b>	59	70	119	119	132
<b>6300, 6301</b>	88	106	177	166	188
<b>7101</b>	148	177	296	264	296
<b>8001</b>	251	280	476	449	502

See notes at previous page.

## 8.2 - Gear reducers R 3I

### Dimensions



\* For sizes  $\geq 6300$ .

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 $\varnothing$	K <sub>1</sub> $\varnothing$ H11	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub>	lb	
			M <sub>1</sub>						1)	R										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	5220 5400	5380 5580
<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	5950 6130	6150 6370
<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	10190 10450	10490 10800
<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	12190 12460	12630 12940
<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	17110 17330	17730 18060
<b>7101</b>	1630	930	1228	115	590	843	601	510	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	29080	30180
<b>8001</b>	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	45040	46630

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

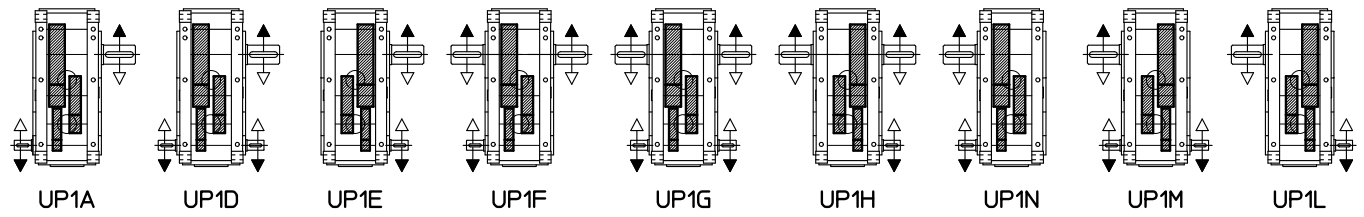
1) Working length on thread  $1,7 \cdot F$ .

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

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

## 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)



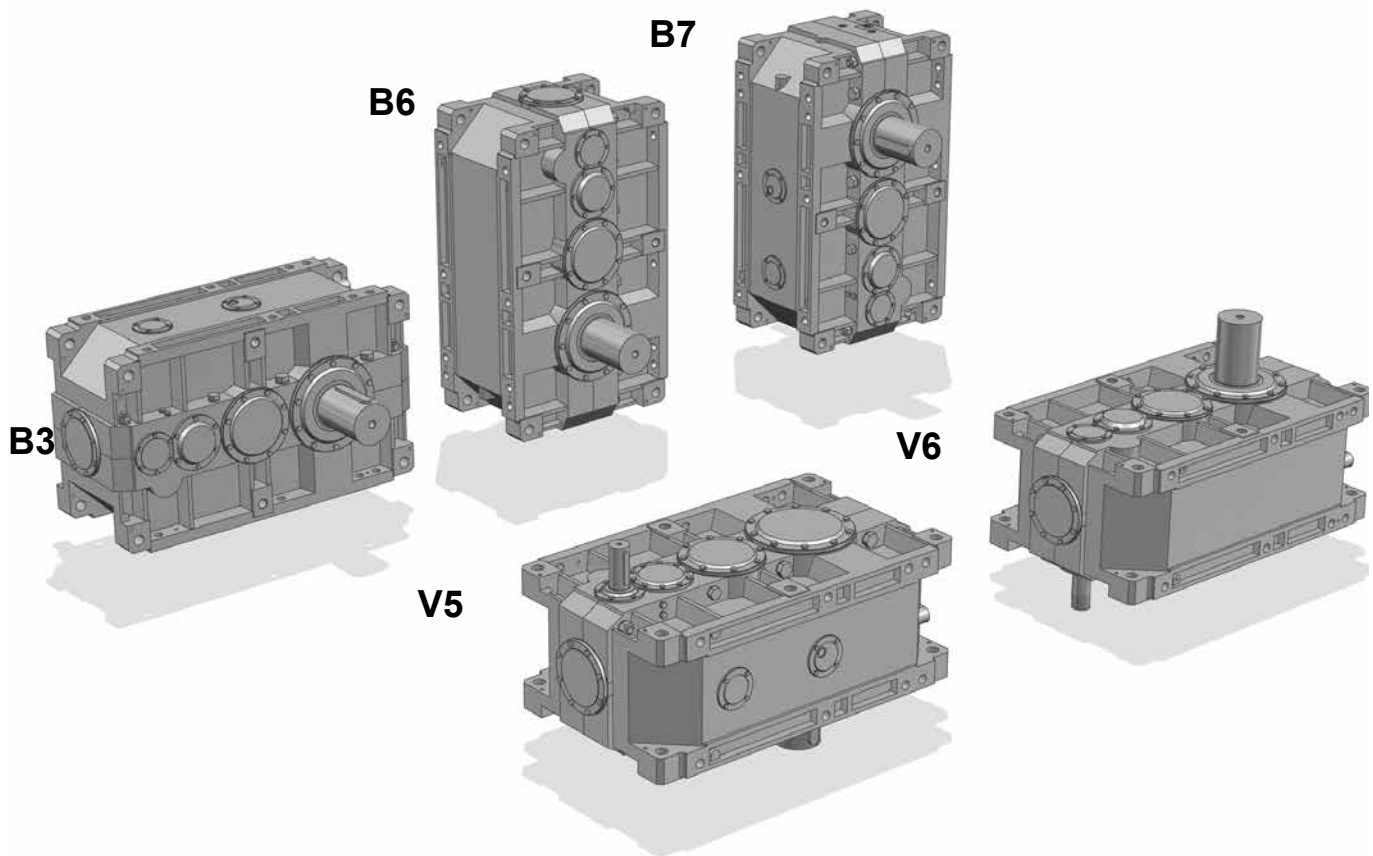
Hollow low speed shaft with keyway (on request)



UT. C. 2179

## 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).

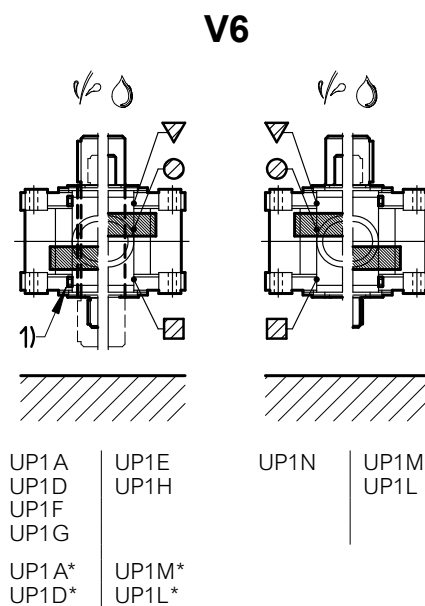
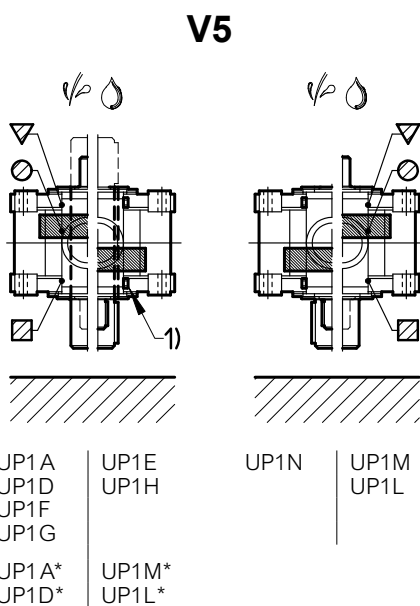
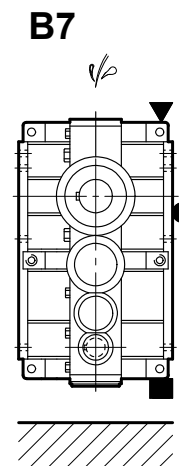
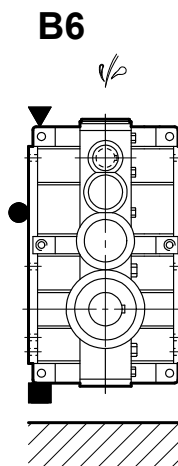
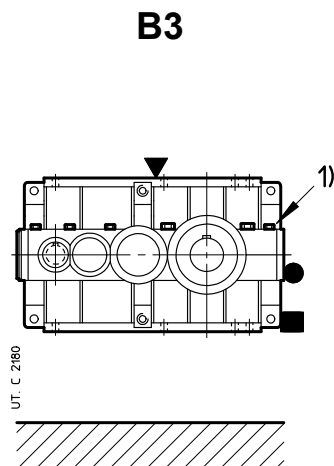
- ▼ Oil filler plug
- Oil level plug
- Oil drain plug

- ▼ 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)

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

## Lubrication - Plug position and oil quantity

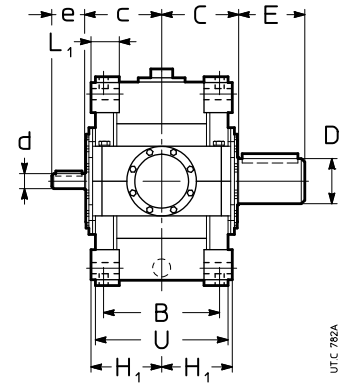
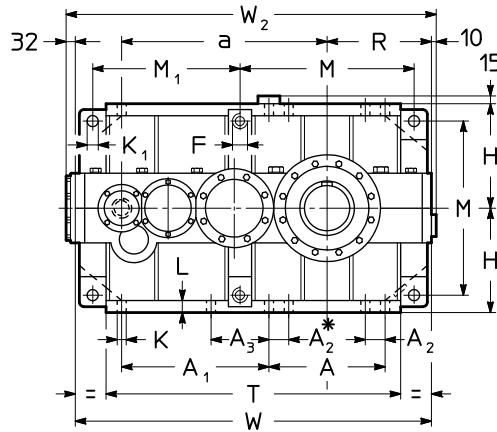
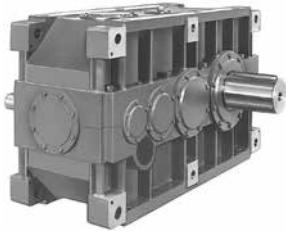
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	37	62	59	62	66
<b>4500, 4501</b>	37	62	59	62	66
<b>5000, 5001</b>	74	119	119	119	132
<b>5600, 5601</b>	74	119	119	119	132
<b>6300, 6301</b>	106	166	177	166	188
<b>7101</b>	166	251	280	264	296
<b>8001</b>	280	476	449	476	502

## 8.3 - Gear reducers R 4I

### Dimensions



\* For sizes  $\geq 6300$ .

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 $\emptyset$	K <sub>1</sub> $\emptyset$ H11	L	L <sub>1</sub>	M	T	U	W	W <sub>2</sub>	lb <sup>3)</sup>	
			M <sub>1</sub>						1)	R											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	5200 5360	5360 5530
<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	5840 6000	6040 6240
<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	10210 10450	10520 10800
<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	12170 12430	12610 12920
<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	17040 17260	17660 17990
<b>7101</b>	1630	930	1228	115	590	843	601	540	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	29170	30270
<b>8001</b>	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	45020	46610

Size	D $\emptyset$	E	d $\emptyset$ <sup>4)</sup>		e	
			$i_N \leq 160$	$i_N \geq 200$	$i_N \leq 160$	$i_N \geq 200$
<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  $1,7 \cdot F$ .

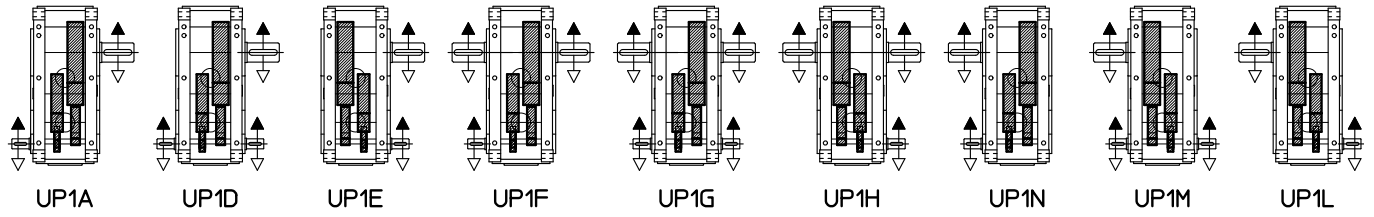
2) For mounting positions B6, B7, V5, V6, dimension  $W_2$  increases by approx. 20 for overall dimensions of filler plug.

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  $i_N \geq 200$ .

## 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)



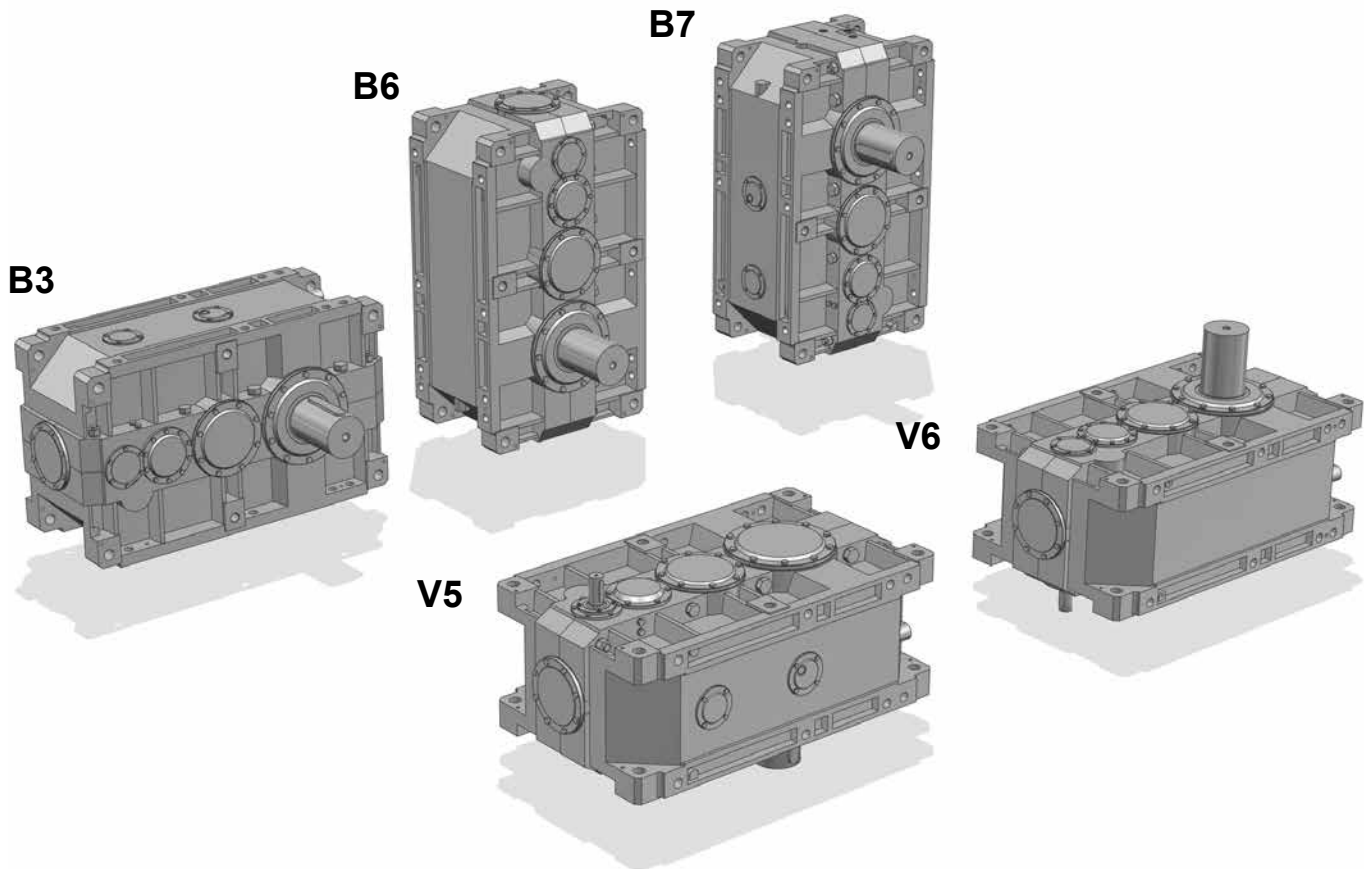
Hollow low speed shaft with keyway (on request)



UT. C. 2181

## Mounting positions

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



☞ Possible high oil splash: for the corrective factor  $f_{t3}$  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).

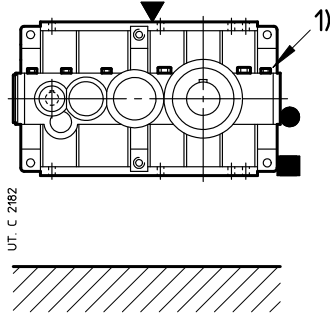
- ▼ Oil filler plug
- Oil level plug
- Oil drain plug

- ▽ 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)

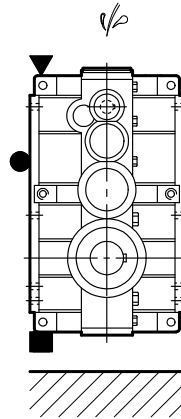
## Lubrication - Plug position and oil quantity

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.

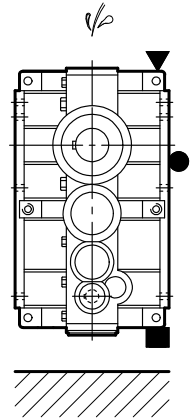
### B3



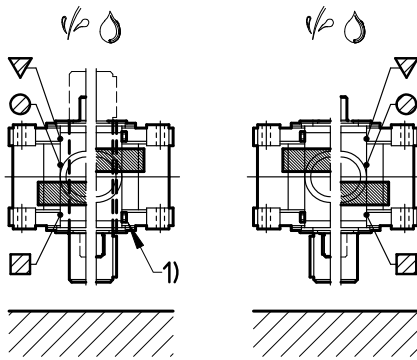
### B6



### B7



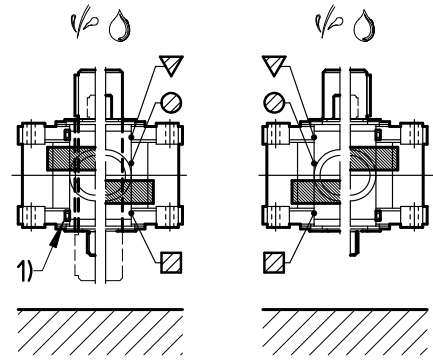
### V5



UP1A	UP1E
UP1D	UP1H
UP1F	
UP1G	
UP1A*	UP1M*
UP1D*	UP1L*

UP1N	UP1M
	UP1L

### V6



UP1A	UP1E
UP1D	UP1H
UP1F	
UP1G	
UP1A*	UP1M*
UP1D*	UP1L*

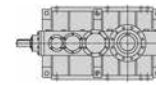
UP1N	UP1M
	UP1L

Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
<b>4000, 4001</b>	42	70	59	66	70
<b>4500, 4501</b>	42	70	59	66	70
<b>5000, 5001</b>	83	140	112	132	140
<b>5600, 5601</b>	83	140	112	132	140
<b>6300, 6301</b>	119	198	166	188	198
<b>7101</b>	198	296	280	296	296
<b>8001</b>	312	528	449	502	502

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# Selection tables (bevel helical gear reducers)

# Selection tables (bevel helical gear reducers)



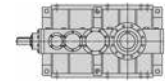
9

$n_1 = 1\ 800\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size													
			Nominal output power		$P_{N2}$ [hp]		Nominal output torque		$T_{N2} (T_{2max})$ [10 <sup>3</sup> lb in]							
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001		
CI	8	224	2380 ▲ 645 (1250)	2560 ▲ 695 (1400)	3030 ▲ 860 (1700)	-	-	-	-	-	-	-	-	-	-	-
	9	200	2290 ▲ 710 (1320)	2510 ▲ 775 (1500)	2710 ▲ 885 (1700)	2980 ▲ 975 (1950)	-	-	-	-	-	-	-	-	-	-
	10	180	1990 ▲ 710 (1320)	2240 ▲ 795 (1500)	2490 ▲ 885 (1750)	2750 ▲ 990 (1800)	-	-	-	-	-	-	-	-	-	-
	11,2	160	1800 ▲ 710 (1320)	2020 ▲ 795 (1500)	2170 ▲ 885 (1750)	2430 ▲ 990 (2000)	-	-	-	-	-	-	-	-	-	-
	12,5	140	1580 ▲ 710 (1320)	1710 ▲ 765 (1550)	1970 ▲ 885 (1700)	2200 ▲ 990 (1700)	-	-	-	-	-	-	-	-	-	-
	14	132	1420 ▲ 710 (1250)	1600 ▲ 795 (1450)	1710 ▲ 885 (1750)	1920 ▲ 990 (2000)	-	-	-	-	-	-	-	-	-	-
	16	112	1240 ▲ 710 (1320)	1330 ▲ 755 (1450)	1560 ▲ 885 (1650)	1690 ▲ 960 (1850)	-	-	-	-	-	-	-	-	-	-
	18	100	1120 ▲ 710 (1280)	1260 ▲ 795 (1450)	1330 ▲ 865 (1750)	-	-	-	-	-	-	-	-	-	-	-
	C2I	20	90	1220 ▲ 840 (1450)	1320 ▲ 910 (1650)	1230 ▲ 885 (1650)	1330 ▲ 955 (1900)	-	-	-	-	-	-	-	-	-
22,4		80	1100 ▲ 865 (1450)	1210 ▲ 945 (1650)	1280 ▲ 1020 (2000)	1390 ▲ 1105 (2240)	2160 ▲ 1680 (2900)	2360 ▲ 1835 (3350)	-	-	-	-	-	-	-	-
25		71	978 ▲ 885 (1400)	1080 ▲ 975 (1600)	1180 ▲ 1060 (2000)	1280 ▲ 1160 (2300)	1840 ▲ 1635 (2800)	2010 ▲ 1790 (3250)	2420 ▲ 2150 (4000)	2740 ▲ 2435 (4500)	-	-	-	-	-	-
28		63	902 ▲ 885 (1450)	1010 ▲ 990 (1650)	1050 ▲ 1090 (1850)	1150 ▲ 1195 (2120)	1730 ▲ 1680 (2900)	1930 ▲ 1875 (3350)	2120 ▲ 2150 (3750)	2420 ▲ 2460 (4250)	2650 ▲ 2655 (5300)	2960 ▲ 2965 (6000)	-	-	-	-
31,5		56	783 ▲ 885 (1450)	877 ▲ 990 (1650)	980 ▲ 1105 (2000)	1080 ▲ 1220 (2300)	1500 ▲ 1665 (2900)	1690 ▲ 1875 (3350)	1930 ▲ 2150 (4000)	2230 ▲ 2480 (4620)	2450 ▲ 2830 (5600)	2710 ▲ 3185 (6300)	-	-	-	-
35,5		50	716 ▲ 885 (1450)	802 ▲ 990 (1700)	853 ▲ 1105 (1900)	955 ▲ 1240 (2180)	1370 ▲ 1680 (2900)	1530 ▲ 1875 (3350)	1700 ▲ 2150 (3750)	1950 ▲ 2480 (4370)	2320 ▲ 2965 (5600)	2630 ▲ 3365 (6300)	-	-	-	-
40		45	622 ▲ 885 (1450)	696 ▲ 990 (1700)	778 ▲ 1105 (2060)	872 ▲ 1240 (2360)	1200 ▲ 1680 (2900)	1340 ▲ 1875 (3350)	1540 ▲ 2150 (4120)	1770 ▲ 2480 (4750)	2150 ▲ 3100 (5800)	2410 ▲ 3540 (6700)	-	-	-	-
45		40	568 ▲ 885 (1500)	636 ▲ 990 (1700)	677 ▲ 1105 (1950)	758 ▲ 1240 (2240)	1090 ▲ 1680 (3000)	1210 ▲ 1875 (3450)	1350 ▲ 2150 (3870)	1550 ▲ 2480 (4500)	1980 ▲ 3140 (5800)	2280 ▲ 3645 (5600)	-	-	-	-
50		35,5	493 ▲ 885 (1500)	552 ▲ 990 (1700)	617 ▲ 1105 (2060)	691 ▲ 1240 (2360)	952 ▲ 1680 (3000)	1060 ▲ 1875 (3450)	1220 ▲ 2150 (4120)	1400 ▲ 2480 (4750)	1720 ▲ 3140 (5800)	1960 ▲ 3645 (6700)	-	-	-	-
56		31,5	448 ▲ 885 (1500)	501 ▲ 990 (1750)	537 ▲ 1105 (1950)	601 ▲ 1240 (2240)	858 ▲ 1680 (3070)	957 ▲ 1875 (3450)	1070 ▲ 2150 (4000)	1230 ▲ 2480 (4500)	1570 ▲ 3140 (5800)	1800 ▲ 3645 (5600)	-	-	-	-
63		28	388 ▲ 885 (1500)	435 ▲ 990 (1750)	487 ▲ 1105 (2120)	545 ▲ 1240 (2430)	750 ▲ 1680 (3070)	837 ▲ 1875 (3450)	960 ▲ 2150 (4250)	1110 ▲ 2480 (4870)	1360 ▲ 3140 (6000)	1550 ▲ 3645 (6700)	-	-	-	-
71		25	358 ▲ 885 (1550)	401 ▲ 990 (1750)	423 ▲ 1105 (2000)	474 ▲ 1240 (2300)	686 ▲ 1680 (3070)	765 ▲ 1875 (3550)	841 ▲ 2150 (4000)	969 ▲ 2480 (4620)	1230 ▲ 3140 (5800)	1430 ▲ 3645 (5450)	-	-	-	-
80		22,4	311 ▲ 885 (1550)	348 ▲ 990 (1750)	384 ▲ 1105 (2180)	430 ▲ 1240 (2430)	600 ▲ 1680 (3070)	670 ▲ 1875 (3550)	768 ▲ 2150 (4250)	885 ▲ 2480 (4870)	1070 ▲ 3140 (6150)	1220 ▲ 3645 (6900)	-	-	-	-
90		20	286 ▲ 885 (1550)	321 ▲ 990 (1750)	339 ▲ 1105 (2060)	379 ▲ 1240 (2360)	549 ▲ 1680 (3070)	612 ▲ 1875 (3550)	673 ▲ 2150 (4120)	776 ▲ 2480 (4750)	969 ▲ 3140 (5800)	1120 ▲ 3645 (6700)	-	-	-	-
100		18	249 ▲ 885 (1550)	278 ▲ 990 (1750)	307 ▲ 1105 (2180)	344 ▲ 1240 (2500)	480 ▲ 1680 (3070)	536 ▲ 1875 (3550)	614 ▲ 2150 (4250)	708 ▲ 2480 (4870)	884 ▲ 3140 (5300)	1030 ▲ 3645 (6150)	1370 ▲ 4885 (9750)	2180 ▲ 8190 (16000)	-	-
125	14	-	-	246 ▲ 1105 (1900)	275 ▲ 1240 (2180)	-	-	491 ▲ 2150 (3750)	566 ▲ 2480 (4250)	-	-	-	-	-	-	
C3I	125	14	194 ▲ 885 (1550)	218 ▲ 990 (1750)	243 ▲ 1105 (2180)	272 ▲ 1240 (2500)	369 ▲ 1680 (3070)	412 ▲ 1875 (3550)	472 ▲ 2150 (4250)	544 ▲ 2480 (5000)	681 ▲ 3140 (6000)	718 ▲ 3375 (6700)	1260 ▲ 5750 (11200)	1720 ▲ 8190 (16000)	-	-
	160	11,2	154 ▲ 885 (1550)	172 ▲ 990 (1750)	193 ▲ 1105 (2180)	216 ▲ 1240 (2500)	293 ▲ 1680 (3070)	327 ▲ 1875 (3550)	375 ▲ 2150 (4250)	432 ▲ 2480 (5000)	545 ▲ 3140 (6150)	621 ▲ 3645 (7100)	1010 ▲ 5750 (11200)	1370 ▲ 8190 (16000)	-	-
	200	9	121 ▲ 885 (1550)	136 ▲ 990 (1750)	152 ▲ 1105 (2180)	170 ▲ 1240 (2500)	238 ▲ 1680 (3070)	265 ▲ 1875 (3550)	304 ▲ 2150 (4250)	351 ▲ 2480 (5000)	432 ▲ 3140 (6000)	497 ▲ 3645 (6700)	801 ▲ 5750 (11200)	1090 ▲ 8190 (16000)	-	-
	250	7,1	95,5 ▲ 885 (1550)	107 ▲ 990 (1750)	120 ▲ 1105 (2180)	134 ▲ 1240 (2500)	188 ▲ 1680 (3070)	209 ▲ 1875 (3550)	240 ▲ 2150 (4250)	276 ▲ 2480 (5000)	345 ▲ 3140 (6150)	394 ▲ 3645 (7100)	631 ▲ 5750 (11200)	859 ▲ 8190 (16000)	-	-
	315	5,6	77,7 ▲	87 ▲	97,3 ▲	109 ▲	148 ▲	165 ▲	189 ▲	218 ▲	272 ▲	301 ▲	498 ▲	677 ▲	-	-

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

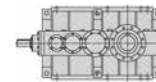
# Selection tables (bevel helical gear reducers)



$n_1 = 1\ 500\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size												
			Nominal output power						$P_{N2}$ [hp]						
			Nominal output torque						$T_{N2} (T_{2max})$ [ $10^3\ \text{lb in}$ ]						
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
C1	8	190	2040 ▲ 665 (1280)	2230 ▲ 730 (1450)	2580 ▲ 880 (1750)	-	-	-	-	-	-	-	-	-	-
	9	170	2030 ▲ 750 (1320)	2230 ▲ 830 (1550)	2390 ▲ 940 (1750)	2540 ▲ 995 (2000)	-	-	-	-	-	-	-	-	-
	10	150	1760 ▲ 750 (1320)	1970 ▲ 840 (1550)	2200 ▲ 940 (1850)	2420 ▲ 1045 (1850)	-	-	-	-	-	-	-	-	-
	11,2	132	1590 ▲ 750 (1360)	1780 ▲ 840 (1550)	1910 ▲ 940 (1750)	2130 ▲ 1045 (2060)	-	-	-	-	-	-	-	-	-
	12,5	118	1400 750 (1360)	1520 820 (1550)	1740 ▲ 940 (1750)	1930 ▲ 1045 (1750)	-	-	-	-	-	-	-	-	-
	14	106	1260 750 (1280)	1410 840 (1500)	1520 940 (1800)	1640 1010 (2000)	-	-	-	-	-	-	-	-	-
	16	95	1040 710 (1360)	1110 755 (1500)	1380 940 (1650)	1520 1035 (1900)	-	-	-	-	-	-	-	-	-
	18	85	995 750 (1320)	1110 840 (1500)	1120 880 (1750)	-	-	-	-	-	-	-	-	-	-
C2I	20	75	1070 ▲ 885 (1500)	1150 ▲ 955 (1700)	1090 940 (1700)	1120 970 (1950)	-	-	-	-	-	-	-	-	-
	22,4	67	996 ▲ 940 (1500)	1070 ▲ 1010 (1700)	1110 ▲ 1060 (2000)	1190 ▲ 1135 (2240)	1890 ▲ 1770 (3000)	2120 ▲ 1980 (3450)	-	-	-	-	-	-	-
	25	60	864 ▲ 940 (1450)	962 ▲ 1045 (1650)	1030 ▲ 1115 (2000)	1140 ▲ 1240 (2300)	1660 ▲ 1770 (2900)	1810 ▲ 1930 (3350)	2130 ▲ 2275 (4000)	2400 ▲ 2565 (4620)	-	-	-	-	-
	28	53	797 940 (1450)	887 1045 (1700)	938 ▲ 1170 (1900)	1040 ▲ 1300 (2180)	1520 ▲ 1770 (2900)	1700 ▲ 1985 (3350)	1870 ▲ 2275 (3870)	2070 ▲ 2525 (4370)	2320 ▲ 2790 (5450)	2530 ▲ 3040 (6150)	-	-	-
	31,5	47,5	691 940 (1450)	770 1045 (1700)	863 1170 (2060)	980 1330 (2360)	1330 ▲ 1770 (2900)	1490 ▲ 1985 (3350)	1700 ▲ 2275 (4120)	1920 ▲ 2565 (4750)	2170 ▲ 3010 (5800)	2390 ▲ 3365 (6700)	-	-	-
	35,5	42,5	633 940 (1500)	704 1045 (1700)	750 1170 (1950)	853 1330 (2240)	1200 ▲ 1770 (3000)	1350 ▲ 1985 (3450)	1490 ▲ 2275 (3870)	1660 ▲ 2530 (4500)	2050 ▲ 3140 (5800)	2310 ▲ 3540 (6500)	-	-	-
	40	37,5	549 940 (1500)	611 1045 (1700)	685 1170 (2060)	778 1330 (2430)	1050 ▲ 1770 (3000)	1180 ▲ 1985 (3450)	1350 ▲ 2275 (4120)	1510 ▲ 2535 (4750)	1870 ▲ 3230 (6000)	2080 ▲ 3675 (6900)	-	-	-
	45	33,5	501 940 (1500)	558 1045 (1750)	596 1170 (1950)	677 1330 (2240)	954 1770 (3070)	1070 1985 (3450)	1190 ▲ 2275 (4000)	1320 ▲ 2535 (4500)	1700 ▲ 3230 (5800)	1960 ▲ 3760 (5800)	3170 ▲ 5930 (10900)	4360 ▲ 8410 (15500)	-
	50	30	435 940 (1500)	484 1045 (1750)	543 1170 (2120)	617 1330 (2430)	835 1770 (3070)	935 1985 (3450)	1070 2275 (4250)	1210 2555 (4870)	1470 ▲ 3230 (6000)	1680 ▲ 3760 (6700)	2750 ▲ 5930 (10900)	3780 ▲ 8410 (15500)	-
	56	26,5	395 940 (1550)	440 1045 (1750)	472 1170 (2000)	537 1330 (2300)	752 1770 (3070)	843 1985 (3550)	940 2275 (4000)	1050 2540 (4620)	1340 3230 (6000)	1550 ▲ 3760 (6000)	2490 ▲ 5930 (10600)	3420 ▲ 8410 (15000)	-
	63	23,6	343 940 (1550)	382 1045 (1750)	428 1170 (2180)	487 1330 (2500)	658 1770 (3070)	737 1985 (3550)	846 2275 (4250)	954 2565 (5000)	1170 3230 (6150)	1340 3760 (6900)	2200 ▲ 5930 (11200)	3110 ▲ 8410 (16000)	-
	71	21,2	316 940 (1550)	352 1045 (1750)	372 1170 (2060)	423 1330 (2360)	602 1770 (3070)	674 1985 (3550)	742 2275 (4120)	830 2545 (4750)	1050 3230 (5800)	1230 3760 (5800)	1990 ▲ 5930 (10600)	2810 ▲ 8410 (15000)	-
	80	19	275 940 (1550)	306 1045 (1750)	338 1170 (2180)	384 1330 (2500)	527 1770 (3070)	590 1985 (3550)	677 2275 (4250)	764 2565 (4870)	921 3230 (6150)	1050 3760 (6900)	-	-	-
	90	17	253 940 (1550)	282 1045 (1750)	298 1170 (2060)	339 1330 (2360)	481 1770 (3070)	539 1985 (3550)	593 2275 (4120)	666 2555 (4750)	831 3230 (5800)	967 3760 (6700)	-	-	-
	100	15	220 940 (1550)	244 1045 (1750)	270 1170 (2180)	307 1330 (2500)	421 1770 (3070)	472 1985 (3550)	541 2275 (4250)	611 2565 (5000)	758 3230 (5450)	884 3760 (6150)	1230 ▲ 5270 (10600)	1870 ▲ 8410 (16000)	-
125	11,8	-	-	216 1170 (1900)	246 1330 (2180)	-	-	433 2275 (3750)	489 2565 (4250)	-	-	-	-	-	
C3I	125	11,8	172 940 (1550)	191 1045 (1750)	214 1170 (2180)	227 1240 (2500)	324 1770 (3070)	363 1985 (3550)	394 2150 (4250)	454 2480 (5000)	583 3230 (6150)	629 3545 (6900)	1080 ▲ 5930 (11200)	1470 ▲ 8410 (16000)	-
	160	9,5	136 940 (1550)	151 1045 (1750)	170 1170 (2180)	189 1305 (2500)	257 1770 (3070)	288 1985 (3550)	330 2270 (4250)	360 2480 (5000)	467 3230 (6150)	534 3760 (7100)	868 5930 (11200)	1180 ▲ 8410 (16000)	-
	200	7,5	107 940 (1550)	119 1045 (1750)	134 1170 (2180)	152 1330 (2500)	209 1770 (3070)	234 1985 (3550)	268 2275 (4250)	292 2480 (5000)	370 3230 (6150)	427 3760 (6900)	688 5930 (11200)	932 8410 (16000)	-
	250	6	84,4 940 (1550)	93,9 1045 (1750)	105 1170 (2180)	120 1330 (2500)	165 1770 (3070)	184 1985 (3550)	211 2275 (4250)	239 2565 (5000)	296 3230 (6150)	338 3760 (7100)	542 5930 (11200)	735 8410 (16000)	-
	315	4,75	68,6 940 (1550)	76,4 1045 (1750)	85,6 1170 (2180)	97,3 1330 (2500)	130 1770 (3070)	145 1985 (3550)	167 2275 (4250)	188 2565 (5000)	233 3230 (6150)	253 3565 (7100)	428 5930 (11200)	580 8410 (16000)	-

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

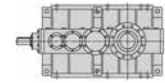


$n_1 = 1\ 200\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size													
			Nominal output power $P_{N2}$ [hp]						Nominal output torque $T_{N2} (T_{2max})$ [ $10^3$ lb in]							
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001		
C1	8	150	1680 685 (1280)	1790 730 (1450)	2080 ▲ 890 (1800)	-	-	-	-	-	-	-	-	-	-	-
	9	132	1630 755 (1360)	1790 830 (1550)	1920 ▲ 945 (1750)	2050 ▲ 1005 (2000)	-	-	-	-	-	-	-	-	-	-
	10	118	1420 755 (1360)	1580 845 (1550)	1770 945 (1900)	1940 ▲ 1050 (1900)	-	-	-	-	-	-	-	-	-	-
	11,2	106	1280 755 (1360)	1430 845 (1550)	1540 945 (1800)	1710 1050 (2060)	-	-	-	-	-	-	-	-	-	-
	12,5	95	1120 755 (1360)	1250 845 (1600)	1400 945 (1800)	1550 1050 (1800)	-	-	-	-	-	-	-	-	-	-
	14	85	1010 755 (1280)	1130 845 (1500)	1220 945 (1800)	1320 1020 (2060)	-	-	-	-	-	-	-	-	-	-
	16	75	858 735 (1360)	887 760 (1500)	1110 945 (1700)	1230 1050 (1950)	-	-	-	-	-	-	-	-	-	-
	18	67	800 755 (1320)	887 840 (1500)	909 890 (1800)	-	-	-	-	-	-	-	-	-	-	-
	C2	20	60	857 890 (1500)	927 960 (1700)	872 945 (1700)	908 980 (1950)	-	-	-	-	-	-	-	-	-
22,4		53	798 940 (1500)	859 1010 (1700)	893 1065 (2060)	955 1140 (2300)	1520 ▲ 1770 (3000)	1710 ▲ 1990 (3450)	-	-	-	-	-	3830 ▲ 4675 (9000)	6350 ▲ 8030 (13200)	
25		47,5	692 940 (1450)	771 1045 (1650)	827 1120 (2060)	920 1245 (2360)	1330 ▲ 1770 (2900)	1490 ▲ 1990 (3350)	1710 ▲ 2285 (4000)	1920 ▲ 2570 (4620)	-	-	-	3830 ▲ 5180 (10000)	6040 ▲ 8430 (14500)	
28		42,5	638 940 (1500)	710 1045 (1700)	752 1170 (1900)	839 1305 (2180)	1210 1770 (3000)	1360 1990 (3350)	1500 ▲ 2285 (3870)	1660 ▲ 2525 (4370)	1870 ▲ 2810 (5450)	2030 ▲ 3060 (6150)	3820 ▲ 5940 (10600)	5240 ▲ 8430 (15000)		
31,5		37,5	554 940 (1500)	617 1045 (1700)	692 1170 (2060)	786 1330 (2360)	1060 1770 (3000)	1190 1990 (3350)	1370 2285 (4120)	1540 2575 (4750)	1750 ▲ 3025 (5800)	1920 ▲ 3380 (6700)	3450 ▲ 5940 (10000)	4740 ▲ 8430 (14500)		
35,5		33,5	507 940 (1500)	564 1045 (1750)	602 1170 (1950)	684 1330 (2240)	964 1770 (3000)	1080 1990 (3450)	1200 2285 (3870)	1330 2530 (4500)	1650 ▲ 3160 (5800)	1850 ▲ 3560 (6500)	3050 ▲ 5940 (10000)	4310 ▲ 8430 (14500)		
40		30	440 940 (1500)	490 1045 (1750)	549 1170 (2120)	624 1330 (2430)	844 1770 (3000)	948 1990 (3450)	1090 2285 (4250)	1210 2545 (4870)	1500 3245 (6000)	1670 3685 (6900)	2760 ▲ 5940 (10000)	3900 ▲ 8430 (14500)		
45		26,5	402 940 (1550)	447 1045 (1750)	478 1170 (2000)	543 1330 (2300)	764 1770 (3070)	859 1990 (3550)	953 2285 (4000)	1060 2540 (4620)	1360 3245 (5800)	1570 3770 (6000)	2540 ▲ 5940 (10900)	3490 ▲ 8430 (16000)		
50		23,6	349 940 (1550)	388 1045 (1750)	435 1170 (2120)	495 1330 (2430)	669 1770 (3070)	752 1990 (3550)	861 2285 (4250)	968 2565 (4870)	1180 3245 (6000)	1350 3770 (6700)	2210 ▲ 5940 (11200)	3030 ▲ 8430 (16000)		
56		21,2	317 940 (1550)	353 1045 (1750)	379 1170 (2000)	431 1330 (2300)	603 1770 (3070)	677 1990 (3550)	755 2285 (4000)	841 2545 (4620)	1080 3245 (6000)	1240 3770 (6000)	1990 ▲ 5940 (10600)	2740 ▲ 8430 (15000)		
63		19	275 940 (1550)	306 1045 (1750)	343 1170 (2180)	390 1330 (2500)	527 1770 (3070)	593 1990 (3550)	679 2285 (4250)	766 2575 (5000)	938 3245 (6150)	1070 3770 (6900)	1760 ▲ 5940 (11200)	2490 ▲ 8430 (16000)		
71		17	253 940 (1550)	282 1045 (1750)	299 1170 (2060)	339 1330 (2360)	482 1770 (3070)	542 1990 (3550)	595 2285 (4120)	665 2550 (4750)	846 3245 (6000)	984 3770 (6000)	1590 ▲ 5940 (10600)	2260 ▲ 8430 (15000)		
80		15	220 940 (1550)	245 1045 (1750)	271 1170 (2180)	308 1330 (2500)	422 1770 (3070)	474 1990 (3550)	543 2285 (4250)	613 2575 (4870)	740 3245 (6150)	844 3770 (6900)	-	-		
90		13,2	203 940 (1550)	226 1045 (1750)	239 1170 (2060)	272 1330 (2360)	386 1770 (3070)	433 1990 (3550)	476 2285 (4120)	533 2555 (4750)	667 3245 (5800)	775 3770 (6700)	-	-		
100		11,8	176 940 (1550)	196 1045 (1750)	217 1170 (2180)	246 1330 (2500)	337 1770 (3070)	379 1990 (3550)	435 2285 (4250)	490 2575 (5000)	608 3245 (5600)	709 3770 (6300)	1020	1500 ▲		
125	9,5	-	-	173 1170 (1900)	197 1330 (2180)	-	-	348 2285 (3750)	392 2575 (4250)	-	-	-	-			
C3	125	9,5	137 940 (1550)	153 1045 (1750)	172 1170 (2180)	183 1245 (2500)	260 1770 (3070)	292 1990 (3550)	318 2170 (4250)	363 2480 (5000)	469 3245 (6150)	520 3670 (6900)	870 5940 (11200)	1180 ▲ 8430 (16000)		
	160	7,5	109 940 (1550)	121 1045 (1750)	136 1170 (2180)	155 1330 (2500)	206 1770 (3070)	231 1990 (3550)	265 2285 (4250)	288 2480 (5000)	375 3245 (6150)	428 3770 (7100)	696 5940 (11200)	942 8430 (16000)		
	200	6	85,7 940 (1550)	95,4 1045 (1750)	107 1170 (2180)	122 1330 (2500)	167 1770 (3070)	188 1990 (3550)	215 2285 (4250)	241 2560 (5000)	297 3245 (6150)	342 3770 (6900)	552 5940 (11200)	747 8430 (16000)		
	250	4,75	67,6 940 (1550)	75,2 1045 (1750)	84,4 1170 (2180)	96 1330 (2500)	132 1770 (3070)	148 1990 (3550)	170 2285 (4250)	192 2575 (5000)	238 3245 (6150)	271 3770 (7100)	435 5940 (11200)	590 8430 (16000)		
	315	3,75	55 940 (1550)	61,2 1045 (1750)	68,7 1170 (2180)	78,1 1330 (2500)	104 1770 (3070)	117 1990 (3550)	134 2285 (4250)	151 2575 (5000)	187 3245 (6150)	209 3685 (7100)	343 5940 (11200)	465 8430 (16000)		

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

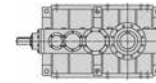
# Selection tables (bevel helical gear reducers)



$n_1 = 1\ 000\ \text{rpm}$

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power				$P_{N2}$ [hp]							
			Nominal output torque				$T_{N2} (T_{2max})$				[10 <sup>3</sup> lb in]			
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
CI	8	125	1490 730 (1320)	1510 735 (1450)	1770 905 (1800)	-	-	-	-	-	-	-	-	-
	9	112	1370 765 (1360)	1490 830 (1600)	1620 950 (1800)	1740 1025 (2060)	-	-	-	-	-	-	-	-
	10	100	1190 765 (1360)	1330 855 (1600)	1490 950 (1900)	1630 1060 (1900)	-	-	-	-	-	-	-	-
	11,2	90	1080 765 (1400)	1200 855 (1600)	1290 950 (1800)	1440 1060 (2060)	-	-	-	-	-	-	-	-
	12,5	80	944 765 (1400)	1050 855 (1600)	1170 950 (1800)	1310 1060 (1800)	-	-	-	-	-	-	-	-
	14	71	853 765 (1320)	953 855 (1500)	1030 950 (1850)	1120 1040 (2060)	-	-	-	-	-	-	-	-
	16	63	741 760 (1360)	750 770 (1550)	930 950 (1700)	1040 1060 (1950)	-	-	-	-	-	-	-	-
	18	56	673 765 (1360)	741 840 (1550)	771 905 (1800)	-	-	-	-	-	-	-	-	-
C2I	20	50	720 895 (1500)	781 970 (1750)	734 950 (1750)	771 1000 (2000)	-	-	-	-	-	-	-	-
	22,4	45	666 940 (1500)	720 1020 (1750)	750 1075 (2060)	807 1155 (2300)	1270 1775 (3070)	1430 2010 (3350)	-	-	-	-	3410 ▲ 5000 (9250)	5560 ▲ 8430 (13600)
	25	40	578 940 (1500)	644 1050 (1700)	696 1130 (2060)	776 1260 (2360)	1110 1775 (3000)	1260 2010 (3350)	1440 2300 (4120)	1610 2575 (4750)	-	-	3410 ▲ 5540 (10300)	5060 ▲ 8460 (15000)
	28	35,5	533 940 (1500)	594 1050 (1750)	630 1175 (1950)	704 1315 (2240)	1010 1775 (3000)	1150 2010 (3450)	1260 2300 (3870)	1390 2530 (4500)	1580 2855 (5600)	1710 3090 (6150)	3190 ▲ 5970 (10900)	4380 ▲ 8450 (15500)
	31,5	31,5	463 940 (1500)	515 1050 (1750)	579 1175 (2120)	659 1340 (2430)	887 1775 (3000)	1000 2010 (3450)	1150 2300 (4250)	1290 2580 (4870)	1470 3060 (6000)	1610 3405 (6900)	2890 ▲ 5970 (10300)	3970 ▲ 8460 (14500)
	35,5	28	423 940 (1550)	471 1050 (1750)	504 1175 (2000)	573 1340 (2300)	805 1775 (3070)	911 2010 (3550)	1010 2300 (4000)	1110 2540 (4620)	1390 3190 (6000)	1560 3595 (6700)	2560 ▲ 5970 (10300)	3610 ▲ 8460 (14500)
	40	25	367 940 (1550)	409 1050 (1750)	460 1175 (2120)	523 1340 (2430)	705 1775 (3070)	798 2010 (3550)	912 2300 (4250)	1020 2565 (4870)	1260 3270 (6000)	1400 3710 (7100)	2310 ▲ 5970 (10000)	3260 ▲ 8460 (14500)
	45	22,4	335 940 (1550)	374 1050 (1750)	400 1175 (2000)	455 1340 (2300)	638 1775 (3070)	723 2010 (3550)	800 2300 (4000)	885 2545 (4620)	1140 3270 (6000)	1320 3790 (6000)	2130 5970 (11200)	2920 ▲ 8460 (16000)
	50	20	291 940 (1550)	324 1050 (1750)	365 1175 (2180)	415 1340 (2500)	559 1775 (3070)	632 2010 (3550)	723 2300 (4250)	812 2585 (5000)	994 3270 (6150)	1130 3790 (6900)	1850 5970 (11200)	2540 ▲ 8460 (16000)
	56	18	264 940 (1550)	295 1050 (1750)	317 1175 (2060)	361 1340 (2360)	503 1775 (3070)	570 2010 (3550)	634 2300 (4120)	703 2550 (4750)	907 3270 (6000)	1040 3790 (6000)	1670 5970 (10600)	2290 ▲ 8460 (15000)
	63	16	230 940 (1550)	256 1050 (1750)	288 1175 (2180)	327 1340 (2500)	440 1775 (3070)	498 2010 (3550)	570 2300 (4250)	643 2595 (5000)	788 3270 (6150)	897 3790 (6900)	1480 5970 (11200)	2090 ▲ 8460 (16000)
	71	14	212 940 (1550)	236 1050 (1750)	250 1175 (2060)	284 1340 (2360)	403 1775 (3070)	456 2010 (3550)	500 2300 (4120)	555 2555 (4750)	710 3270 (6000)	824 3790 (6000)	1340 5970 (10600)	1890 ▲ 8460 (15000)
	80	12,5	184 940 (1550)	205 1050 (1750)	227 1175 (2180)	258 1340 (2500)	352 1775 (3070)	399 2010 (3550)	456 2300 (4250)	514 2595 (5000)	621 3270 (6150)	707 3790 (6900)	-	-
	90	11,2	169 940 (1550)	189 1050 (1750)	200 1175 (2060)	228 1340 (2360)	322 1775 (3070)	365 2010 (3550)	400 2300 (4120)	445 2560 (4750)	560 3270 (5800)	649 3790 (6700)	-	-
	100	10	147 940 (1550)	164 1050 (1750)	182 1175 (2180)	206 1340 (2500)	282 1775 (3070)	319 2010 (3550)	365 2300 (4250)	412 2595 (5000)	511 3270 (5600)	594 3790 (6300)	906 5830 (11200)	1250 8460 (16000)
	125	8	-	-	145 1175 (1900)	165 1340 (2180)	-	-	292 2300 (3750)	329 2595 (4250)	-	-	-	-
	C3I	125	8	115 940 (1550)	128 1050 (1750)	144 1175 (2180)	163 1335 (2500)	217 1775 (3070)	245 2010 (3550)	281 2300 (4250)	302 2480 (5000)	393 3270 (6150)	438 3705 (7100)	728 5970 (11200)
160		6,3	91 940 (1550)	101 1050 (1750)	114 1175 (2180)	130 1340 (2500)	172 1775 (3070)	195 2010 (3550)	222 2300 (4250)	243 2515 (5000)	315 3270 (6150)	358 3790 (7100)	583 5970 (11200)	789 8460 (16000)
200		5	71,6 940 (1550)	79,8 1050 (1750)	89,7 1175 (2180)	102 1340 (2500)	140 1775 (3070)	158 2010 (3550)	181 2300 (4250)	204 2595 (5000)	250 3270 (6150)	287 3790 (7100)	462 5970 (11200)	625 8460 (16000)
250		4	56,4 940 (1550)	62,9 1050 (1750)	70,7 1175 (2180)	80,4 1340 (2500)	110 1775 (3070)	125 2010 (3550)	143 2300 (4250)	161 2595 (5000)	200 3270 (6150)	227 3790 (7100)	364 5970 (11200)	493 8460 (16000)
315		3,15	45,9 940 (1550)	51,1 1050 (1750)	57,5 1175 (2180)	65,4 1340 (2500)	86,8 1775 (3070)	98,2 2010 (3550)	112 2300 (4250)	127 2595 (5000)	157 3270 (6150)	179 3790 (7100)	287 5970 (11200)	389 8460 (16000)

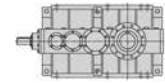
▲ Necessary forced lubrication with motor pump and possible heat exchanger (see ch. 6 and 12).



$n_1 = 750$  rpm

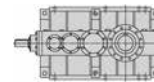
Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size												
			Nominal output power $P_{N2}$ [hp]		Nominal output torque $T_{N2}$ ( $T_{2max}$ ) [ $10^3$ lb in]										
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001	
CI	8	95	1120 735 (1360)	1170 760 (1500)	1370 930 (1850)	-	-	-	-	-	-	-	-	-	-
	9	85	1040 775 (1400)	1120 835 (1600)	1230 965 (1850)	1340 1055 (2120)	-	-	-	-	-	-	-	-	-
	10	75	906 775 (1400)	1010 865 (1600)	1130 965 (1950)	1240 1075 (2000)	-	-	-	-	-	-	-	-	-
	11,2	67	819 775 (1450)	915 865 (1600)	984 965 (1850)	1100 1075 (2120)	-	-	-	-	-	-	-	-	-
	12,5	60	718 775 (1450)	802 865 (1650)	893 965 (1850)	995 1075 (1850)	-	-	-	-	-	-	-	-	-
	14	53	649 775 (1360)	725 865 (1550)	780 965 (1900)	867 1070 (2120)	-	-	-	-	-	-	-	-	-
	16	47,5	558 765 (1400)	578 790 (1600)	708 965 (1750)	789 1075 (2000)	-	-	-	-	-	-	-	-	-
	18	42,5	512 775 (1400)	558 845 (1600)	594 930 (1850)	-	-	-	-	-	-	-	-	-	-
	C2I	20	37,5	546 905 (1550)	595 985 (1800)	558 965 (1800)	594 1025 (2060)	-	-	-	-	-	-	-	-
22,4		33,5	501 945 (1550)	545 1025 (1800)	570 1090 (2120)	618 1180 (2360)	954 1785 (3150)	1090 2040 (3550)	-	-	-	-	2840 5540 (9500)	4190 8460 (14000)	
25		30	435 945 (1500)	485 1055 (1750)	529 1145 (2120)	592 1285 (2430)	835 1785 (3070)	955 2040 (3450)	1090 2325 (4250)	1210 2585 (4870)	-	-	2780 6020 (10600)	3820 8520 (15500)	
28		26,5	401 945 (1550)	447 1055 (1750)	476 1185 (2000)	534 1330 (2300)	763 1785 (3070)	873 2040 (3550)	954 2325 (4000)	1040 2540 (4620)	1210 2920 (5800)	1300 3135 (6300)	2410 6020 (11200)	3300 8480 (16000)	
31,5		23,6	348 945 (1550)	388 1055 (1750)	438 1185 (2180)	498 1350 (2500)	668 1785 (3070)	764 2040 (3550)	871 2325 (4250)	970 2590 (5000)	1120 3110 (6150)	1220 3450 (6900)	2180 6020 (10600)	3000 8520 (15000)	
35,5		21,2	319 945 (1550)	355 1055 (1750)	381 1185 (2060)	433 1350 (2360)	606 1785 (3070)	693 2040 (3550)	764 2325 (4120)	836 2545 (4750)	1060 3240 (6150)	1190 3650 (6900)	1930 6020 (10600)	2720 8500 (15000)	
40		19	276 945 (1550)	308 1055 (1750)	348 1185 (2180)	396 1350 (2500)	530 1785 (3070)	607 2040 (3550)	692 2325 (4250)	771 2590 (5000)	955 3305 (6150)	1060 3750 (7100)	1750 6020 (10300)	2460 8520 (15000)	
45		17	252 945 (1550)	281 1055 (1750)	302 1185 (2060)	344 1350 (2360)	481 1785 (3070)	550 2040 (3550)	606 2325 (4120)	666 2555 (4750)	866 3300 (6000)	994 3815 (6150)	1610 6020 (11200)	2210 8520 (16000)	
50		15	219 945 (1550)	244 1055 (1750)	276 1185 (2180)	314 1350 (2500)	421 1785 (3070)	481 2040 (3550)	548 2325 (4250)	614 2600 (5000)	754 3305 (6150)	855 3815 (6900)	1400 6020 (11200)	1920 8520 (16000)	
56		13,2	199 945 (1550)	222 1055 (1750)	240 1185 (2060)	273 1350 (2360)	379 1785 (3070)	433 2040 (3550)	481 2325 (4120)	529 2560 (4750)	688 3305 (6150)	785 3815 (6150)	1260 6020 (10600)	1730 8520 (15000)	
63		11,8	173 945 (1550)	193 1055 (1750)	217 1185 (2180)	247 1350 (2500)	332 1785 (3070)	379 2040 (3550)	432 2325 (4250)	485 2610 (5000)	598 3305 (6150)	677 3815 (7100)	1120 6020 (11200)	1580 8520 (16000)	
71		10,6	159 945 (1550)	178 1055 (1750)	189 1185 (2060)	215 1350 (2360)	303 1785 (3070)	347 2040 (3550)	379 2325 (4120)	418 2565 (4750)	539 3305 (6150)	622 3815 (6150)	1010 6020 (10600)	1420 8520 (15000)	
80		9,5	138 945 (1550)	154 1055 (1750)	171 1185 (2180)	195 1350 (2500)	265 1785 (3070)	303 2040 (3550)	346 2325 (4250)	390 2620 (5000)	471 3305 (6150)	534 3815 (7100)	-	-	
90		8,5	127 945 (1550)	142 1055 (1750)	151 1185 (2060)	172 1350 (2360)	243 1785 (3070)	277 2040 (3550)	303 2325 (4120)	335 2570 (4750)	425 3305 (5800)	491 3815 (6700)	-	-	
100		7,5	111 945 (1550)	123 1055 (1750)	137 1185 (2180)	156 1350 (2500)	212 1785 (3070)	243 2040 (3550)	277 2325 (4250)	312 2620 (5000)	388 3305 (5800)	448 3815 (6500)	702 6020 (11200)	947 8520 (16000)	
125		6	-	-	110 1185 (1900)	125 1350 (2180)	-	-	221 2325 (3750)	250 2620 (4250)	-	-	-	-	
C3I		125	6	86,4 945 (1550)	96,3 1055 (1750)	109 1185 (2180)	124 1350 (2500)	163 1785 (3070)	187 2040 (3550)	213 2325 (4250)	236 2575 (5000)	299 3305 (6150)	330 3720 (7100)	550 6020 (11200)	744 8520 (16000)
	160	4,75	68,5 945 (1550)	76,3 1055 (1750)	86,1 1185 (2180)	98 1350 (2500)	129 1785 (3070)	148 2040 (3550)	169 2325 (4250)	190 2620 (5000)	239 3305 (6150)	271 3815 (7100)	440 6020 (11200)	595 8520 (16000)	
	200	3,75	53,9 945 (1550)	60,1 1055 (1750)	67,8 1185 (2180)	77,1 1350 (2500)	105 1785 (3070)	120 2040 (3550)	137 2325 (4250)	155 2620 (5000)	189 3305 (6150)	217 3815 (7100)	349 6020 (11200)	472 8520 (16000)	
	250	3	42,5 945 (1550)	47,4 1055 (1750)	53,4 1185 (2180)	60,8 1350 (2500)	82,9 1785 (3070)	94,8 2040 (3550)	108 2325 (4250)	122 2620 (5000)	151 3305 (6150)	172 3815 (7100)	275 6020 (11200)	372 8520 (16000)	
	315	2,36	34,6 945 (1550)	38,5 1055 (1750)	43,5 1185 (2180)	49,5 1350 (2500)	65,3 1785 (3070)	74,7 2040 (3550)	85,1 2325 (4250)	96 2620 (5000)	119 3305 (6150)	135 3815 (7100)	217 6020 (11200)	294 8520 (16000)	

# Selection tables (bevel helical gear reducers)



$n_1 \leq 90$  rpm

Train of gears	$i_N$	$n_{N2}$ rpm	Gear reducer size											
			Nominal output power				$P_{N2}$ [hp]							
			Nominal output torque				$T_{N2} (T_{2max})$				[10 <sup>3</sup> lb in]			
			4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
C1	8	11,2	138 750 (1450)	149 810 (1600)	173 985 (1950)	-	-	-	-	-	-	-	-	-
	9	10	136 840 (1550)	143 885 (1750)	158 1035 (2060)	173 1135 (2240)	-	-	-	-	-	-	-	-
	10	9	118 840 (1550)	132 940 (1750)	147 1045 (2060)	158 1140 (2120)	-	-	-	-	-	-	-	-
	11,2	8	107 840 (1550)	119 940 (1700)	128 1045 (2060)	143 1170 (2360)	-	-	-	-	-	-	-	-
	12,5	7,1	93,6 840 (1550)	104 935 (1750)	116 1045 (1950)	130 1170 (1950)	-	-	-	-	-	-	-	-
	14	6,3	84,6 840 (1450)	94,4 940 (1700)	101 1045 (2000)	110 1135 (2240)	-	-	-	-	-	-	-	-
	16	5,6	68,4 780 (1500)	73,1 830 (1650)	91,9 1045 (1900)	103 1170 (2180)	-	-	-	-	-	-	-	-
	18	5	66,7 840 (1450)	68,4 860 (1700)	75,2 985 (1950)	-	-	-	-	-	-	-	-	-
C21	20	4,5	69,8 965 (1600)	78,2 1080 (1800)	68,4 985 (1900)	74,9 1080 (2180)	-	-	-	-	-	-	-	-
	22,4	4	61,4 965 (1600)	68,8 1080 (1800)	73,4 1170 (2180)	81,7 1300 (2500)	117 1825 (3150)	142 2215 (3650)	-	-	-	-	386 6280 (10000)	517 8710 (14500)
	25	3,55	53,3 965 (1550)	59,7 1080 (1750)	68,6 1240 (2180)	78,4 1415 (2500)	102 1825 (3070)	124 2215 (3550)	139 2480 (4250)	151 2680 (5000)	-	-	349 6280 (11200)	476 8850 (16000)
	28	3,15	49,1 965 (1550)	55 1080 (1750)	59,7 1240 (2060)	68,2 1415 (2360)	93,7 1825 (3070)	114 2215 (3550)	122 2480 (4120)	132 2675 (4750)	156 3125 (6150)	170 3405 (6900)	302 6280 (11200)	413 8850 (16000)
	31,5	2,8	42,7 965 (1550)	47,7 1080 (1750)	54,9 1240 (2180)	62,7 1415 (2500)	82 1825 (3070)	99,5 2215 (3550)	111 2480 (4250)	124 2760 (5000)	148 3425 (6150)	156 3660 (7100)	273 6280 (10600)	374 8850 (15000)
	35,5	2,5	39 965 (1550)	43,7 1080 (1750)	47,7 1240 (2060)	54,6 1415 (2360)	74,4 1825 (3070)	90,3 2215 (3550)	97,7 2480 (4120)	109 2755 (4750)	138 3540 (6150)	156 3985 (7100)	242 6280 (10600)	340 8850 (15000)
	40	2,24	33,9 965 (1550)	37,9 1080 (1750)	43,6 1240 (2180)	49,8 1415 (2500)	65,1 1825 (3070)	79 2215 (3550)	88,5 2480 (4250)	99,5 2790 (5000)	123 3540 (6150)	136 3985 (7100)	219 6280 (10900)	307 8850 (16000)
	45	2	30,9 965 (1550)	34,6 1080 (1750)	37,9 1240 (2060)	43,3 1415 (2360)	59 1825 (3070)	71,6 2215 (3550)	77,6 2480 (4120)	87,3 2790 (4750)	111 3540 (6150)	125 3985 (7100)	202 6280 (11200)	275 8850 (16000)
	50	1,8	26,9 965 (1550)	30,1 1080 (1750)	34,6 1240 (2180)	39,5 1415 (2500)	51,6 1825 (3070)	62,6 2215 (3550)	70,1 2480 (4250)	78,9 2790 (5000)	96,9 3540 (6150)	107 3985 (7100)	175 6280 (11200)	239 8850 (16000)
	56	1,6	24,4 965 (1550)	27,3 1080 (1750)	30,1 1240 (2060)	34,3 1415 (2360)	46,5 1825 (3070)	56,4 2215 (3550)	61,5 2480 (4120)	69,2 2790 (4750)	88,4 3540 (6150)	98,3 3985 (7100)	158 6280 (10600)	216 8850 (15000)
	63	1,4	21,2 965 (1550)	23,7 1080 (1750)	27,2 1240 (2180)	31,1 1415 (2500)	40,7 1825 (3070)	49,4 2215 (3550)	55,3 2480 (4250)	62,2 2790 (5000)	76,8 3540 (6150)	84,8 3985 (7100)	140 6280 (11200)	197 8850 (16000)
	71	1,25	19,5 965 (1550)	21,8 1080 (1750)	23,7 1240 (2060)	27,1 1415 (2360)	37,2 1825 (3070)	45,1 2215 (3550)	48,5 2480 (4120)	54,5 2790 (4750)	69,3 3540 (6150)	77,9 3985 (7100)	126 6280 (10600)	178 8850 (15000)
	80	1,12	16,9 965 (1550)	19 1080 (1750)	21,5 1240 (2180)	24,6 1415 (2500)	32,5 1825 (3070)	39,5 2215 (3550)	44,2 2480 (4250)	49,8 2790 (5000)	60,5 3540 (6150)	66,9 3985 (7100)	-	-
	90	1	15,6 965 (1550)	17,5 1080 (1750)	19 1240 (2060)	21,7 1415 (2360)	29,8 1825 (3070)	36,1 2215 (3550)	38,8 2480 (4120)	43,6 2790 (4750)	54,6 3540 (5800)	61,4 3985 (6700)	-	-
	100	0,9	13,5 965 (1550)	15,2 1080 (1750)	17,2 1240 (2180)	19,7 1415 (2500)	26 1825 (3070)	31,6 2215 (3550)	35,4 2480 (4250)	39,8 2790 (5000)	49,8 3540 (6150)	56,2 3985 (6900)	87,9 6280 (11200)	118 8850 (16000)
	125	0,71	-	-	13,8 1240 (1900)	15,7 1415 (2180)	-	-	28,3 2480 (3750)	31,8 2790 (4250)	-	-	-	-
C31	125	0,71	10,6 965 (1550)	11,8 1080 (1750)	13,6 1240 (2180)	15,6 1415 (2500)	20 1825 (3070)	24,3 2215 (3550)	27,2 2480 (4250)	30,6 2790 (5000)	38,4 3540 (6150)	40,4 3800 (7100)	69 6280 (11200)	92,8 8850 (16000)
	160	0,56	8,39 965 (1550)	9,39 1080 (1750)	10,8 1240 (2180)	12,3 1415 (2500)	15,9 1825 (3070)	19,3 2215 (3550)	21,6 2480 (4250)	24,3 2790 (5000)	30,7 3540 (6150)	33,9 3985 (7100)	55,2 6280 (11200)	74,2 8850 (16000)
	200	0,45	6,6 965 (1550)	7,39 1080 (1750)	8,5 1240 (2180)	9,71 1415 (2500)	12,9 1825 (3070)	15,7 2215 (3550)	17,5 2480 (4250)	19,7 2790 (5000)	24,3 3540 (6150)	27,1 3985 (7100)	43,7 6280 (11200)	58,8 8850 (16000)
	250	0,355	5,21 965 (1550)	5,83 1080 (1750)	6,7 1240 (2180)	7,66 1415 (2500)	10,2 1825 (3070)	12,3 2215 (3550)	13,8 2480 (4250)	15,6 2790 (5000)	19,5 3540 (6150)	21,5 3985 (7100)	34,5 6280 (11200)	46,4 8850 (16000)
	315	0,28	4,23 965 (1550)	4,74 1080 (1750)	5,45 1240 (2180)	6,23 1415 (2500)	8,01 1825 (3070)	9,72 2215 (3550)	10,9 2480 (4250)	12,3 2790 (5000)	15,3 3540 (6150)	16,9 3985 (7100)	27,2 6280 (11200)	36,6 8850 (16000)



## Summary of transmission ratios $i$

Train of gears	Nominal gear ratio $i_N$	Gear reducer size											
		Actual gear ratio $i$											
		4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	800
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	–	–	–	–	–	–	–	–	–
	C2I	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*	–	–	–	–	
C3I	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

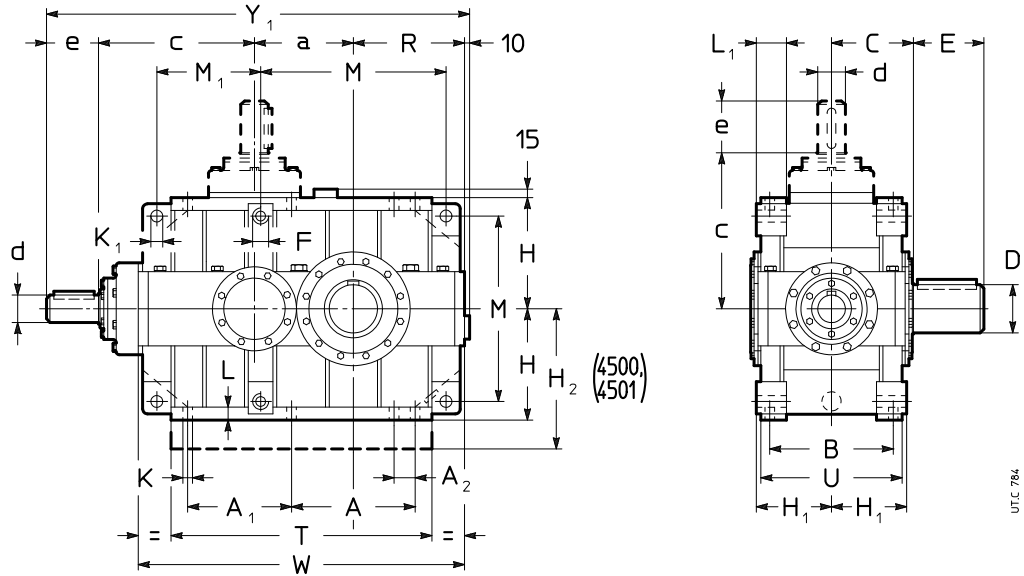
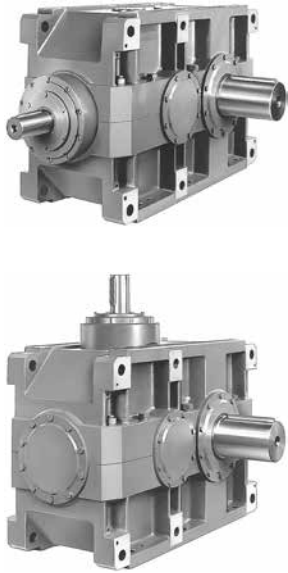
\* Finite transmission ratio.

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

<b>10.1 - Gear reducers R CI .....</b>	<b>72</b>
Dimensions.....	72
Designs (direction of rotation) .....	73
Mounting positions .....	74
Lubrication - Plug position and oil quantity .....	75
<b>10.2 - Gear reducers R C2I .....</b>	<b>76</b>
Dimensions.....	76
Designs (direction of rotation) .....	77
Mounting positions .....	78
Lubrication - Plug position and oil quantity .....	79
<b>10.3 - Gear reducers R C3I .....</b>	<b>80</b>
Dimensions.....	80
Designs (direction of rotation) .....	81
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	lb	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	4940 5090	5090 5270
<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	6060 6240	6260 6480

Size	D ∅	E	d ∅	e	Y <sub>1</sub>	d ∅	e	Y <sub>1</sub>
<b>4000</b> <b>4001</b>	190 200	280	110	210	1675	90	170	1635
<b>4500</b> <b>4501</b>	210 220	300	110	210	1725	90	170	1685

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

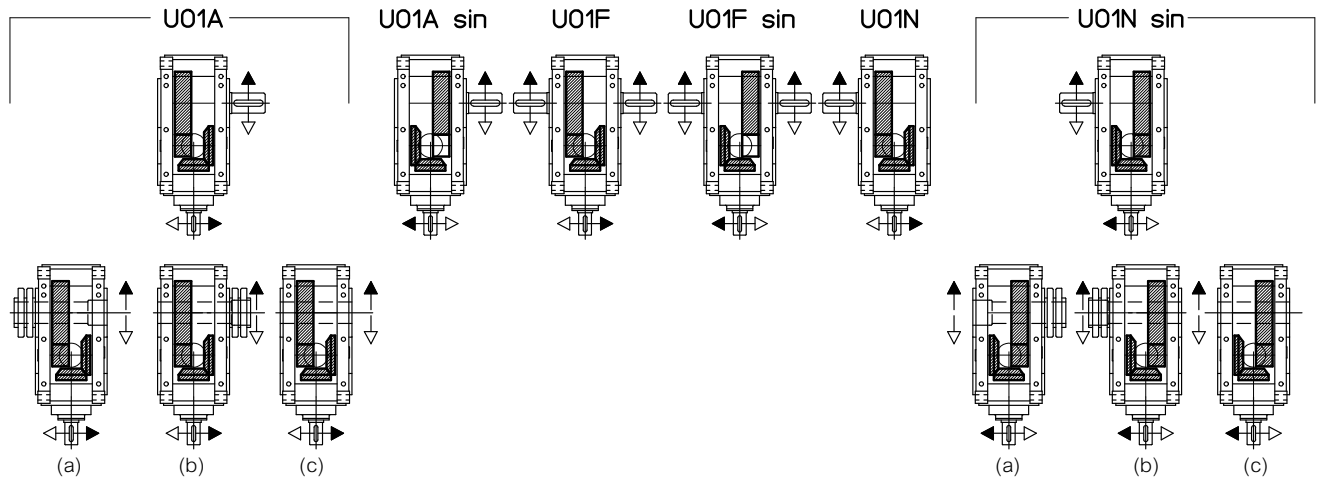
2) For mounting positions B6, B7, V5, V6, dimension  $Y_1$  increases by approx. 20 for filler plug overall dimensions.

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.

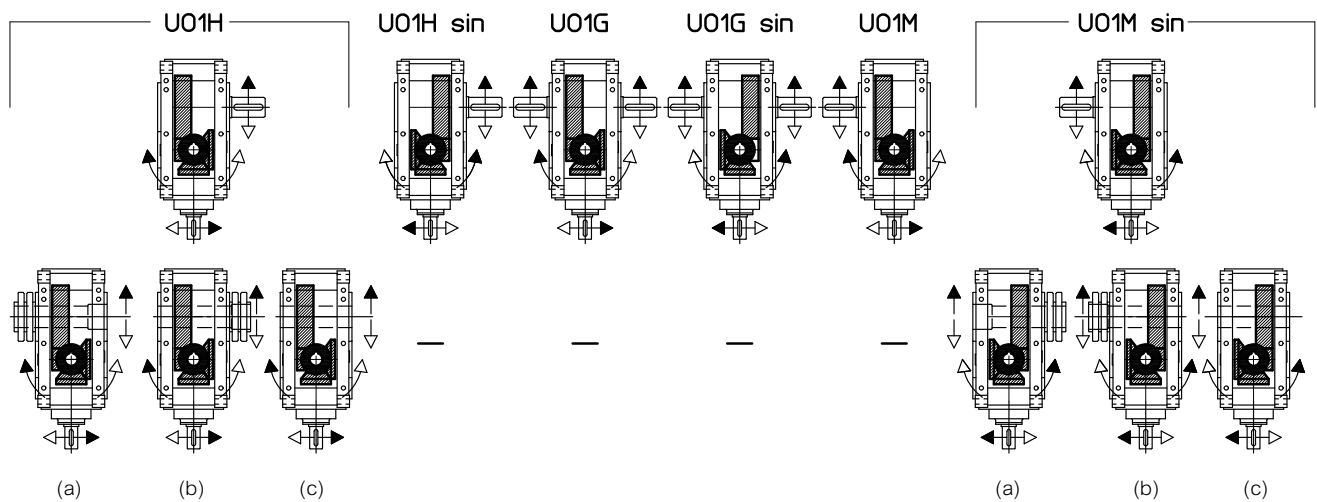
4) Values valid for double extension low speed shaft.

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

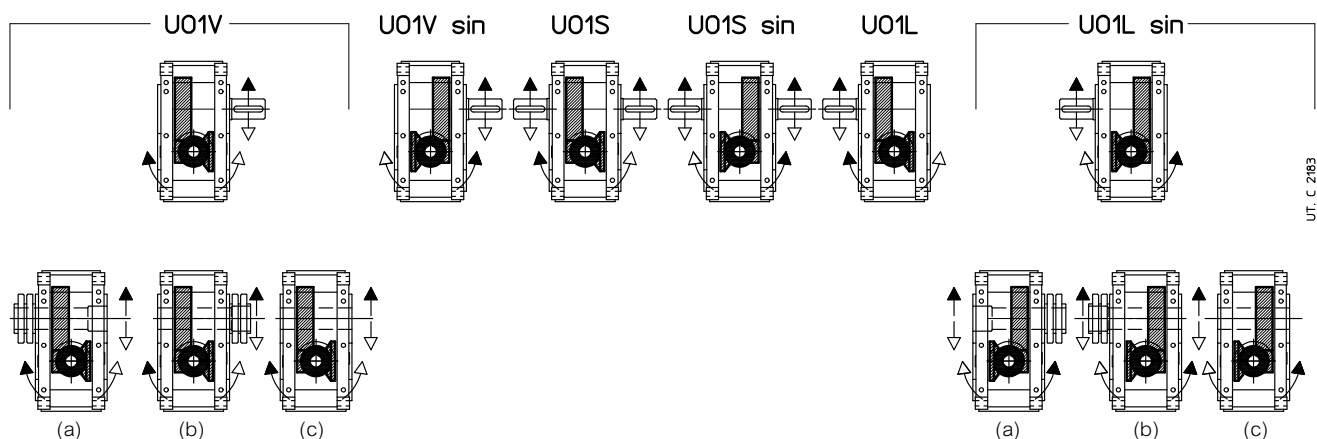
Solid low speed shaft (standard)



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).

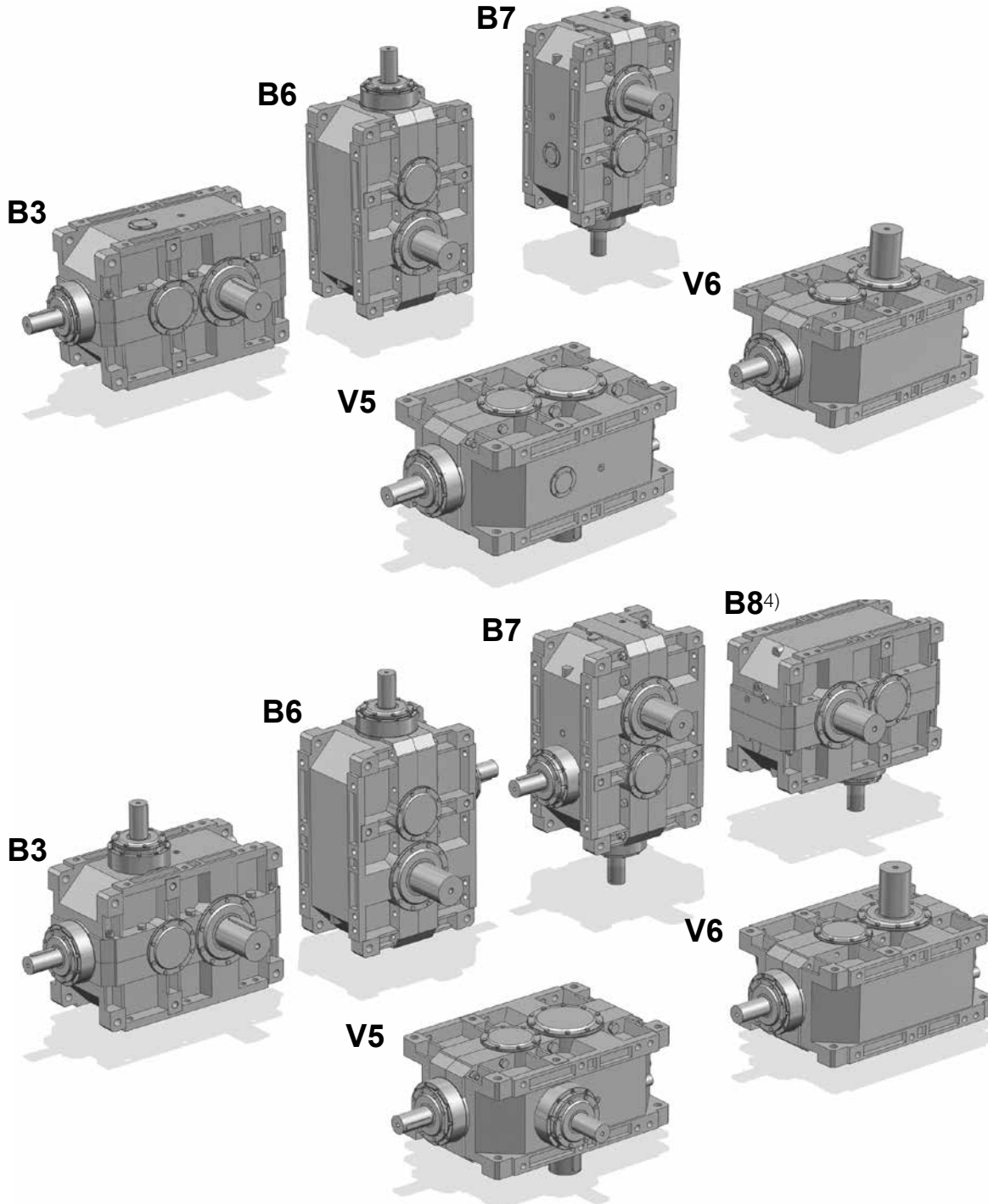
(c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

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.

## Mounting positions

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



10

▼ Possible high oil splash: for the corrective factor  $f_3$  of nominal thermal power  $P_{T_N}$  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.

▼ Oil filler plug

● Oil level plug

■ Oil drain plug

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

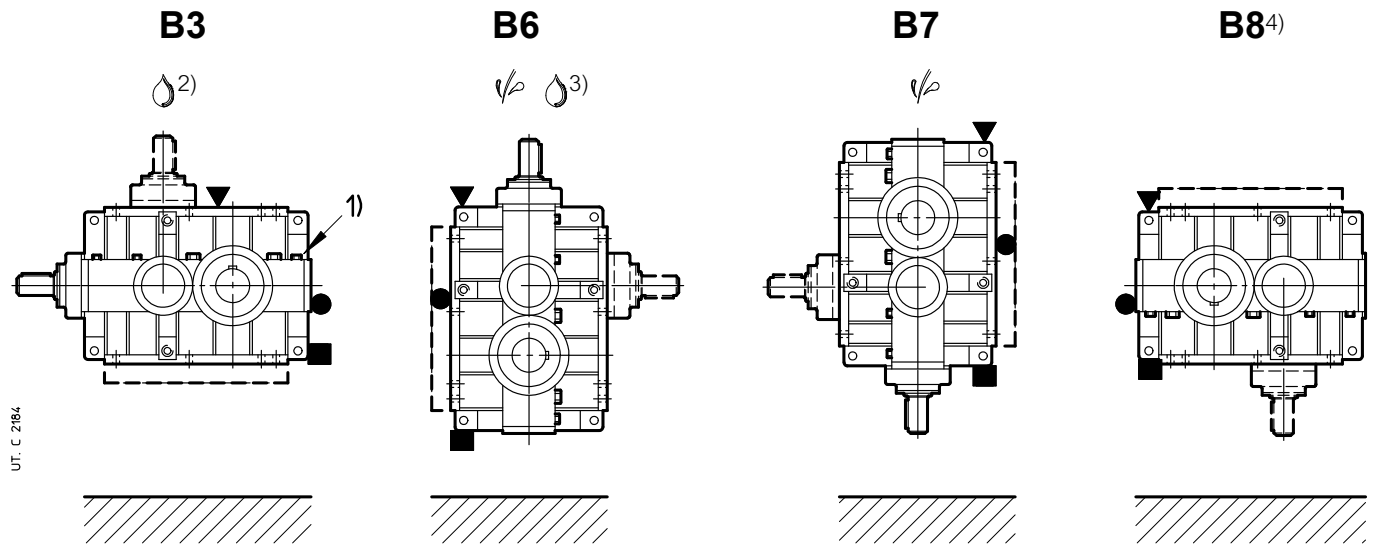
▣ Oil level plug on opposite side (not in view)

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

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

## Lubrication - Plug position and oil quantity

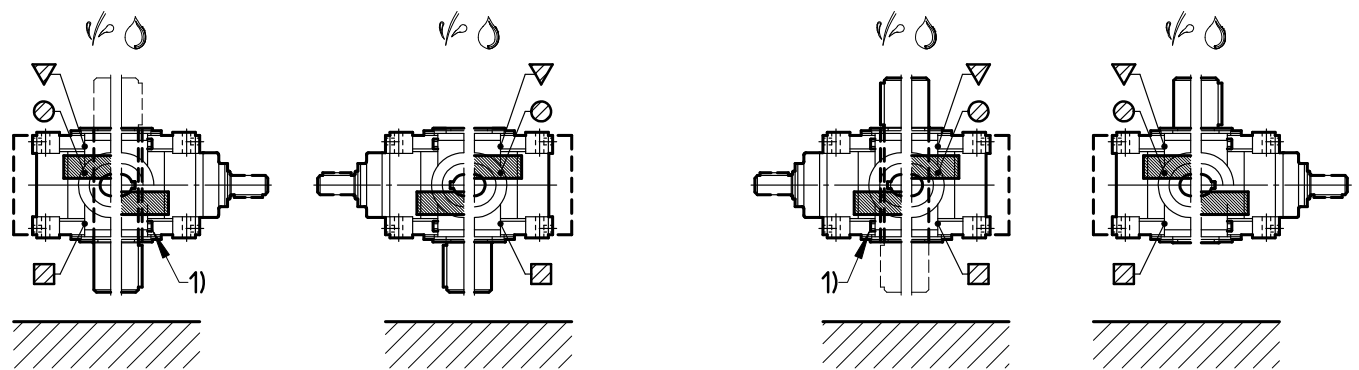
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.



UT. C 2184

## V5

## V6



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*

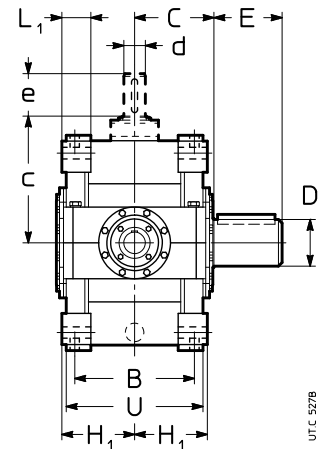
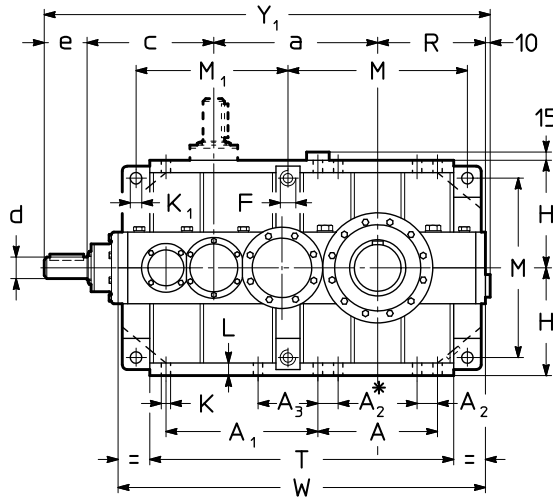
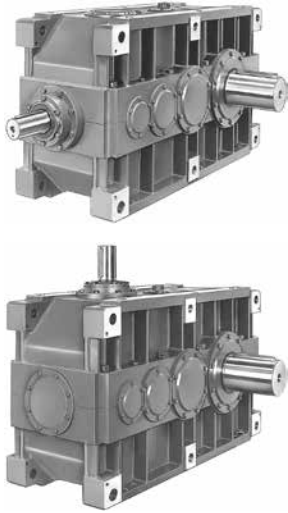
UO1N	UO1N sin
UO1M	UO1M sin
UO1L	UO1L sin

Size	Oil quantity [gal]					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>	26	40	42	26	30	31	
<b>4500, 4501</b>	35	50	56	35	37	45	

Notes at previous page.

10.2 - Gear reducers R C2I

Dimensions



UT L 527B

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

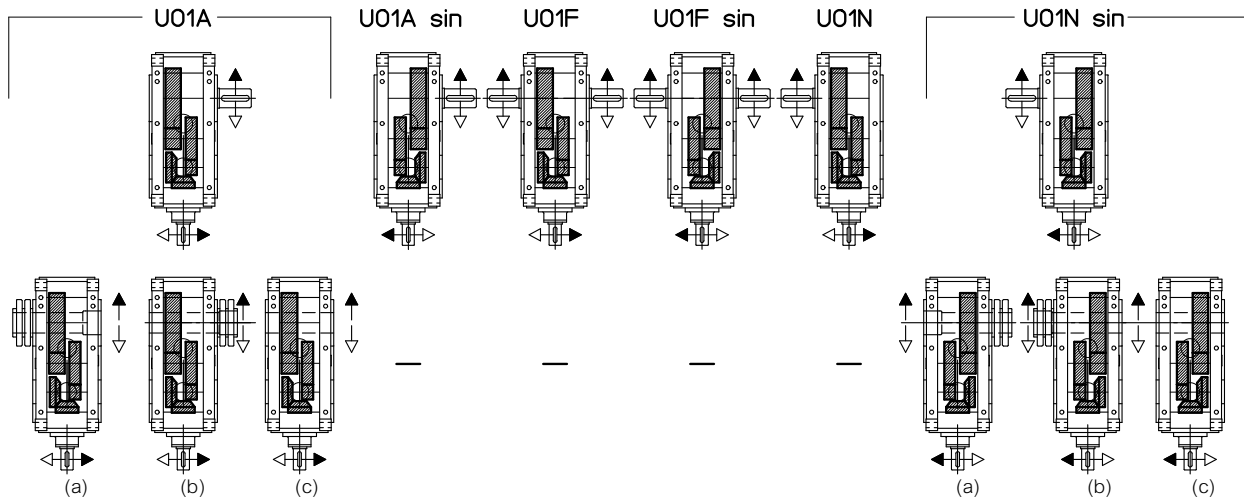
Size	a	A	A <sub>1</sub> M <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B	C	c	F 1)	H h <sub>11</sub> R	H <sub>1</sub> h <sub>12</sub>	K ∅	K <sub>1</sub> ∅ H <sub>11</sub>	L	L <sub>1</sub>	M	T	U	W	lb 3)	
<b>4000</b> <b>4001</b>	700	505	625	90	-	500	330	480	M45	450	296	39	48	52	116	750	1260	580	1525	5380 5560	5530 5730
<b>4500</b> <b>4501</b>	750	505	675	90	-	500	358	480	M45	450	296	39	48	52	116	750	1310	580	1575	6130 6280	6330 6530
<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	10560 10820	10870 11180
<b>5600</b> <b>5601</b>	935	630	845	115	-	625	445	605	M56	560	370	48	60	65	148	930	1635	725	1965	12520 12790	12960 13270
<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	17530 17770	18140 18500
<b>7101</b>	1270	930	1228	115	590	843	601	833	M56	710	481	48	66	71	185	1230	2279	943	2648	29430	30530
<b>8001</b>	1430	1008	1286	145	596	944	682	934	M90	900	544	60	95	85	250	1574	2590	1064	3086	45300	46890

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	$i_n \leq 50$ <sup>6)</sup> 210	2535	90	$i_n \geq 56$ <sup>6)</sup> 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

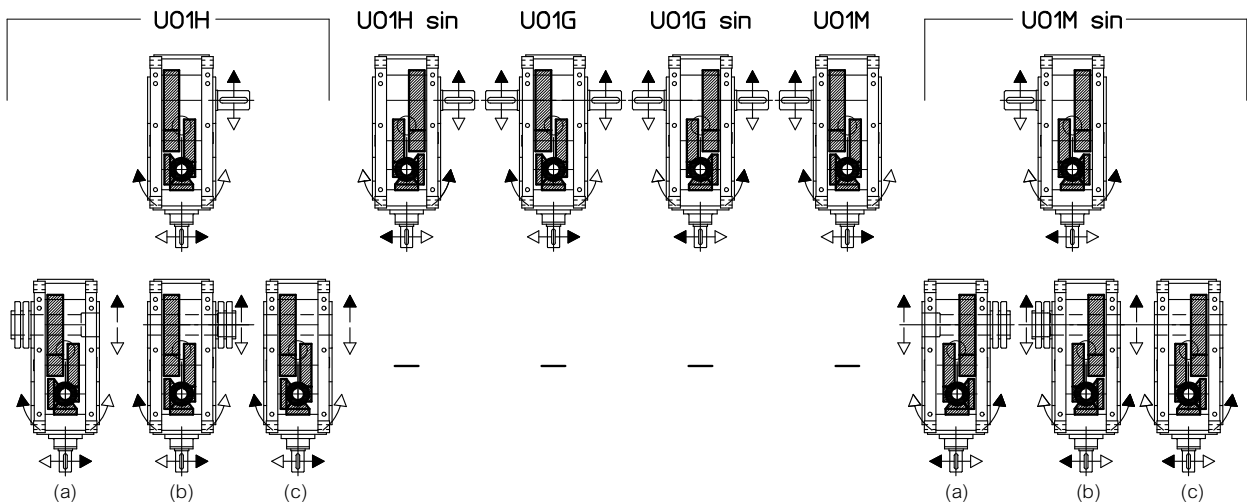
- 1) Working length of thread  $1,7 \cdot F$ .
- 2) For mounting positions B6, B7, V5, V6 dimension Y<sub>1</sub> increases by approx. 20 for overall dimensions of filler plug.
- 3) Values valid for double extension low speed shaft.
- 4) The cover on bevel wheel side overhangs from C dimension (see ch. 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.

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

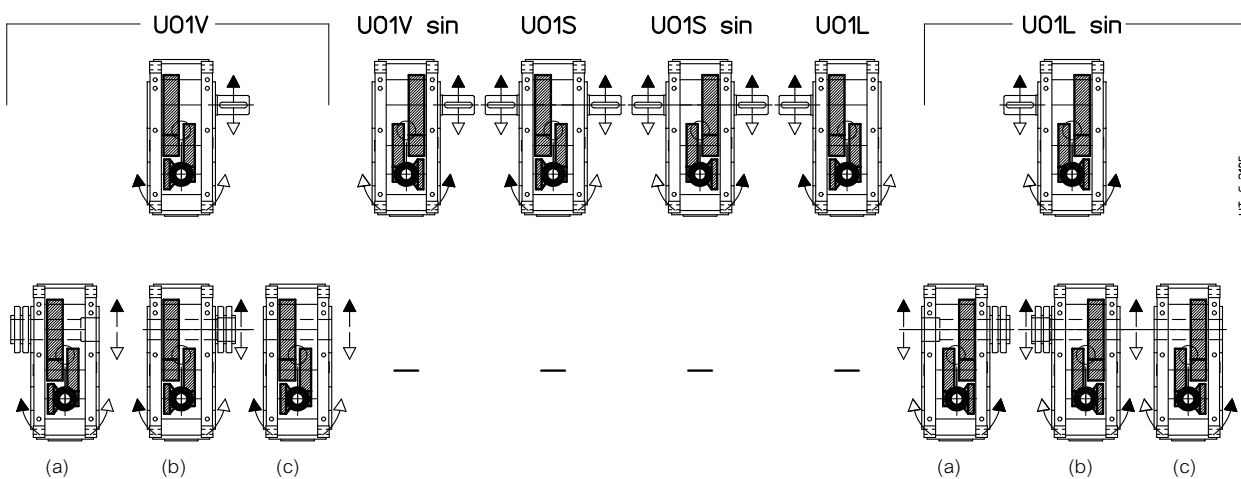
Solid low speed shaft (standard)



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).

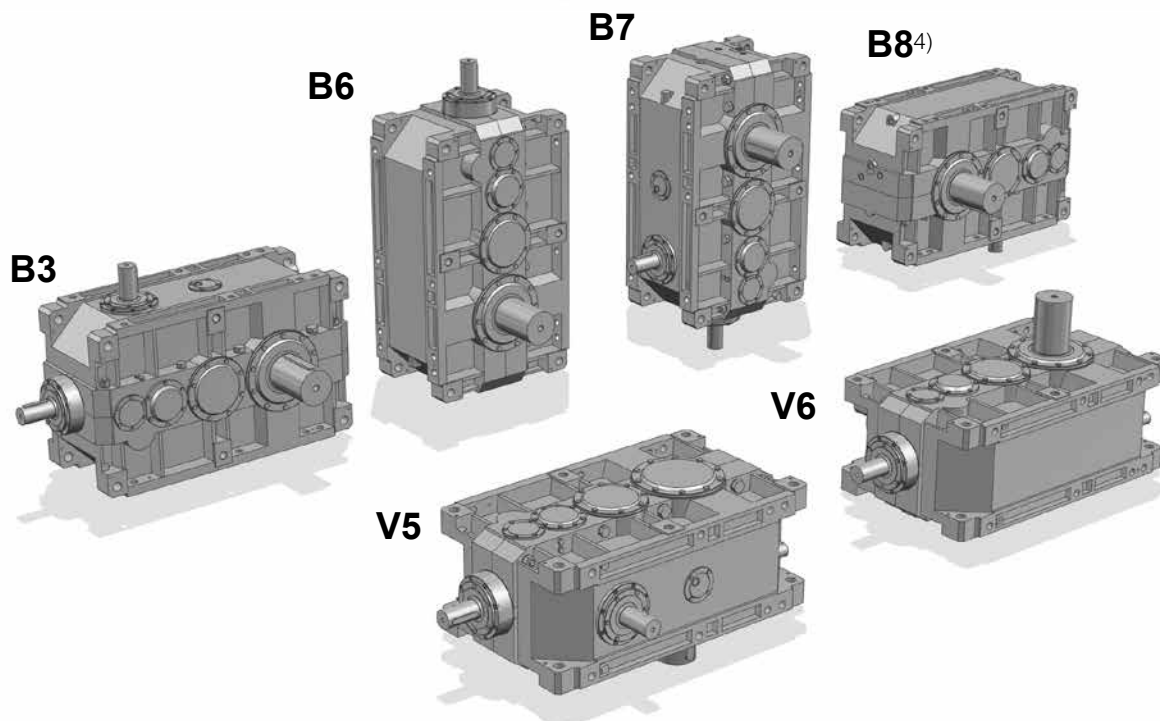
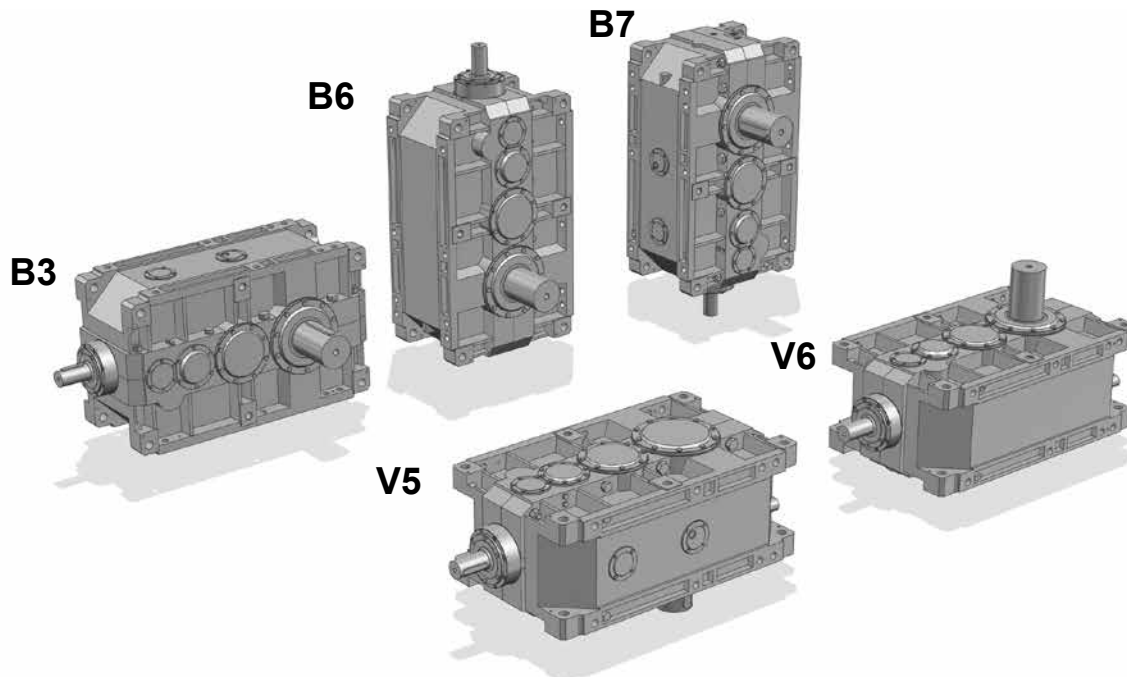
(c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

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.

## 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.

▼ 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)

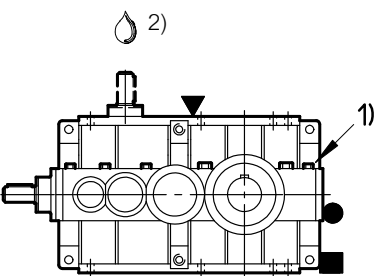
⊖ Oil drain plug on opposite side (not in view)

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

## Lubrication - Plug position and oil quantity

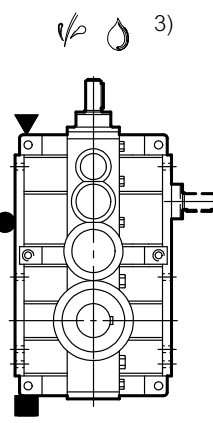
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.

**B3**

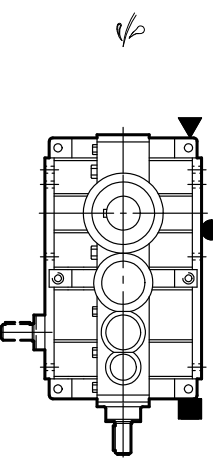


UT. C 2486

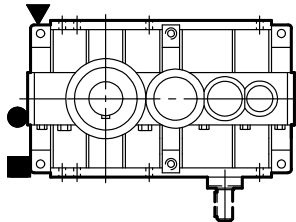
**B6**



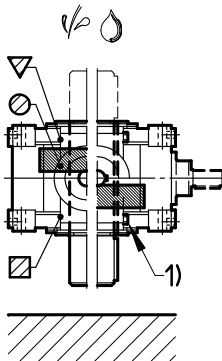
**B7**



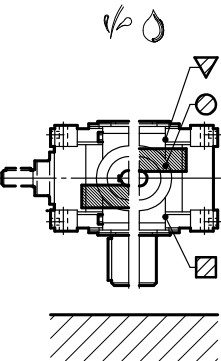
**B8<sup>4)</sup>**



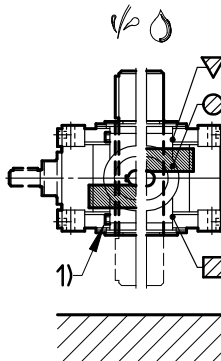
**V5**



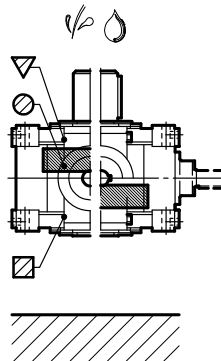
**V5**



**V6**



**V6**



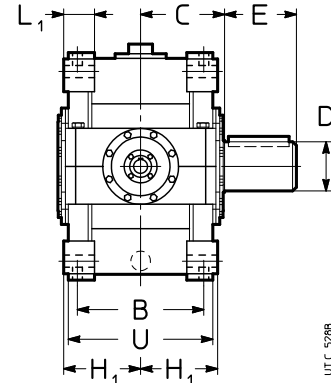
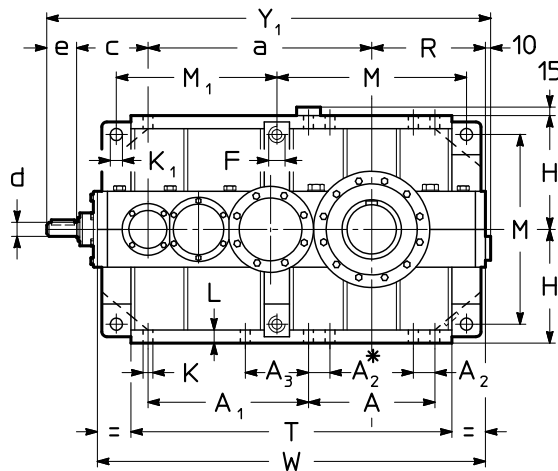
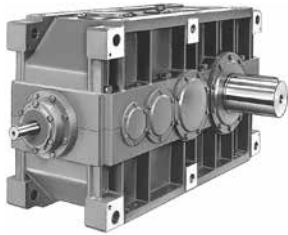
UO1A	UO1A sin	UO1N	UO1N sin	UO1A	UO1A sin	UO1N	UO1N sin
UO1F	UO1F sin			UO1F	UO1F sin		
UO1H	UO1H sin	UO1M	UO1M sin	UO1H	UO1H sin	UO1M	UO1M sin
UO1G	UO1G sin			UO1G	UO1G sin		
UO1V	UO1V sin	UO1L	UO1L sin	UO1V	UO1V sin	UO1L	UO1L sin
UO1S	UO1S sin			UO1S	UO1S sin		
UO1A*	UO1N sin*			UO1A*	UO1N sin*		
UO1H*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

Size	Oil quantity [gal]					
	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>	35	59	59	35	59	66
<b>4500, 4501</b>	35	59	59	35	59	66
<b>5000, 5001</b>	70	119	112	70	119	125
<b>5600, 5601</b>	70	119	112	70	119	125
<b>6300, 6301</b>	99	166	166	99	166	188
<b>7001</b>	159	251	280	159	251	280
<b>8001</b>	264	449	449	264	449	476

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	H <sub>1</sub>	K	K <sub>1</sub>	L	L <sub>1</sub>	M	T	U	W	lb	
			M <sub>1</sub>					1)	h <sub>11</sub>	h <sub>12</sub>	∅	∅							3)	
									R		H <sub>11</sub>	H <sub>11</sub>								
<b>4000</b> <b>4001</b>	900	505	625	90	-	500	330	M45	450	296	39	48	52	116	750	1260	580	1525	5270	5420
																			5420	5600
<b>4500</b> <b>4501</b>	950	505	675	90	-	500	358	M45	450	296	39	48	52	116	750	1310	580	1575	5840	6040
																			6000	6240
<b>5000</b> <b>5001</b>	1125	630	785	115	-	625	410	M56	560	370	48	60	65	148	930	1575	725	1905	10250	10560
																			10520	10870
<b>5600</b> <b>5601</b>	1185	630	845	115	-	625	445	M56	560	370	48	60	65	148	930	1635	725	1965	12190	12630
																			12410	12900
<b>6300</b> <b>6301</b>	1380	770	970	115	-	695	490	M56	630	406	48	60	65	148	1070	1900	795	2230	17000	17610
																			17240	17970
<b>7101</b>	1630	930	1228	115	590	843	601	M56	710	481	48	66	71	185	1230	2279	943	2648	29230	30340
<b>8001</b>	1880	1008	1286	145	596	944	682	M90	900	544	60	95	85	250	1574	2590	1064	3086	45080	46670

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

1) Working length of thread 1,7 · F.

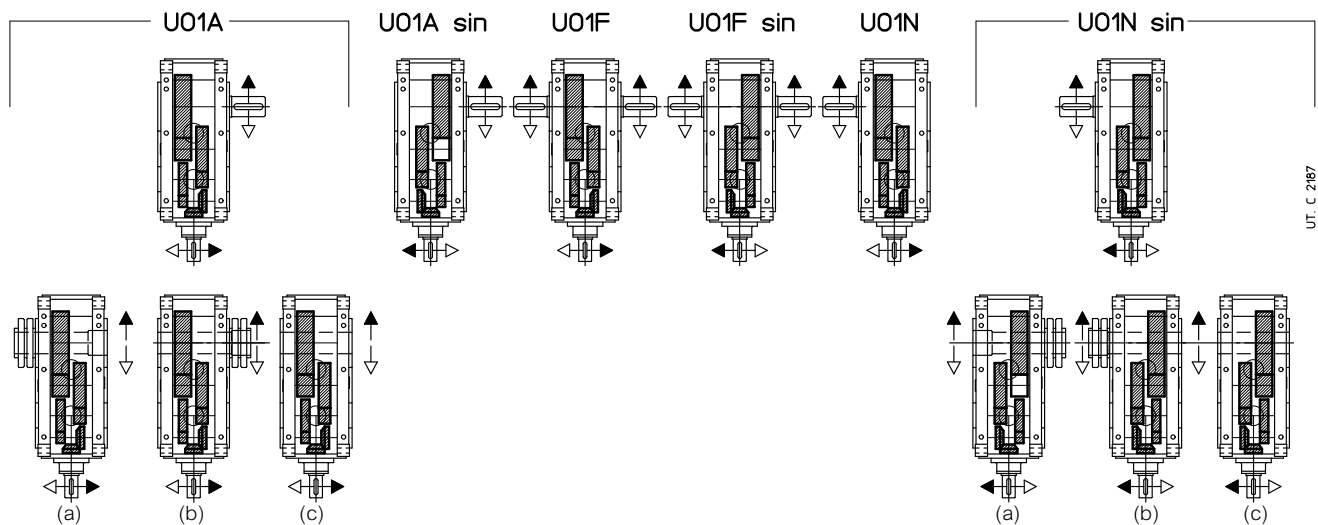
2) For mounting positions B6, B7, V5, V6 dimension Y<sub>1</sub> increases by approx. 20 for overall dimensions of filler plug.

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

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

## 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).

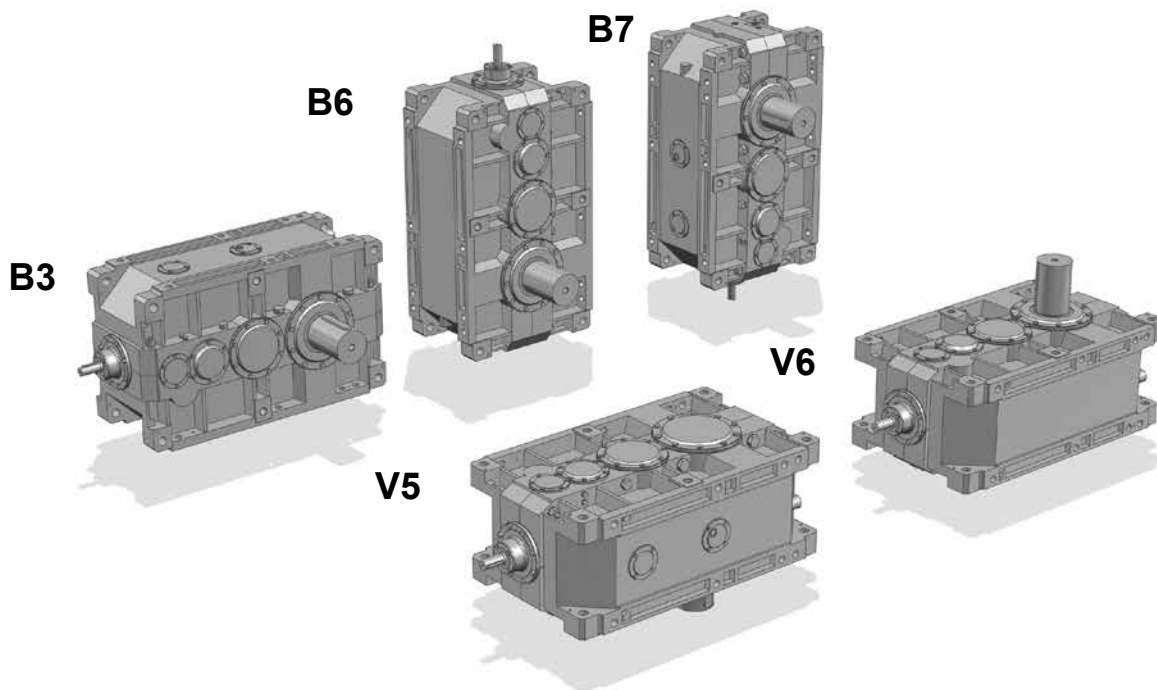
(c) Hollow low speed shaft **with keyway** (on request, see ch. 12).

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.

## Mounting positions

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



10

⚠ 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).

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

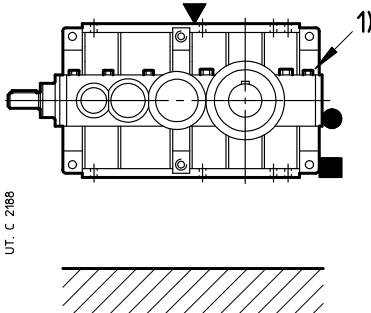
- ▽ Oil filler plug on opposite side (not in view)
- ▣ Oil level plug on opposite side (not in view)
- ⊙ Oil drain plug on opposite side (not in view)

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

## Lubrication - Plug position and oil quantity

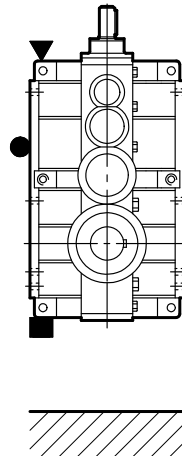
Oil quantity are approximate for provisioning and can vary according to the design and specific application. The exact quantity the gear reducer is to be filled with is definitely given by the level.

### B3

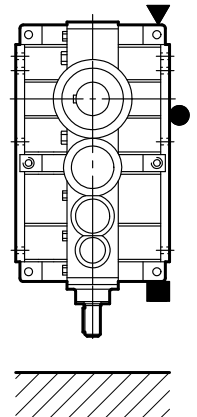


UT. C 2188

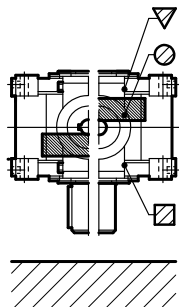
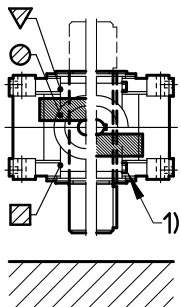
### B6



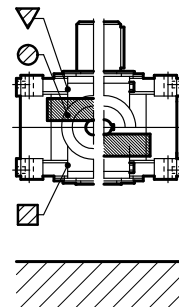
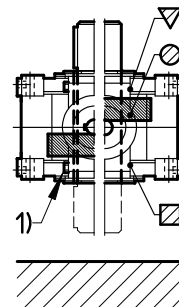
### B7



### V5



### V6



10

UO1A | UO1A sin  
UO1F | UO1F sin  
UO1A\* | UO1N sin\*

UO1N | UO1N sin

UO1A | UO1A sin  
UO1F | UO1F sin  
UO1A\* | UO1N sin\*

UO1N | UO1N sin

Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft below	with upper low speed wheel
<b>4000, 4001</b>	40	74	59	66	70
<b>4500, 4501</b>	40	74	59	66	70
<b>5000, 5001</b>	79	148	119	132	140
<b>5600, 5601</b>	79	148	119	132	140
<b>6300, 6301</b>	112	225	166	188	198
<b>7001</b>	188	349	264	280	296
<b>8001</b>	296	592	449	476	502

Notes at previous page.

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# Radial loads

<b>11.1 - Radial loads <math>F_{r1}</math> [10<sup>3</sup> lbf]</b> .....	<b>86</b>
V-belt drives .....	87
<b>11.2 - Axial loads <math>F_{a2}</math> [10<sup>3</sup> lbf] or radial loads <math>F_{r2}</math> [10<sup>3</sup> lbf] on low speed shaft end</b> .....	<b>88</b>
Axial loads $F_{a2}$ .....	88
Radial loads $F_{r2}$ .....	88

## 11.1 - Radial loads<sup>1)</sup> (OHL) $F_{r1}$ [ $10^3$ lbf] on high speed shaft end

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.

$n_1$ rpm	$F_{r1}$ [ $10^3$ lbf]																	
	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>	4.5	2.8	1.1	7.1	4.5	1.8	9	5.6	2.2	4.5	1.8	14.2	9	2.8	18	11.2	4.5	
<b>1 500</b>	4.8	3	1.2	7.5	4.8	1.9	9.6	6	2.4	4.8	1.9	15.1	9.6	3	19.1	11.9	4.8	
<b>1 200</b>	5	3.1	1.3	8	5	2	10.1	6.3	2.5	5	2	16	10.1	3.1	20.2	12.6	5	
<b>1 000</b>	5.3	3.4	1.3	8.4	5.3	2.1	10.7	6.7	2.7	5.3	2.1	16.9	10.7	3.4	21.4	13.5	5.3	
<b>710</b>	6	3.8	1.5	9.6	6	2.4	11.9	7.5	3	6	2.4	19.1	11.9	3.8	23.8	15.1	6	
<b>560</b>	6.3	4	1.6	10.1	6.3	2.5	12.6	8	3.1	6.3	2.5	20.2	12.6	4	25.2	16	6.3	
<b>450</b>	6.7	4.3	1.7	10.7	6.7	2.7	13.5	8.4	3.4	6.7	2.7	21.4	13.5	4.3	26.5	16.9	6.7	
<b>355</b>	7.5	4.8	1.9	11.9	7.5	3	15.1	9.6	3.8	7.5	3	23.8	15.1	4.8	29.7	19.1	7.5	
<b><math>F_{r1max}</math></b>	<b>7.5</b>	<b>4.8</b>	<b>1.9</b>	<b>11.9</b>	<b>7.5</b>	<b>3</b>	<b>15.1</b>	<b>9.6</b>	<b>3.8</b>	<b>7.5</b>	<b>3</b>	<b>23.8</b>	<b>15.1</b>	<b>4.8</b>	<b>29.7</b>	<b>19.1</b>	<b>7.5</b>	

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

$$F_{r1} = \frac{189.09 \cdot P_1}{d \cdot n_1} \quad [10^3 \text{ lbf}] \quad \text{for timing belt drive}$$

$$F_{r1} = \frac{315.15 \cdot P_1}{d \cdot n_1} \quad [10^3 \text{ lbf}] \quad \text{for V-belt drive}$$

where:

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

$n_1$  [rpm] is the speed;

$d$  [in] is the pitch diameter.

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.

## 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:  $(315\ 150 \cdot P_1) / (d \cdot n_i)$  at 60 Hz.

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  $d \geq 16$  must be dynamically balanced.

Motor		Motor pulley: belt number and section type, pitch diameter d[in], radial load $F_{r1}$ [lb]														
$P_1$ hp	Size and polen.	d	$F_{r1}$ ≈	d	$F_{r1}$ ≈	d	$F_{r1}$ ≈	d	$F_{r1}$ ≈	d	$F_{r1}$ ≈	d	$F_{r1}$ ≈			
1.5	90S 4	2 A	3.55	80	2 A	4	71	2 A	4.5	63	1 A	5	56	1 A	5.6	50
	90L 6	2 A	3.55	118	2 A	4	100	2 A	4.5	90	2 A	5	80	1 A	5.6	75
2	90L 4	2 A	3.55	106	2 A	4	95	2 A	4.5	80	2 A	5	75	1 A	5.6	67
	100LA 6	3 A	3.55	150	3 A	4	140	2 A	4.5	118	2 A	5	112	2 A	5.6	100
3	100LA 4	3 A	3.55	160	3 A	4	140	3 A	4.5	125	2 A	5	112	2 A	5.6	100
	112M 6	3 A	4.5	180	3 A	5	160	3 A	5.6	150	2 A	6.3	132	2 A	7.1	118
4	100LB 4	3 A	4.5	160	3 A	5	150	2 A	5.6	132	2 A	6.3	118	2 A	7.1	106
	132S 6	3 SPA	4	280	3 SPA	4.5	250	2 SPA	5	224	2 SPA	5.6	200	2 SPA	6.3	170
5.4	112M 4	3 A	5	200	3 A	5.6	180	3 A	6.3	160	2 A	7.1	140	2 A	8	125
	132M 6	3 SPA	4.5	335	3 SPA	5	300	2 SPA	5.6	265	2 SPA	6.3	236	2 SPA	7.1	212
7.5	132S 4	3 SPA	4.5	315	3 SPA	5	280	2 SPA	5.6	250	2 SPA	6.3	224	2 SPA	7.1	200
	132MB 6	3 SPA	5.6	375	3 SPA	6.3	335	2 SPA	7.1	280	2 SPA	8	250	2 SPA	9	224
10	132M 4	3 SPA	5	375	3 SPA	5.6	335	2 SPA	6.3	300	2 SPA	7.1	265	2 SPA	8	236
	160M 6	3 SPA	6.3	425	3 SPA	7.1	375	3 SPA	8	335	2 SPA	9	300	2 SPA	10	280
12.4	132MB 4	–	–	–	3 SPA	5.6	400	2 SPA	6.3	355	2 SPA	7.1	315	2 SPA	8	280
15	160M 4	3 SPA	6.3	450	3 SPA	7.1	400	3 SPA	8	355	2 SPA	9	315	2 SPA	10	280
	160L 6	3 SPA	8	500	3 SPA	9	450	3 SPA	10	400	2 SPA	11.2	375	2 SPA	12.5	335
20	160L 4	3 SPA	7.1	530	3 SPA	8	475	3 SPA	9	400	3 SPA	10	375	2 SPA	11.2	335
	180L 6	4 SPA	8	670	4 SPA	9	600	4 SPA	10	560	3 SPA	11.2	500	3 SPA	12.5	450
25	180M 4	4 SPA	7.1	670	4 SPA	8	560	4 SPA	9	500	3 SPA	10	475	3 SPA	11.2	425
	200LR 6	4 SPB	8	850	4 SPB	9	750	3 SPB	10	670	3 SPB	11.2	600	3 SPB	12.5	560
30	180L 4	4 SPA	8	710	4 SPA	9	630	4 SPA	10	560	3 SPA	11.2	500	3 SPA	12.5	450
	200L 6	4 SPB	9	900	4 SPB	10	800	3 SPB	11.2	750	3 SPB	12.5	670	3 SPB	14	600
40	200L 4	4 SPB	9	800	4 SPB	10	750	3 SPB	11.2	670	3 SPB	12.5	600	3 SPB	14	530
	225M 6	5 SPB	10	1120	5 SPB	11.2	1000	4 SPB	12.5	900	4 SPB	14	800	4 SPB	16	670
50	225S 4	5 SPB	9	1000	5 SPB	10	950	4 SPB	11.2	850	4 SPB	12.5	750	4 SPB	14	670
	250M 6	6 SPB	10	1400	6 SPB	11.2	1250	5 SPB	12.5	1120	5 SPB	14	1000	5 SPB	16	850
60	225M 4	5 SPB	10	1120	5 SPB	11.2	1000	4 SPB	12.5	900	4 SPB	14	800	4 SPB	16	710
75	250M 4	6 SPB	10	1400	6 SPB	11.2	1250	5 SPB	12.5	1120	5 SPB	14	1000	5 SPB	16	850
100	280S 4	6 SPB	11.2	1700	5 SPB	12.5	1500	5 SPB	14	1320	5 SPB	16	1180	–	–	–
125	280M 4	6 SPB	12.5	1900	5 SPC	12.5	1900	5 SPC	14	1700	4 SPC	16	1400	–	–	–
150	315S 4	6 SPC	12.5	2240	5 SPC	14	2000	4 SPC	16	1700	–	–	–	–	–	–
175	315M 4	6 SPC	14	2360	5 SPC	16	2000	4 SPC	18	1800	–	–	–	–	–	–
200	315MC 4	6 SPC	16	2360	6 SPC	18	2000	5 8V	18	2000	–	–	–	–	–	–

1) Not valid for power 12.37 hp:  $d \geq 140$  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.

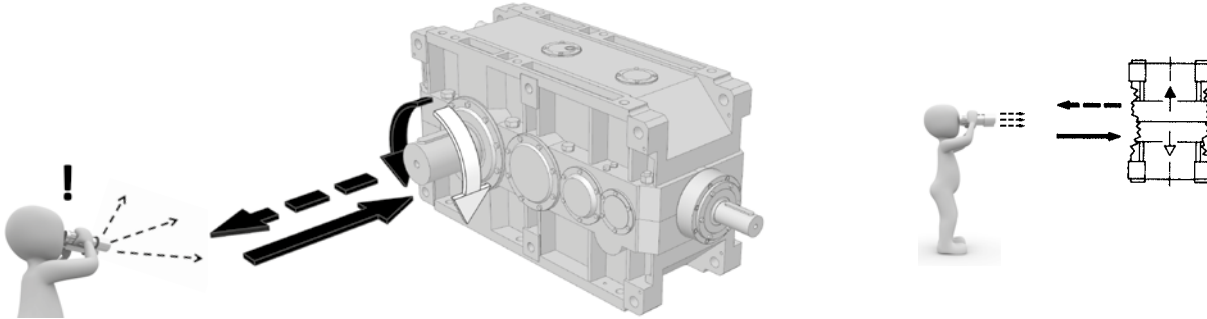
## 11.2 - Radial loads (OHL) $F_{r2}$ [10<sup>3</sup> lbf] or axial loads $F_{a2}$ [10<sup>3</sup> lbf] on low speed shaft end

### 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.

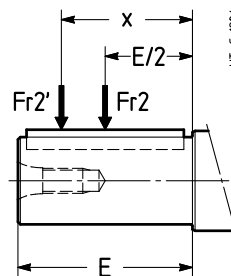
Normally, radial loads on low speed shaft ends are considerable: in fact there is a tendency to connect the gear reducer to the machine by means of a transmission with high transmission ratio (economizing on the gear reducer) and with small diameters (economizing on the drive, and for requirements dictated 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  $n_2$  [rpm] for the bearing duration  $L_h$  [h] required, the direction of rotation, the angular position  $\varphi$  [°] the load and torque  $M_2$  [lbf in] 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  $F_{r2max}$ , 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.**

$$F'_{r2} = F_{r2} \cdot \frac{E/2 + y}{x + y} [10^3 \text{ lbf}]$$



where:

$F'_{r2}$  [lbf] is the permissible radial load acting at the distance x from shaft shoulder;

$F_{r2}$  [lbf] 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;

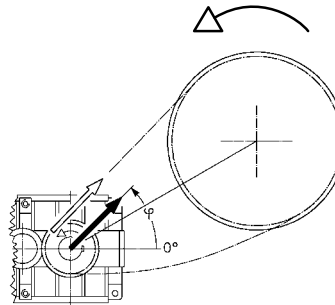
x [mm] is the distance between the shaft shoulder and the load application point.

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

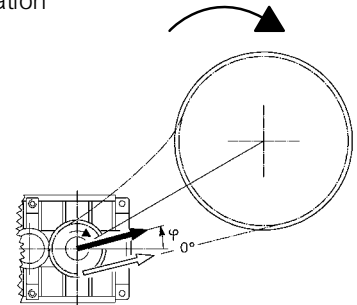
Radial load  $F_{r2}$  for the most common drives has the following value and angular position:

$$F_{r2} = \frac{126.06 \cdot P_2}{d \cdot n_2} \quad [10^3 \text{ lbf}]$$

for chain drive (lifting in general); for toothed belt drive replace 126.06 with 189.09

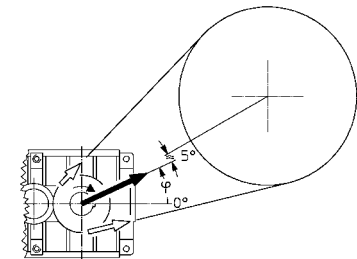
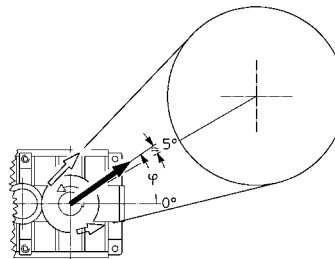


Rotation



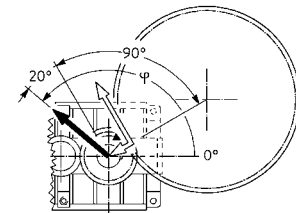
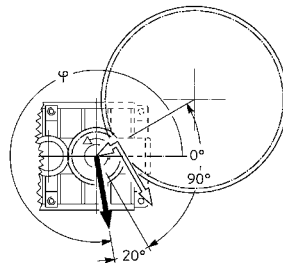
$$F_{r2} = \frac{315.15 \cdot P_2}{d \cdot n_2} \quad [10^3 \text{ lbf}]$$

for V-belt drive



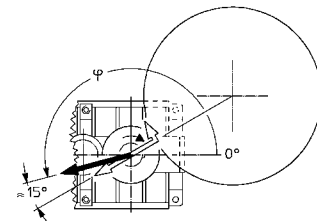
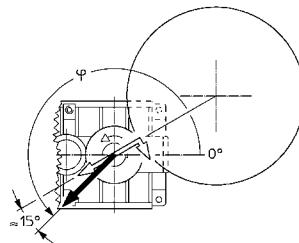
$$F_{r2} = \frac{134.11 \cdot P_2}{d \cdot n_2} \quad [10^3 \text{ lbf}]$$

for spur gear pair drive



$$F_{r2} = \frac{447.55 \cdot P_2}{d \cdot n_2} \quad [10^3 \text{ lbf}]$$

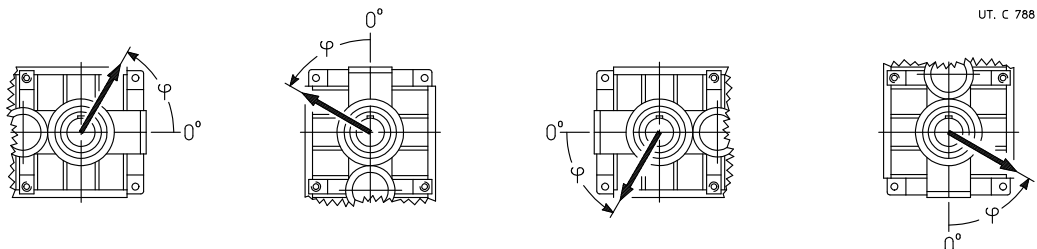
for friction wheel drive (rubber-on-metal)



UT.C 787

where:  $P_2$  [hp] is power required at the output side of the gear reducer,  $n_2$  [rpm] is the speed,  $d$  [in] 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.



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

size **4000**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1) 2)}$																$F_{a2}^{1)}$	
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	710	45	45	45	45	45	45	45	45	37.5	33.5	35.5	45	45	45	45	45	7.1	18
	500	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>450,000</b>	710	45	45	45	45	45	45	45	45	33.5	28	31.5	40	45	45	45	45	5.6	18
	500	45	45	45	45	45	45	45	45	45	40	42.5	45	45	45	45	45	9	18
<b>560,000</b>	710	45	45	37.5	33.5	45	45	45	45	28	23.6	26.5	35.5	45	45	45	45	4	18
	500	45	45	45	45	45	45	45	45	40	35.5	37.5	45	45	45	45	45	9	18
<b>710,000</b>	710	45	45	23.6	21.2	33.5	45	45	45	23.6	20	22.4	31.5	45	45	45	33.5	2.8	18
	500	45	45	45	45	45	45	45	45	35.5	31.5	33.5	40	45	45	45	42.5	7.5	18
<b>900,000</b>	710	45	21.2	9	8	13.2	45	42.5	45	19	15	17	26.5	40	45	42.5	30	2	18
	500	45	45	45	45	45	45	45	45	31.5	28	30	35.5	45	45	45	37.5	6.3	18
	355	45	45	45	45	45	45	45	45	37.5	35.5	37.5	42.5	45	45	45	45	9	18
<b>1,120,000</b>	500	45	45	45	45	45	45	42.5	45	28	23.6	26.5	33.5	42.5	45	45	35.5	5.3	18
	355	45	45	45	45	45	45	45	45	33.5	31.5	33.5	37.5	45	45	45	40	8.5	18
<b>1,400,000</b>	500	45	45	37.5	35.5	45	40	40	42.5	23.6	21.2	22.4	30	37.5	45	40	31.5	4	18
	355	45	45	45	45	45	42.5	42.5	45	31.5	28	30	35.5	42.5	45	42.5	35.5	7.5	18
<b>1,800,000</b>	500	45	45	26.5	25	35.5	37.5	35.5	37.5	20	17	19	25	35.5	40	37.5	28	3	18
	355	45	45	45	45	45	40	37.5	40	28	25	26.5	31.5	37.5	42.5	40	33.5	6.3	17
<b>2,240,000</b>	500	42.5	33.5	18	17	25	33.5	33.5	35.5	17	14	16	22.4	31.5	37.5	33.5	25	2	17
	355	42.5	45	45	45	40	35.5	35.5	37.5	25	22.4	23.6	28	35.5	37.5	35.5	30	5.3	16
<b>2,800,000</b>	355	37.5	45	40	37.5	37.5	33.5	33.5	33.5	22.4	20	21.2	26.5	31.5	35.5	33.5	28	4.5	15
	250	40	42.5	45	42.5	37.5	35.5	33.5	35.5	28	25	26.5	30	33.5	37.5	35.5	31.5	7.1	14
<b>3,550,000</b>	355	35.5	40	33.5	31.5	35.5	31.5	30	31.5	19	17	18	22.4	30	33.5	31.5	25	3.55	14
	250	35.5	40	40	40	35.5	33.5	31.5	33.5	25	22.4	23.6	28	31.5	33.5	33.5	28	6	13.2
<b>4,500,000</b>	355	33.5	37.5	25	23.6	33.5	30	28	30	17	14	16	20	26.5	31.5	28	22.4	2.8	13.2
	250	33.5	37.5	37.5	35.5	33.5	31.5	30	31.5	22.4	20	21.2	25	30	31.5	30	26.5	5.3	12.5

max **45**

max **9** max **18**

size **4001**

<b>355,000</b>	850	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>450,000</b>	850	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>560,000</b>	850	45	45	45	45	45	45	45	45	45	42.5	45	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>710,000</b>	850	45	45	45	45	45	45	45	45	42.5	37.5	40	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>900,000</b>	850	45	45	45	45	45	45	45	45	37.5	31.5	33.5	45	45	45	45	45	8.5	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>1,120,000</b>	600	45	45	45	45	45	45	45	45	45	40	42.5	45	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>1,400,000</b>	600	45	45	45	45	45	45	45	45	40	35.5	37.5	45	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>1,800,000</b>	600	45	45	45	45	45	45	45	45	33.5	31.5	33.5	40	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	42.5	40	42.5	45	45	45	45	45	9	18
<b>2,240,000</b>	600	45	45	45	45	45	45	45	45	31.5	26.5	30	37.5	45	45	45	40	8	18
	425	45	45	45	45	45	45	45	45	37.5	35.5	37.5	42.5	45	45	45	45	9	18
<b>2,800,000</b>	425	45	45	45	45	45	45	45	45	35.5	31.5	33.5	40	45	45	45	42.5	9	18
	300	45	45	45	45	45	45	45	45	40	37.5	40	45	45	45	45	45	9	18
<b>3,550,000</b>	425	45	45	45	45	45	42.5	40	42.5	31.5	28	30	35.5	45	45	45	37.5	9	18
	300	45	45	45	45	45	45	42.5	45	35.5	33.5	35.5	40	45	45	45	42.5	9	18
<b>4,500,000</b>	425	45	45	45	45	45	40	37.5	40	28	25	26.5	31.5	40	45	42.5	35.5	8	18
	300	45	45	45	45	45	42.5	40	42.5	33.5	31.5	31.5	35.5	42.5	45	45	37.5	9	18

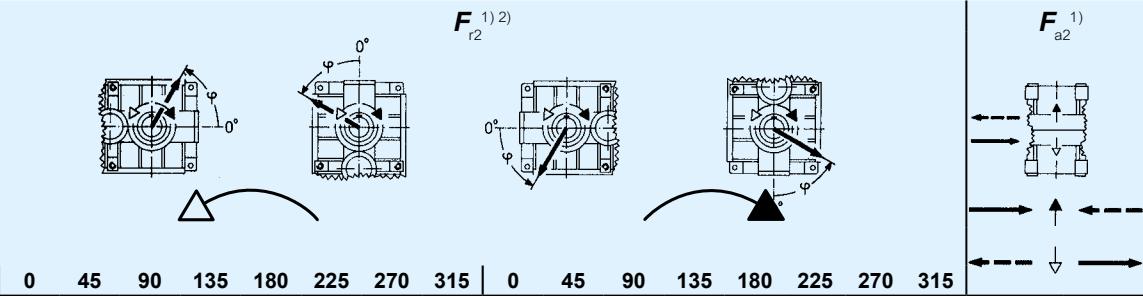
max **45**

max **9** max **18**

- 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  $0.9 \cdot F_{r2max}$ .
- 3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.

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

size **4000**



$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1) 2)}$																$F_{a2}^{1)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
rpm h	10 lbf in																		
<b>355,000</b>	710	45	45	45	45	45	45	45	45	28	21.2	22.4	33.5	45	45	45	45	7.1	18
	500	45	45	45	45	45	45	45	45	45	35.5	37.5	45	45	45	45	45	9	18
<b>450,000</b>	710	45	45	45	45	45	45	42.5	45	22.4	16	17	28	45	45	45	42.5	5.6	18
	500	45	45	45	45	45	45	45	45	37.5	31.5	33.5	42.5	45	45	45	45	9	18
<b>560,000</b>	710	45	45	45	45	45	45	37.5	40	17	11.8	12.5	22.4	45	45	45	35.5	4	18
	500	45	45	45	45	45	45	45	45	33.5	28	30	37.5	45	45	45	45	9	18
<b>710,000</b>	710	45	45	45	45	45	40	33.5	35.5	11.2	7.5	8	16	42.5	45	45	30	2.8	18
	500	45	45	45	45	45	45	42.5	45	30	23.6	25	33.5	45	45	45	42.5	7.5	18
<b>900,000</b>	710	45	45	45	45	45	35.5	30	31.5	-	-	-	7.5	35.5	45	45	21.2	2.24	18
	500	45	45	45	45	45	42.5	37.5	40	25	19	20	30	45	45	45	37.5	6.3	18
	355	45	45	45	45	45	45	42.5	45	33.5	30	31.5	37.5	45	45	45	45	9	18
<b>1,120,000</b>	500	45	45	45	45	45	37.5	33.5	35.5	20	15	17	25	42.5	45	45	33.5	5.3	18
	355	45	45	45	45	45	42.5	37.5	40	31.5	26.5	26.5	33.5	45	45	45	40	8.5	18
<b>1,400,000</b>	500	42.5	45	45	45	45	35.5	31.5	33.5	17	11.8	12.5	20	37.5	45	45	31.5	4	18
	355	45	45	45	45	45	40	35.5	37.5	28	22.4	23.6	31.5	42.5	45	45	37.5	7.5	18
<b>1,800,000</b>	500	37.5	45	45	45	45	31.5	26.5	30	12.5	8.5	9.5	16	33.5	45	45	26.5	3	18
	355	40	45	45	45	45	35.5	31.5	33.5	23.6	19	20	26.5	37.5	45	45	33.5	6.3	17
<b>2,240,000</b>	500	35.5	45	45	42.5	40	30	23.6	26.5	8.5	-	-	11.8	30	45	42.5	22.4	2.24	17
	355	37.5	45	45	45	42.5	33.5	30	31.5	20	16	17	23.6	35.5	45	42.5	31.5	5.3	16
<b>2,800,000</b>	355	35.5	45	45	45	37.5	30	26.5	28	17	13.2	14	20	31.5	42.5	40	28	4.5	15
	250	35.5	45	45	45	40	33.5	30	31.5	25	21.2	22.4	28	35.5	40	40	31.5	7.1	14
<b>3,550,000</b>	355	31.5	42.5	45	45	35.5	28	23.6	25	14	10.6	11.2	17	30	40	35.5	25	3.55	14
	250	33.5	40	45	42.5	35.5	31.5	28	30	22.4	18	19	25	31.5	37.5	35.5	30	6	13.2
<b>4,500,000</b>	355	30	40	45	42.5	33.5	25	21.2	22.4	11.2	8.5	9	14	26.5	35.5	33.5	21.2	2.8	13.2
	250	31.5	37.5	42.5	40	33.5	28	25	26.5	19	16	17	21.2	30	35.5	33.5	26.5	5.3	12.5

max **45**

max **9**

max **18**

size **4001**

<b>355,000</b>	850	45	45	45	45	45	45	45	45	45	40	42.5	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>450,000</b>	850	45	45	45	45	45	45	45	45	45	33.5	35.5	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>560,000</b>	850	45	45	45	45	45	45	45	45	37.5	28	30	45	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>710,000</b>	850	45	45	45	45	45	45	45	45	31.5	22.4	23.6	37.5	45	45	45	45	9	18
	600	45	45	45	45	45	45	45	45	45	40	40	45	45	45	45	45	9	18
<b>900,000</b>	850	45	45	45	45	45	45	42.5	45	23.6	17	18	30	45	45	45	45	7.5	18
	600	45	45	45	45	45	45	45	45	42.5	33.5	35.5	45	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
<b>1,120,000</b>	600	45	45	45	45	45	45	45	45	35.5	30	31.5	42.5	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	45	40	42.5	45	45	45	45	45	9	18
<b>1,400,000</b>	600	45	45	45	45	45	45	42.5	45	31.5	25	26.5	37.5	45	45	45	45	9	18
	425	45	45	45	45	45	45	45	45	42.5	35.5	37.5	45	45	45	45	45	9	18
<b>1,800,000</b>	600	45	45	45	45	45	45	37.5	40	26.5	20	21.2	31.5	45	45	45	45	8.5	18
	425	45	45	45	45	45	45	45	45	37.5	31.5	33.5	42.5	45	45	45	45	9	18
<b>2,240,000</b>	600	45	45	45	45	45	40	33.5	37.5	22.4	16	17	26.5	45	45	45	40	6.7	18
	425	45	45	45	45	45	45	40	42.5	33.5	28	30	37.5	45	45	45	45	9	18
<b>2,800,000</b>	425	45	45	45	45	45	42.5	37.5	40	30	23.6	25	33.5	45	45	45	42.5	9	18
	300	45	45	45	45	45	45	42.5	42.5	37.5	33.5	33.5	40	45	45	45	45	9	18
<b>3,550,000</b>	425	45	45	45	45	45	37.5	33.5	35.5	26.5	20	21.2	30	45	45	45	37.5	8.5	18
	300	45	45	45	45	45	42.5	37.5	40	33.5	30	30	35.5	45	45	45	42.5	9	18
<b>4,500,000</b>	425	40	45	45	45	45	35.5	30	31.5	22.4	17	18	26.5	40	45	45	35.5	7.1	18
	300	42.5	45	45	45	45	37.5	35.5	35.5	30	26.5	26.5	33.5	42.5	45	45	40	9	18

max **45**

max **9**

max **18**

- 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  $0.9 \cdot F_{r2max}$ .
- 3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.

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

size **4500**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$	
		0°								0°								↔ ↑ ↔ ↓ ↔	
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	1000	56	56	56	56	56	56	56	56	42.5	35.5	40	53	56	56	56	56	8.5	22.4
	710	56	56	56	56	56	56	56	56	56	50	53	56	56	56	56	56	11.2	22.4
<b>450,000</b>	1000	56	56	56	53	56	56	56	56	35.5	31.5	33.5	45	56	56	56	50	6.3	22.4
	710	56	56	56	56	56	56	56	56	50	45	47.5	56	56	56	56	56	11.2	22.4
<b>560,000</b>	1000	56	56	42.5	37.5	56	56	56	56	31.5	25	28	40	56	56	56	45	4.5	22.4
	710	56	56	56	56	56	56	56	56	45	40	42.5	53	56	56	56	56	10	22.4
<b>710,000</b>	1000	56	50	25	22.4	33.5	56	53	56	25	20	22.4	33.5	53	56	56	40	2.8	22.4
	710	56	56	56	56	56	56	56	56	40	35.5	37.5	47.5	56	56	56	50	8.5	22.4
<b>900,000</b>	1000	56	-	-	-	-	53	47.5	53	18	13.2	15	26.5	45	56	53	31.5	2.24	22.4
	710	56	56	56	56	56	56	53	56	33.5	30	31.5	42.5	56	56	56	56	7.1	22.4
	500	56	56	56	56	56	56	56	56	45	40	42.5	50	56	56	56	53	11.2	22.4
<b>1,120,000</b>	710	56	56	53	50	56	53	50	53	30	26.5	28	35.5	50	56	53	40	5.6	22.4
	500	56	56	56	56	56	56	53	56	40	35.5	37.5	45	53	56	56	47.5	10	22.4
<b>1,400,000</b>	710	56	56	40	37.5	53	47.5	45	47.5	26.5	21.2	23.6	31.5	45	53	50	35.5	4.5	22.4
	500	56	56	56	56	56	50	50	53	35.5	33.5	33.5	40	50	56	53	45	8.5	22.4
<b>1,800,000</b>	710	53	50	28	25	35.5	45	40	45	21.2	18	19	28	42.5	50	45	31.5	3	22.4
	500	53	56	56	56	53	47.5	45	47.5	31.5	28	30	35.5	45	50	47.5	40	7.5	21.2
<b>2,240,000</b>	710	50	33.5	17	15	23.6	40	37.5	40	17	14	16	23.6	37.5	47.5	42.5	28	1.9	21.2
	500	50	56	56	56	50	45	42.5	45	28	25	26.5	33.5	42.5	47.5	45	35.5	6.3	20
<b>2,800,000</b>	500	47.5	53	50	45	45	40	37.5	40	25	21.2	23.6	30	37.5	45	42.5	31.5	5.3	19
	355	47.5	53	53	50	47.5	42.5	40	42.5	31.5	30	31.5	35.5	42.5	45	42.5	37.5	8	18
<b>3,550,000</b>	500	42.5	50	37.5	35.5	42.5	37.5	35.5	37.5	21.2	18	20	26.5	35.5	40	37.5	30	4	18
	355	45	47.5	50	47.5	42.5	37.5	37.5	40	28	26.5	26.5	31.5	37.5	42.5	40	33.5	7.1	17
<b>4,500,000</b>	500	40	47.5	30	26.5	37.5	33.5	31.5	33.5	18	16	17	23.6	31.5	37.5	35.5	26.5	3.15	17
	355	40	45	47.5	45	40	35.5	31.5	35.5	25	22.4	23.6	30	35.5	37.5	35.5	31.5	6	16

max **56**

max **11** max **22**

size **4501**

<b>355,000</b>	1180	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>450,000</b>	1180	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>560,000</b>	1180	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>710,000</b>	1180	56	56	56	56	56	56	56	56	56	50	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>900,000</b>	1180	56	56	56	56	56	56	56	56	50	45	47.5	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>1,120,000</b>	850	56	56	56	56	56	56	56	56	56	53	56	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>1,400,000</b>	850	56	56	56	56	56	56	56	56	53	47.5	50	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>1,800,000</b>	850	56	56	56	56	56	56	56	56	47.5	40	42.5	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	53	53	56	56	56	56	56	11.2	22.4
<b>2,240,000</b>	850	56	56	56	56	56	56	56	56	40	35.5	37.5	50	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	50	47.5	50	56	56	56	56	56	11.2	22.4
<b>2,800,000</b>	600	56	56	56	56	56	56	56	56	47.5	42.5	45	53	56	56	56	56	11.2	22.4
	425	56	56	56	56	56	56	56	56	53	50	53	56	56	56	56	56	11.2	22.4
<b>3,550,000</b>	600	56	56	56	56	56	56	53	56	42.5	37.5	40	47.5	56	56	56	53	11.2	22.4
	425	56	56	56	56	56	56	56	56	47.5	45	47.5	53	56	56	56	56	11.2	22.4
<b>4,500,000</b>	600	56	56	56	56	56	53	50	53	37.5	33.5	35.5	42.5	56	56	56	47.5	11.2	22.4
	425	56	56	56	56	56	53	53	56	45	40	42.5	47.5	56	56	56	50	11.2	22.4

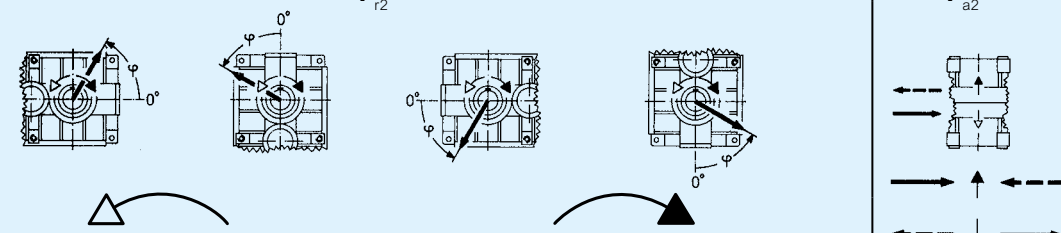
max **56**

max **11** max **22**

- 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.

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

size **4500**

$n_2 \cdot L_n$	$T_2$	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$		
																				
rpm h	10 lbf/in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315			
<b>355,000</b>	1000	56	56	56	56	56	56	56	56	31.5	23.6	26.5	40	56	56	56	56	8.5	22.4	
	710	56	56	56	56	56	56	56	56	50	42.5	45	56	56	56	56	56	11.2	22.4	
<b>450,000</b>	1000	56	56	56	56	56	56	50	56	25	18	20	31.5	56	56	56	50	6.3	22.4	
	710	56	56	56	56	56	56	56	56	45	35.5	37.5	50	56	56	56	56	11.2	22.4	
<b>560,000</b>	1000	56	56	56	56	56	56	53	45	50	19	12.5	14	25	56	56	56	42.5	4.5	22.4
	710	56	56	56	56	56	56	56	56	37.5	31.5	33.5	45	56	56	56	56	10	22.4	
<b>710,000</b>	1000	56	56	56	56	56	47.5	40	45	11.8	-	-	17	50	56	56	33.5	2.8	22.4	
	710	56	56	56	56	56	56	50	53	33.5	26.5	28	37.5	56	56	56	50	8.5	22.4	
<b>900,000</b>	1000	56	56	56	40	50	42.5	35.5	40	-	-	-	-	37.5	56	56	19	2.24	22.4	
	710	56	56	56	56	56	50	45	47.5	28	21.2	22.4	33.5	53	56	56	45	7.1	22.4	
	500	56	56	56	56	56	56	50	53	40	33.5	35.5	45	56	56	56	53	11.2	22.4	
<b>1,120,000</b>	710	56	56	56	56	56	47.5	40	42.5	22.4	17	18	28	50	56	56	40	5.6	22.4	
	500	56	56	56	56	56	53	47.5	50	35.5	31.5	31.5	40	56	56	56	50	10	22.4	
<b>1,400,000</b>	710	50	56	56	56	56	42.5	35.5	40	18	12.5	14	22.4	45	56	56	33.5	4.5	22.4	
	500	53	56	56	56	56	47.5	42.5	45	31.5	26.5	28	35.5	50	56	56	45	8.5	22.4	
<b>1,800,000</b>	710	47.5	56	56	53	53	37.5	31.5	35.5	12.5	-	9.5	17	40	56	53	30	3	22.4	
	500	50	56	56	56	53	42.5	37.5	40	28	22.4	23.6	31.5	47.5	56	53	40	7.5	21.2	
<b>2,240,000</b>	710	42.5	56	47.5	42.5	47.5	33.5	30	31.5	-	-	-	11.8	33.5	56	50	23.6	1.9	21.2	
	500	47.5	56	56	56	50	40	35.5	37.5	23.6	19	20	28	42.5	53	50	35.5	6.3	20	
<b>2,800,000</b>	500	42.5	56	56	56	47.5	35.5	31.5	33.5	20	16	17	23.6	37.5	50	47.5	31.5	5.3	19	
	355	45	53	56	56	47.5	40	35.5	37.5	30	25	26.5	31.5	42.5	50	47.5	37.5	8	18	
<b>3,550,000</b>	500	40	53	56	56	42.5	33.5	30	31.5	17	12.5	13.2	20	35.5	47.5	45	28	4	18	
	355	40	50	56	53	45	35.5	33.5	35.5	25	21.2	22.4	30	37.5	47.5	45	33.5	7.1	17	
<b>4,500,000</b>	500	35.5	47.5	50	45	40	30	26.5	28	12.5	9	10	17	31.5	45	40	25	3.15	17	
	355	37.5	47.5	53	50	40	33.5	30	31.5	22.4	18	19	25	35.5	42.5	40	31.5	6	16	

max **56**

max **11** max **22**

size **4501**

<b>355,000</b>	1180	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>450,000</b>	1180	56	56	56	56	56	56	56	56	56	53	56	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>560,000</b>	1180	56	56	56	56	56	56	56	56	56	45	47.5	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>710,000</b>	1180	56	56	56	56	56	56	56	56	47.5	35.5	40	56	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>900,000</b>	1180	56	56	56	56	56	56	56	56	40	30	31.5	47.5	56	56	56	56	11.2	22.4
	850	56	56	56	56	56	56	56	56	56	47.5	50	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>1,120,000</b>	850	56	56	56	56	56	56	56	56	53	42.5	45	56	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	11.2	22.4
<b>1,400,000</b>	850	56	56	56	56	56	56	56	56	45	35.5	37.5	53	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	56	50	53	56	56	56	56	56	11.2	22.4
<b>1,800,000</b>	850	56	56	56	56	56	56	53	56	37.5	30	31.5	45	56	56	56	56	11.2	22.4
	600	56	56	56	56	56	56	56	56	53	45	47.5	56	56	56	56	56	11.2	22.4
<b>2,240,000</b>	850	56	56	56	56	56	56	47.5	53	33.5	25	26.5	40	56	56	56	53	10.6	22.4
	600	56	56	56	56	56	56	56	56	47.5	40	42.5	53	56	56	56	56	11.2	22.4
<b>2,800,000</b>	600	56	56	56	56	56	56	50	53	42.5	35.5	35.5	47.5	56	56	56	56	11.2	22.4
	425	56	56	56	56	56	56	56	56	50	45	47.5	56	56	56	56	56	11.2	22.4
<b>3,550,000</b>	600	56	56	56	56	56	53	47.5	50	35.5	30	31.5	42.5	56	56	56	53	11.2	22.4
	425	56	56	56	56	56	56	53	53	45	40	42.5	50	56	56	56	56	11.2	22.4
<b>4,500,000</b>	600	56	56	56	56	56	47.5	42.5	45	31.5	25	28	37.5	56	56	56	47.5	10.6	22.4
	425	56	56	56	56	56	50	47.5	50	40	35.5	37.5	45	56	56	56	53	11.2	22.4

max **56**

max **11** max **22**

- 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.

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

size **5000**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$	
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	1400	71	71	71	71	71	71	71	71	56	47.5	53	67	71	71	71	71	9.5	28
	1000	71	71	71	71	71	71	71	71	71	67	71	71	71	71	71	71	14	28
<b>450,000</b>	1400	71	71	63	60	71	71	71	71	47.5	40	45	60	71	71	71	63	7.1	28
	1000	71	71	71	71	71	71	71	71	63	60	63	71	71	71	71	71	14	28
<b>560,000</b>	1400	71	71	42.5	40	60	71	71	71	40	33.5	37.5	53	71	71	71	56	4.75	28
	1000	71	71	71	71	71	71	71	71	60	53	56	67	71	71	71	71	12.5	28
<b>710,000</b>	1400	71	47.5	20	18	31.5	71	71	71	33.5	28	31.5	45	67	71	71	50	3.35	28
	1000	71	71	71	71	71	71	71	71	53	47.5	50	60	71	71	71	63	10.6	28
<b>900,000</b>	1400	-	-	-	-	-	-	-	-	22.4	18	20	33.5	56	71	63	37.5	3.75	28
	1000	71	71	71	71	71	71	71	71	45	40	42.5	53	71	71	71	60	8.5	28
	710	71	71	71	71	71	71	71	71	56	53	56	63	71	71	71	67	14	28
<b>1,120,000</b>	1000	71	71	67	63	71	67	63	71	40	33.5	37.5	47.5	63	71	67	53	6.7	28
	710	71	71	71	71	71	71	71	71	53	47.5	50	60	67	71	71	60	11.8	28
<b>1,400,000</b>	1000	71	71	50	45	63	63	60	63	33.5	30	31.5	42.5	60	67	63	47.5	5.3	28
	710	71	71	71	71	71	67	63	67	47.5	42.5	45	53	63	71	67	56	10.6	28
<b>1,800,000</b>	1000	67	60	31.5	30	45	56	53	60	28	23.6	26.5	35.5	53	63	56	40	3.35	28
	710	71	71	71	71	67	60	60	63	40	35.5	40	47.5	60	63	60	50	8.5	26.5
<b>2,240,000</b>	1000	63	37.5	17	15	25	53	50	53	23.6	20	22.4	31.5	47.5	56	53	35.5	2.12	26.5
	710	63	71	71	67	63	56	53	56	35.5	31.5	35.5	42.5	53	60	56	45	7.5	25
<b>2,800,000</b>	710	60	67	60	56	60	53	50	53	31.5	28	31.5	37.5	50	56	53	40	6	23.6
	500	60	67	67	63	60	53	53	56	40	37.5	40	45	53	56	53	47.5	10	22.4
<b>3,550,000</b>	710	56	63	45	42.5	53	47.5	45	47.5	28	23.6	26.5	33.5	45	50	47.5	35.5	4.75	22.4
	500	56	63	63	60	56	50	47.5	50	35.5	33.5	35.5	40	47.5	53	50	42.5	8.5	20
<b>4,500,000</b>	710	53	56	33.5	30	45	45	42.5	45	23.6	20	22.4	30	40	47.5	42.5	31.5	3.35	20
	500	53	56	60	56	50	47.5	45	47.5	33.5	30	31.5	37.5	45	50	47.5	40	7.5	19
max <b>71</b>																		max <b>14</b>	max <b>28</b>

size **5001**

<b>355,000</b>	1700	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
	1180	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
<b>450,000</b>	1700	71	71	71	71	71	71	71	71	67	60	63	71	71	71	71	71	14	28
	1180	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
<b>560,000</b>	1700	71	71	71	71	71	71	71	71	60	50	56	71	71	71	71	71	11.8	28
	1180	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
<b>710,000</b>	1700	71	71	63	60	71	71	71	71	50	42.5	47.5	63	71	71	71	71	9	28
	1180	71	71	71	71	71	71	71	71	71	63	67	71	71	71	71	71	14	28
<b>900,000</b>	1700	71	71	37.5	33.5	56	71	71	71	42.5	35.5	37.5	56	71	71	71	63	6.3	28
	1180	71	71	71	71	71	71	71	71	63	56	60	71	71	71	71	71	14	28
	850	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
<b>1,120,000</b>	1180	71	71	71	71	71	71	71	71	56	50	53	67	71	71	71	71	13.2	28
	850	71	71	71	71	71	71	71	71	67	63	67	71	71	71	71	71	14	28
<b>1,400,000</b>	1180	71	71	71	71	71	71	71	71	50	42.5	47.5	60	71	71	71	67	11.2	28
	850	71	71	71	71	71	71	71	71	63	56	60	71	71	71	71	71	14	28
<b>1,800,000</b>	1180	71	71	67	63	71	71	67	71	42.5	35.5	40	53	71	71	71	60	8.5	28
	850	71	71	71	71	71	71	71	71	56	50	53	63	71	71	71	67	14	28
<b>2,240,000</b>	1180	71	71	50	47.5	71	63	60	67	37.5	31.5	33.5	47.5	67	71	71	53	6.7	28
	850	71	71	71	71	71	71	67	71	50	45	47.5	56	71	71	71	63	12.5	28
<b>2,800,000</b>	850	71	71	71	71	71	63	60	63	45	40	42.5	50	63	71	67	56	10.6	28
	600	71	71	71	71	71	67	63	67	53	50	53	60	67	71	71	63	14	28
<b>3,550,000</b>	850	67	71	71	71	67	60	56	60	40	33.5	35.5	45	60	67	63	50	9	28
	600	67	71	71	71	67	63	60	63	47.5	45	47.5	53	63	67	63	56	13.2	26.5
<b>4,500,000</b>	850	63	71	60	56	63	53	50	53	33.5	30	31.5	40	53	63	60	45	7.5	26.5
	600	63	71	71	71	63	56	56	56	42.5	40	42.5	47.5	60	63	60	53	11.8	25
max <b>71</b>																		max <b>14</b>	max <b>28</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  $0.9 \cdot F_{r2max}$ .
- 3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.

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

size **5000**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1) 2)}$																$F_{a2}^{1)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
rpm h	10 lbf in																		
<b>355,000</b>	1400	71	71	71	71	71	71	71	71	37.5	28	30	47.5	71	71	71	71	9.5	28
	1000	71	71	71	71	71	71	71	71	63	53	56	71	71	71	71	71	14	28
<b>450,000</b>	1400	71	71	71	71	71	71	63	67	28	20	21.2	37.5	71	71	71	60	7.1	28
	1000	71	71	71	71	71	71	71	71	56	45	47.5	63	71	71	71	71	14	28
<b>560,000</b>	1400	71	71	71	71	71	67	56	60	20	12.5	14	28	71	71	71	50	4.75	28
	1000	71	71	71	71	71	71	67	71	47.5	37.5	40	56	71	71	71	71	12.5	28
<b>710,000</b>	1400	71	71	71	71	71	60	50	53	-	-	-	16	60	71	71	37.5	3.35	28
	1000	71	71	71	71	71	71	63	67	40	31.5	33.5	47.5	71	71	71	63	10.6	28
<b>900,000</b>	1400	67	71	63	56	71	53	42.5	47.5	-	-	-	-	-	-	-	-	-	28
	1000	71	71	71	71	71	63	56	60	33.5	26.5	28	40	71	71	71	56	8.5	28
	710	71	71	71	71	71	71	63	67	50	42.5	45	56	71	71	71	67	14	28
<b>1,120,000</b>	1000	71	71	71	71	71	60	50	53	28	20	21.2	33.5	63	71	71	50	6.7	28
	710	71	71	71	71	71	63	60	63	45	37.5	37.5	50	71	71	71	63	11.8	28
<b>1,400,000</b>	1000	63	71	71	71	71	53	45	47.5	21.2	15	16	28	56	71	71	45	5.3	28
	710	67	71	71	71	71	60	53	56	40	31.5	33.5	45	63	71	71	56	10.6	28
<b>1,800,000</b>	1000	60	71	71	71	67	47.5	40	42.5	14	-	-	20	50	71	67	35.5	3.35	28
	710	63	71	71	71	67	53	47.5	50	33.5	26.5	28	37.5	60	71	71	50	8.5	26.5
<b>2,240,000</b>	1000	53	71	67	60	63	42.5	35.5	37.5	-	-	-	12.5	42.5	71	63	30	2.12	26.5
	710	60	71	71	71	63	50	45	47.5	30	22.4	23.6	33.5	53	71	63	45	7.5	25
<b>2,800,000</b>	710	53	71	71	71	60	45	40	42.5	23.6	18	19	30	50	63	60	40	6	23.6
	500	56	67	71	71	60	50	45	47.5	35.5	31.5	31.5	40	53	63	63	47.5	10	22.4
<b>3,550,000</b>	710	50	67	71	71	56	40	35.5	37.5	19	14	15	23.6	45	60	56	35.5	4.75	22.4
	500	53	63	71	67	56	45	42.5	45	31.5	26.5	28	35.5	50	60	56	45	8.5	20
<b>4,500,000</b>	710	45	63	67	63	50	35.5	31.5	33.5	14	-	-	19	40	56	53	31.5	3.35	20
	500	47.5	60	67	63	53	42.5	37.5	40	28	22.4	23.6	31.5	45	56	53	40	7.5	19
max <b>71</b>																		max <b>14</b>	max <b>28</b>

size **5001**

<b>355,000</b>	1700	71	71	71	71	71	71	71	71	60	45	47.5	71	71	71	71	71	14	28
	1180	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	14	28
<b>450,000</b>	1700	71	71	71	71	71	71	71	71	47.5	35.5	37.5	60	71	71	71	71	12.5	28
	1180	71	71	71	71	71	71	71	71	71	63	67	71	71	71	71	71	14	28
<b>560,000</b>	1700	71	71	71	71	71	71	71	71	37.5	26.5	30	47.5	71	71	71	71	10	28
	1180	71	71	71	71	71	71	71	71	67	56	60	71	71	71	71	71	14	28
<b>710,000</b>	1700	71	71	71	71	71	71	60	67	28	19	20	35.5	71	71	71	67	7.1	28
	1180	71	71	71	71	71	71	71	71	60	47.5	50	67	71	71	71	71	14	28
<b>900,000</b>	1700	71	71	71	71	71	67	53	60	18	10.6	11.8	23.6	71	71	71	53	4.5	28
	1180	71	71	71	71	71	71	67	71	50	40	42.5	60	71	71	71	71	14	28
	850	71	71	71	71	71	71	71	71	67	60	60	71	71	71	71	71	14	28
<b>1,120,000</b>	1180	71	71	71	71	71	71	63	67	42.5	33.5	35.5	50	71	71	71	71	11.8	28
	850	71	71	71	71	71	71	71	71	60	50	53	67	71	71	71	71	14	28
<b>1,400,000</b>	1180	71	71	71	71	71	67	56	60	35.5	26.5	28	42.5	71	71	71	63	9.5	28
	850	71	71	71	71	71	71	67	71	53	45	47.5	60	71	71	71	71	14	28
<b>1,800,000</b>	1180	71	71	71	71	71	60	50	53	28	20	21.2	35.5	67	71	71	56	7.5	28
	850	71	71	71	71	71	67	60	63	47.5	37.5	40	53	71	71	71	67	13.2	28
<b>2,240,000</b>	1180	63	71	71	71	71	53	45	47.5	21.2	14	16	28	63	71	71	47.5	5.6	28
	850	71	71	71	71	71	63	53	56	40	33.5	33.5	47.5	71	71	71	63	11.8	28
<b>2,800,000</b>	850	67	71	71	71	71	56	47.5	50	35.5	28	30	40	63	71	71	56	10	28
	600	67	71	71	71	71	63	56	60	47.5	40	42.5	53	71	71	71	63	14	28
<b>3,550,000</b>	850	60	71	71	71	67	50	42.5	47.5	30	22.4	23.6	35.5	60	71	71	50	8.5	26.5
	600	63	71	71	71	71	56	50	53	42.5	35.5	37.5	47.5	67	71	71	60	13.2	26.5
<b>4,500,000</b>	850	56	71	71	71	63	45	37.5	42.5	23.6	18	19	31.5	53	71	71	45	6.7	25
	600	60	71	71	71	63	53	47.5	47.5	37.5	31.5	33.5	42.5	60	71	67	53	11.2	25
max <b>71</b>																		max <b>14</b>	max <b>28</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  $0.9 \cdot F_{r2max}$ .  
 3) For radial loads acting simultaneously on both sides of double extension low speed shaft or for hollow low speed shaft, consult us.

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

size **5600**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1) 2)}$																$F_{a2}^{1)}$	
		rpm h								10 lbf in								10 lbf in	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	2000	90	90	90	90	90	90	90	90	63	53	60	80	90	90	90	85	10.6	35.5
	1400	90	90	90	90	90	90	90	90	85	80	85	90	90	90	90	90	18	35.5
<b>450,000</b>	2000	90	90	80	75	90	90	90	90	53	45	50	67	90	90	90	75	8	35.5
	1400	90	90	90	90	90	90	90	90	75	67	71	90	90	90	90	90	17	35.5
<b>560,000</b>	2000	90	90	56	50	75	90	90	90	45	35.5	40	60	90	90	90	67	5.3	35.5
	1400	90	90	90	90	90	90	90	90	67	60	63	80	90	90	90	85	14	35.5
<b>710,000</b>	2000	90	45	18	16	26.5	90	85	90	31.5	25	30	45	80	90	85	56	3.75	35.5
	1400	90	90	90	90	90	90	90	90	60	53	56	71	90	90	90	75	11.8	35.5
<b>900,000</b>	2000	-	-	-	-	-	-	-	-	19	14	17	31.5	63	85	75	40	-	35.5
	1400	90	90	90	90	90	90	85	90	50	45	47.5	63	85	90	90	67	9.5	35.5
	1000	90	90	90	90	90	90	90	90	67	63	63	75	90	90	90	80	16	35.5
<b>1,120,000</b>	1400	90	90	75	71	90	80	75	85	45	37.5	40	56	75	90	85	63	7.5	35.5
	1000	90	90	90	90	90	85	85	85	63	56	60	71	85	90	90	75	14	35.5
<b>1,400,000</b>	1400	90	90	56	53	75	75	71	75	37.5	31.5	33.5	47.5	71	85	75	53	5.3	35.5
	1000	90	90	90	90	90	80	75	80	56	50	53	63	80	85	80	67	11.8	33.5
<b>1,800,000</b>	1400	85	67	35.5	31.5	47.5	67	63	71	30	25	28	40	63	75	71	47.5	3.35	33.5
	1000	85	90	90	90	85	75	71	75	47.5	42.5	45	56	71	80	75	60	10	31.5
<b>2,240,000</b>	1400	75	25	-	-	14	63	60	63	22.4	17	20	31.5	56	71	60	37.5	-	31.5
	1000	80	90	90	85	75	67	63	71	42.5	37.5	40	50	63	75	71	56	8.5	30
<b>2,800,000</b>	1000	75	85	71	67	71	63	60	63	37.5	31.5	35.5	45	60	71	63	50	7.1	28
	710	75	80	85	80	71	67	63	67	47.5	45	47.5	53	63	71	67	56	11.2	26.5
<b>3,550,000</b>	1000	67	80	56	53	67	56	56	60	31.5	26.5	30	40	56	63	60	45	5.3	26.5
	710	67	75	80	75	67	60	60	63	42.5	37.5	40	50	60	63	63	53	10	25
<b>4,500,000</b>	1000	63	71	40	37.5	53	53	50	53	26.5	22.4	25	33.5	50	60	53	37.5	3.75	25
	710	63	71	75	71	63	56	53	56	37.5	33.5	35.5	45	53	60	56	47.5	8.5	23.6

max **90**

max **18** max **36**

size **5601**

<b>355,000</b>	2360	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>450,000</b>	2360	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>560,000</b>	2360	90	90	90	90	90	90	90	90	90	75	80	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>710,000</b>	2360	90	90	90	90	90	90	90	90	80	67	71	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>900,000</b>	2360	90	90	90	90	90	90	90	90	67	53	60	80	90	90	90	90	14	35.5
	1700	90	90	90	90	90	90	90	90	90	80	85	90	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>1,120,000</b>	1700	90	90	90	90	90	90	90	90	85	71	75	90	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>1,400,000</b>	1700	90	90	90	90	90	90	90	90	75	63	67	85	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	90	85	85	90	90	90	90	90	18	35.5
<b>1,800,000</b>	1700	90	90	90	90	90	90	90	90	63	53	56	75	90	90	90	90	15	35.5
	1180	90	90	90	90	90	90	90	90	80	75	75	90	90	90	90	90	18	35.5
<b>2,240,000</b>	1700	90	90	90	90	90	90	85	90	56	45	47.5	67	90	90	90	80	12.5	35.5
	1180	90	90	90	90	90	90	90	90	75	67	67	80	90	90	90	90	18	35.5
<b>2,800,000</b>	1180	90	90	90	90	90	90	85	90	67	60	63	75	90	90	90	85	18	35.5
	850	90	90	90	90	90	90	90	90	80	71	75	85	90	90	90	90	18	35.5
<b>3,550,000</b>	1180	90	90	90	90	90	85	75	80	60	50	53	67	85	90	90	75	15	35.5
	850	90	90	90	90	90	90	85	85	71	63	67	75	90	90	90	85	18	35.5
<b>4,500,000</b>	1180	85	90	90	90	90	75	71	75	53	45	47.5	60	80	90	90	71	13.2	35.5
	850	90	90	90	90	90	80	75	80	63	56	60	71	85	90	90	75	18	35.5

max **90**

max **18** max **36**

- 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.

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

size **5600**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$			
		rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	2000	90	90	90	90	90	90	90	90	90	47.5	33.5	35.5	60	90	90	90	90	85	10.6	35.5
	1400	90	90	90	90	90	90	90	90	90	75	63	67	85	90	90	90	90	90	18	35.5
<b>450,000</b>	2000	90	90	90	90	90	90	80	85	85	35.5	25	26.5	45	90	90	90	90	71	8	35.5
	1400	90	90	90	90	90	90	90	90	90	67	53	56	75	90	90	90	90	90	17	35.5
<b>560,000</b>	2000	90	90	90	90	90	85	71	80	80	25	16	18	33.5	85	90	90	90	60	5.3	35.5
	1400	90	90	90	90	90	90	85	90	90	56	47.5	50	67	90	90	90	90	85	14	35.5
<b>710,000</b>	2000	90	90	90	75	90	75	63	71	-	-	-	-	15	71	90	90	90	40	3.75	35.5
	1400	90	90	90	90	90	85	75	85	47.5	37.5	40	60	90	90	90	90	75	11.8	35.5	
<b>900,000</b>	2000	85	90	50	42.5	56	67	56	63	-	-	-	-	-	-	-	-	-	-	-	35.5
	1400	90	90	90	90	90	80	71	75	40	30	31.5	50	85	90	90	90	67	9.5	35.5	
	1000	90	90	90	90	90	90	80	85	63	53	56	71	90	90	90	90	85	16	35.5	
<b>1,120,000</b>	1400	85	90	90	90	90	71	63	67	31.5	23.6	25	40	75	90	90	90	60	7.5	35.5	
	1000	90	90	90	90	90	80	75	75	56	45	47.5	63	85	90	90	90	75	14	35.5	
<b>1,400,000</b>	1400	80	90	90	90	90	67	56	63	25	17	19	31.5	67	90	90	90	50	5.3	35.5	
	1000	85	90	90	90	90	75	67	71	47.5	40	42.5	56	80	90	90	90	67	11.8	33.5	
<b>1,800,000</b>	1400	71	90	85	75	80	60	50	53	16	-	-	22.4	60	90	80	80	40	3.35	33.5	
	1000	80	90	90	90	85	67	60	63	40	33.5	35.5	47.5	71	90	85	60	60	10	31.5	
<b>2,240,000</b>	1400	67	90	60	53	67	53	45	47.5	-	-	-	-	47.5	85	71	26.5	-	-	31.5	
	1000	71	90	90	90	80	63	56	60	35.5	28	30	42.5	63	85	80	56	8.5	30	-	
<b>2,800,000</b>	1000	67	85	90	90	71	56	50	53	30	22.4	23.6	35.5	60	80	71	47.5	7.1	28	-	
	710	71	85	90	85	75	63	56	60	45	37.5	37.5	50	63	75	75	60	11.2	26.5	-	
<b>3,550,000</b>	1000	63	80	90	85	67	50	50	47.5	23.6	17	19	30	53	71	67	42.5	5.3	26.5	-	
	710	63	80	85	85	71	56	53	53	37.5	31.5	33.5	45	60	71	67	53	10	25	-	
<b>4,500,000</b>	1000	56	75	75	67	63	47.5	40	42.5	18	-	-	23.6	47.5	67	63	35.5	3.75	25	-	
	710	60	75	80	75	63	53	47.5	50	33.5	28	30	37.5	56	67	63	47.5	8.5	23.6	-	

max **90**

max **18** max **36**

size **5601**

<b>355,000</b>	2360	90	90	90	90	90	90	90	90	90	80	85	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>450,000</b>	2360	90	90	90	90	90	90	90	90	85	67	71	90	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>560,000</b>	2360	90	90	90	90	90	90	90	90	75	56	60	85	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>710,000</b>	2360	90	90	90	90	90	90	90	90	60	42.5	45	71	90	90	90	90	18	35.5
	1700	90	90	90	90	90	90	90	90	90	75	80	90	90	90	90	90	18	35.5
<b>900,000</b>	2360	90	90	90	90	90	85	90	90	47.5	31.5	33.5	56	90	90	90	90	11.8	35.5
	1700	90	90	90	90	90	90	90	90	80	63	67	90	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	18	35.5
<b>1,120,000</b>	1700	90	90	90	90	90	90	90	90	71	56	60	80	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	90	80	85	90	90	90	90	90	18	35.5
<b>1,400,000</b>	1700	90	90	90	90	90	85	90	90	60	47.5	50	71	90	90	90	90	18	35.5
	1180	90	90	90	90	90	90	90	90	85	71	75	90	90	90	90	90	18	35.5
<b>1,800,000</b>	1700	90	90	90	90	90	90	75	80	50	37.5	37.5	60	90	90	90	85	13.2	35.5
	1180	90	90	90	90	90	90	90	90	75	63	63	80	90	90	90	90	18	35.5
<b>2,240,000</b>	1700	90	90	90	90	90	80	67	71	40	30	31.5	50	90	90	90	75	10.6	35.5
	1180	90	90	90	90	90	80	85	67	56	56	75	90	90	90	90	90	18	35.5
<b>2,800,000</b>	1180	90	90	90	90	90	85	75	75	60	47.5	50	67	90	90	90	85	17	35.5
	850	90	90	90	90	90	90	80	85	75	63	67	80	90	90	90	90	18	35.5
<b>3,550,000</b>	1180	85	90	90	90	90	75	67	71	50	40	42.5	56	85	90	90	75	14	35.5
	850	90	90	90	90	90	85	75	80	67	56	60	71	90	90	90	85	18	35.5
<b>4,500,000</b>	1180	80	90	90	90	90	67	60	63	42.5	33.5	35.5	50	80	90	90	71	11.8	35.5
	850	85	90	90	90	90	75	67	71	60	50	50	63	85	90	90	80	18	33.5

max **90**

max **18** max **36**

- 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.

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

size **6300**

$n_2 \cdot L_n$	$T_2$																		
		rpm h								rpm h									
	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
<b>355,000</b>	2800	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>450,000</b>	2800	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>560,000</b>	2800	90	90	85	80	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>710,000</b>	2800	90	90	75	67	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>900,000</b>	2800	90	85	60	56	67	90	90	90	90	75	85	90	90	90	90	90	35.5	14
	2000	90	90	85	80	90	67	90	90	90	90	90	90	90	90	90	90	35.5	18
	1400	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,120,000</b>	2000	90	90	80	71	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1400	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,400,000</b>	2000	90	85	67	63	71	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1400	90	90	85	80	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,800,000</b>	2000	90	75	60	56	63	85	90	90	90	90	90	90	90	90	90	90	35.5	16
	1400	90	90	75	71	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>2,240,000</b>	2000	90	67	53	47.5	56	75	90	90	90	75	80	90	90	90	85	90	35.5	12.5
	1400	90	80	67	63	71	85	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>2,800,000</b>	1400	90	75	63	60	63	80	90	90	90	90	90	90	90	90	85	90	35.5	18
	1000	90	85	75	71	75	85	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>3,550,000</b>	1400	85	67	53	50	56	71	90	90	90	90	90	90	90	85	80	80	35.5	16
	1000	90	75	67	63	67	80	90	90	90	90	90	90	90	85	85	85	35.5	18
<b>4,500,000</b>	1400	75	60	47.5	45	50	63	80	90	85	80	90	90	90	75	71	75	35.5	13.2
	1000	80	71	60	56	63	71	85	90	85	90	90	90	90	80	75	80	35.5	18

max **90**

max **36** max **18**

size **6301**

<b>355,000</b>	3550	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2500	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>450,000</b>	3550	90	90	80	80	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2500	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>560,000</b>	3550	90	90	71	63	80	90	90	90	90	80	80	90	90	90	90	90	35.5	16
	2500	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>710,000</b>	3550	90	80	56	50	63	90	90	90	71	45	50	90	90	90	90	90	35.5	10
	2500	90	90	80	80	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>900,000</b>	3550	90	71	45	40	50	80	90	90	25	16	16	45	90	90	90	90	35.5	6.3
	2500	90	90	80	71	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1800	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,120,000</b>	2500	90	80	63	63	71	90	90	90	90	90	90	90	90	90	90	90	35.5	16
	1800	90	90	80	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,400,000</b>	2500	90	80	56	56	63	80	90	90	90	80	80	90	90	90	90	90	35.5	14
	1800	90	90	80	80	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>1,800,000</b>	2500	90	71	50	45	56	80	90	90	80	56	56	90	90	90	90	90	35.5	10
	1800	90	80	71	63	71	90	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>2,240,000</b>	2500	90	56	40	35.5	45	71	90	90	50	31.5	35.5	80	90	90	80	80	35.5	8
	1800	90	80	56	56	63	80	90	90	90	90	90	90	90	90	90	90	35.5	16
<b>2,800,000</b>	1800	90	71	56	50	56	80	90	90	90	90	90	90	90	90	80	80	35.5	14
	1250	90	80	71	71	71	80	90	90	90	90	90	90	90	90	90	90	35.5	18
<b>3,550,000</b>	1800	80	56	50	45	50	71	80	90	90	71	80	90	90	80	80	80	35.5	12.5
	1250	80	71	63	56	63	80	90	90	90	90	90	90	90	80	80	80	35.5	18
<b>4,500,000</b>	1800	80	56	40	35.5	45	56	80	90	80	56	56	90	90	80	71	71	35.5	9
	1250	80	71	56	56	56	71	80	90	80	90	90	90	90	80	80	80	35.5	16

max **90**

max **35.5** max **18**

- 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.

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

size **6300**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1)2)}$																$F_{a2}^{1)}$	
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355,000	2800	90	90	80	80	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
450,000	2800	90	90	67	63	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
560,000	2800	90	80	53	50	67	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	85	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
710,000	2800	90	67	42.5	37.5	53	90	90	90	90	90	90	90	90	90	90	90	35.5	16
	2000	90	90	75	71	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
900,000	2800	90	53	30	28	40	90	90	90	90	90	90	90	90	90	80	90	35.5	11.2
	2000	90	90	63	63	75	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1400	90	90	90	85	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,120,000	2000	90	80	56	53	67	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1400	90	90	80	75	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,400,000	2000	90	67	47.5	42.5	56	90	90	90	90	90	90	90	90	90	80	90	35.5	17
	1400	90	90	71	67	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,800,000	2000	90	56	35.5	33.5	45	80	90	90	90	90	90	90	90	80	71	85	35.5	13.2
	1400	90	80	60	60	71	90	90	90	90	90	90	90	90	90	85	90	35.5	18
2,240,000	2000	90	47.5	30	26.5	37.5	71	90	90	90	90	90	90	90	71	63	75	35.5	10.6
	1400	90	71	53	50	63	90	90	90	90	90	90	90	90	80	75	85	35.5	18
2,800,000	1400	90	63	45	42.5	53	80	90	90	90	90	90	90	90	75	71	80	35.5	17
	1000	90	75	63	60	71	90	90	90	90	90	90	90	90	85	80	85	35.5	18
3,550,000	1400	85	53	37.5	35.5	47.5	71	90	90	90	90	90	90	85	67	63	71	35.5	14
	1000	90	71	56	53	63	80	90	90	90	90	90	90	90	75	71	80	35.5	18
4,500,000	1400	75	47.5	31.5	30	37.5	63	90	90	85	90	90	90	80	63	56	67	35.5	11.8
	1000	85	63	50	47.5	56	75	90	90	90	90	90	90	85	71	67	71	35.5	18

max 90

max 36

max 18

size **6301**

355,000	3350	90	90	56	53	71	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2360	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
450,000	3350	90	71	42.5	37.5	56	90	90	90	90	90	90	90	90	90	90	90	35.5	16
	2360	90	90	85	80	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
560,000	3350	90	56	30	28	40	90	90	90	90	90	90	90	90	90	90	90	35.5	11.8
	2360	90	90	71	67	85	90	90	90	90	90	90	90	90	90	90	90	35.5	18
710,000	3350	90	37.5	18	16	25	80	90	90	90	90	90	90	90	90	80	90	35.5	7.1
	2360	90	85	60	56	75	90	90	90	90	90	90	90	90	90	90	90	35.5	18
900,000	3350	90	16	-	-	9	56	90	90	90	90	90	90	90	75	71	85	35.5	3
	2360	90	75	50	45	63	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	1700	90	90	75	75	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,120,000	2360	90	63	40	37.5	50	90	90	90	90	90	90	90	90	90	80	90	35.5	15
	1700	90	90	67	63	80	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,400,000	2360	90	50	31.5	28	40	80	90	90	90	90	90	90	90	80	75	85	35.5	11.8
	1700	90	80	60	56	71	90	90	90	90	90	90	90	90	90	90	90	35.5	18
1,800,000	2360	90	37.5	21.2	19	28	67	90	90	90	90	90	90	90	71	63	75	35.5	8
	1700	90	67	50	47.5	60	90	90	90	90	90	90	90	90	85	80	90	35.5	18
2,240,000	2360	80	26.5	12.5	11.8	18	56	90	90	90	90	90	90	90	63	56	67	35.5	5.3
	1700	90	60	42.5	40	50	80	90	90	90	90	90	90	90	75	71	80	35.5	16
2,800,000	1700	90	53	33.5	31.5	42.5	71	90	90	90	90	90	90	90	71	63	75	35.5	12.5
	1180	90	71	56	53	63	85	90	90	90	90	90	90	90	80	75	85	35.5	18
3,550,000	1700	80	42.5	28	25	33.5	63	90	90	90	90	90	90	80	63	56	67	35.5	10
	1180	90	63	47.5	47.5	56	80	90	90	90	90	90	90	90	71	67	75	35.5	18
4,500,000	1700	71	35.5	20	19	26.5	56	90	90	85	90	90	90	75	56	50	60	35.5	7.5
	1180	80	56	42.5	40	50	71	90	90	90	90	90	90	80	67	63	71	35.5	16

max 90

max 36

max 18

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.

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

size **7101**

$n_2 \cdot L_h$	$T_2$	$F_{r2}^{1)2)}$														$F_{a2}^{1)}$				
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315			
min <sup>-1</sup> ·h	10 lbf in																			
<b>355,000</b>	5600	106	112	112	112	112	112	95	90	112	112	112	112	112	100	106	112	45	22.4	
<b>355,000</b>	4000	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	45	22.4	
<b>450,000</b>	5600	90	112	112	112	112	112	80	71	112	112	112	112	90	56	60	112	45	22.4	
<b>450,000</b>	4000	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	45	22.4	
<b>560,000</b>	5600	71	112	112	112	112	112	100	63	60	112	112	112	112	28	16	17	47.5	45	20
<b>560,000</b>	4000	112	112	112	112	112	112	112	106	100	112	112	112	112	112	112	112	112	45	22.4
<b>710,000</b>	5600	56	100	112	112	112	80	50	42.5	56	25	30	90	-	-	-	-	45	13.2	
<b>710,000</b>	4000	100	112	112	112	112	112	95	85	112	112	112	112	112	112	112	112	45	22.4	
<b>900,000</b>	5600	31.5	71	112	112	112	53	26.5	22.4	112	80	95	90	-	-	-	-	45	7.1	
<b>900,000</b>	4000	85	112	112	112	112	106	80	75	112	112	112	112	112	100	106	112	45	22.4	
<b>900,000</b>	2800	112	112	112	112	112	112	112	106	112	112	112	112	112	112	112	112	45	22.4	
<b>1,120,000</b>	4000	75	106	112	112	112	95	67	63	112	112	112	112	100	67	75	112	45	22.4	
<b>1,120,000</b>	2800	106	112	112	112	112	112	100	95	112	112	112	112	112	112	112	112	45	22.4	
<b>1,400,000</b>	4000	63	95	112	112	112	80	56	50	112	112	112	112	63	37.5	40	90	45	19	
<b>1,400,000</b>	2800	95	112	112	112	112	106	90	85	112	112	112	112	112	112	112	112	45	22.4	
<b>1,800,000</b>	4000	50	80	112	112	112	67	45	37.5	112	112	106	112	10	5.3	6	18	45	13.2	
<b>1,800,000</b>	2800	80	106	112	112	112	95	75	71	112	112	112	112	112	112	112	112	45	22.4	
<b>2,240,000</b>	2800	71	95	112	112	112	90	67	63	112	112	112	112	112	100	106	112	45	22.4	
<b>2,240,000</b>	2000	90	112	112	112	112	100	90	85	112	112	112	112	112	112	112	112	45	22.4	
<b>2,800,000</b>	2800	63	85	112	112	106	75	60	53	112	106	100	106	106	75	80	112	42.5	21.2	
<b>2,800,000</b>	2000	85	100	112	112	112	95	80	75	112	112	106	112	112	112	112	112	45	22.4	
<b>3,550,000</b>	2800	53	75	106	112	95	67	47.5	45	112	100	90	95	75	50	56	100	40	18	
<b>3,550,000</b>	2000	75	90	112	112	106	85	71	67	112	106	100	106	112	112	112	112	45	22.4	
<b>4,500,000</b>	2800	45	67	95	106	90	60	40	35.5	106	90	85	90	45	28	31.5	67	35.5	13.2	
<b>4,500,000</b>	2000	67	85	100	106	95	75	63	60	112	95	90	95	112	106	112	112	40	22.4	

max **112**

max **45** max **22.4**

size **8001**

<b>355,000</b>	8000	140	140	140	140	140	140	140	140	140	118	132	140	140	140	140	140	26.5	56
<b>355,000</b>	5600	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	28	56
<b>450,000</b>	8000	140	140	95	90	140	140	140	140	118	95	106	140	140	140	140	140	17	56
<b>450,000</b>	5600	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	28	56
<b>560,000</b>	8000	140	106	42.5	37.5	67	140	140	140	100	80	90	132	140	140	140	140	8.5	56
<b>560,000</b>	5600	140	140	140	140	140	140	140	140	140	132	140	140	140	140	140	140	28	56
<b>710,000</b>	8000	25	140	-	-	-	71	14	12.5	80	60	71	112	140	140	140	132	-	3.15
<b>710,000</b>	5600	140	140	140	140	140	140	140	140	132	118	125	140	140	140	140	140	28	56
<b>900,000</b>	8000	140	140	-	-	-	112	90	75	50	37.5	45	80	140	140	140	100	-	15
<b>900,000</b>	5600	140	140	140	140	140	140	140	140	118	100	112	140	140	140	140	140	26.5	56
<b>900,000</b>	4000	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	28	56
<b>1,120,000</b>	5600	140	140	118	112	140	140	140	140	100	85	95	125	140	140	140	140	20	56
<b>1,120,000</b>	4000	140	140	140	140	140	140	140	140	132	125	132	140	140	140	140	140	28	56
<b>1,400,000</b>	5600	140	140	80	71	112	140	140	140	85	71	80	112	140	140	140	125	13.2	56
<b>1,400,000</b>	4000	140	140	140	140	140	140	140	140	125	112	118	140	140	140	140	140	28	56
<b>1,800,000</b>	5600	140	80	33.5	30	53	140	140	140	71	56	63	95	140	140	140	112	6.3	56
<b>1,800,000</b>	4000	140	140	140	140	140	140	140	140	106	95	100	125	140	140	140	140	28	56
<b>2,240,000</b>	4000	140	140	140	132	140	140	140	140	95	85	90	112	140	140	140	125	23.6	56
<b>2,240,000</b>	2800	140	140	140	140	140	140	140	140	118	112	118	132	140	140	140	140	28	56
<b>2,800,000</b>	4000	140	140	112	106	140	140	132	140	85	71	80	100	140	140	140	112	19	56
<b>2,800,000</b>	2800	140	140	140	140	140	140	140	140	112	100	106	125	140	140	140	132	28	56
<b>3,550,000</b>	4000	140	140	80	75	112	125	118	125	71	60	67	90	125	140	132	100	13.2	56
<b>3,550,000</b>	2800	140	140	140	140	140	132	132	132	100	90	95	112	132	140	140	118	28	56
<b>4,500,000</b>	4000	140	100	50	45	71	118	106	118	60	50	53	80	112	140	125	90	8.5	56
<b>4,500,000</b>	2800	140	140	140	140	140	125	118	125	90	80	85	100	125	140	132	106	26.5	56

max **140**

max **28** max **56**

- 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.

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

size **7101**

$n_2 \cdot L_h$ min <sup>-1</sup> ·h	$T_2$ 10 lbf·in	$F_{r2}^{(1)(2)}$																$F_{a2}^{(1)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355,000	5600	56	112	112	112	112	75	40	37.5	112	112	112	112	112	112	112	112	45	18
355,000	4000	112	112	112	112	112	112	100	95	112	112	112	112	112	112	112	112	45	22.4
450,000	5600	33.5	112	112	112	112	47.5	22.4	20	112	112	112	112	112	112	112	112	45	10.6
450,000	4000	100	112	112	112	112	112	85	80	112	112	112	112	112	112	112	112	45	22.4
560,000	5600	10.6	80	112	112	112	18	6.3	6	112	112	100	112	112	112	112	112	45	3.75
560,000	4000	90	112	112	112	112	100	71	63	112	112	112	112	112	112	112	112	45	22.4
710,000	5600	-	33.5	10.6	9.5	21.2	-	-	-	112	95	90	112	112	112	112	112	6	-
710,000	4000	71	112	112	112	112	85	53	50	112	112	112	112	112	112	112	112	45	22.4
900,000	5600	-	35.5	35.5	30	71	-	-	-	112	85	75	95	85	63	71	112	15	-
900,000	4000	53	112	112	112	112	67	40	35.5	112	112	106	112	112	112	112	112	45	18
900,000	2800	100	112	112	112	112	112	85	80	112	112	112	112	112	112	112	112	45	22.4
1,120,000	4000	37.5	95	112	112	112	50	28	25	112	100	95	112	112	112	112	112	45	12.5
1,120,000	2800	90	112	112	112	112	100	71	71	112	112	112	112	112	112	112	112	45	22.4
1,400,000	4000	22.4	80	112	112	112	33.5	15	14	112	90	85	100	112	112	112	112	45	7.1
1,400,000	2800	75	112	112	112	112	90	63	60	112	112	106	112	112	112	112	112	45	22.4
1,800,000	4000	3.75	50	112	112	95	6.7	2.24	2	112	80	71	90	112	106	112	112	45	1.32
1,800,000	2800	63	106	112	112	112	75	50	47.5	112	100	95	106	112	112	112	112	45	22.4
2,240,000	2800	50	95	112	112	112	63	40	35.5	112	90	85	100	112	112	112	112	45	18
2,240,000	2000	80	112	112	112	112	90	71	67	112	106	100	112	112	112	112	112	45	22.4
2,800,000	2800	40	80	112	112	100	50	30	28	106	80	75	90	112	112	112	112	45	13.2
2,800,000	2000	71	100	112	112	112	80	60	56	112	95	90	100	112	112	112	112	45	22.4
3,550,000	2800	28	71	112	112	90	37.5	20	19	100	71	67	80	112	112	112	112	45	9.5
3,550,000	2000	63	90	112	112	106	71	50	47.5	106	90	85	95	112	112	112	112	45	22.4
4,500,000	2800	17	56	112	112	80	25	11.2	10.6	90	63	60	71	106	95	106	112	42.5	5.3
4,500,000	2000	53	85	112	112	95	60	42.5	40	100	80	75	85	112	112	112	112	45	19

max **112**

max **45** max **22.4**

size **8001**

355,000	8000	140	140	140	140	140	140	140	140	80	56	60	106	140	140	140	140	28	56
355,000	5600	140	140	140	140	140	140	140	140	140	132	140	140	140	140	140	140	28	56
450,000	8000	140	140	140	140	140	140	140	140	53	33.5	35.5	75	140	140	140	140	28	56
450,000	5600	140	140	140	140	140	140	140	140	140	112	118	140	140	140	140	140	28	56
560,000	8000	140	140	140	140	140	140	132	140	25	14	16	37.5	140	140	140	118	28	56
560,000	5600	140	140	140	140	140	140	140	140	118	95	100	140	140	140	140	140	28	56
710,000	8000	140	140	140	140	140	140	118	125	-	-	-	-	9	4.5	5.3	26.5	20	56
710,000	5600	140	140	140	140	140	140	140	140	100	75	80	118	140	140	140	140	28	56
900,000	8000	140	140	118	100	132	125	100	112	-	-	-	-	80	28	33.5	45	11.8	56
900,000	5600	140	140	140	140	140	140	140	140	80	56	60	100	140	140	140	140	28	56
900,000	4000	140	140	140	140	140	140	140	140	132	106	112	140	140	140	140	140	28	56
1,120,000	5600	140	140	140	140	140	140	125	132	60	40	45	80	140	140	140	132	28	56
1,120,000	4000	140	140	140	140	140	140	140	140	118	95	95	132	140	140	140	140	28	56
1,400,000	5600	140	140	140	140	140	132	112	118	42.5	26.5	30	56	140	140	140	112	28	56
1,400,000	4000	140	140	140	140	140	140	140	140	100	80	85	118	140	140	140	140	28	56
1,800,000	5600	140	140	140	140	140	118	95	106	19	11.2	12.5	30	132	140	140	85	20	56
1,800,000	4000	140	140	140	140	140	140	125	132	85	63	67	100	140	140	140	132	28	56
2,240,000	4000	140	140	140	140	140	125	112	118	71	50	56	85	140	140	140	125	28	56
2,240,000	2800	140	140	140	140	140	140	132	132	106	90	95	118	140	140	140	140	28	56
2,800,000	4000	140	140	140	140	140	118	100	106	56	40	42.5	71	132	140	140	106	28	56
2,800,000	2800	140	140	140	140	140	132	118	125	95	80	80	106	140	140	140	132	28	56
3,550,000	4000	125	140	140	140	140	106	90	95	40	28	30	53	118	140	140	95	23.6	53
3,550,000	2800	140	140	140	140	140	125	106	112	85	67	71	95	140	140	140	118	28	56
4,500,000	4000	118	140	140	132	140	95	75	85	26.5	17	19	37.5	106	140	140	75	19	47.5
4,500,000	2800	125	140	140	140	140	112	95	106	71	56	60	85	125	140	140	112	28	53

max **140**

max **28** max **56**

- 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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# Accessories and non-standard designs

(1) Hollow low speed shaft with shrink disc.....	104
(2) Hollow low speed shaft with keyway (sizes 4000 ... 6301).....	106
(3) Hollow low speed shaft washer.....	107
(4) Backstop device .....	108
(5) Reaction bolt using disc springs (sizes 4000 ... 6301).....	109
(6) Fan cooling.....	110
(7) Water cooling by coil (sizes 4000 ... 6301).....	111
(8) Independent cooling unit.....	112
(9) Forced bearing lubrication .....	114
(10) Oil heater.....	114
(11) Special painting cycles.....	115
(12) High and low speed shaft seals.....	116
(13) Desiccant breather .....	117
(14) Oil level plug with dip stick.....	117
(15) Oil drain tap.....	118
(16) Oil temperature probe.....	118
(17) Oil temperature probe with terminal box and ammetric transducer 4 ÷ 20 mA.....	119
(18) Bearing temperature probe.....	120
(19) Bearing temperature probe with terminal box and ammetric transducer 4 – 20 mA.....	121
(20) Bi-metal type thermostat.....	121
(21) Oil level switch with float.....	122
(22) Oil optical probe.....	122
(24) Remote temperature indicator instrument with set point.....	122
– Various .....	123

**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

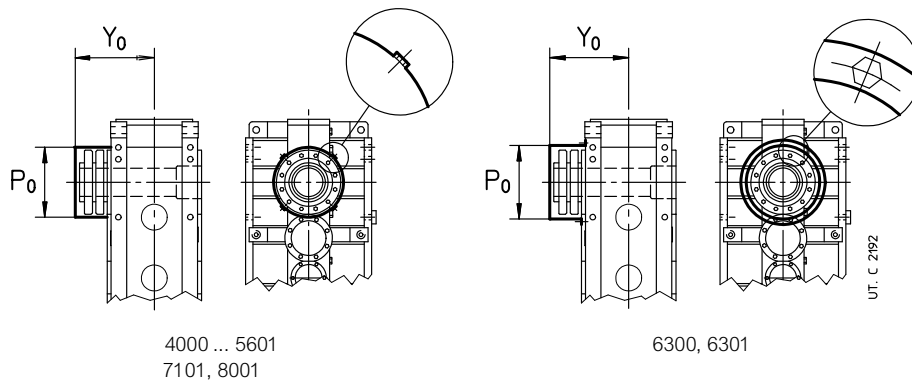
### Opposite side to machine

**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.

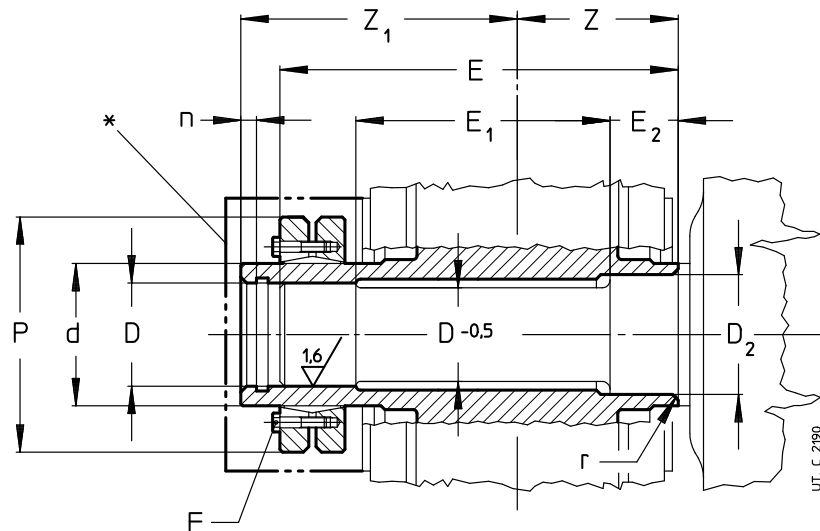
**Safety** guards made of steel for shrink disc, supplied **as standard**.

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

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



Gear reducer size	P <sub>0</sub> ∅	Y <sub>0</sub>
<b>4000, 4001</b>	449	522
<b>4500, 4501</b>	479	534
<b>5000, 5001</b>	536	635
<b>5600, 5601</b>	608	659
<b>6300, 6301</b>	750	752
<b>7101</b>	850	990
<b>8001</b>	977	1127



Gear reducer size	D	D <sub>2</sub> **	E	E <sub>1</sub>	E <sub>2</sub>	F	T <sub>s</sub>	n	d	P	r	Z	Z <sub>1</sub>	T <sub>2SD</sub>	Δm	
	∅	∅			1)	2)	3)		∅	∅				4)	lb	
	H7/h6, j6						lbf in							10 <sup>3</sup> lbf in		
<b>4000, 4001</b>	210	220	788	480	165	130	M20 n. 14	4336	14	260	430	5	330	497	2250	-155
<b>4500, 4501</b>	230	240	799	465	180	130	M20 n. 16	4336	14	280	460	5	330	508	2895	-310
<b>5000, 5001</b>	260	270	970	600	200	165	M20 n. 20	4336	16	320	520	6	410	605	4045	-355
<b>5600, 5601</b>	290	300	992	572	225	180	M20 n. 24	4336	16	360	590	6	410	627	5365	-595
<b>6300, 6301</b>	325	335	1 110	650	250	200	M24 n. 21	7434	18	400	660	7	460	700	7715	-905
<b>7101</b>	360	370	1 394	782	280	225	M27 n.28	11062	20	460	770	7	551	899	14600	-970
<b>8001</b>	400	410	1 606	886	315	250	M27 n. 34	11062	20	530	910	8	626	1036	18760	-795

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.

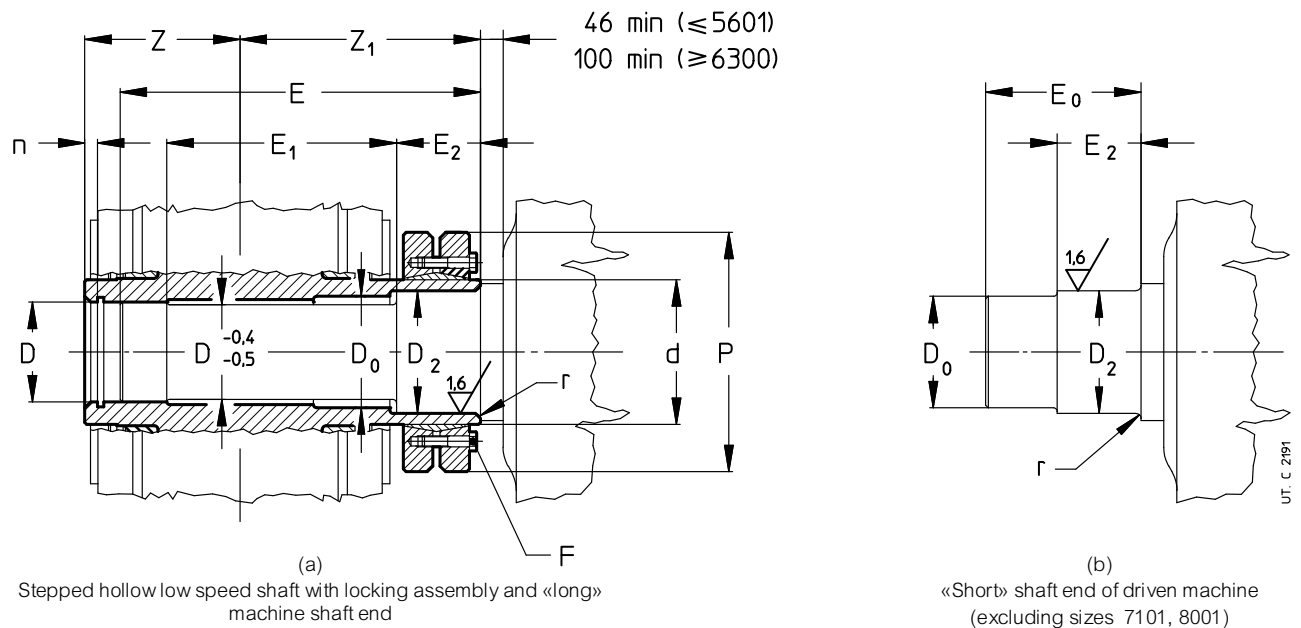
In the first case (fig. a), where the «long» shaft end of driven machine acts as a guide, mounting operations are facilitated.

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 and 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  $(1,18 \cdot 1,25) \cdot D$ .

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



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	T <sub>s</sub>	n	d	P	r	Z	Z <sub>1</sub>	T <sub>2SD</sub>	Δm	
	∅	∅	∅				1)	2)	3)		∅	∅				4)	lb	
	H7 / h6, j6								lbf·in							10 <sup>3</sup> lbf·in		
<b>4000, 4001</b>	210	220	215	754	307	446	165	130	M20 n. 14	4336	14	260	430	5	330	463	2520	-175
<b>4500, 4501</b>	230	240	232	768	342	434	180	130	M20 n. 14	4336	14	280	460	5	330	477	3210	-330
<b>5000, 5001</b>	260	270	265	935	380	565	200	165	M20 n. 16	4336	16	320	520	6	410	570	4435	-420
<b>5600, 5601</b>	290	300	295	958	428	538	225	180	M20 n. 16	4336	16	360	590	6	410	593	5825	-660
<b>6300, 6301</b>	325	335	330	1 063	475	603	250	200	M24 n. 18	7434	18	400	660	7	460	653	8300	-1015
<b>7101</b>	360	370	-	1 335	-	774	327	327	M27 n. 28	11062	20	460	770	7	551	840	15045	-1015
<b>8001</b>	400	410	-	1 548	-	879	400	400	M27 n. 34	11062	20	530	910	8	626	978	19115	-880

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)

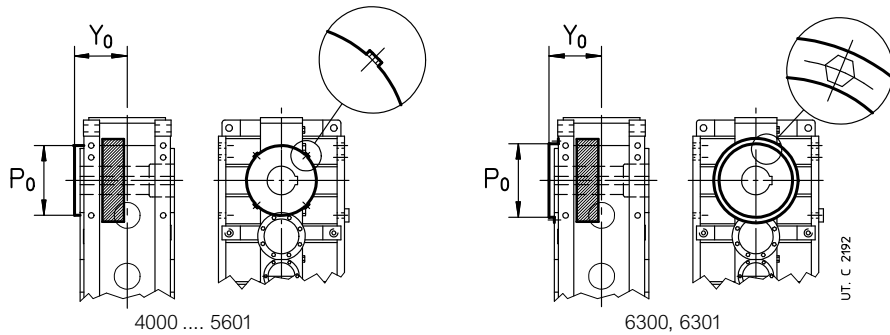
Hollow low speed shaft, normal (fig. a) or stepped (fig. b), with keyway. With required torque higher than table values, two keyways at 120° are necessary.

**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 4I; see also ch. 8 and 10).

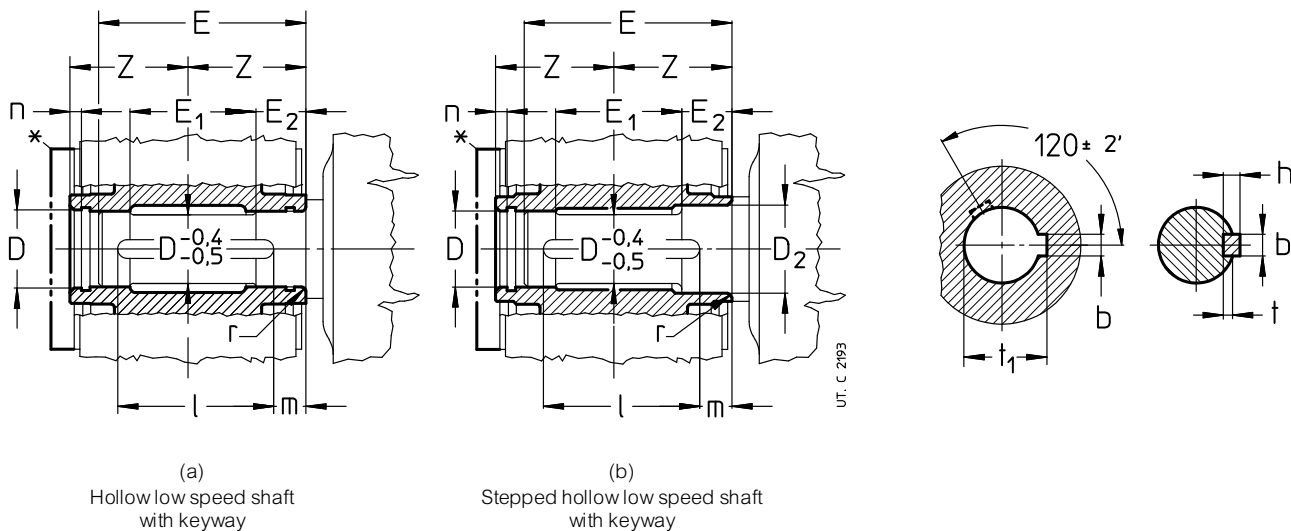
Hollow low speed shaft washer (see ch. 12 (5)), available on request.

**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	$P_0$ ∅	$Y_0$ ≈
<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



(a) Hollow low speed shaft with keyway

(b) Stepped hollow low speed shaft with keyway

Gear reducer size	Hollow shaft				Shaft end of driven machine					Parallel key			Keyway			$T_2$ 2) 10 <sup>3</sup> lbf in	$\Delta m$ lb	
	$D^{**}$ ∅ H7 / h6, j6	$D_2^{**}$ ∅	n	Z	E 3)	$E_1$	$E_2$ 3) 1) 3)	m	r	b h9	h h11	l	b H9hub N9shaft	t shaft	$t_1$ hub			
<b>4000, 4001</b>	200	210	14	330	620	300	165	130	10	5	45	25	600	45	15	210,4	<b>990</b>	-330
<b>4500, 4501</b>	220	230	14	330	620	300	180	130	10	5	50	28	600	50	17	231,4	<b>1240</b>	-530
<b>5000, 5001</b>	250	260	16	410	775	400	200	165	13	6	56	32	750	56	20	262,4	<b>1980</b>	-660
<b>5600, 5601</b>	280	290	16	410	775	400	225	180	13	6	63	32	750	63	20	292,4	<b>2210</b>	-925
<b>6300, 6301</b>	310	320	18	460	870	400	250	200	15	7	70	36	840	70	22	324,4	<b>3140</b>	-1475

1) Values valid for **R 4I**.

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 ( $E_2$ ) by the A quantity stated in the table at ch. 12.(12).

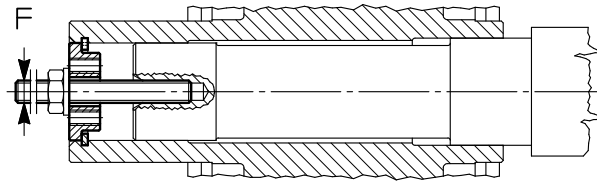
\* Hollow low speed shaft protection with keyway, as standard.

\*\* 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.

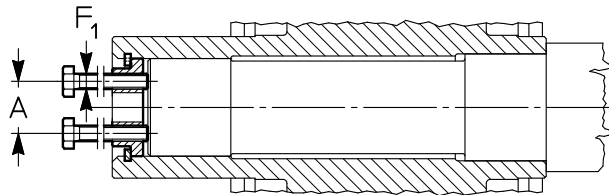
Supplementary description when ordering by **designation: hollow low speed shaft with keyway, hollow low speed shaft with two keyways, stepped hollow low speed shaft with keyway, stepped hollow low speed shaft with two keyways.**

### (3) Hollow low speed shaft washer

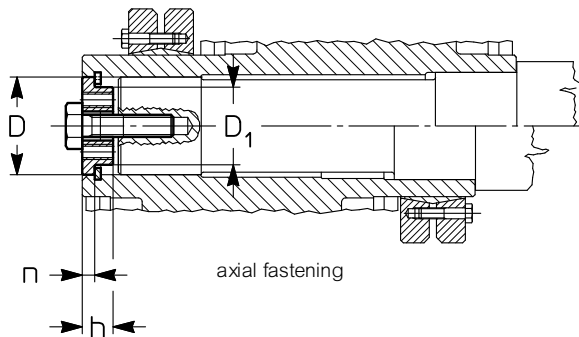
Washer, retaining ring and screw for axial fastening of gear reducer with hollow low speed shaft with shrink disc or with keyway.



installing



removing



axial fastening

Gear reducer size	A		D		D <sub>1</sub>		F	F <sub>1</sub>	h	n	Axial fastening bolt 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

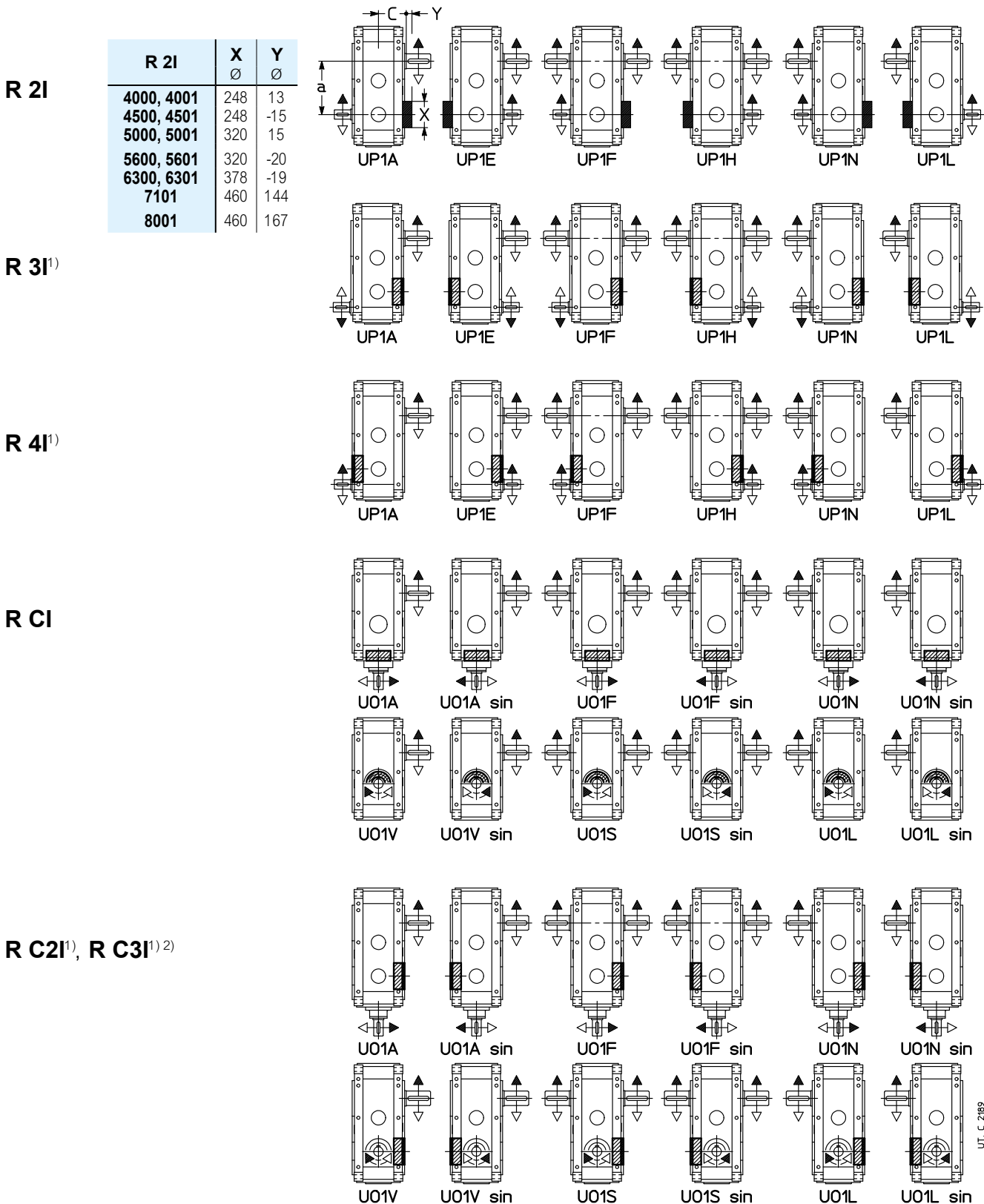
1) Dimension valid for design with hollow low speed shaft with keyway.

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.



UT. C 2189

1) Backstop device does not project from dimension C.

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

## Backstop device load capacity

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

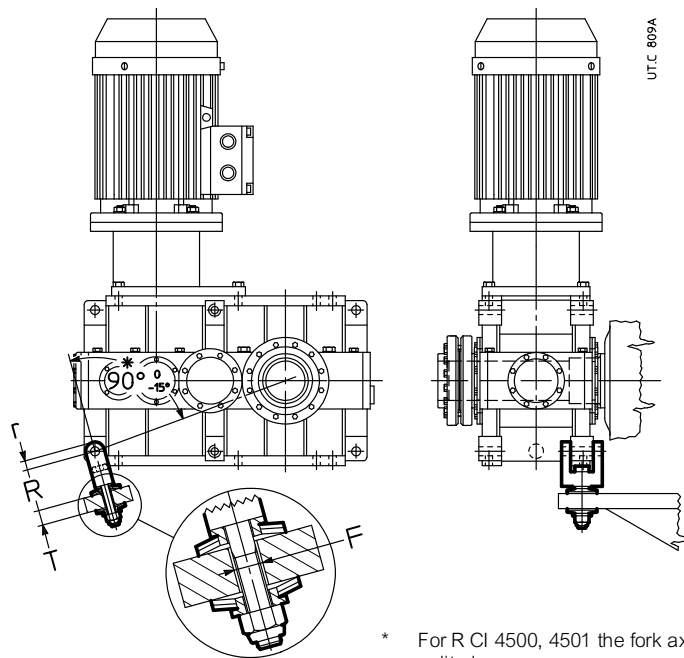
Train of gears	$i_N$	$T_{2BS}$ [ $10^3$ lbf in]					
		4001	4501	5001	5601	6301	7101
<b>3I</b>	25	840	–	–	–	–	5575
	28	990	990	1980	1980	2965	–
	31,5	–	1105	–	2210	3320	–
	35,5	990	1240	1980	2480	2965	–
	40	–	1105	–	–	3320	–
<b>4I</b>	45	–	1240	–	2480	–	–
	$\leq 250$	–	1240	–	2480	–	–
<b>C2I</b>	20	840	–	–	–	–	–
	22,4	990	990	1980	–	–	–
	25	–	1105	–	2210	–	–
	28	990	1240	1980	–	–	–
	31,5	–	1150	–	2210	–	–
	35,5	–	1240	–	2480	–	–

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.

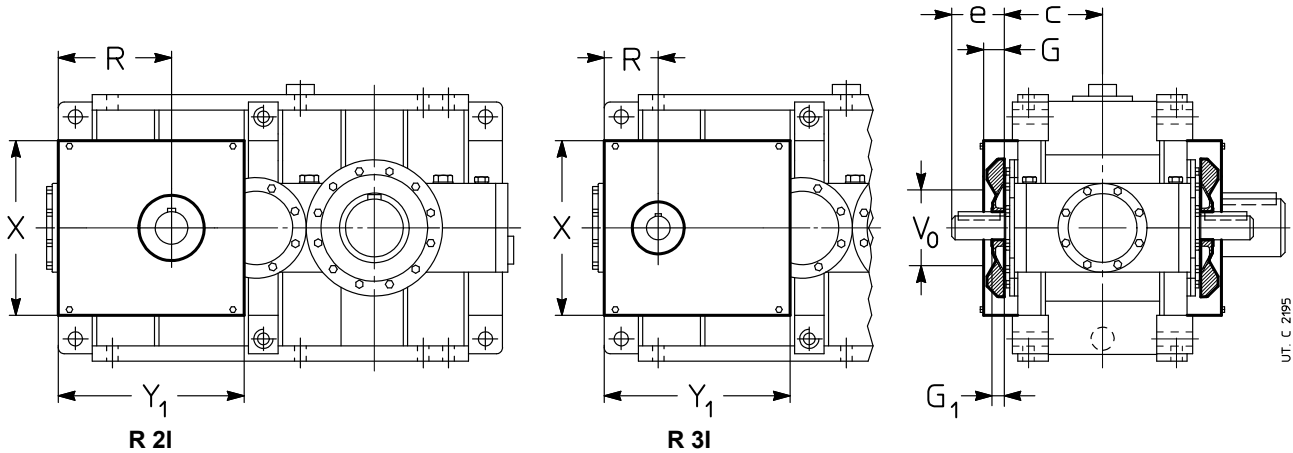
Gear reducer size	Screw UNI 5737-88	Disc spring DIN 2093	T	F Ø	R	r
<b>4000 ... 4501</b>	M45 260	A 125 n. 2	55	50	211	50
<b>5000 ... 5601</b>	M56 300	A 160 n. 2	70	62	274	60
<b>6300, 6301</b>	M56 300	A 160 n. 3	70	62	284	60

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.



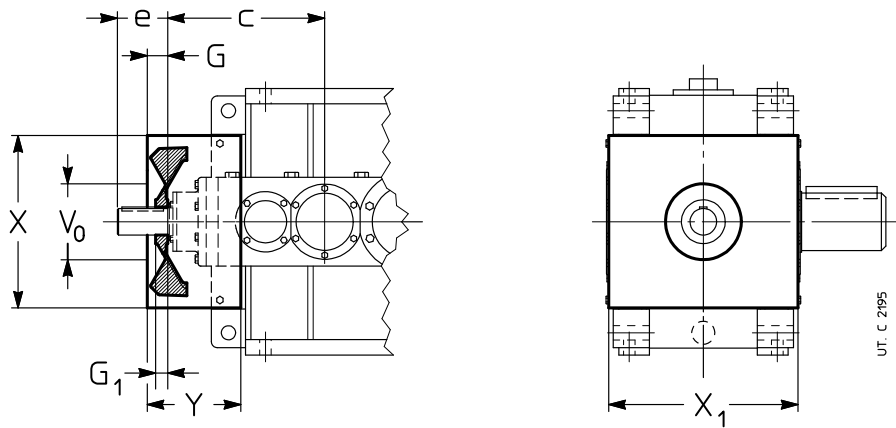
Gear reducer size			2I		3I			X	Y <sub>1</sub>
	G	G <sub>1</sub>	R	V <sub>0</sub>	G <sub>1</sub>	R	V <sub>0</sub>		
	1)	2)		∅	2)		∅		
<b>4000 ... 4501</b>	63	50	363	220	40	163	175	590	633
<b>5000 ... 5601</b>	75	50	453	290	50	203	220	740	795
<b>6300, 6301</b>	75	–	–	–	50	203	220	880	980

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.



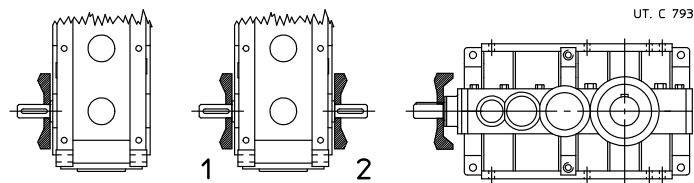
Gear reducer size		G	G <sub>1</sub>	V <sub>0</sub>	X	X <sub>1</sub>	Y	
<b>CI</b>	<b>4000 ... 4501</b>	80	40	280	590	640	345	
	<b>4000 ... 4501</b>	72	47	220	590	640	310	
<b>C2I</b>	<b>5000 ... 5601</b>	80	40	290	740	800	380	
	<b>6300, 6301</b>	80	40	290	880	872	330	
<b>C3I</b>	<b>6300, 6301</b>	<i>i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

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>**.

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.

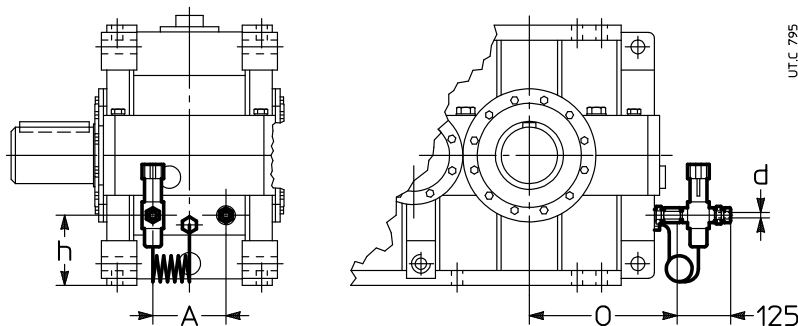
Supplementary description when ordering by **designation: fan cooling**; in designs with double extension high speed shaft state – only for helical gear reducers – if pos. **1** or **2** or ... **with 2 fans**

## (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

Cooling water specifications:

- be not too hard;
- be at max temperature 68 °F (20 °C);
- capacity 2.6 – 5.2 gal/min;
- pressure 29 – 58 psi (2 – 4 bar).

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

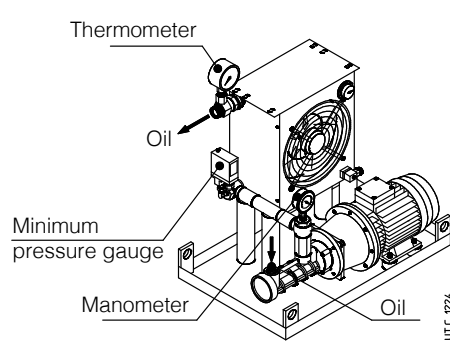
The load loss of coil, according to capacity and water pressure, is approximately 9 – 12 psi.

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 122 – 194 °F (50 – 90 °C), are Buyer's responsibility.

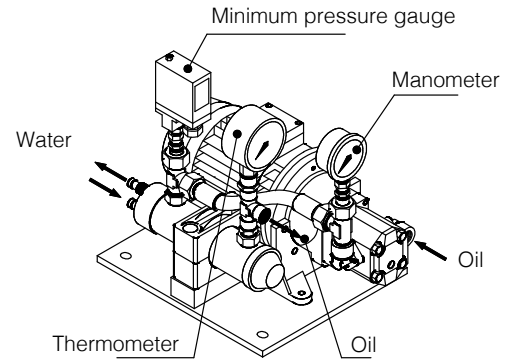
For ambient temperature lower than 32 °F (0 °C) consult us.

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 for the dissipation of thermal power produced by gear reducer during operation (see ch. 4).

Including:

- **oil/air heat exchanger** (O/A; with thermostat and adjustable control knob 32 – 194 °F (0 – 90 °C) or **oil/water heat exchanger** (O/W),
- **motor pump**: screw pump with fluoro rubber seals (gear pump for UR O/W5.4 hp – UR O/W 28 hp); 4 pole motor B3/ B5; motor-pump connection with coupling;
- **motor fan** (O/A) (three-phase or single phase supply, see next table)
- **analogic manometer** 0 – 250 psi (0 – 16 bar) mounted between pump and exchanger;
- **analogic thermometer** 32 – 250 °F (0 – 120 °C) mounted at exchanger output;
- **low pressure switch** (with on-off switch) mounted between pump and exchanger;
- **supporting frame** with nameplate.

On request, several accessories are at disposal (supplied separately, assembled by Customer) in order to satisfy all functionality and safety needs.

- **oil temperature probe Pt100**;
- **2-threshold signalling device CT03** (necessary also the oil temperature probe Pt100) for the mounting on rail to DIN EN 50022;
- **3-threshold signalling device CT10** (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 filters M60)

Connections realized by flexible pipes (type SAE 100 R1, maximum length 6 ft) 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:

$$P_s \geq (P_1 - P_{t_N} \cdot ft_1 \cdot ft_2 \cdot ft_3 \cdot ft_4) \cdot (1 - \eta) \cdot K_1$$


where:


- $P_s$  nominal power of unit [hp], i.e. the power dissipated by hot oil at approx. 176 °F (80 °C) and cooling air at 104 °F (40 °C) (O/A) or cooling water at 68 °F (20 °C) (O/W) with stated capacity (see next table);
- $P_1$  power at gear reducer input [hp] (consider the power installed when being uncertain about the power absorbed).
- $P_{t_N}$  nominal thermal power of gear reducer [hp] (see ch. 4);
- $ft_1$  thermal factor according to input speed (see ch. 4);
- $ft_2$  thermal factor according to ambient temperature (see ch. 4);
- $ft_3$  thermal factor according to mounting position (see ch. 4);
- $ft_4$  thermal factor according to altitude (see ch. 4); for UR O/A derate also the exchanger power: multiply  $P_s$  by 0.85 (for 3 300 – 8 200 ft a.s.l.) or by 0.71 (for 8 200 – 16 400 ft a.s.l.);
- 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.

Notes on page 347.

- 1) Oil connection valid for UR O/A 21 hp.
- 2) Oil connections valid when filter is present.
- 3) It is advisable to delay the gear reducer motor starting by at least 1 min compared to the motor pump starting.
- 4) The oil filter requires that cooling unit is started with oil already warm: refer to case A1 or B1.

Designation	Nominal power $P_s$		Heat exchanger code	Oil motor pump		Motor fan		Oil connections		Exchanger capacity ft <sup>3</sup>	
	hp	kW		motor 3~ hp	flow rate ft <sup>3</sup> /min	motor hp	flow rate ft <sup>3</sup> /min	intake	delivery		
UR O/A 7hp	6.7	5	AP 300 E	2	1.1	0.20 1~	540	1" (1") <sup>2)</sup>	1" (1") <sup>2)</sup>	0.07	130
UR O/A 9hp	9.4	7	AP 300/2 E	2	1.1	0.20 1~	770			0.13	145
UR O/A 13hp	13	10	AP 430 E	2	1.1	0.15 3~	1620			0.13	155
UR O/A 17hp	17	13	AP 430/2 E	2	1.1	0.19 3~	2060			0.19	165
UR O/A 21hp	21	16	AP 580 EB	3	2	0.19 3~	2830			0.53	210
UR O/A 28hp	28	21	AP 680 EB	3	2	1.41 3~	5180			0.57	260
UR O/A 35hp	35	26	AP 730 EB	4	2	1.41 3~	5180	1"	1" (1") <sup>1)</sup>	0.57	280
UR O/A 40hp	40	30	AP 730 EB	4	2.8	1.41 3~	5180			0.57	280
UR O/A 54hp	54	40	AP 830 EB	3	2	1.74 3~	6770			0.71	310
UR O/A 62hp	62	46	AP 830 EB	4	2.8	1.74 3~	6770			0.71	310

Designation	Nominal power $P_s$		Heat exchanger code	Oil motor pump		Water pipe		Oil connections		Exchanger capacity ft <sup>3</sup>	
	hp	kW		motor 3~ hp	flow rate ft <sup>3</sup> /min	flow rate ft <sup>3</sup> /min	connections	intake	delivery		
UR O/W 5hp	5.4	4	T60CB1	0.5	0.6	≥0.3 (≤1.1)	Ø12 mm	G "	G "	0.01	30
UR O/W 8hp	8	6	T60CB2	0.5	0.6	≥0.4 (≤1.1)	Ø12 mm	G "	G "	0.02	35
UR O/W 12hp	12	9	T80CB2	0.75	0.6	≥0.6 (≤1.1)	Ø12 mm	G "	G "	0.04	40
UR O/W 17hp	17	13	MS84P2	1.5	1.1	≥0.9 (≤1.6)	G "	G "	G "	0.04	70
UR O/W 28hp	28	21	MS134P1	2	1.1	≥1.4 (≤3.9)	G 1"	G "	G "	0.11	95
UR O/W 42hp	42	31	MS134P1	3	2	≥1.8 (≤3.9)	G 1"	G 1"	G 1"	0.11	120
UR O/W 67hp	67	50	MS134P2	4	2.8	≥2.8 (≤3.9)	G 1"	G 1"	G 1"	0.16	155

### Starting mode and required accessories


Ref.	Gear reducer lubrication system	Gear reducer starting mode	$T_{amb}$ °F (°C)	Required accessories	Required oil type	Description and remarks
A1	Splash lubrication	Without oil pre-heating	32 – 77 (0 – 25)	Pt100 + CT10	Mineral oil or synthetic oil (preferable)	<b>Gear reducer starting and subsequent motor-pump starting with warm oil.</b> The motor-pump is managed by the <b>three-threshold</b> oil temperature control system (Pt100 + CT10). Set the three-threshold device CT10 with: – operating temperature 140 °F (60 °C) (starting of motor-pump); – restoring temperature 104 °F (40 °C); – warning temperature 194 °F (90 °C).
A2	Splash lubrication	Without oil pre-heating	> 77 (> 25)	–	Polyalphaolefine 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	32 – 77 (0 – 25)	Pt100 + CT03 Pt100 + CT10 Oil heater	Mineral oil or synthetic oil (preferable)	<b>Simultaneous starting of gear reducer and motor-pump after oil pre-heating<sup>3)</sup>.</b> The oil heater is managed by the <b>two-threshold</b> oil temperature control system (Pt100 + CT03). The motor-pump and the gear reducer motor are managed by the <b>three-threshold</b> oil temperature control system (Pt100 + CT10). Set the two-threshold device CT03 with: – operating temperature 122 °F (50 °C) (oil heater disconnection); – restoring temperature 86 °F (30 °C). Set the three-threshold device CT10 with: – operating temperature 104 °F (40 °C) (starting of motor-pump and gear reducer motor); – restoring temperature 50 °F (10 °C); – warning temperature 194 °F (90 °C).
B2	Forced lubrication (bearings and/or gears)	Without oil pre-heating	> 77 (> 25)	–	Polyalphaolefine based synthetic oil	<b>Simultaneous starting of gear reducer and motor-pump<sup>3)</sup></b> Oil filter not possible <sup>4)</sup> .

See notes on page 112.

Additional description when ordering by **designation: independent oil-air cooling unit UR O/A ...** or **independent oil-water cooling unit UR O/W ...**, possibly integrated, when required by the application, with description: «**Forced lubrication ...**» and the statement of bearings and/or gear pairs 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>UO1A ... UO1N sin</b>	–	P	–	n.a.	P	P
	<b>UO1H ... UO1M sin</b>	P	P	–	n.a.	P	P
	<b>UO1V ... UO1L sin</b>	P	–	–	–	P	P
<b>C2I</b>	<b>UO1A ... UO1N sin</b>	–	P	–	n.a.	P	P
	<b>UO1H ... UO1M sin</b>	P	P	–	n.a.	P	P
	<b>UO1V ... UO1L 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 ( $T_{\text{ambient}} = T_{\text{oil}} \leq 77 \text{ °F (25 °C)}$ ) 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 particular 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.**

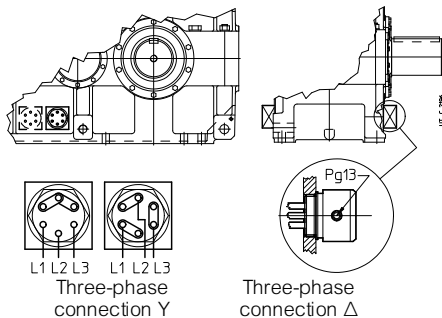
## (10) Oil heater

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

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

Features:

- specific power 2W/in<sup>2</sup>
- three-phase supply  $\Delta$ 230 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 194 °F (90 °C);
- threaded brass joint G 2"1/2 ;
- available also in explosion-proof design ATEXII 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

The gear reducers and gearmotors can be supplied with optional painting cycles, according to following table.

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

Application field	Features	Corrosivity class ISO 12944-2	Durability classes ISO 12944-2	Description	Average final thickness on machined parts ISO 19840 µm	Code
<b>Applications in aggressive environments</b>	Good resistance to atmospheric and aggressive agents	C4	L	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 160	<b>1HRAL5010</b> (blue)
			M <sup>2)</sup>	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 180	<b>2HRAL5010</b> (blue)
			H <sup>3)</sup>	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 240	<b>3HRAL5010</b> (blue)
<b>Outdoor applications in saline environment</b>	Excellent resistance to atmospheric and aggressive agents Outdoor applications in saline environment	C 5	M	Sandblasting Zinc-rich dual-compound anti-rust primer Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 240	<b>2IRAL5010</b> (blue)
			H <sup>2)</sup>	Sandblasting Zinc-rich dual-compound anti-rust primer Dual-compound, high-thickness epoxy primer Sealing with polyurethane sealant Water-based dual-compound polyacrylic enamel	≥ 280	<b>2KRAL5010</b> (blue)
<b>Outdoor applications in chemically aggressive environment and high humidity industrial areas</b>	Excellent resistance to atmospheric and aggressive agents Outdoor applications in chemically aggressive environment (fertilizers, etc.)	C 5	M	Sandblasting Zinc-rich dual-compound anti-rust primer Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 240	<b>2LRAL5010</b> (blue)
			H <sup>2)</sup>	Sandblasting Zinc-rich dual-compound anti-rust primer Dual-compound, high-thickness epoxy primer Sealing with polyurethane sealant Water-based dual-compound polyacrylic enamel	≥ 280	<b>2YRAL5010</b> (blue)

2) Not available on motors.

3) For motors ,C4H possible with cycle 2H sp ≥ 180 µm.

NOTE: cycles with specific features: antibacterial for FOOD environments, for ATEX environments, for zinc free environments on request.

## (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.

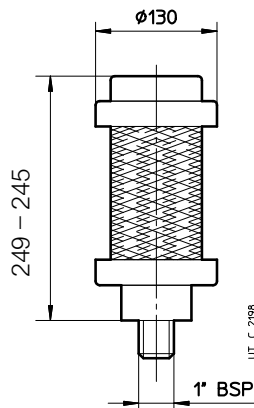
Seal type	Scheme																											
Standard																												
<b>Double seal on high speed shaft</b> Quite polluting environment and/or outdoor																												
<b>Low speed shaft double seal</b> Quite polluting environment and/or outdoor	<p>Supplementary description when ordering by <b>designation</b>:  <b>double seal on high speed shaft</b>  <b>double seal on low speed shaft</b></p>																											
<b>High speed shaft seal with labyrinth and grease feeder («taconite»)</b> Very polluting environment (e.g.: mining industry)	<p>Supplementary description when ordering by <b>designation</b>:  <b>high speed shaft seal with labyrinth and grease feeder.</b></p>																											
<b>Low speed shaft double seal with labyrinth and grease feeder («taconite»)</b> Very polluting environment (e.g.: mining industry)	<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> <p>Size ≤ 6301: 2 G"                      Size ≥ 7101: 4 G"</p> </div> <div style="flex: 1; margin-left: 20px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #e0f0ff;"> <th style="font-size: small;">Gear reducer size</th> <th style="font-size: small;">A</th> <th style="font-size: small;">B</th> </tr> <tr style="background-color: #e0f0ff;"> <th style="font-size: x-small;"></th> <th style="font-size: x-small;">1)</th> <th style="font-size: x-small;">2) Ø</th> </tr> </thead> <tbody> <tr> <td style="font-weight: bold; font-size: small;">4000, 4001</td> <td style="font-size: x-small;">19</td> <td style="font-size: x-small;">9 328</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">4500, 4501</td> <td style="font-size: x-small;">19</td> <td style="font-size: x-small;">9 368</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">5000, 5001</td> <td style="font-size: x-small;">19</td> <td style="font-size: x-small;">11 402</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">5600, 5601</td> <td style="font-size: x-small;">22</td> <td style="font-size: x-small;">11 462</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">6300, 6301</td> <td style="font-size: x-small;">24</td> <td style="font-size: x-small;">13 496</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">7101</td> <td style="font-size: x-small;">0</td> <td style="font-size: x-small;">10 653</td> </tr> <tr> <td style="font-weight: bold; font-size: small;">8001</td> <td style="font-size: x-small;">0</td> <td style="font-size: x-small;">10 759</td> </tr> </tbody> </table> </div> </div> <p>Supplementary description when ordering by <b>designation</b>:  <b>low speed shaft seal with labyrinth and grease feeder.</b></p>	Gear reducer size	A	B		1)	2) Ø	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
Gear reducer size	A	B																										
	1)	2) Ø																										
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																										

See notes at following page.

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



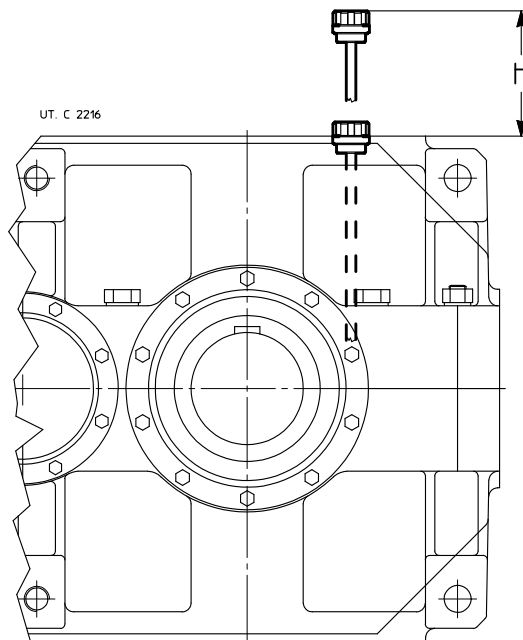
Desiccant breather with 3 stage filtration design: solid contaminant filter 2  $\mu\text{m}$ , water vapor adsorbent bed in silica gel, activated carbon final filter. This filter traps water vapor and solid contaminant particles and keeps them from entering the gear box and simultaneously holds oil vapors 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:  $-82^\circ\text{F}$   $+199^\circ\text{F}$ .

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

### (14) Oil level with dip stick



Gear reducer size	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

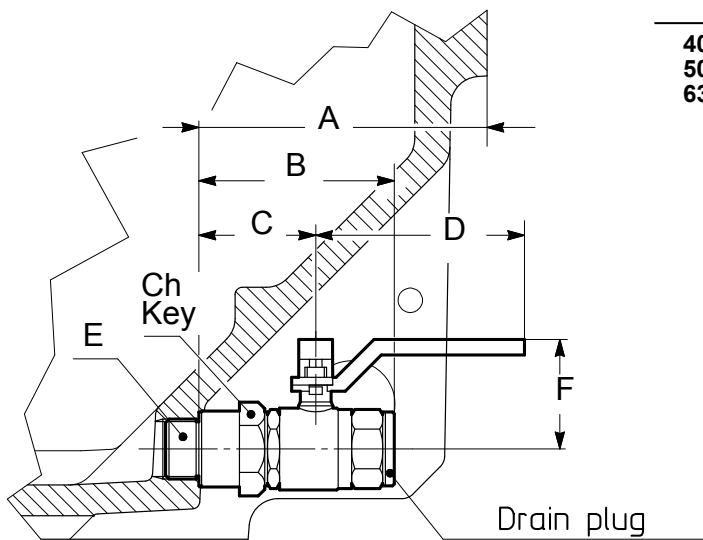
12

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

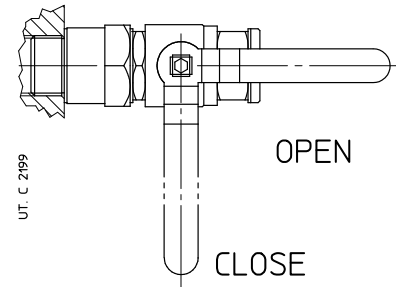
Supplementary description when ordering by **designation**: **Oil level with dip stick**

- 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).

## (15) Oil drain tap

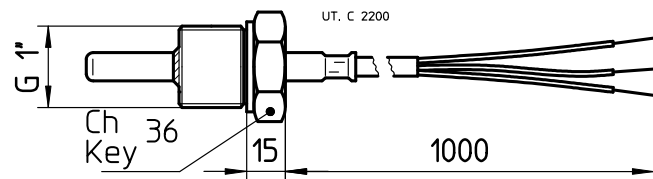
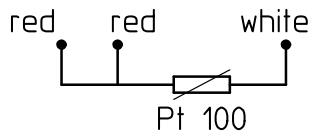


Gear reducer size	A	B	C	D	Ch Key	E	F
<b>4000, 4501</b>	158	106	66	115	46	G1"	60
<b>5000, 5601</b>	208	106	66	115	46	G1"	60
<b>6300, 6301</b>	190	106	66	115	46	G1"	60
<b>7101</b>	225	158	95	138	55	G1"	75
<b>8001</b>	280	170	102	158	60	G1"	91



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 (at Buyer's responsibility) instead of an existing drain plug, or into a hole properly pre-arranged. The temperature gauge is realized with a thermo-resistor Pt100 having following features:

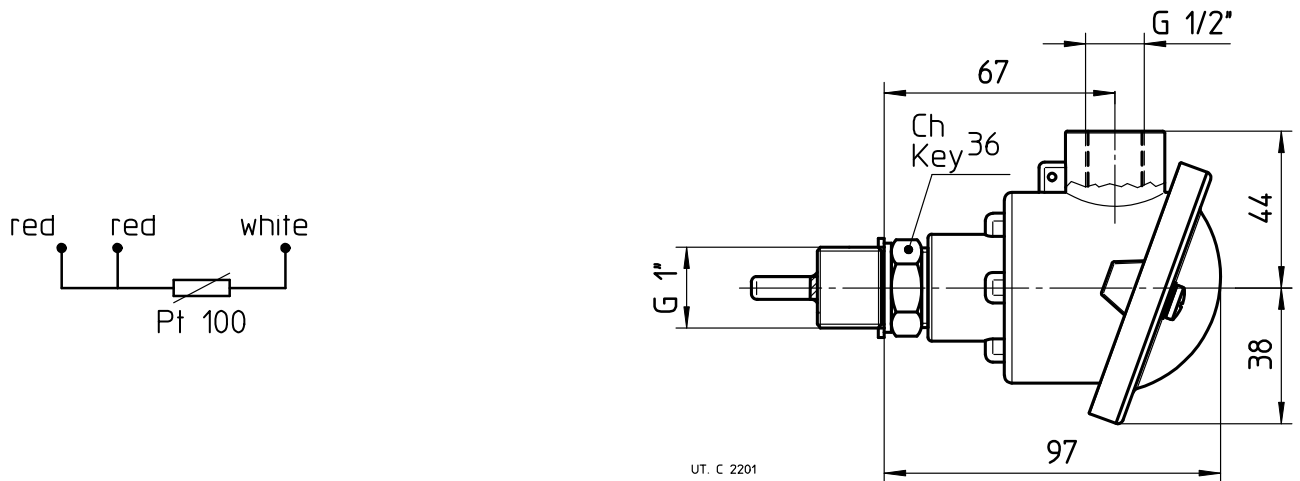
- platinum wire with 100  $\Omega$  at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °F +328 °F (-40 °C +200 °C);
- max current 3 mA;
- 3 wires connection according to IEC 751 (see fig. below);
- stainless steel probe AISI 316; diameter 6 mm;
- cable 1 m long with free end.

For the connection of probe to relevant signalling device CT03 or CT10 (on request, consult us) use a protected section cable  $\geq 1.5$  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 amperometric transducer 4 ÷ 20 mA



Remote oil temperature gauge, with terminal box and amperometric transducer; installation (at Buyer's responsibility) instead of drain plug. The temperature gauge is realized with a thermo-resistor Pt100 having following features:

- platinum wire with 100  $\Omega$  at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- temperature range -40 °F - +328 °F (-40 °C - +200 °C);
- 3 wires connection according to IEC 751 (see fig. below);
- stainless steel probe AISI 316; diameter 6 mm;
- amperometric transducer with output signal 4 - 20 mA;
- aluminium terminal block (supplied without cable gland);
- protection IP65;
- input cables G ".

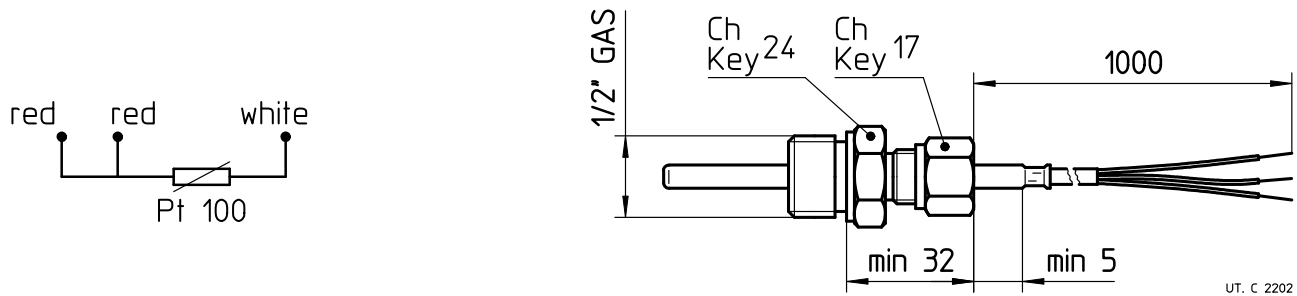
For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable  $\geq 1,5 \text{ mm}^2$  positioned separately from power cables.

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

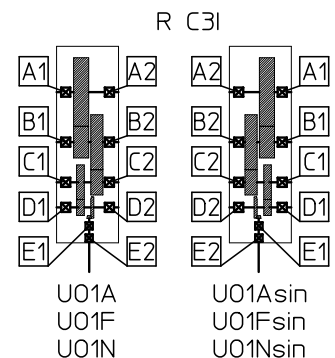
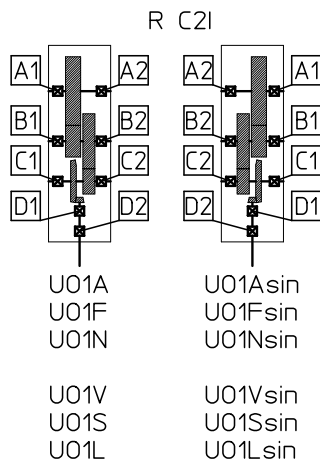
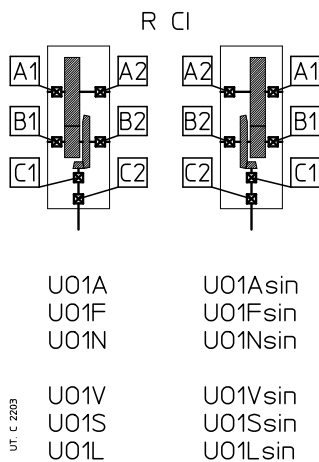
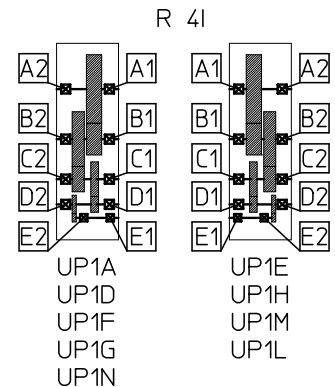
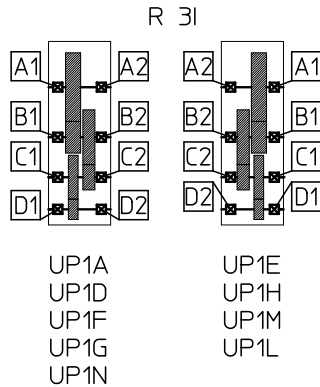
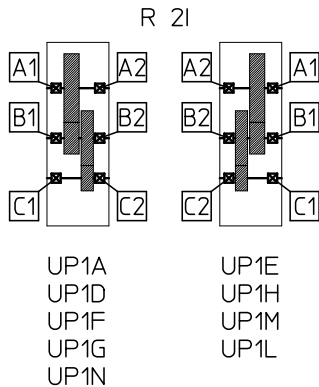
In case of gear reducer supplied **filled with oil** foresee the probe equipped with **immersion bulb** (pre-mounted in the factory), its position is to be agreed with Rossi; consult us.

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

## (18) Bearing temperature probe



UT. C 2202



UT. C 2203

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:

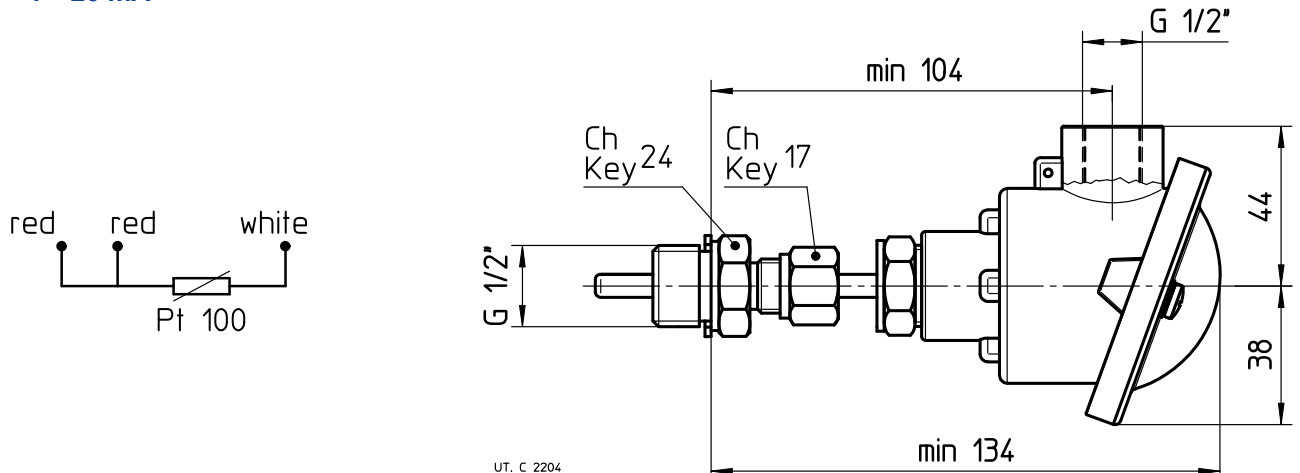
- platinum wire with 100 Ω at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °F 328 °F (-40 °C – + 200 °C);
- max current 40 mA;
- 3 wire connection according to IEC 751 (see fig. on the top);
- stainless steel AISI 316 flat probe; diameter 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 mA



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:

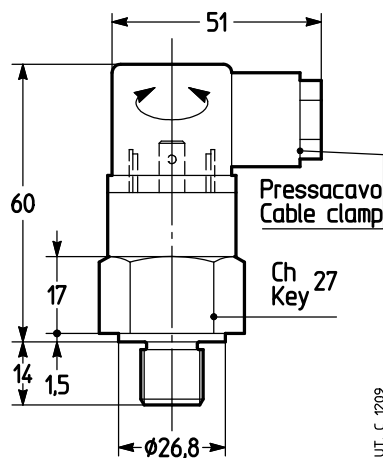
- platinum wire with 100  $\Omega$  at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °F 328 °F (-40 °C – +200 °C);
- 3 wire connection according to IEC 751 (see fig. on the top);
- ammetric transducer with output signal 4 – 20 mA;
- aluminium terminal block (supplied without cable gland);
- IP65 protection;
- input cables G ”;
- 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:

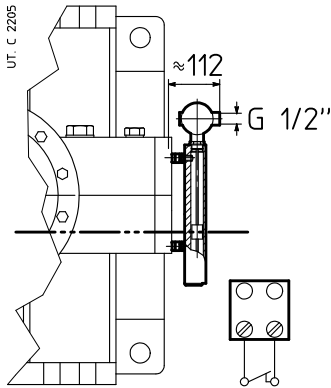
- NC contact with maximum current 10 A 240 V a.c. (5 A - 24 V c.c.);
- G 1/2" thread connection;
- cable gland Pg09 DIN 43650;
- protection IP65;
- operating temperature 194 °F  $\pm 9$  °F (90  $\pm 5$  °C) (further operating temperatures are available on request);
- differential temperature 59 °F (15 °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.

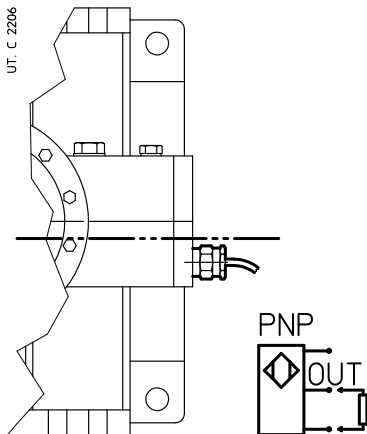
The switch is supplied ready for use; when level goes down approx 5 mm, the switch goes on and contact opens.

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 °F +257 °F (-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.**

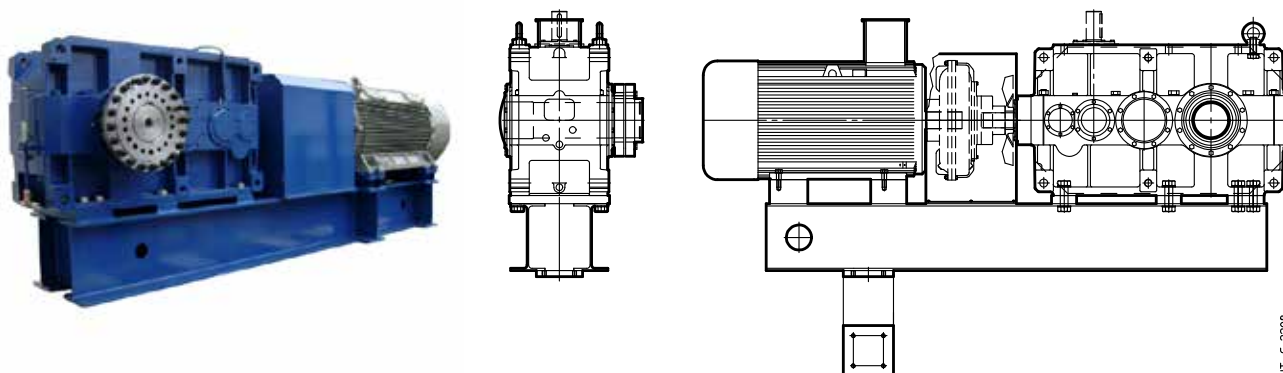
## (24) Remote temperature indicator instrument with set point

Digital thermometer (dimensions 72x213x30 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.

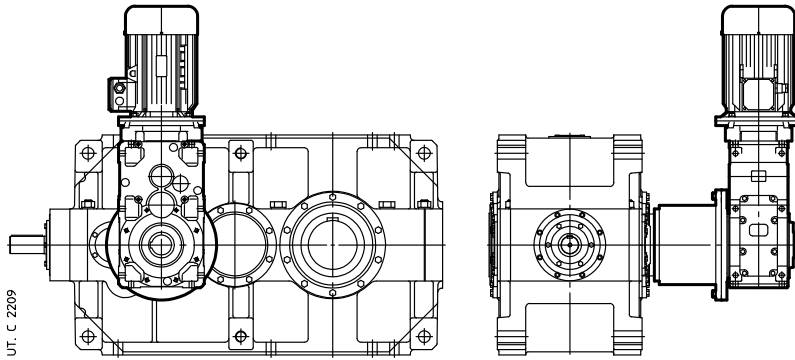
#### Joint

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.

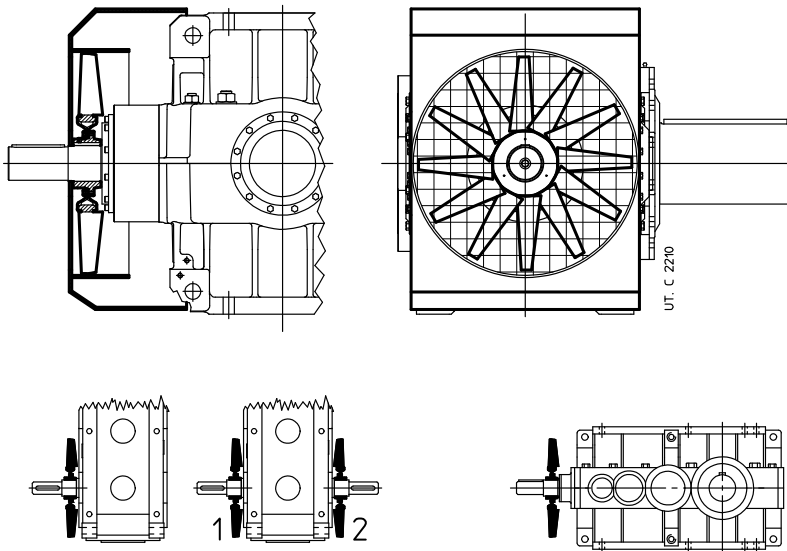
For further details see cat. RE: consult us.

## - Auxiliary drive



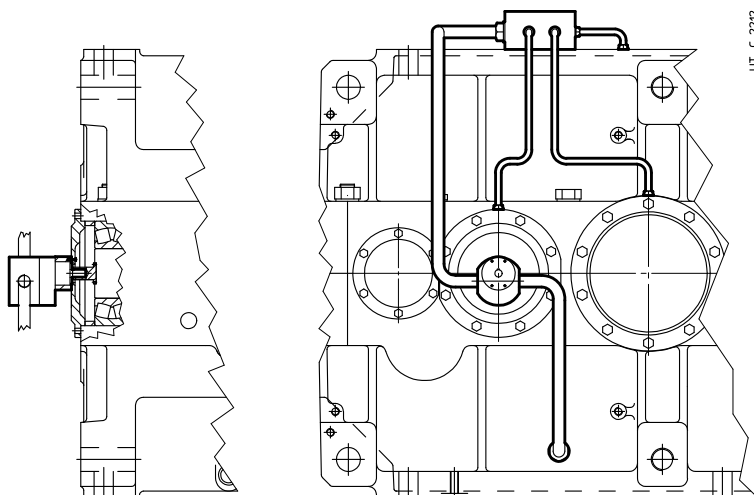
Additional motor drive with bevel helical gearmotor (cat. G, trains of gears Cl, lCl, C2l) connected with main gear reducer through bell, coupling and free wheel.

## - Axial fan cooling



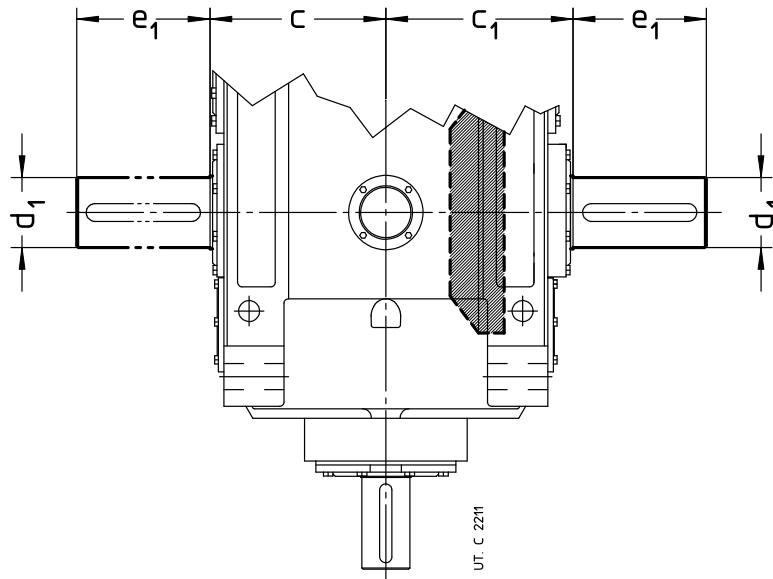
Forced cooling by axial fan for applications with one direction of rotation only (to be specified when ordering); for thermal factor values  $f_{t1b}$  see ch. 4. The possible designs are those illustrated below. Dimensions on request: consult us.

## - 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.

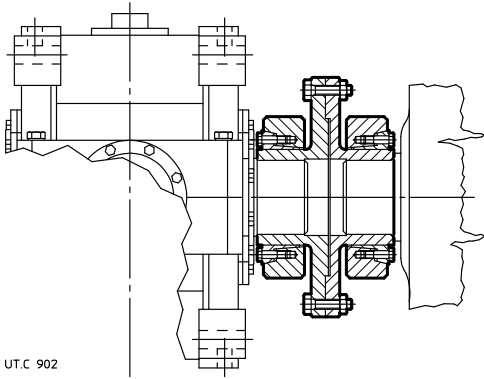
Size	R C1				R C2I				R C3I			
	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>	c	c <sub>1</sub>	d <sub>1</sub> Ø	e <sub>1</sub>
<b>4000 ... 4501</b>	330	370	120	210	335	335	90	170	325	325	65	140
<b>5000 ... 5601</b>	-	-	-	-	430	430	110	210	405	405	80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

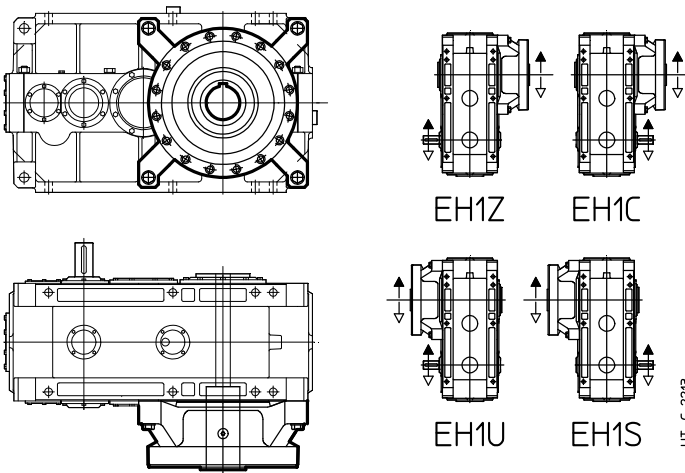
- 1) First reduction stage nominal transmission ratio.
- 2) For R C2I 6301 with  $i_N = 56$ :  $u_{N1} = 2,5$  instead of 3,15.
- 3) For R C3I 6301 with  $i_N = 200$ :  $u_{N1} = 2,5$  instead of 3,15.

## - 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).

## - 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  $T \leq 135 \text{ }^\circ\text{C}$  (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 polyurethan conductive enamel, color grey RAL 7040, corrosivity class C3 ISO 12944-2;
- oil temperature probe and eventual bearing temperature probe (cat. 2 GD).

# Installation and maintenance

13.1 - Safety.....	128
13.2 - Application conditions and use limits.....	128
13.3 - General.....	128
13.4 - Mounting of components on high and low speed shaft ends.....	129
13.5 - Machine shaft end.....	130
13.6 - Lubrication .....	130
13.7 - Gear reducer starting at low ambient temperature ( $T_{amb} = T_{oil} \leq 77 \text{ }^\circ\text{F}$ ) .....	131
13.8 - Shaft mounting arrangements.....	131
13.9 - Tightening torques .....	132
13.10 - Nameplate.....	132

## 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).

## 13.2 - Application conditions and use limits

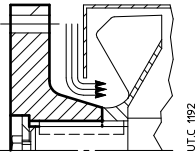
Gear reducers are designed **for industrial applications according to name plate data**, when no vibrations (permissible vibration velocity:  $v_{\text{eff}} < 0.14$  in/s for  $P_1 \leq 20$  hp,  $v_{\text{eff}} < 0.18$  in/s for  $P_1 > 20$  hp), no nuclear radiations and important magnetic fields, with ambient temperature  $-4$  °F ( $-20$  °C)  $+104$  °F ( $+40$  °C) with peaks at  $+122$  °F ( $+50$  °C), with air velocity  $\geq 4$  ft/s, maximum altitude 3281 ft, and max relative humidity 80 % .

For continuous ambient temperature higher than  $104$  °F ( $+40$  °C) or lower than  $-4$  °F ( $-20$  °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).



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).

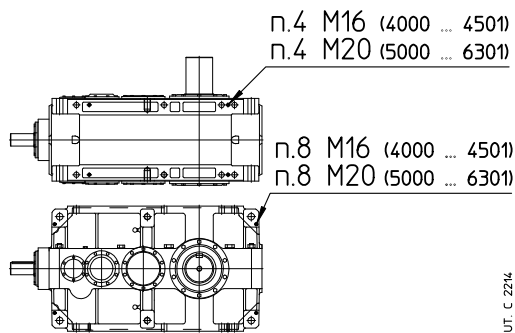
For outdoor installation or in a hostile environment protect the gear reducer or gearmotor with anticorrosion paint. Added protection may be afforded by water-repellent grease (especially around the rotary seating of seal rings and the accessible zones of shaft end).

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 104 °F (40 °C) or less than 32 °F (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 176 212 °F. (80 – 100 °C)

The couplings having a tip speed on external diameter up to 66 ft/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 3.2 ft/s it is necessary to install proper malfunction markers such as aligning sensors, etc;
- in the gear transmission there is an adequate gear mesh ( $\approx 0,03 \text{ } 0,04 \cdot m$ ) 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 104 °F (40 °C).

Speed $n_2$ rpm	Ambient temperature <sup>1)</sup>				
	mineral oil			synthetic oil	
	-4 - 32 °F (-20 - 0 °C)	32 - 68 °F (0 - 20 °C)	68 - 104 °F (20 - 40 °C)	-4 - 32 °F (-20 - 0 °C)	32 - 104 °F (0 - 40 °C)
> <b>224</b>	150	150	150	150	150
<b>224 - 22.4</b>	150	150	220	220	220
<b>22.4 - 5.6</b>	150	220	320	320	320
< <b>5.6</b>	220	320	460	460	460

Oil temperature		Oil change interval [h]	
°F	°C	mineral oil	synthetic oil
≤ <b>149</b>	≤ 65	8 000	25 000
<b>149 - 176</b>	65 - 80	4 000	18 000
<b>176 - 203</b>	80 - 95	2 000	12 500
<b>203 - 230<sup>1)</sup></b>	95 - 110 <sup>1)</sup>	—	9 000

### Oil types

Manufacturer	PAO synthetic oil	mineral oil
	ISO VG 150 ... 460	ISO VG 150 ... 460
AGIP	Blasia SX	Blasia
ARAL	Degol PAS	Degol BG
BP	Enersyn EPX	Energol GR XP
CASTROL	Alphasyn EP	Alpha SP
FUCHS	Renolin Unisys CLP	Renolin CLP
KLÜBER	Klübersynth GEM4	Klüberoil GEM1
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 18 °F (10 °C) above the ambient temperature range are acceptable. For the running at **cold starting** ( $T_{amb} = T_{oil} \leq 77 \text{ °F (25 °C)}$ ) 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 ( $T_{amb} = T_{oil} \leq 77 \text{ °F (25 °C)}$ )

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  $\geq -4 \text{ °F (-20 °C)}$ , 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 140 °F.

### 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  $\geq 77 \text{ °F (25 °C)}$ , 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 77 °F (25 °C).

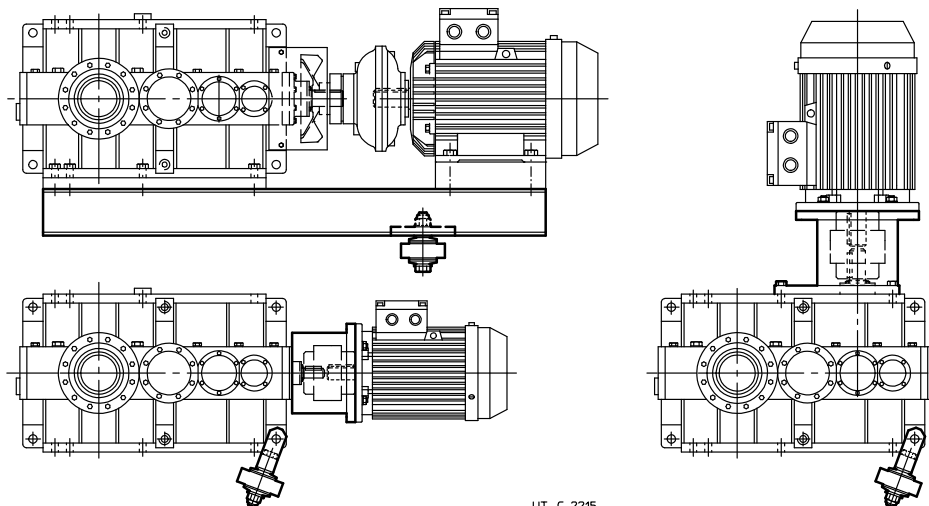
## 13.8 - Shaft mounting arrangements

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.

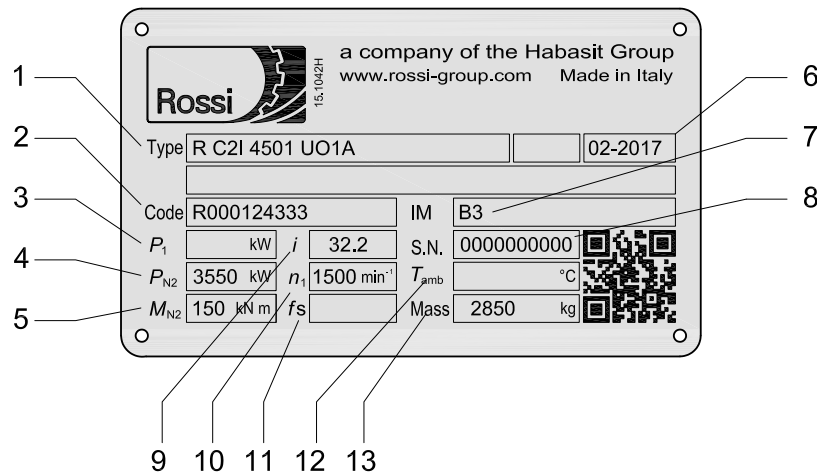
In general, the bolts are to be diagonally tightened with the maximum tightening torque.

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 DIN 931 DIN 912	Tightening torque $T_s$ [lbf in]			
	Feet, flanges and threaded holes at the shaft butt-end			Shrink disc Class 10.9
	Class 8.8	Class 10.9	Class 12.9	
<b>M10</b>	442	619	752	-
<b>M12</b>	752	1062	1283	-
<b>M16</b>	1814	2566	3097	-
<b>M20</b>	3540	4956	6018	4336
<b>M24</b>	6283	8850	10619	7434
<b>M27</b>	8938	12389	15044	11062
<b>M30</b>	12212	17257	20796	-
<b>M36</b>	22124	31416	37168	-
<b>M45</b>	44248	61947	74336	-
<b>M56</b>	86726	122124	146018	-

## 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

**velocity** in rotary motion

**speed**

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

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

starting or stopping **distance** as a function of a starting or stopping time, of a starting or braking velocity

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

**mass**

**weight** (weight force)

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

**dynamic moment  $Gd^2$ , moment of inertia  $J$**  due to a motion of translation (numerically  $J = \frac{Gd^2}{4}$ )

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

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

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

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

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

## With Technical System units

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

$$v = \frac{\pi \cdot d \cdot n}{60} = \frac{d \cdot n}{19,1} \text{ [m/s]}$$

$$n = \frac{60 \cdot v}{\pi \cdot d} = \frac{19,1 \cdot v}{d} \text{ [min}^{-1}\text{]}$$

$$\alpha = \frac{n}{9,55 \cdot t} \text{ [rad/s}^2\text{]}$$

$$\alpha = \frac{39,2 \cdot M}{Gd^2} \text{ [rad/s}^2\text{]}$$

$$\varphi = \frac{n \cdot t}{19,1} \text{ [rad]}$$

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

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

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

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

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

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

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

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

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

$$W = \frac{G \cdot v^2}{19,6} \text{ [kgf m]}$$

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

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

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

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

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

## With SI units

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

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

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

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

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

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

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

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

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

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

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

m is the unit of mass [kg]

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

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

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

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

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

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

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

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

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

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

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

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

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

$$P = 1,73 \cdot U \cdot I \cdot \eta \cdot \cos \varphi \text{ [W]}$$

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

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